

Systematics and cladistic analysis of Cerophytidae (Elateroidea: Coleoptera)

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Abstract. The elateroid family Cerophytidae, originally based on *Cerophytum* Latreille, is characterized and revised. Detailed morphological studies of adults and a cladistic analysis permitted the recognition of three well-defined lineages: one in the Holarctic Region, and the other two in the Neotropical Region, each one distributed from southern Mexico to South America. The resulting cladogram for these genera is ((*Cerophytum*) (*Brachycerophytum*, *Phytocerum*)). *Cerophytum* includes four species: *C. elateroides* (Latreille) (type species, southern and central Europe), *C. convexicolle* (LeConte) (western U.S.A.), *C. japonicum* Sasaji (Japan) and *C. pulsator* (Haldeman) (eastern U.S.A.). *Brachycerophytum* gen.n. contains two Neotropical species: *B. fuscicorne* (Bonvouloir) comb.n. (type species, Mexico to Colombia) and *B. sinchona* sp.n. (Peru and Bolivia). *Phytocerum* gen.n. includes fifteen species: *P. golbachi* sp.n. (type species, Argentina), *P. alleni* sp.n. (Costa Rica, Nicaragua), *P. belloi* sp.n. (Brazil), *P. birai* sp.n. (Brazil), *P. boliviense* (Golbach) comb.n. (Bolivia), *P. burakowskii* sp.n. (Trinidad), *P. cayennense* (Bonvouloir) comb.n. (Mexico, French Guyana, Brazil), *P. distinguendum* (Soares & Peracchi) comb.n. (Brazil, Paraguay and Argentina), *P. serraticorne* sp.n. (Guatemala), *P. golbachi* sp.n. (Argentina), *P. ingens* sp.n. (Brazil), *P. inpa* sp.n. (Brazil), *P. minutum* (Golbach) comb.n. (Argentina), *P. simonkai* sp.n. (Trinidad), *P. trinidadense* (Golbach) comb.n. (Trinidad) and *P. zikani* (Soares & Peracchi) comb.n. (Brazil). Diagnoses for the genera, redescriptions and descriptions for the species, as well as keys to genera and species, are provided. The larva of *C. elateroides* is redescribed.

Introduction

Cerophytidae, up to now, included *Cerophytum* Latreille with eleven species from Japan (one), Europe (one), the U.S.A. (two), and Central and South America (seven). *Anischia* Fleutiaux was also included in the family by some authors (Schenkling, 1928; Soares & Peracchi, 1964), but Fleutiaux (1936) placed that genus in a new subfamily of Elateridae [considered to be *incertae sedis* by Lawrence & Newton (1995)], and Lawrence *et al.* (1999b) elevated Anischiinae to family rank. *Aphytocerus* Zherikhin (1977), based on two species from Upper Cretaceous amber, was

also placed here by its author. Although this genus is superficially similar to *Cerophytum* and may well represent a plesiomorphic sister group, diagnostic features of the family are either absent or not visible on the types. The genus will be excluded from further consideration in this paper.

Latreille (1825, 1834) divided his 'Serricornia' into two large groups: the 'Sternoxi' (= Elateroidea *pars*) and the 'Malacodermi' (= Cantharoidea *pars*). *Cerophytum* was included in Sternoxia along with *Throscus*, *Trixagus*, *Lisso-*
mus, *Drapetes*, *Chelonarium* and *Cryptostoma*. Lacordaire (1857) placed *Cerophytum* in a separate family, based on the absence of metacoxal plates, and suggested a relationship to Eucnemidae. The unusual, apparently plesiomorphic, nature of the cerophytid propleurocoxal mechanism prompted Hlavac (1975) to remove the group from

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Elateroidea and place it together with two other elateriform families of doubtful affinities, Armatopodidae and Brachypsectridae. Lawrence (1988) presented a phylogeny and classification of Elateriformia based on cladistic and phenetic analyses. He associated Cerophytidae with Throscidae (*s.s.*) and Eucnemidae. A similar association was found in analyses conducted by Calder *et al.* (1993), Beutel (1995) and Lawrence *et al.* (1995). In Muona's (1993) revision of Eucnemidae, Cerophytidae were considered basal to the elateroid complex (Elateroidea *sensu* Crowson, 1955) and in a later cladistic analysis (Muona, 1995) Cerophytidae and Eucnemidae formed one clade, whereas Throscidae represented a derived group within Elateridae.

Three previous works deal with the species of *Cerophytum*. Soares & Peracchi (1964) described two new species of *Cerophytum* from Brazil and presented a key to seven Neotropical species. Golbach (1983) added three additional Neotropical species, and Sasaji (1999) described the first species from Japan. Burakowski (1991) briefly redescribed the family, giving morphological data on the mouthparts and the male and female reproductive organs of *C. elateroides* for the first time.

Materials and methods

Material

We examined 118 adults and two larvae from the following collections and institutions: Ayr de Moura Bello Collection (private), Rio de Janeiro (AMBC); Canadian National Collections of Insects, Arachnids and Nematodes, Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-food Canada, Ottawa (CNCI); American Museum of Natural History, New York (AMNH); Australian National Insect Collection, CSIRO Entomology, Canberra (ANIC); California Academy of Sciences, San Francisco (CASC); California State Collection of Arthropods, Sacramento (CDAE); Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba (DEES); Instituto Miguel Lillo, San Miguel de Tucumán (IMLA); Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA); Museum of Comparative Zoology, Harvard University, Cambridge (MCZC); Entomologie, Museum National d'Histoire Naturelle, Paris (MNHN); Plant Science Department, South Dakota State University, Brookings (SDSU); Museu de Zoologia, Universidade de São Paulo, São Paulo (MZSP); National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM).

Measurements and terminology

The terminology for the pterothorax is based on Lawrence *et al.* (1999b). Wing vein homologies are based on Kukalová-Peck & Lawrence (1993), with modifications from Haas & Kukalová-Peck (2001). The length was taken from the anterior part of the head to the apex of the elytra.

Cladistic analysis

A phylogenetic analysis was performed with the twenty-one known species of Cerophytidae (one of them, *C. japonicum*, from the literature) and five species as outgroup taxa (Nixon & Carpenter, 1993), for which eighteen morphological noncontinuous characters (Appendix 1) of adults were used (seventeen binary and one multistate and nonadditive). Some of these characters were used by Calder *et al.* (1993) and Muona (1995) in their analyses of Elateriformia, and in this case the reference is cited after the respective character. The phylogenies presented by Calder *et al.*, Muona and Lawrence *et al.* (1995), and the comments by Lawrence *et al.* (1999b) were adopted for the selection of the operational outgroup taxa. The following species were considered: *Pyrophorus noctilucus* L. and *Physodactylus henningi* Fisch.-Waldh. (Elateridae); *Cryptosoma spinicornis* (F.) and *Gastraulacus bisulcatus* (Latreille) (Eucnemidae); *Aulonothroscus* sp. (Throscidae). Parsimony analyses were performed using PAUP Version 4.0b10 (Swofford, 2001) with all characters treated as unweighted. Whenever necessary, the accelerated transformation (ACCTRAN and DELTRAN) optimization was used. Taxonomic equivalents were deleted (Wilkinson, 1995), resulting in eight terminals analysed. In the data matrix, unknown data are represented by '?' and inapplicable data by '-'.

Biology

Most of our knowledge of cerophytid biology is based on data from European *C. elateroides* (Latreille) and North American *C. pulsator* (Haldeman). Adults have been collected in light traps or malaise traps, by beating vegetation, or in association with rotten wood or bark, and in north temperate regions they may be found in the spring in mature, mainly deciduous forests and are active at night (Steiner, 2000). *Cerophytum elateroides* has been reported from a number of deciduous tree genera, including *Ulmus*, *Fagus*, *Quercus*, *Salix*, *Populus*, *Acer*, *Tilia*, *Betula* and *Juglans*. Cerophytid adults are capable of 'clicking' like Elateridae, but there has been some confusion as to the nature of the jumping mechanism. Haldeman (1845) noted that *C. pulsator* draws the fore legs close to the prothorax and then releases them. Although this movement of the fore legs was confirmed by du Buysson (1910) for *C. elateroides*, the latter author pointed out that the actual jumping mechanism was similar to that in elaterids (involving the sudden release of the prothorax, which is held under tension by a small mucro at the edge of the mesoventral cavity). This author also observed the beetles to jump without moving the fore legs. Further confusion was caused by the statement made by Crowson (1955) that *Cerophytum* '... is able to leap by the action of its hind legs...'. It is possible that the enlarged and modified profemora and the loss of metacoxal plates in Cerophytidae are both connected with some kind of escape behaviour, but further observations are needed.

The larva of *C. elateroides* was first described by Rey (1887) based on specimens collected with an adult in the rotten trunk of *Sambucus*. Although the description is brief and unillustrated, the mention of two unique features, the five-dentate labial plate (considered to be epistomal) and the paired claws on the front legs, makes it obvious that this larva is the same as that later described by Mamaev (1978). This description was more or less ignored by later authors, and the larva described by van Emden (1932) as that of *C. elateroides*, belongs to Dryopidae (Lawrence & Newton, 1995). Mamaev redescribed and illustrated the true *Cerophytum* larva based on a series of specimens found in the dark fungus-infested wood (brown rot) of a dead standing *Ulmus* in association with larvae of Oedemeridae. Using specimens from the same series, Lawrence (1991) and Lawrence *et al.* (1999a) provided a more complete description and new illustrations, pointing out that the spiracles seen by Mamaev were actually paired glandular structures present on all thoracic segments and all but the last two abdominal segments. It is likely that these larvae feed in old brown rotten wood belonging to a variety of hardwoods.

Cerophytidae Latreille, 1834

Adult. Length: 4.3–9.2 mm (Fig. 1). Head about as long as wide, deeply inserted into prothorax and only slightly

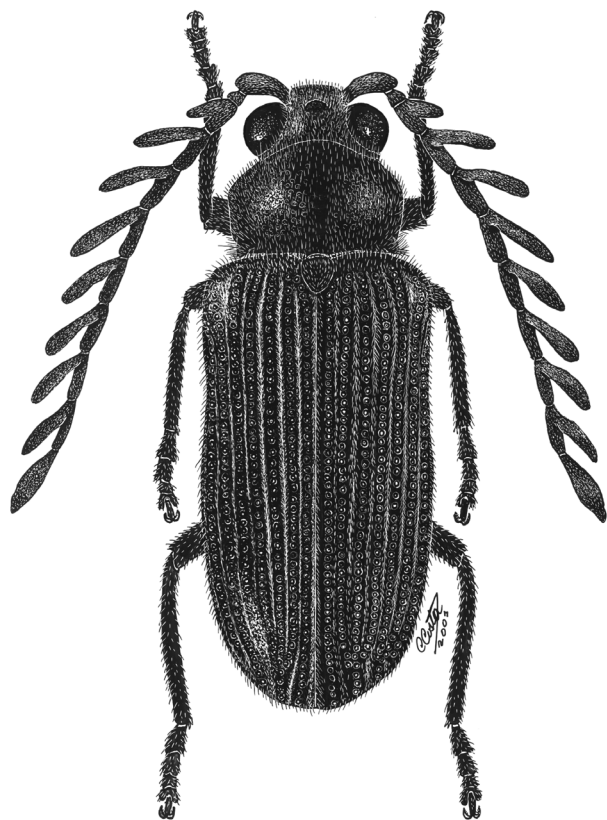


Fig. 1. *Phytoceram minutum*, habitus, male holotype. Length = 5.1 mm.

declined, with weak occipital carina continuing behind and below eyes to form short subgenal ridges; frons produced in front of eyes forming median prominence bearing antennal insertions, and strongly declined in front of this, so that frontoclypeal region is more or less vertical, with or without anterior median carina, and mouthparts are directed ventrally; frontoclypeal suture absent. Eyes large, more or less globular, strongly protruding and finely faceted, with exocone ommatidia and no interfacetal hairs. Antennal insertions moderately close together, partly exposed from above or concealed by frontal ridges; subantennal grooves absent. Gular sutures widely separated; corporotentorium absent. Cervical sclerites well developed. Antennae (Figs 2A–F, 16A, B, E, F, 19A–I) 11-segmented, serrate to pectinate from antennomere 3–10, with rami arising from base of each, 11 simple and narrowly rounded or notched; scape more than 3× as long as pedicel, which is attached subapically, so that antennae are more or less geniculate. Labrum (Figs 3A, 13F, 28A) free, well sclerotized, strongly transverse and truncate. Mandibles (Figs 3B, C, 13B, C, 28B, C) narrow, strongly curved and acute; without mola but with membranous prostheca. Maxillae (Figs 3D, 28D) with both galea and lacinia densely setose at apex; apical palpomere more or less expanded and truncate, usually securiform or elongate oval. Ligula (Figs 3E, 13E, 28E) membranous, rounded apically; palps approximate, apical palpomere subtriangular.

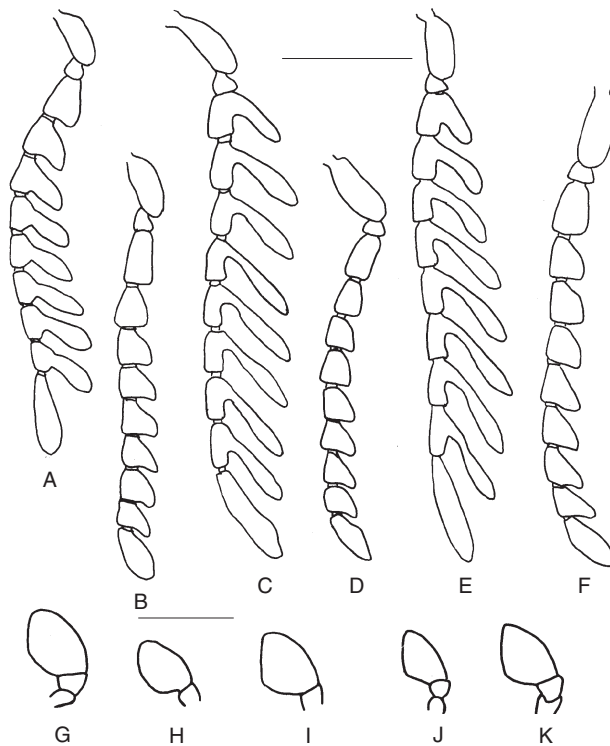


Fig. 2. *Cerophytum* spp. Antenna: A, B, *C. convexicolle*, male and female; C, D, *C. elateroides*, male and female; E, F, *C. pulsator*, male and female. Maxillary palpomere: G, *C. convexicolle*, female; H–I, *C. elateroides* male and female; J, K, *C. pulsator*, male and female. Scales = 1.0 mm (A–F); 0.5 mm (G–K).

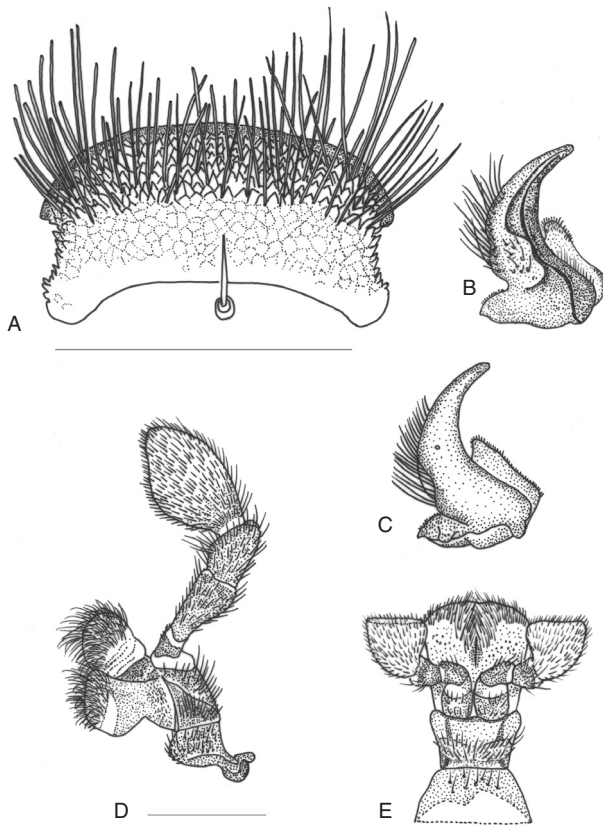


Fig. 3. *Cerophytum pulsator*, male. A, Labrum; B, C, mandibles, dorsal and ventral; D, maxilla, ventral; E, labium. Scale = 0.5 mm (A; B–E).

Prothorax (Figs 4A–J, 14A–I, 20A–F) strongly transverse, without lateral carinae; posterior angles acute and slightly produced laterally or obtuse and not produced; posterior interlocking device weakly developed; disc moderately convex. Hypomera extensive, obliquely vertical; prosternum strongly convex, at least $2\times$ as long as a coxal cavity; chin piece variable, either absent or present and ventrally directed; head rest (upper surface of anterior edge of sternum) strongly oblique (from lateral perspective) and hemispherical to strongly transverse; prosternal process moderately broad and curved dorsally, laterally expanded at middle to form secondary condyle on each side, then narrowed to form acute apex which fits into mesoventral cavity; procoxal cavities subglobular or slightly transverse, open internally and externally. Procoxa with long, narrow internal extension, articulating with a long, narrow, concealed trochantin and its attached endopleuron, latter not fused to hypomeron.

Elytra with 9 distinct puncture rows, sometimes with an additional subhumeral row (Fig. 23C); scutellary striole absent; epipleuron wide anteriorly, abruptly narrowed just behind humeri and extending almost to apex, narrow posterior portion weakly delimited and almost vertical (completely visible in lateral view). Scutellum abruptly elevated, with straight basal edge, slightly rounded lateral edges and apex subacute to rounded.

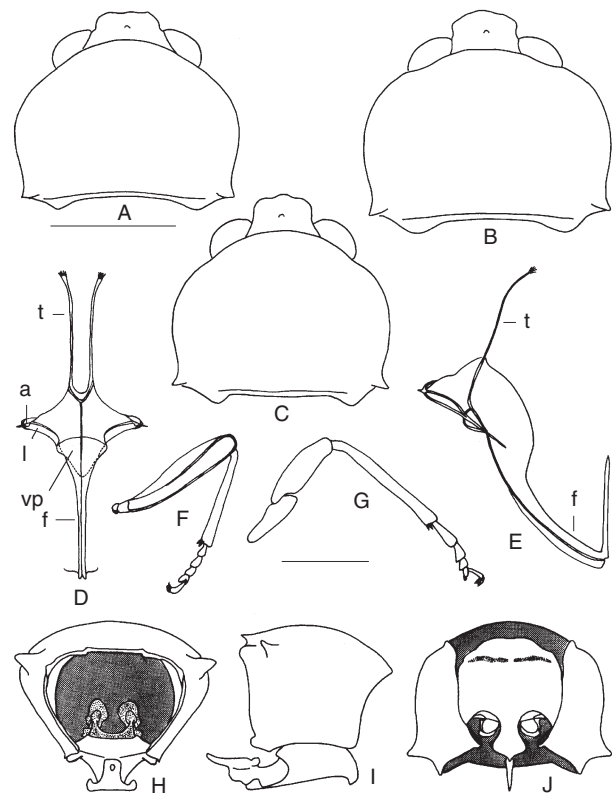


Fig. 4. *Cerophytum* spp. A, *C. convexicolle*, male, head and pronotum; B, *C. pulsator*, male, head and pronotum; C–J, *C. elateroides* male, head and pronotum, metendosternite (dorsal and lateral), proleg, metaleg, posterior prothorax, lateral prothorax, ventral prothorax. a = lateral arm; f = furca; l = lateral part of ventral process; t = anterior tendon; vp = ventral process. Scale = 1.0 mm (A–E, H–I; F, G).

Pterothorax strongly convex. Mesoventrite (Fig. 14I) with large, deep mesal cavity, preceded by sclerotized lip, flanked anteriorly by a pair of concave areas and posteriorly by the mesocoxal cavities, and extending posteriorly almost to edge of ventrite; mesometaventral junction a straight line separating coxal cavities by more than half the shortest diameter of one of them. Mesepisternum separated by suture from mesoventrite, anteriorly with narrow, oblique housings into which hypomera fit, posteriorly fused to mesepimeron, a vague internal ridge probably indicating position of reduced pleural apophysis. Metaventrite without discrimen; visible portion of metepisternum very narrow and distant from mesocoxal cavity; metacoxae large and somewhat oblique, extending laterally to meet epipleura; coxal plates completely absent. Metendosternite (Fig. 4D, E) with long stalk, short, broad arms, and well-developed anterior process bearing approximate tendons.

Hind wing (Fig. 21J) about $2.25\times$ as long as wide, with very short apical area bearing 2 parallel, oblique, anterior sclerotizations and sometimes an additional oblique posterior one; radial cell elongate, its base complete, forming a right or very slightly acute angle; cross-vein r3 moderately

long and slightly oblique, extending almost to RP, which extends to basal third of wing; medial area with 4 free veins (MP₃, MP₄+CuA₁, CuA₂ and AA₃); wedge cell absent; anal notch absent, AP₃₊₄ undivided.

Legs (Figs 4F, G, 14C, D, 23F, H) moderately long and slender. Protrochanter short, less than one-fifth length of profemur with trochanterofemoral joint truncate or slightly oblique; profemur subequal in length to protibia, with ventral longitudinal carina and slight concavity into which protibia fits, sometimes with additional longitudinal carina on posterior surface (Figs 4F, 14C, 23F). Meso- and metatrochanters (Figs 4G, 14D, 23H) longer, more than 0.5× as long as corresponding femora, with trochanterofemoral joints strongly oblique; meso- and metafemora without longitudinal carina and only 0.75–0.85× as long as corresponding tibiae. Tibial spurs small, paired and subequal on all tibiae. Tarsi 5-5-5; tarsomere 1 and 5 about equal in length, 2 shorter than 1, 3 and 4 subequals, the latter with a ventral lobe. Pretarsal claws pectinate; empodium not visible.

Abdomen strongly convex; basal 4 ventrites connate; 1 slightly shorter than 2 and bearing narrow, acute intercoxal process; 2, 3 and 4 subequal; 5 broadly rounded at apex. Abdominal spiracles on segments I–VIII, located in pleural membrane. Sternite VIII in ♂ broadly rounded anteriorly, without median strut; sternite IX (Fig. 12B) similarly rounded at base, produced apically to form elongate, narrow, apically rounded, lightly sclerotized process; tergite IX (Figs 12A, 5) in ♂ narrowly scleromarginate almost to base, distinctly separated from tergite X, which is long and narrow with rounded apex. Sternite VIII (Fig. 9C) in ♀ forming long spiculum ventrale.

Aedeagus (Figs 5, 15, 21, 22, 25, 26, 30, 31, 33) symmetrical, of trilobate type, phallobase, parameres and penis with extensive weakly sclerotized areas. Phallobase, ventrally, less sclerotized in the centre and more sclerotized at the proximal edge, with shallow to deep anterior emargination and long, narrow posterior process which is closely associated with ventral surface of penis. Parameres, ventrally, loosely articulated to phallobase, fused dorsally at base forming a more or less developed convex anterior projection; divided into 2 parts, the proximal sclerotized and with variable hooklike structures; and the distal membranous, unilobate, bilobate or trilobate. Penis more or less flattened; base with median, dorsally curved strut which joins parameres dorsally at their point of fusion.

Ovipositor (Figs 9A, B, 17A, 7C) long and narrow; coxites not divided, styli short and terminal, baculi elongate. Internal ♀ tract (Figs 9D, E, 17B, C, 7A, B) consisting of elongate vagina, large terminal bursa with 1 or 2 pairs of basal embedded sclerites; spermatheca present or absent.

Remarks. Until now the family was monogeneric to *Cerophytum* Latreille, 1809. However, the cladistic analyses (see below) showed the existence of three different clades, and it would be appropriate to nominate them as distinct genera: *Cerophytum*, *Brachycerophytum* and *Phytoceram*.

The mouthparts of *C. pulsator*, *B. sinchona* and *P. golbachii* have been studied. The mandibles of these

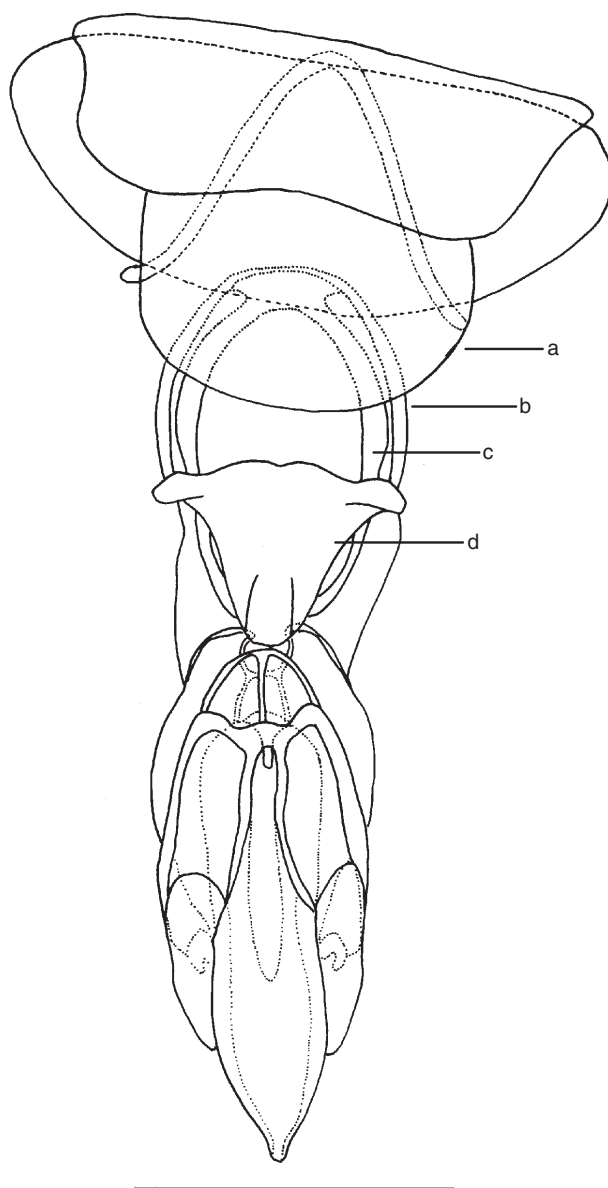


Fig. 5. *Phytoceram golbachii*, last abdominal segments and male genitalia, dorsal. a = tergite VIII; b = basal tergite arm IX; c = sternite IX; d = tergites IX–X. Scale = 1.0 mm.

three species present a very characteristic lobed and pilose prostheca that is absent in the examined species of Eucnemidae and Throscidae. In Elateridae, there is a prostheca represented by a row of setae.

The male genitalia of Cerophytidae are very peculiar, different from any other Elateriformia. When examining and dissecting the male genitalia of the Neotropical species, a structure was noticed which is similar to a 'phallobase' but located dorsally, herein named 'dorsal anterior projection of the parameres'. In *Cerophytum* (Fig. 8A–D), the dorsal anterior projection is very modified and fused to the base of the parameres. In *Brachycerophytum* (Fig. 8E–H) and

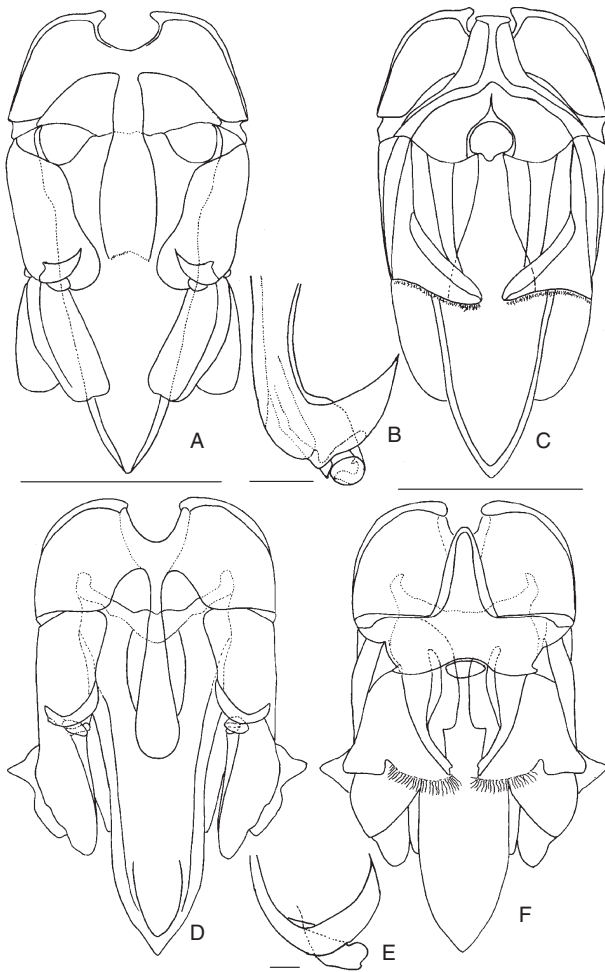


Fig. 6. *Cerophytum* spp. Male genitalia, ventral, parameres hook and dorsal. A–C, *C. convexicolle*; D–F, *C. elateroides*. Scales = 1.0 mm (A, C, F); 0.1 mm (B; E).

Phytoceram (Fig. 8I–L), it is well developed, clearly delimited with an incomplete or complete median rod, which in several species of *Phytoceram* gives the appearance of an inverted anchor.

Based on the Neotropical species, and considering the dorsal anterior projection of the parameres as the phallobase, it is necessary to suppose a displacement of that piece, from the ventral to the dorsal position. That dorsal condition occurs, for instance, in the genus *Chalcolepidius* (Elateridae) (Casari, 2002). However, we are following the traditional interpretation here, considering the phallobase as the ventral structure with a median apical appendix varying in length and width among the different species. However, this kind of phallobase is very unusual and probably unique to the Coleoptera and, at least for one of us (CC), the question remaining is: which structure is the real phallobase, the dorsal or the ventral? To answer that question, further detailed work is needed, and this will be the subject of a future paper.

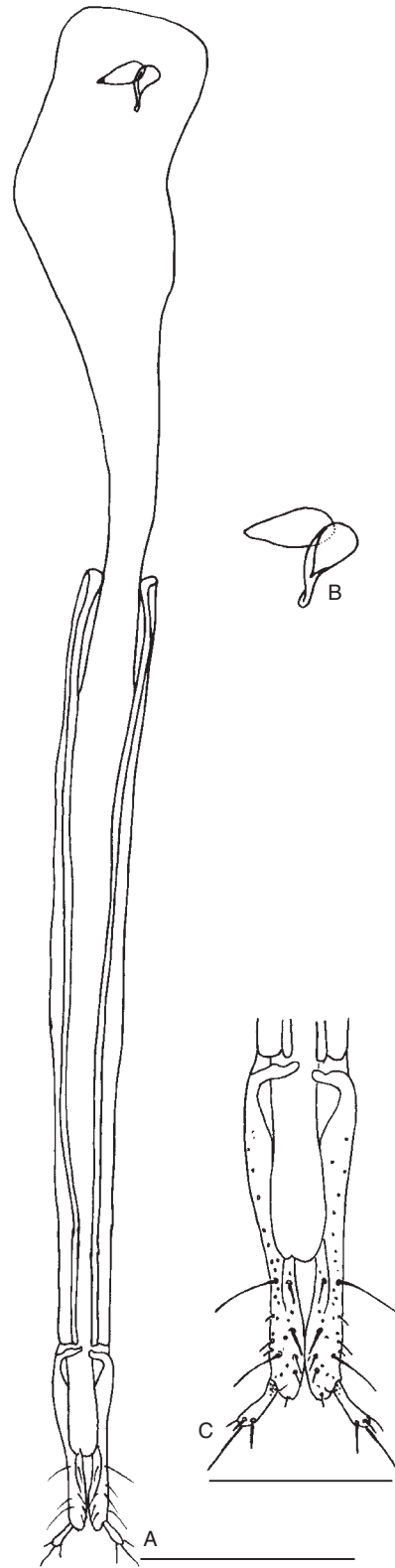


Fig. 7. *Phytoceram ingens*, female. A, genital tract; B, sclerotized plates from bursa copulatrix; C, ovipositor. Scales = 1.0 mm (A); 0.5 mm (B, C).

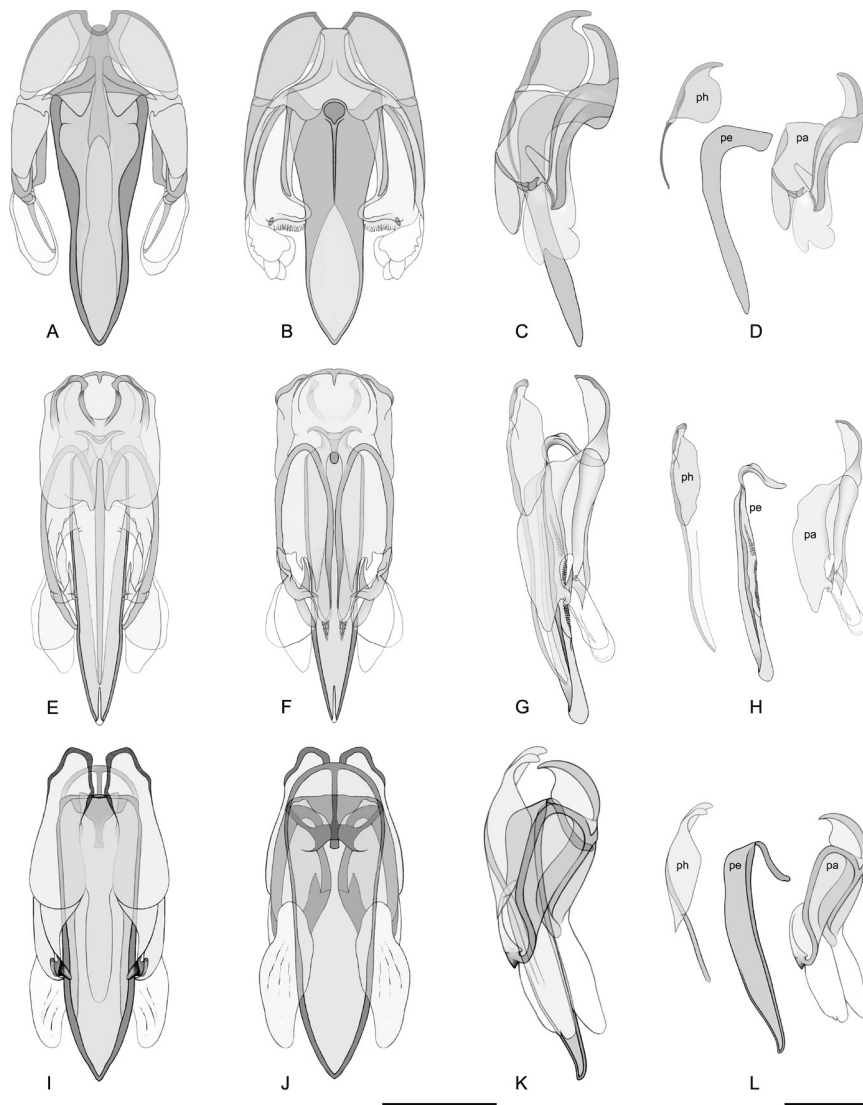


Fig. 8. Male genitalia, ventral, dorsal, lateral: A–D, *Cerophytum pulsator*; E–H, *Brachycerophytum sinchona*; I–L, *Phytoceram cayennense*; pa = parameres; pe = penis; ph = phallobase. Scale = 1.0 mm (A–C, E–G, I–K; D, H, L).

Larva (based on *C. elateroides*). Length: 3–15 mm (Fig. 10A, B). Body elongate, robust but more or less parallel sided, slightly curved ventrally; very lightly pigmented, white in colour, except for legs, anterior part of protergum and head capsule, which are yellow, and pretarsus, internal prothoracic skeleton and labial plate, which are dark brown; vestiture consisting of fine hairs or setae only.

Head (Fig. 10G, H) prognathous and protracted or slightly retracted, much narrower than thorax, strongly transverse and flattened above; posterior edge not emarginate; frontal arms and dorsal endocarinae absent; ventral longitudinal endocarinae present along lateral edges of maxillae and between maxillae and labium. One stemma on each side of head, with well-developed lens but no pigment spot. Antennae (Fig. 11I, J) short, 3-segmented; subconical sensorium on preapical antennomere longer

than apical antennomere, which bears a second conical sensorium. Frontoclypeal suture vaguely indicated. Labrum fused to head capsule, strongly transverse, deeply emarginate and lightly pigmented. Mandibles (Fig. 11A, B) flattened, symmetrical and nonopposable, more or less parallel to one another and fitting into lateral channels on labial plate; each mandible with basolateral, rounded expansion, narrow, blade-like, sharply acute apex, and internal channel extending from near base to apex; mola and prostheca absent. Ventral mouthparts strongly retracted, forming maxillolabial complex (Fig. 10H); maxillae (Fig. 11C, D) with cardines not clearly delimited; stipes elongate; maxillary articulating area absent; galea and lacinia forming slender, blade-like, channelled mala, which is narrowly acute at apex; maxillary palpomeres 3, but palpiger enlarged and partly articulated at base, so that palps appear

4-segmented. Prementum and hypopharynx forming 5-dentate sclerome; postmentum subquadrate and strongly convex; labial palps 2-segmented with subacute apical palpomere, closely adpressed to side of sclerome and difficult to see except in side view. Hypostomal region, hypostomal rods, ventral epicranial ridges and gula absent.

Prothorax almost as long as meso- and metathorax combined; venter with 2 pairs of anterior sclerotizations: lateral, subtrapezoidal and slightly curved pleurites, which extend from the neck region to the anterior articulations of procoxae, and oblique, slender, sternal rods, which converge posteriorly and define a subtriangular area, which is lightly sclerotized and has a short endocarina near posterior end; procoxae (Fig. 10C) large, oval, strongly oblique and moderately heavily pigmented, separated by about $0.25\times$ the shortest diameter of one of them; trochanters short and lightly pigmented; femora stout, only slightly longer than wide, subcylindrical; tibiotarsus short and broad, about $0.33\times$ as long as femur; pretarsus slightly shorter than tibiotarsus (Fig. 10D), heavily pigmented, deeply emarginate forming a pair of clawlike processes, one slightly shorter than the other, with 2 setae lying side by side. Meso- and metacoxae $0.75\times$ as long as procoxae (greatest diameter), separated by about 3 times the shortest diameter of one of them; trochanter similar to that on fore leg; femur more slender, about $2\times$ as long as wide; tibiotarsus about $0.66\times$ as long as femur and slender; pretarsus slender, clawlike, with 2 setae (Fig. 10E).

Abdomen about $3\times$ as long as thorax; segments I–VIII each with 3 clearly defined lateral lobes on each side (laterotergites, pleurites and laterosternites); terga densely clothed with long hairs but without transverse plicae or rows or patches of asperities. Paired gland openings present on all thoracic terga and abdominal terga I–VIII. Segment IX about $0.5\times$ as long as VIII, tergum dorsal, simple, without urogomphi; X about $0.33\times$ as long as IX, cylindrical and terminal, without pygopods. Thoracic and abdominal spiracles biforous (Fig. 10F); closing apparatus present.

Examined material. RUSSIA: Voronezh Region, in decaying wood of *Ulmus*, 15.ix. 1959 (B. Mamaev), two specimens.

Key to genera of Cerophytidae

1. Profemur (posterior surface) with longitudinal carina, upper distal angle rounded (Fig. 4F); posterior angles of pronotum acute and produced laterally (Fig. 4A–C); Holarctic..... *Cerophytum*
- Profemur (posterior surface) without longitudinal carina, upper distal angle acute and produced (Fig. 23F); posterior angles of pronotum not produced laterally (Fig. 20); southern Mexico, Central and South America..... 2
- 2(1). Elytra with additional subhumeral row of punctures between stria 8 and 9 (Fig. 23C); elytral interstria IX weakly convex; chin piece weakly produced and truncate (Fig. 23G)..... *Phytoceram*

- Elytra without additional subhumeral row of punctures between stria 8 and 9 (Fig. 14G); elytral interstria IX strongly convex; chin piece strongly produced and rounded (Fig. 14H)..... *Brachycerophytum*

Cerophytum Latreille, 1806

Cerophytum Latreille (1806: 247, 1809: 375). Type species: *Elater elateroides* Latreille (1804: 76), monotypy.

Chorea Haldeman (1845: 150). Type species: *Chorea pulsator* Haldeman (1845: 150).

Diagnosis. Head: frontoclypeal region with carina; posterior frontal carina absent; apical maxillary palpomere elongate oval. Prothorax: pronotum subtrapezoidal, posterior angles acute and produced laterally; chin piece strongly produced and rounded. Elytra: without subhumeral row of punctures between stria 8 and 9; interstria IX weakly convex. Legs: profemur (posterior surface) with longitudinal carina (Fig. 4F); upper distal angle rounded. Aedeagus: phallobase transverse; base of parameres Y-shaped, membranous region of parameres trilobate, dorsal region of parameres fringed. Bursa copulatrix well developed, with a pair of small spiculate sclerites. Spermatheca present, strongly curved and sclerotized.

Distribution. Japan, southern and central Europe, western and eastern North America.

Remarks. *Cerophytum* includes *C. elateroides*, *C. pulsator*, *C. convexicollis* and *C. japonicum*. Besides the differences presented in the key, these Holarctic species are characterized by a dark general coloration. *Brachycerophytum fusicorne* is the only Neotropical species that is similarly dark. The aedeagus (Fig. 8A–C) is shorter, with a transverse phallobase; in the other two genera, the aedeagus is longer with a conspicuous elongate phallobase. In some female specimens of *C. elateroides* and *C. pulsator* dissected, we found a nematode worm inside the bursa copulatrix, similar to the one illustrated by Burakowski (1991: 9, fig. 16). In the two species examined, we did not observe an associated spermathecal gland to the spermatheca capsule (Fig. 9D, E). In Burakowski's figure, the spermatheca also lacked an associated gland.

Key to species of *Cerophytum*

1. Antennomere III ♂ serrate (Fig. 2A); antennomere XI ♀ broader, about $2.2\times$ as long as wide (Fig. 2B)..... 2
- Antennomere III ♂ pectinate (Fig. 2C, E); antennomere XI ♀ more slender, about $2.5\text{--}3.0\times$ as long as wide (Fig. 2D, F)..... 3
- 2(1). Antennomere XI ♂ more slender, about $4.3\times$ as long as wide (Japan)..... *japonicum*

- Antennomere XI ♂ broader, about 3.1× as long as wide (Fig. 2A) (western U.S.A.)..... *convexicolle* 3(1).
- Antennomere XI ♂ and ♀ with well-marked preapical notch (Fig. 2C, D) (Europe)..... *elateroides*
- Antennomere XI ♂ and ♀ with preapical notch weak or absent (Fig. 2E, F) (eastern U.S.A.) *pulsator*

***Cerophytum convexicolle* LeConte, 1866** (Figs 2A, B, G, 4A, 6A–C)

Cerophytum convexicolle LeConte (1866: 383) (type locality: U.S.A., California), de Bonvouloir (1870: 80, 83), Horn (1886: 51), Soares & Peracchi (1964: 132) (key), Golbach (1983: 131).

Redescription. Length: 6.0–7.4 mm. General coloration: dorsum dark reddish brown to dark brownish black, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.48. Frons convex; frontal puncture shallow, V-shaped, obsolete in some specimens; anterior carina present, strong but vanishing near antennal insertion; posterior carina absent. Antenna (Fig. 2A, B): antennomere III serrate, 1.1× as long as wide in ♂ and 1.7× in ♀; antennomeres IV and V serrate; antennomere XI 3.9× as long as wide in ♂ and 2.2–2.3× in ♀. Apical maxillary palpomere (Fig. 2G) similar in ♂ and ♀, elongate oval, about 1.5× as long as wide. Pronotum (Fig. 4A) strongly convex, subtrapezoidal; about 0.7× as long as wide; sides rounded, widest at about middle; sides strongly converging anteriorly to rounded anterior margin, converging posteriorly; posterior angles sharply pointed and well produced laterally; disc with homogeneous, well-separated punctures, median depression absent; without median carina. Prosternum: chin piece strongly produced and rounded. Elytra 0.7× as long as body length, each one 3.8–3.9× as long as wide, without additional row, interstria IX strongly convex. Scutellum triangular, about as long as wide. Aedeagus: penis about 1.9× as long as broad, apex acuminate, phallobase transverse about 0.5× as long as wide, posterior process about 1.7× as long as base length of phallobase, basal emargination omega-shaped; parameres trilobate at apex, dorsal lobe fringed, hooklike structures as in Fig. 6(B).

Examined material. U.S.A. Oregon, Jackson Co., Buckhorn Min. Spr., 19.v.1960 (Joe Schuh), 1 ♀ (AMNH); California, Alameda Co., 3 mi. S Sunol, 22.iv. 1972 (W.H. Tyson), 1 ♀ (CDAE); El Dorado Co., 0.7 mi. E Pacific House, screening flume, 28.iv.1992 (F. Andrews and T. Eichlin), 1 ♀ (CDAE); Solano Co., Mix Cyn., 04.iii.1936 (R.M. Bohart), 1 ♂ (CASC, dissected).

Distribution. Western U.S.A.

Remarks. *Cerophytum convexicolle* shares with *C. japonicum* the antennomere 3 serrate in males. In males of both species the rami of the pectinate antennomere is inserted at about the middle. In the other *Cerophytidae* species, the rami arise from the base. This feature easily

distinguishes *C. convexicolle* from *C. pulsator*, the other North American species.

***Cerophytum elateroides* (Latreille, 1804)** (Figs 2C, D, H, I, 3A–E, 4C–J, 6D–F, 9A–E, 10A–H, 11A–I)

Elater elateroides Latreille (1804: 76) (type locality: Europe?), Schenkling (1928: 2) (catalogue).

Cerophytum elateroides Latreille (1806: 247, 1809: 375), Schenkling (1928: 2) (catalogue), Soares & Peracchi (1964: 132) (key), Golbach (1983: 131).

Redescription. Length: 5.9–7.4 mm. General coloration: dorsum dark reddish brown, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.43. Frons convex; frontal puncture shallow, V-shaped, obsolete in some specimens; anterior carina present, strong but vanishing near antennal insertion; posterior carina absent. Antenna (Fig. 2C, D): antennomere III pectinate, 0.8× as long as wide in ♂ and 1.8× in ♀; antennomere IV and V pectinate; antennomere XI 3.7× as long as wide in ♂ and 2.6× in ♀. Apical maxillary palpomere (Fig. 2H, I) similar in ♂ and ♀, elongate oval, about 1.5× as long as wide. Pronotum (Fig. 4C) strongly convex; subtrapezoidal; about 0.8× as long as wide in ♂ and 0.7× in ♀; sides weakly rounded, widest about the middle; lateral sides gently

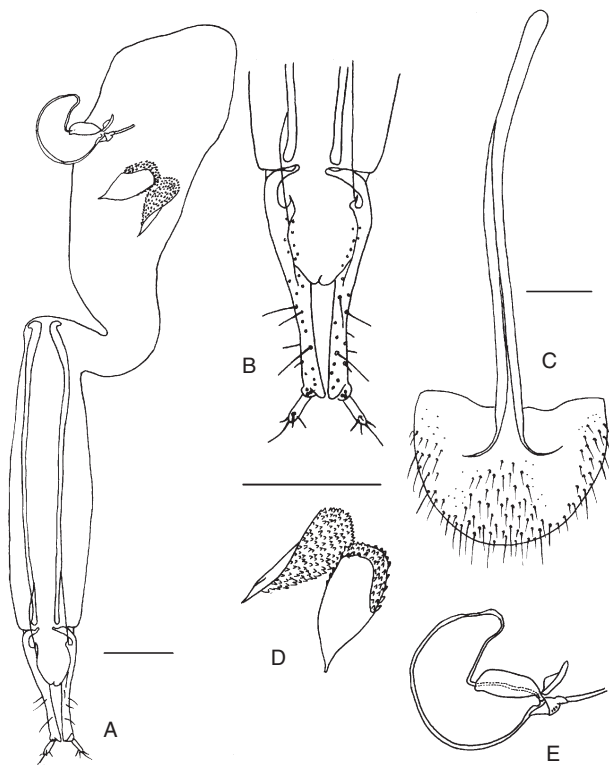


Fig. 9. *Cerophytum elateroides*, female. A, B, Ovipositor; C, sternite VIII; D, sclerites of bursa copulatrix; E, spermatheca. Scale = 0.5 mm (A; B, D, E; C).

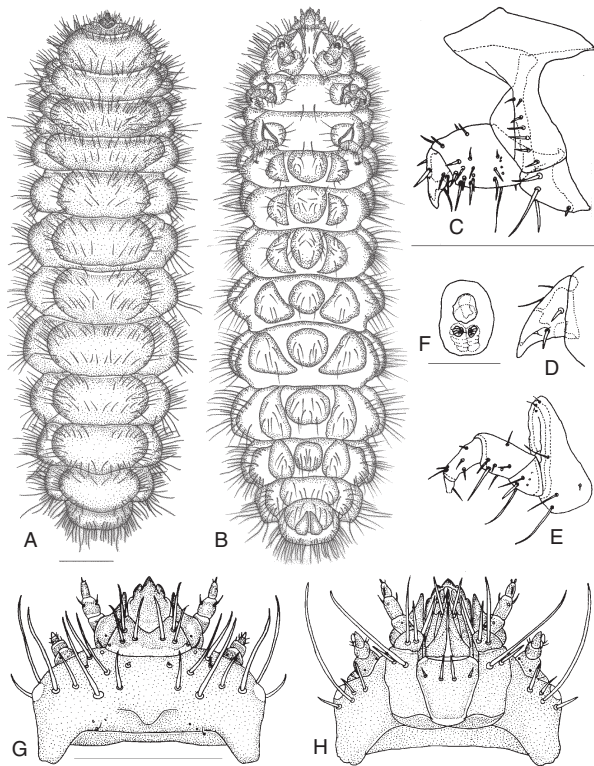


Fig. 10. *Cerophytum elateroides*, larva. A, B, Habitus, dorsal and ventral; C–E, proleg, protibiotarsus, metaleg; F, prothoracic spiracle; G, H, head, dorsal, ventral. Scales = 1.0 mm (A, B, C, E); 0.05 mm (D, G, H); 0.01 mm (F).

converging anteriorly to sinuous anterior margin, weakly converging posteriorly; posterior angles sharply pointed and well produced laterally; disc with homogeneous well-separated punctures, median depression absent; with low median carina. Prosternum (Fig. 4I, J): chin piece strongly produced and rounded. Elytra 0.6–0.7× as long as body length, each one 4.0–4.1× as long as wide, without additional row, IX weakly convex. Scutellum triangular, about as long as wide. Aedeagus (Fig. 6D, F): penis about 2.5× as long as broad, apex acuminate, phallobase transverse about 0.5× as long as wide, posterior process about 1.6× as long as base length of phallobase, basal emargination U-shaped; parameres weakly mucronate at apex, dorsal lobe fringed; hooklike structures as in Fig. 6(E). ♀ genitalia (Fig. 9A–E): ovipositor long and narrow; coxites not divided, styli short and terminal (Fig. 9B), baculi elongate about 2.7× as long as coxites (Fig. 9A). Internal ♀ tract consisting of elongate vagina, large terminal bursa with 1 pair of spiculate sclerites; spermatheca C-shaped (Fig. 9E).

Examined material. AUSTRIA: 2 ♂ (Leng) (CASC). ENGLAND: 3 ♂, 1 ♀ (van Dyke) (CASC). GERMANY: Hanau/Main (Lane), 1 ♂ (USNM). POLAND: Maciejowiec, dist. Lwówek Śląski, 26.vi.1956 (Z. Sliwiński), 1 ♂ (MZSP). EUROPE: 1 ♂ (van Dyke) (CASC). No locality: 1 ♂ (Imhoff) (MCZC).

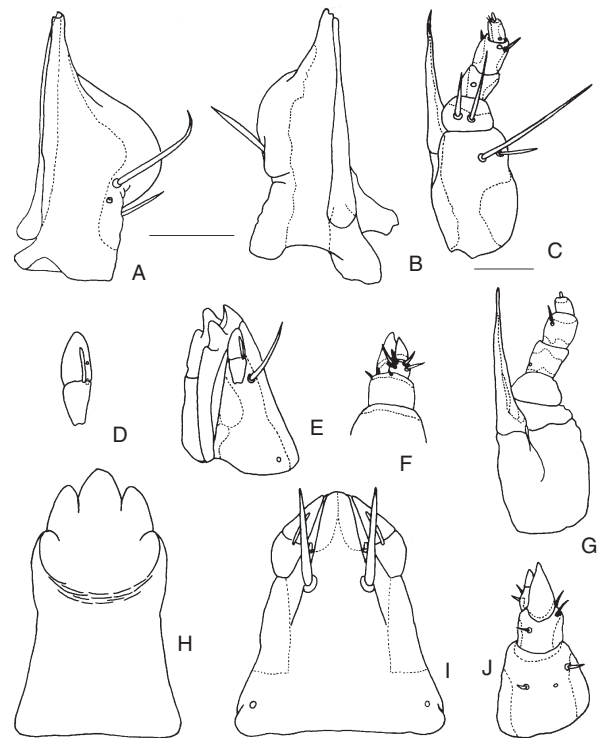


Fig. 11. *Cerophytum elateroides*, larva. A, B, Mandibles, dorsal, mesoventral; C, G maxilla, ventral, dorsal; D, E, H, I labium palp, anterior lateral, dorsal and ventral; F, J, antenna, dorsal, ventral; Scale = 0.01 mm (A, B, D, F, H–J; C, E, G).

Distribution. Europe.

Remarks. This European species is very similar to the North American *C. pulsator*, but may be distinguished by the well-marked preapical notch in antennomere XI (weak or absent in *C. pulsator*). *Cerophytum elateroides* appears to be widespread in Europe, being recorded from Austria, Belgium, the Czech Republic, England, France, Germany, Italy, the Netherlands, Poland, Romania, Serbia, Switzerland, and western Russia. de Bonvouloir (1870), in his key for the identification of *Cerophytum* species, mentioned that the females of *C. pulsator* could be separated from the females of *C. elateroides* by the presence of a carina in the middle of the pronotum in the former. However, the presence of carina seems to be a variable character. We have found a weak carina in two of five females examined.

***Cerophytum japonicum* Sasaji, 1999**

Cerophytum japonicum Sasaji (1999: 97) (type locality: Japan, Tochigi, Kuruyama-mura, Tashiro-rindo).

Distribution. Japan.

Remarks. *Cerophytum japonicum* is the first cerophytid species recorded from Asia. Sasaji's (1999) description and illustrations are rather detailed and permit the retention of this species in the genus *Cerophytum*. The acute and laterally produced posterior pronotal angles are conspicuous in his fig. E (Sasaji, 1999: 99). Some other features shared with *Cerophytum* species are the elongate apical maxillary palpomeres and the strongly produced and rounded chin piece. Unfortunately, we have not seen the specimen and an illustration of the male genitalia is not available. However, photographs of the holotype (dorsal, lateral and ventral aspects) available at <http://www.museum.kyushu-u.ac.jp/DB/dbindex> enabled us to confirm the absence of the additional row of elytral punctures. Furthermore, Dr Sasaji kindly observed, upon our request, two important features for the cladistic analysis, not evident in the photographs: the presence of the profemoral carina and the rounded distal angle of the profemur. Sasaji (1999) considered his species similar to *C. elateroides*. However, the antennae of *C. japonicum* resemble those of the North American *C. convexicollis* (see remarks under that species).

***Cerophytum pulsator* (Haldeman, 1845)** (Figs 2E, F, J, K, 3A–E, 12A–F)

Chorea pulsator Haldeman (1845: 150) (type locality: U.S.A., Pennsylvania), Schenkling (1928: 3) (catalogue).

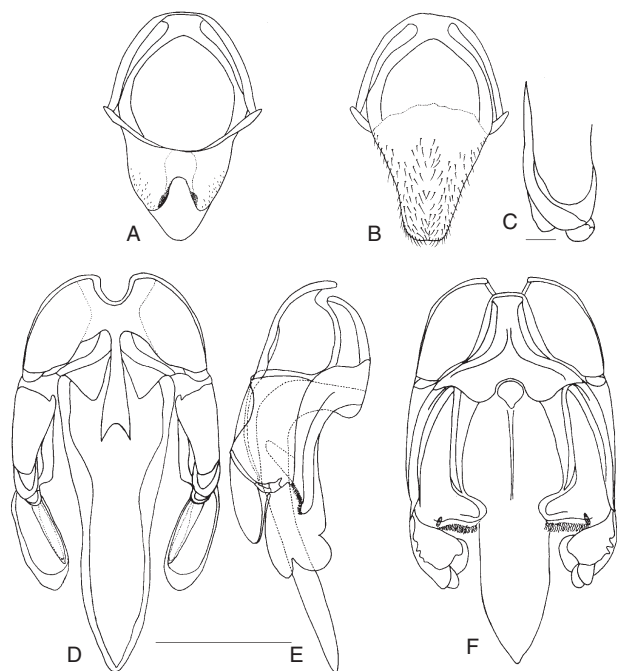


Fig. 12. *Cerophytum pulsator*, male. A, B, IX and X tergites, IX sternite; C, hook of parameres; D–F, genitalia, ventral, lateral and dorsal. Scales = 1.0 mm (A, B, D–F); 0.1 mm (C).

Cerophytum pulsator Haldeman (1845: 348), LeConte (1853: 230), de Bonvouloir (1870: 80, 81), Schenkling (1928: 3) (catalogue), Soares & Peracchi (1964: 132) (key), Golbach (1983: 131).

Redescription. Length: 5.4–8.5 mm. General coloration: dorsum dark reddish black to black, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.36. Frons convex; frontal puncture shallow, V-shaped, obsolete in some specimens; anterior carina present, weak and vanishing near antennal insertion; posterior carina absent. Antenna (Fig. 2E, F): antennomere III pectinate, 0.8× as long as wide in ♂ and 1.4–1.5× in ♀; antennomere IV and V pectinate; antennomere XI 3.7× as long as wide in ♂ and 2.6–3.0× in ♀. Labrum (Fig. 3A) free, well sclerotized, strongly transverse and truncate. Mandible (Fig. 3B, C) narrow, strongly curved and acute; without mola but with membranous prosthema. Maxilla (Fig. 3B, C) with both galea and lacinia densely setose at apex; apical palpomere more or less expanded and truncate, usually securiform or elongate oval. Apical maxillary palpomere (Fig. 2J, K) similar in ♂ and ♀, elongate oval, about 1.3× as long as wide in ♂ and 1.6× in ♀. Labium (Fig. 3E): ligula membranous, rounded apically; palps contiguous, apical palpomere subtriangular. Pronotum strongly convex; subtrapezoidal; about 0.8× as long as wide in ♂ and 0.7× in ♀ sides weakly rounded, widest at about middle; sides gently converging anteriorly to sinuous anterior margin, weakly converging posteriorly; posterior angles sharply pointed and well produced laterally (Fig. 4H–J); disc with homogenous, well-separated punctures, median depression absent; with low median carina. Prosternum (Fig. 4I, J): chin piece strongly produced and rounded. Elytra 0.6–0.7× as long as body length, each one 4.0–4.5× as long as wide, without additional row, interstria IX weakly convex. Scutellum triangular, about as long as wide. Tergites IX–X (Fig. 12A). Sternite IX (Fig. 12B). Aedeagus (Fig. 12D–F): penis about 2.6× as long as broad, apex acuminate, phallobase transverse about 0.5× as long as wide, posterior process about 1.2× as long as base length of phallobase, basal emargination U-shaped, about as long as wide; parameres trilobate at apex, dorsal lobe fringed, hooklike structures as in Fig. 12(C).

Examined material. U.S.A. Virginia, Clarke Co., 2 mi. S Boyce, U. Va. Blandy Exp. Farm, 39°05'N, 78°10'W, malaise trap, 28.iv–10.v.1993 (D.R. Smith), 1 ♀ (USNM); Fairfax Co., Great Falls Park, 29.iii.1979 (A. Freideberg), 1 ♂ (USNM); York Co., 12 km NNW Williamsburg, 37°21'N, 76°44'W, 07–08.iii.1992 (W.E. Steiner and J.M. Swearingen), 3 ♂, 1 ♀ (USNM, ♂, ♀, dissected); (van Dyke), 1 ♂ (CASC); Maryland, Port Deposit, 02.v.1977 (D. Jump), 1 ♂ (USNM); Plummers Island, 05.v.1918, 1 ♀ (CASC); New Jersey (Lane), 1 ♀ (USNM); 1 ♀ (L.L. Buchman) (USNM); New York, Seneca Co., Willard, iv.1969 (Lencyz), 1 ♂ (USNM, dismembered); Indiana, Posey Co., iv.1923 (van Dyke), 1 ♀ (CASC); Pennsylvania, Lane Co., 27.v.1944 (A.W. Shertz), 1 ♀ (MCZC).

Distribution. Eastern U.S.A.

Remarks. See notes under *Cerophytum elateroides*.

***Brachycerophytum*, gen.n.**

Type species *Cerophytum fuscicorne* de Bonvouloir, 1870, present designation.

Diagnosis. Head: frontoclypeal region with carina; posterior frontal carina absent; apical maxillary palpomere elongate oval or securiform. Prothorax: pronotum rectangular, posterior angles not produced laterally. Chin piece strongly produced and rounded. Elytra: without subhumeral row of punctures between striae 8 and 9; interstria IX strongly convex. Legs: profemur (posterior surface) without longitudinal carina; upper distal angle acute and produced. Aedeagus: phallobase elongate; base of parameres rounded, membranous region of parameres bilobate, dorsal region not fringed. Bursa copulatrix well developed, with 2 pairs of sclerites, one small and spiculate, the other elongate and smooth, curved at apex, hook-shaped. Spermatheca globular and sclerotized.

Distribution. Southern Mexico, Central and South America.

Etymology. Brachy (Greek)=short, referring to the short antennae in this genus; gender neuter.

Remarks. *Brachycerophytum* includes two Neotropical species: *B. fuscicorne* and *B. sinchona*. The females have very short antennae; when turned backwards the apices do not surpass the base of the pronotum. The spermatheca of the two species is globular and strongly sclerotized and has a spermathecal gland directly associated with the spermathecal capsule. The duct of the spermatheca and the ducts of the colleterial glands are situated on either side of the common oviduct; one oval elongate accessory gland opens very close to the base of the common oviduct (Fig. 17C).

Key to species of *Brachycerophytum*, gen.n.

1. Pronotum not carinate at middle; each elytron broader, about 3.5× as long as wide; apical maxillary palpomere similar in ♂ (Fig. 16C) and ♀ (Fig. 16D), securiform, about 0.9× as long as wide (southern Mexico, Central America and northern South America)..... *fuscicorne*
- Pronotum weakly carinate at middle; each elytron slenderer, about 3.7× as long as wide; apical maxillary palpomere highly dimorphic: in ♂ elongate oval (Fig. 16G), about 1.7× as long as wide, in ♀ securiform (Fig. 16H), about 0.75× as long as wide (South America)..... *sinchona*

***Brachycerophytum fuscicorne* (de Bonvouloir, 1870), comb.n.** (Figs 16A–D, 14B–I, 15A–C)

Cerophytum fuscicorne de Bonvouloir (1870: 80, 84, table 4, fig. 3) (type locality: Mexico or Colombia, still to be designated, see remarks), Horn (1890: 213), Schenkling (1928: 3) (catalogue), Blackwelder (1944: 275) (catalogue), Soares & Peracchi (1964: 132) (key), Golbach (1983: 135, fig. 6) (redescription).

Redescription. Length: 6.3–6.9 mm. General coloration: dorsum reddish brown to dark reddish black, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.31. Frons convex; frontal puncture shallow, V-shaped, obsolete in some specimens; anterior carina present, strong almost reaching central puncture; posterior carina absent. Antenna (Fig. 16A, B): antennomere III pectinate, 0.8× as long as wide in ♂ and 1.0× in ♀; antennomere IV and V pectinate; antennomere XI 2.6–3.1× as long as wide in ♂ and 3.8× in ♀. Apical maxillary palpomere (Fig. 16C, D) similar in ♂ and ♀, securiform, about 0.9× as long as wide. Pronotum (Fig. 14B, E) strongly convex; rectangular; about 0.6× as long as wide; sides rounded, widest about middle; sides gradually converging anteriorly and posteriorly, anterior margin gently sinuous; posterior angles not produced laterally; disc with

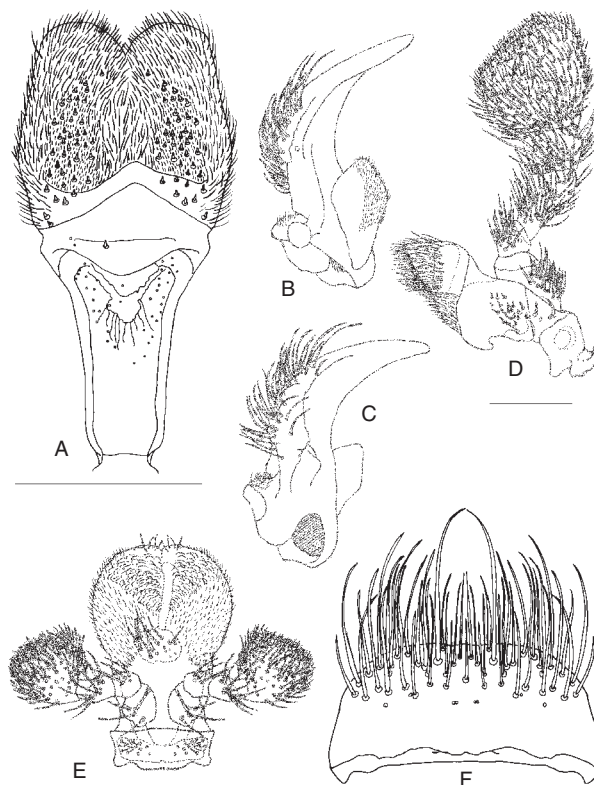


Fig. 13. *Brachycerophytum sinchona*, sp.n. male A. epipharynx; B–C mandibles, ventral, dorsal; D, maxilla, ventral; E, labium; F, labrum. Scale = 0.5 mm (A, F; B–E).

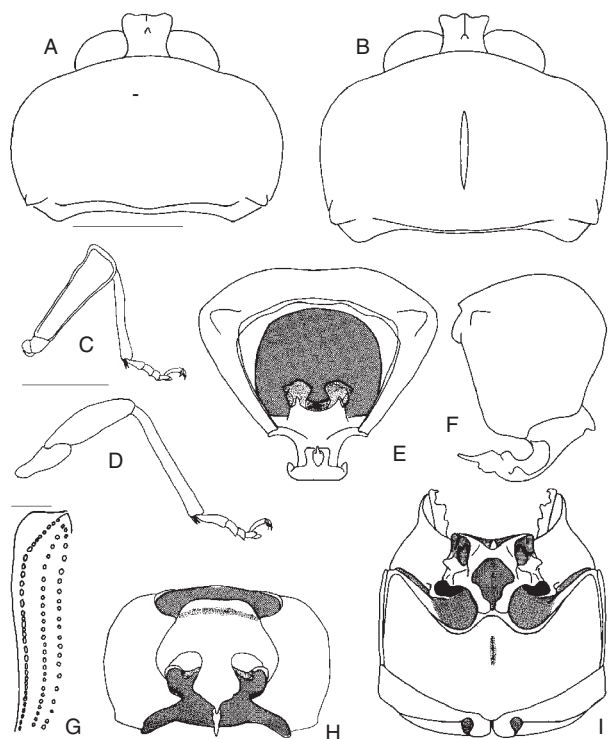


Fig. 14. *Brachycerophytum sinchona*: A, head and pronotum. *B. fuscicorne*: B–I, head and pronotum; proleg; metaleg; prothorax, posterior, lateral; lateral basal elytron; prothorax, ventral; meso-metathorax, ventral. Scale = 1.0 mm (A, B, E, F, H, I; C, D; G).

homogeneous coalescent punctures, median depression absent; without median carina. Prosternum (Fig. 14F, H): chin piece strongly produced and rounded. Elytra (Fig. 14G) 0.8× as long as body length, each one 3.3–3.5× as long as wide, without additional row, interstria IX strongly convex. Scutellum subtriangular, transverse, apex rounded. Mesometathorax (Fig. 14I). Profemur (Fig. 14C) without longitudinal carina (posterior surface), upper distal angle acute and produced. Metaleg (Fig. 14D). Aedeagus (Fig. 15A, B): penis about 4.8× as long as broad, apex acuminate, phallobase elongate about 1.2× as long as wide, posterior process about 0.9× as long as base length of phallobase, basal emargination U-shaped, borders sclerotized; parameres bilobate at apex, hooklike structures as in Fig. 15(C).

Examined material. BELIZE: Toledo Distr., Blue Creek Village, 09.vi.1981 (W.E. Steiner Earthwatch Belize Exp.), 1 ♂ (USNM, dissected). COSTA RICA: Alajuela, Caño Negro, RNVS Caño Negro, 20 m, 17–26.v.1993 (LN319100–450200 INBIO) (K. Martinez), 1 ♀ (SDSU, dissected); Turrialba, 08.vi.1951 (O.L. Cartwright), 1 ♂ (USNM, dissected). PANAMA: Vicinity Boquete, vi.1939 (J.R. Slevin), 1 ♂ (CASC); Panama, 11 km N El Llano, on El Llano-Carti Road, malaise, 13–20.v.1994 (F. Havore and D. Carlson), 1 ♂ (CDAE); Canal Zone, Barro Colorado, v. 1929 (Darlington), 1 ♂ (ANIC, dissected).

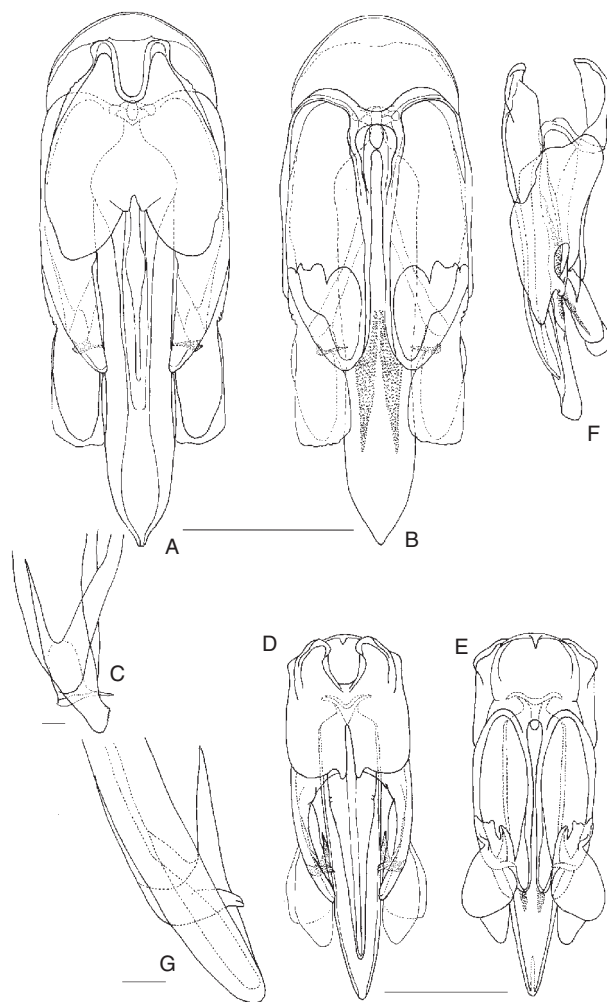


Fig. 15. *Brachycerophytum* spp., male, genitalia. *B. fuscicorne*: A–C, ventral; dorsal; hook of parameres. *B. sinchona*: D–G, ventral; dorsal; lateral; hook of parameres. Scales = 1.0 mm (A, B; D–F); 0.1 mm (C; G).

Distribution. Central and South America.

Remarks. *Brachycerophytum fuscicorne* can be distinguished from the other known species of the genus by the shorter and stouter body. According to the original description (de Bonvouloir, 1870), the species was based on three female specimens from Mexico and Colombia. However, the illustration of this species (de Bonvouloir, 1870: plate 4, fig. 3) is certainly of a male, as is indicated by the pectinate antennae. We did not have an opportunity to examine the three syntypes. Only after examination should a lectotype be designated and the type locality ascertained. This species ranges from southern Mexico through Central America to northern South America. The record of a male and a female from Bolivia (Santa Cruz, El Cidral, IMLA) by Golbach (1983) is due to misidentification. The male proved to be *P. boliviense*, and the female a new species of *Brachycerophytum* described below. We also examined a

single damaged specimen from Panama (Canal Zone, Tabernilla, USNM) misidentified as '*C. fuscicorne*'; this specimen presents a conspicuous additional subhumeral row of punctures, thus belonging to the genus *Phytocerum* (probably a new species).

***Brachycerophytum sinchona*, sp.n.** (Figs 16E–H, 13A–F, 14A, 15D–G, 17A–C)

Description. Length: 7.1–7.7 mm. General coloration: dorsum reddish brown, darker on pronotum, antennae and venter usually lighter than dorsum, tibiae and tarsi yellowish. Interocular distance to head width 0.44 in ♂ and 0.54 in ♀. Frons strongly convex and produced; frontal puncture shallow, V-shaped; anterior carina present, strong reaching central puncture; posterior carina absent. Antenna: in ♂ (Fig. 16E) antennomere III serrate, 1.2× as long as wide, antennomere IV and V serrate, antennomere XI 3.1× as long as wide; in ♀ (Fig. 16F) antennomere III serrate, external angle acuminate, 1.1× as long as wide, antennomere IV and V serrate, antennomere XI 2.6× as long as wide. Labrum (Fig. 13F) free, well sclerotized, strongly transverse and truncate. Epipharynx (Fig. 13A). Mandibles (Fig. 13B, C) narrow, strongly curved and acute; without mola but with membranous prostheca. Maxillae (Fig. 13D) with both galea and lacinia densely setose at apex, apical maxillary palpomere (Fig. 16G, H) in ♂ oval elongate, about 1.7× as long as wide, in ♀ securiform, about 0.8× as long as wide. Ligula (Fig. 13E) membranous, rounded apically; palps narrowly separated at base, apical

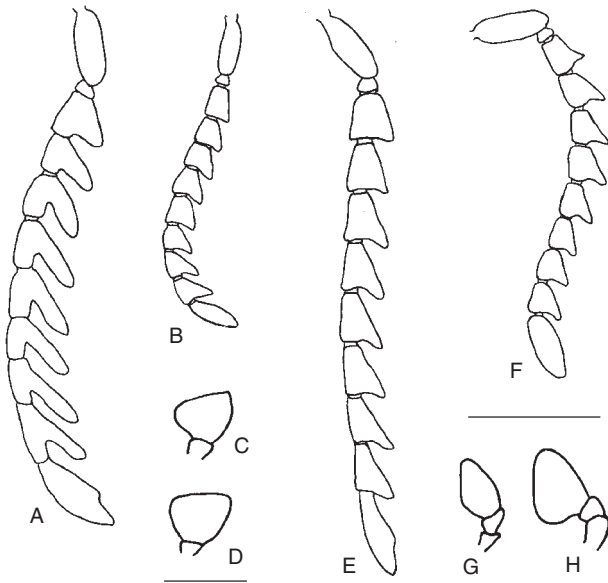


Fig. 16. *Brachycerophytum* spp. *B. fuscicorne*: A, B, antenna, male and female; C, D, maxillary palpomere, male and female. *B. sinchona*: E, F, antenna, male and female; G, H, maxillary palpomere, male and female. Scales = 1.0 mm (A, B, E, F); 0.5 mm (C, D, G, H).

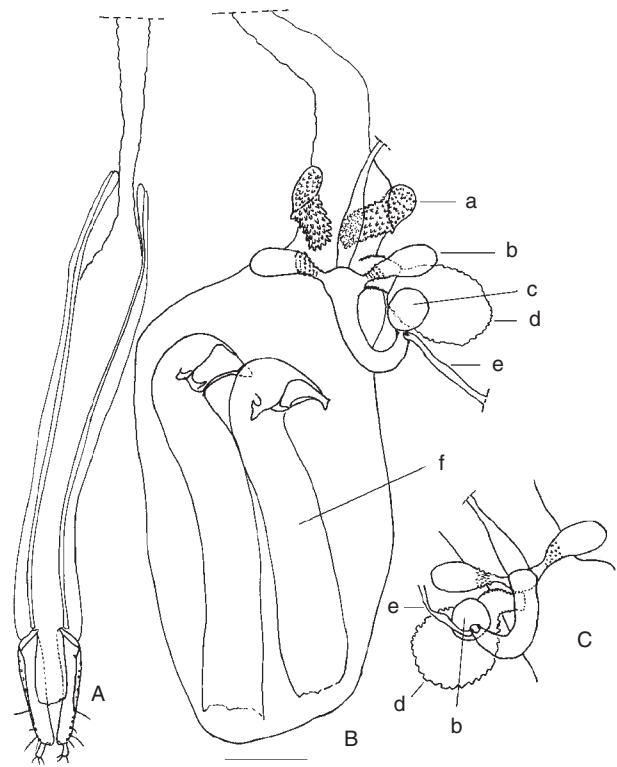


Fig. 17. *Brachycerophytum sinchona*, female. A, Ovipositor; B, C, median oviduct and bursa copulatrix. a = spiculate sclerite; b = spermatheca; c = colleterial glands; d = accessory gland; e = duct of spermatheca; f = smooth sclerite. Scale = 0.5 mm.

palpomere securiform. Pronotum (Fig. 14A) strongly convex; rectangular; about 0.6× as long as wide; sides rounded, widest about middle; sides gradually converging anteriorly and posteriorly, anterior margin gently sinuous; posterior angles not produced laterally; disc with heterogeneous, more or less coalescent punctures, median depression absent in ♂, present in ♀; with median carina. Prosternum: chin piece strongly produced and rounded. Elytra 0.8× as long as body length, each one 3.7× as long as wide, without additional row, interstria IX strongly convex. Scutellum transverse, subpentagonal. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 15D–F): penis about 4.9× as long as broad, apex acuminate, phallobase elongate about 1.3× as long as wide, posterior process about 0.7× as long as base length of phallobase, basal emargination U-shaped, borders sclerotized; parameres bilobate at apex, hooklike structure as in Fig. 15(G). Ovipositor long and narrow; coxites not divided, styli short and terminal (Fig. 17A), baculi elongate about 4.0× as long as coxites (Fig. 17A). Internal ♀ tract consisting of elongate vagina, large terminal bursa copulatrix (Fig. 17B) well developed, with 2 pairs of sclerites, 1 small and spiculate (Fig. 17Ba), the other elongate and smooth (Fig. 17Bf), curved at apex, hook-shaped with diamond-shaped opening. Spermatheca globular and sclerotized (Fig. 17Bb).

Examined material. Holotype, ♂, PERU: Ucayali, Sinchona, 20.iv.1944 (J.G. Sander) (USNM). Paratype, ♀, BOLIVIA: Santa Cruz, El Cidral, 01–28.i.1962 (R. Golbach) (IMLA).

Distribution. Peru and Bolivia.

Etymology. The epithet refers to type locality, Sinchona, used as a substantive.

Remarks. *Brachycerophytum sinchona* is very similar to *B. fuscicorne*, but is distinguished by the more elongate elytra. The paratype was misidentified as '*C. fuscicorne*' by Golbach (1983). However, the female of *B. sinchona* differs from *B. fuscicorne* by the slenderer body, strongly securiform apical maxillary palpomere (about 0.8× as long as wide), and antennomere III with an acute external angle.

***Phytocerum*, gen.n.**

Type species. *Phytocerum golbachi*, sp.n. by present designation.

Diagnosis. Head: frontoclypeal region with or without carina; posterior frontal carina absent or present; apical maxillary palpomere elongate securiform or oval elongate. Prothorax: pronotum subtrapezoidal, subrectangular or rectangular, posterior angles not produced laterally; chin piece weakly produced and truncate. Elytra with additional subhumeral row of punctures between stria 8 and 9; interstria IX weakly convex. Legs: profemur (posterior surface) without longitudinal carina; upper distal angle acute and produced. Aedeagus: phallobase elongate; base of parameres rounded, membranous region of parameres bilobate, dorsal region not fringed. Bursa copulatrix well developed, with a pair of small sclerites, not spiculate. Spermatheca absent.

Distribution. Southern Mexico, Central and South America.

Etymology. *Phytocerum*, an anagram of *Cerophytum*; gender neuter.

Remarks. *Phytocerum* includes fifteen Neotropical species. They are characterized by a lighter coloration than in the other two genera, which varies from yellowish to brownish. The internal female tract of four species was examined (*P. cayennense*, *P. distinguendum*, *P. golbachi* and *P. ingens*). The dissected specimens were pinned, thus not appropriately fixed for studies of soft parts. However, the vagina and bursa were well preserved, with the pair of small not spiculate sclerites very evident, but without evidence of a sclerotized spermatheca or accessory and colleterial glands.

Key to species of *Phytocerum*, gen.n.

1. Frontoclypeal region with carina, although sometimes weak. 2
- Frontoclypeal region without carina 12
- 2(1). Pronotum with sides nearly parallel (Fig. 32D) [Brazil (Minas Gerais)]. *zikani*
- Pronotum with sides converging backwards (Fig. 29D) 3
- 3(2). Posterior frontoclypeal carina present, although sometimes weak. 4
- Posterior frontoclypeal carina absent 9
- 4(3). Apical maxillary palpomere elongate oval (Fig. 27N); ramus of antennomere III longer than the stem itself. 5
- Apical maxillary palpomere securiform (Fig. 19N); ramus of antennomere III as long as stem itself. 7
- 5(4). Smaller, body length 4.7–5.1 mm (Argentina). *minutum*
- Larger, body length 5.3–7.6 mm 6
- 6(5). Antennomere XI ♂ and ♀ not notched (Fig. 27A, D) (Argentina) *golbachi*
- Antennomere XI ♂ and ♀ notched [French Guyana, Brazil (Minas Gerais, São Paulo), Paraguay] *cayennense*
- 7(4). Frontoclypeal carina arcuate (side view) [Brazil (Amazonas)]. *inpa*
- Frontoclypeal carina straight (side view) 8
- 8(7). Elytra about 0.7× as long as body length; apical portion of parameres completely membranous (Fig. 22A, C); hooklike structure of parameres trifold (Fig. 22B) (Bolivia) *boliviense*
- Elytra about 0.8× as long as body length; apical portion of parameres sclerotized (Fig. 22D, F); hooklike structure of parameres bifid (Fig. 22E) [Brazil (Goiás)]. *birai*
- 9(3). Anterior margin of pronotum strongly produced in the apical third (Fig. 23D); apical maxillary palpomere subtriangular elongate (Fig. 24N–P) [Brazil (Distrito Federal, Goiás, Minas Gerais), Argentina, Paraguay] *distinguendum*
- Anterior margin of pronotum weakly produced in the apical third (Fig. 20C, D); apical maxillary palpomere securiform (Fig. 19L, M) 10
- 10(9). Antennomere XI ♂ strongly notched near apex (Fig. 19C, E) [Brazil (Bahia, Minas Gerais)] *belloi*
- Antennomere XI ♂ not or only weakly notched near apex (Fig. 19E) 11
- 11(10). Smaller, length 6.5–7.1 mm; antennomere III ♀ maximum length/maximum width about 1.2; antennomere XI ♂ maximum length/maximum width about 2.8 (Trinidad) *burakowskii*
- Larger, length 8.4–9.2 mm; antennomere III ♀ maximum length/maximum width about 1.7; antennomere XI ♂ maximum length/maximum width about 3.4 [Brazil (Rio de Janeiro, Espírito Santo)]. *ingens*

- 12(1). Posterior frontoclypeal carina present; additional stria longer, surpassing posterior margin of metacoxal plate [Central America (Costa Rica, Nicaragua)] *alleni*
- Posterior frontoclypeal carina absent; additional stria shorter, just surpassing anterior margin of metacoxal plate [South America (Trinidad)] 13
- 13(12). Antennae of ♂ serrate (Fig. 18A) (Guatemala) *serraticorne*
- Antennae of ♂ pectinate (Fig. 18B) 14
- 14(13). Smaller, body length 4.3 mm; pronotum without depression *trinidadense*
- Larger, body length 5.6–6.7 mm; pronotum with a depression, shallower in ♀ *simonkai*

***Phytoceram alleni*, sp.n.** (Figs 9A, B, J, K, 20A, 21A–C)

Description. Length: 6.0–7.0 mm. General coloration: dorsum reddish brown to dark reddish black, antennae,

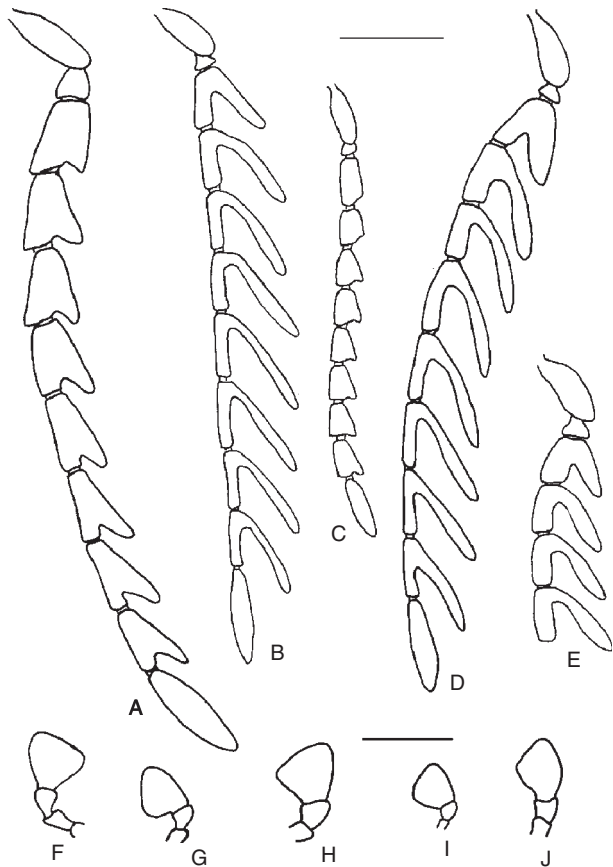


Fig. 18. *Phytoceram* spp. Antenna: A, *P. serraticorne*, male; B, C, *P. simonkai*, male, female; D, *P. trinidadense*, male; E, *P. zikani*, male. Maxillary palpomere: F, *P. serraticorne*, male; G, H, *P. simonkai*, male, female; I, *P. trinidadense*, male; J, *P. zikani*, male. Scales = 1.0 mm (A–E); 0.5 mm (F–J).

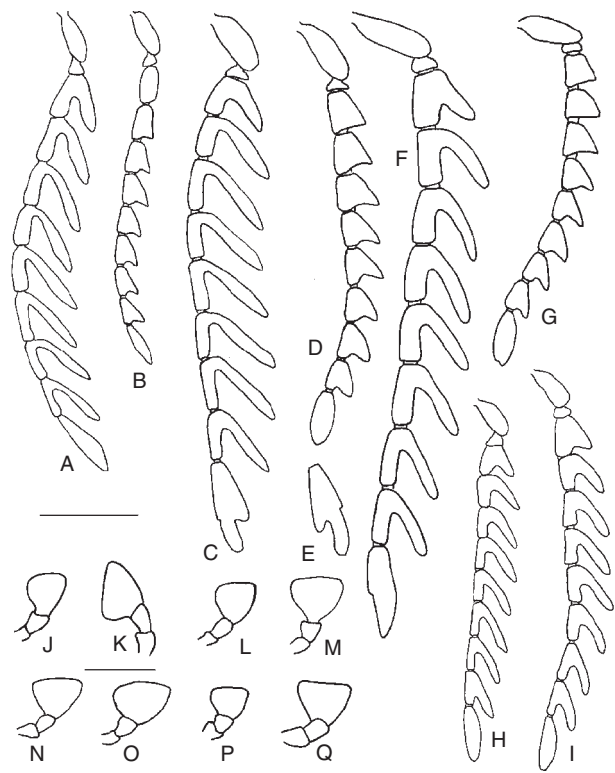


Fig. 19. *Phytoceram* spp. Antenna: A, B, *P. alleni*, male, female; C–E, *P. belloi*, male, female, male; F, G, *P. birai*, male, female; H, I, *P. boliviense*, male. Maxillary palpomere: J, K, *P. alleni*, male, female; L, M, *P. belloi*, male, female; N, O, *P. birai*, male, female; P, Q, *P. boliviense*, male. Scales = 1.0 mm (A–I); 0.5 mm (J–Q).

legs and venter usually lighter than dorsum. Interocular distance to head width 0.48 in ♂ and 0.45 in ♀. Frons weakly convex; frontal puncture shallow, V-shaped, well marked in all specimens; anterior carina absent; posterior carina present and well distinct from central puncture to dorsum of cranium. Antenna (Fig. 19A, B): antennomere III pectinate, 0.9–1.0× as long as wide in ♂ and 1.8× in ♀; antennomere IV and V pectinate; antennomere XI 2.6–3.1× as long as wide in ♂ and 3.8× in ♀. Apical maxillary palpomere (Fig. 19J, K) wider in ♀, securiform, about 1.1× as long as wide in ♂ and 0.9× in ♀. Pronotum (Fig. 20A) convex; subrectangular; about 0.6× as long as wide in ♂ and 0.7× as long as wide in ♀ sides strongly converging anteriorly to sinuous anterior margin and gradually converging posteriorly; posterior angles not produced laterally; disc with coalescent puncture stronger on disc, median depression present and weak; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.7× as long as body length, each one 4.0–4.5× as long as wide, with additional row surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular transverse. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 21A, C): penis about 4.1× as long as broad, apex acuminate, phallobase

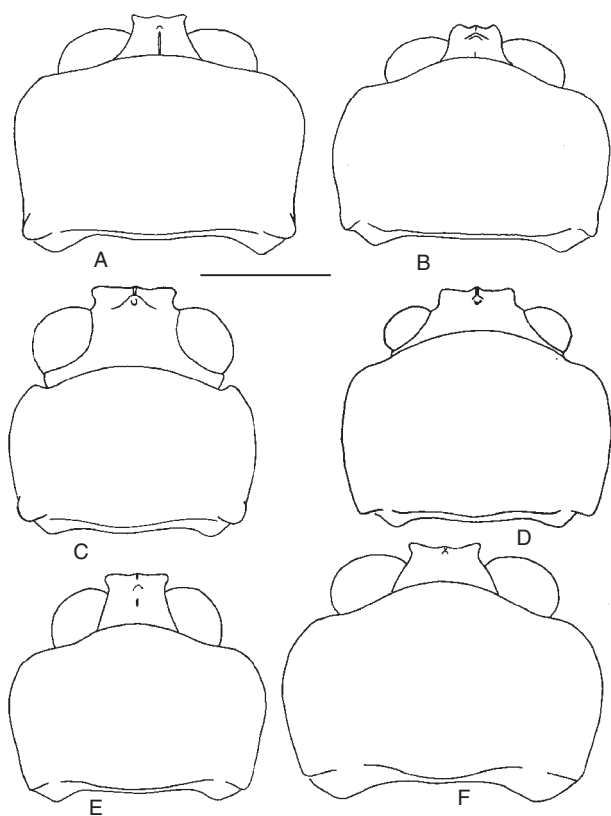


Fig. 20. *Phytoceram* spp. Head and pronotum. A, *P. alleni*, male; B, *P. birai*, male; C, D, *P. belloii*, male, female; E, *P. boliviense*, male; F, *P. burakowskii*, male. Scale = 1.0 mm.

transverse about 1.0× as long as wide, posterior process about 0.7× as long as base length of phallobase, basal emargination very deep, posterior margin weakly sclerotized inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe finely toothed on inner side (Fig. 21B).

Material examined. Holotype, ♂, COSTA RICA: Guanacaste, 9 km S Santa Cecilia, Estación Pitilla, 700 m, P.N. Guanacaste, 31.iii–29.iv.1992 (S. Rojas) (L.N. 330200.380200) (SDSU). Paratypes, ♂, ♀, same locality and data, #1343, 1 ♀ (without abdomen) (SDSU); NICARAGUA: 50 km E Matagalpa, El Coyobar, a luz, 15.v.1991, 1 ♂ (MZSP).

Distribution. Nicaragua and Costa Rica.

Etymology. Named after Albert Allen of Boise, Idaho, who has provided many rare and unusual beetles to the taxonomic community.

Remarks. *Phytoceram alleni* is only known from Central America. It is well distinguished by the additional subhumeral row being longer, surpassing the posterior margin of the metacoxal plate.

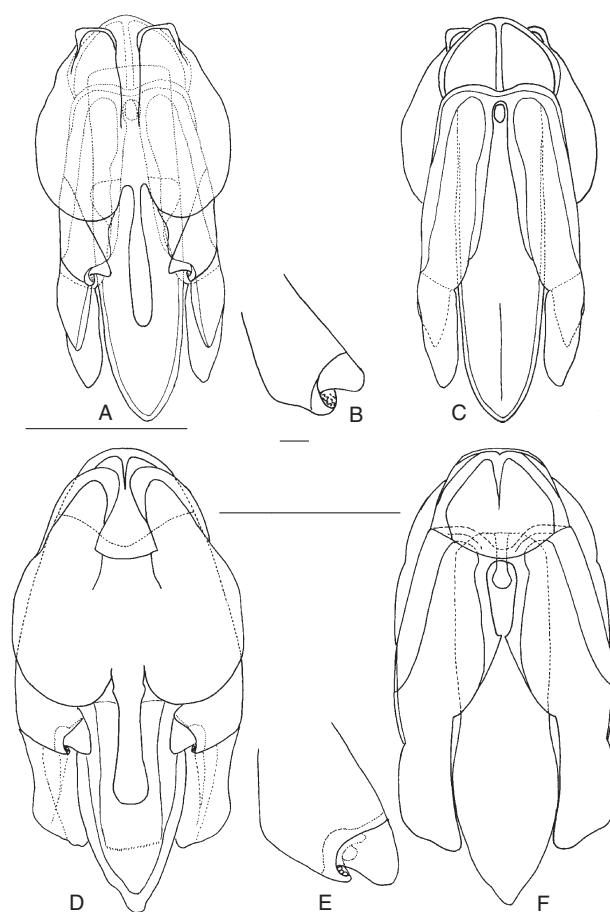


Fig. 21. *Phytoceram* spp., male, genitalia. *P. alleni*: A, ventral; B, paramere hook; C, dorsal. *P. belloii*: D, ventral; E, paramere hook; F, dorsal. Scales = 1.0 mm (A, C; D, F); 0.1 mm (B, E).

***Phytoceram belloii*, sp.n.** (Figs 19C–E, L, M, 20C, D, 21D–F)

Description. Length: 5.8–6.9 mm. General coloration: yellowish brown, dark on pronotum, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.68 in ♂ and 0.53–0.58 in ♀. Frons convex; frontal puncture deep, V-shaped, transverse, well marked; anterior carina present, fine, reaching central puncture; posterior carina absent. Antenna (Fig. 19C–E): antennomere III pectinate, 0.7× as long as wide in ♂ and 1.1× in ♀; antennomere IV and V pectinate; antennomere XI 2.6× as long as wide in ♂ and 2.5× in ♀. Apical maxillary palpomere (Fig. 19L, M) securiform, about as long as wide in ♂ and 0.8–0.9× in ♀. Pronotum (Fig. 20C, D) convex; subrectangular; about 0.7× as long as wide; sides rounded, widest about the middle; sides gradually converging anteriorly and posteriorly, anterior margin gently sinuous; posterior angles not produced laterally; punctures larger on disc with a few coalescent punctures near centre, disc with very weak median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.8× as long as body length, each one 3.7–3.8× as long as

wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subcordiform, about as long as wide, apex acute. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 21D–F): penis about $4.0\times$ as long as broad, apex mucronate, phallobase about $0.9\times$ as long as wide, posterior process about $0.7\times$ as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, conspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe large, outer lobe reduced and minutely dentate in the inner side (Fig. 21E).

Material examined. Holotype, ♂, BRAZIL: Minas Gerais, Águas Vermelhas, xii.1997 (A. Bello) (MZSP). Paratypes, 3 ♀, BRAZIL: Bahia, Encruzilhada, 980 m, xi.1972 (M. Alvarenga), 1 ♀ (AMBC); Maracás, Fazenda M. Inácia, mata cipó, noite, luz, xi.1990 (S.T.P. Amarante), 2 ♀ (MZSP).

Distribution. Brazil (Bahia and Minas Gerais).

Etymology. Named after Ayr de Moura Bello of Rio de Janeiro, Brazil, who collected and kindly donated the types to the Museu de Zoologia, Universidade de São Paulo.

Remarks. *Phytoceram belloi* is characterized by the strongly constricted antennomere XI. The constriction is formed by a very deep notch on the side with the ramus and a minute indentation in the opposite side.

***Phytoceram birai*, sp.n.** (Figs 19F, G, N, O, 20B, 22D–F)

Description. Length: 5.9–7.1 mm. General coloration: yellowish brown to reddish brown, pronotum yellowish brown to reddish brown, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.55. Frons convex; frontal puncture deep, V-shaped, transverse, well marked; anterior carina present, fine, reaching central puncture; posterior carina short but evident in holotype ♂ and paratype ♀, but very weak and inconspicuous in paratype ♂. Antenna (Fig. 19F, G): antennomere III pectinate, $0.8\times$ as long as wide in ♂, and about as long as wide in ♀; antennomere IV and V pectinate; antennomere XI, $3.3\times$ as long as wide in ♂ with a strong notch in the middle of internal margin and $2.6\times$ in ♀. Apical maxillary palpomere (Fig. 19N, O) securiform, about $0.8\times$ as long as wide in ♂ and $0.5\times$ in ♀. Pronotum (Fig. 20B) convex; subrectangular; about $0.6\text{--}0.7\times$ as long as wide; sides rounded, widest about the middle; sides gradually converging anteriorly and posteriorly, anterior margin sinuous; posterior angles not produced laterally; punctures larger on disc with a few coalescent punctures near centre, disc with depression on posterior half; not carinate. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.8\times$ as long as wide, with additional row reaching posterior margin of metacoxal

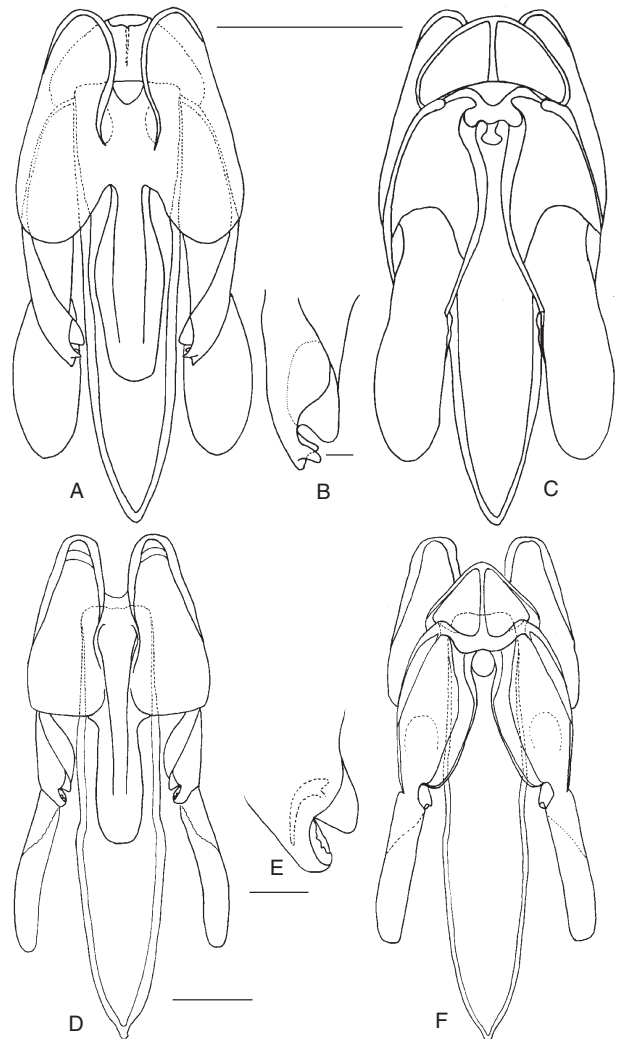


Fig. 22. *Phytoceram* spp., male, genitalia. *P. boliviense*: A, ventral; B, paramere hook; C, dorsal. *P. birai*: D, ventral; E, paramere hook; F, dorsal. Scales = 1.0 mm (A, C; D, F); 0.1 mm (B; E).

plate, interstria IX weakly convex. Scutellum subtriangular, about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 22D, F): penis about $4.9\times$ as long as broad, apex mucronate, phallobase about $1.3\times$ as long as wide, posterior process about $1.4\times$ as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, conspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe large, outer lobe microdentate innerly, slightly longer than the inner one (Fig. 22E).

Examined material. Holotype, ♂, BRAZIL: Goiás, Jataí, xi.1972 (F.M. Oliveira) (CNCI). Paratypes, ♂, ♀, same data as holotype (♂ MZSP, ♀ CNCI).

Distribution. Brazil (Goiás).

Etymology. Named after Ubirajara Martins, Museu de Zoologia, Universidade de São Paulo, as a celebration of his seventieth birthday.

Remarks. *Phytocerus birai* is easily distinguished from the other *Phytocerus* species by the distal part of parameres slender, not completely membranous but feebly sclerotized.

***Phytocerus boliviense* (Golbach, 1983), comb.n.**

(Figs 19H, I, P, Q, 20E, 22A–C, 23C)

Cerophytum boliviense Golbach (1983: 132, fig. 1) (type locality: Bolivia, Santa Cruz, El Cidral).

Redescription. Length: 5.7–7.1 mm. General coloration: light to dark yellowish brown, darker on pronotum, antennae, legs and venter usually lighter than dorsum, prosternum and metaventrite darker. Interocular distance to head width 0.54. Frons weakly convex; frontal puncture

deep, V-shaped, well marked in all specimens; anterior carina present; strong reaching central puncture; posterior carina short but vanishing towards dorsal cranium. Antenna (Fig. 19H, I): antennomere III pectinate, $0.9\times$ as long as wide; antennomere IV and V pectinate; antennomere XI $3.2\text{--}3.4\times$ as long as wide. Apical maxillary palpomere (Fig. 19P, Q) securiform, about as long as wide. Pronotum (Fig. 20E) strongly convex; subtrapezoidal; about $0.7\times$ as long as wide; sides rounded, widest just before middle; sides strongly converging anteriorly to weakly produced anterior margin and gradually converging posteriorly; posterior angles not produced laterally; disc with homogeneous coalescent punctures, median depression absent; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.7\times$ as long as body length, each one $3.5\times$ as long as wide, with additional row (Fig. 23C) not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 22A, C): penis about $4.4\times$ as long as broad, apex acuminate, phallobase slightly broader than longer, about $1.0\times$ as long as wide, posterior process $0.8\times$ as long as base length of phallobase, basal emargination very deep, posterior margin weakly sclerotized, but conspicuous; parameres bilobate at apex, hook-like structures formed by 2 lobes, outer lobe tridentate (Fig. 22B).

Examined material. Holotype, ♂, BOLIVIA: Santa Cruz, El Cidral, 01–28.i.1962 (R. Golbach) (IMLA). Paratypes, 6 ♂, same data as holotype, 3 ♂ (IMLA); BOLIVIA: Santa Cruz, Est. Exp. Gral. Saavedra, 06–12.vii.1972 (C. Potter and L. Stange), 3 ♂ (IMLA, CNCI, MZSP).

Other examined material. BOLIVIA: Santa Cruz, Est. Exp. Gral. Saavedra, 06–12.vii.1972 (C. Potter and L. Stange), 1 ♂ (IMLA).

Distribution. Bolivia.

Remarks. *Phytocerus boliviense* is very similar to *P. inpa*. They can be distinguished by the structure of the parameral hook, trifold in *P. boliviense* and bifid in *P. inpa*.

***Phytocerus burakowskii*, sp.n.** (Figs 20F, 24A, B, H, I, 25A–C)

Description. Length: 6.5–7.1 mm. General coloration: light to dark yellowish brown, darker on pronotum, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.52. Frons convex; frontal puncture shallow, V-shaped, well marked in holotype ♂ and obsolete in ♀ paratype; anterior carina present; fine, reaching central puncture; posterior carina absent. Antenna (Fig. 24A, B): antennomere III pectinate, $0.8\times$ as long as wide in ♂ and $1.4\times$ in ♀; antennomere IV and V

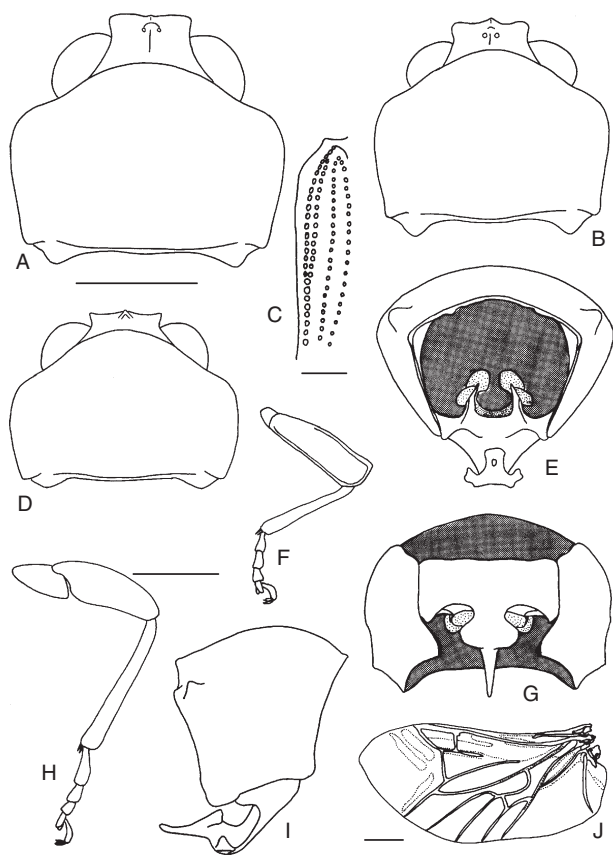


Fig. 23. *Phytocerus* spp. A, B, *P. cayennense*, male, head and pronotum; C, *P. boliviense*, subhumeral row of punctures; *P. distinguishedum*: D, head and pronotum; E, posterior prothorax; F, proleg; G, ventral prothorax; H, metaleg; I, lateral prothorax; J, hind wing. Scale = 1.0 mm (A, B, D, E, G, I; C; F, H; J).

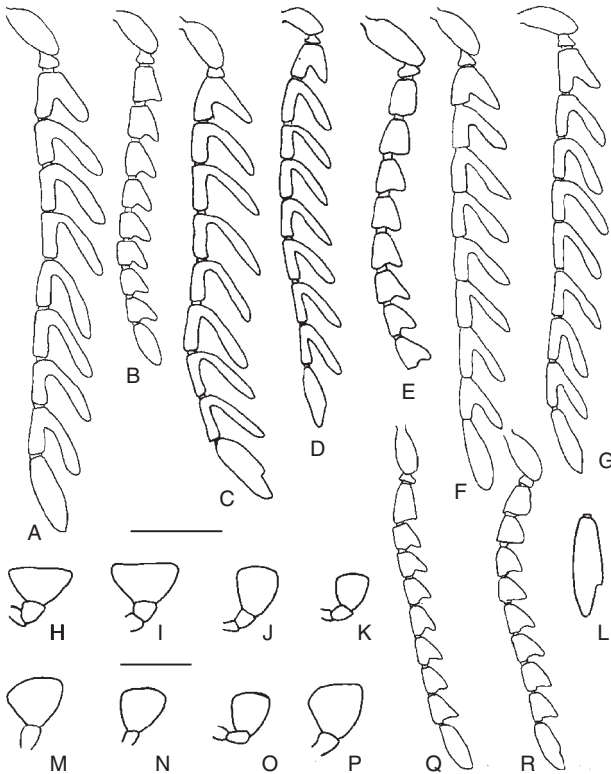


Fig. 24. *Phytoceram* spp. Antenna: A, B, *P. burakowskii*, male, female; C–E, *P. cayennense*, males, female; F, G, L, Q, R, *P. distinguendum*, males, females. Maxillary palpomere: H, I, *P. burakowskii*, male, female; J, K, M, *P. cayennense*, males, female; N–P, *P. distinguendum*, males, female. Scales = 1.0 mm (A–G, Q, R); 0.5 mm (H–P).

pectinate; antennomere XI $3.1\times$ as long as wide in δ and $2.5\times$ in ♀ . Apical maxillary palpomere (Fig. 24H, I) similar in δ and ♀ , securiform, about $0.5\times$ as long as wide in δ and $0.7\times$ in ♀ . Pronotum (Fig. 20F) convex; subtrapezoidal; about $0.5\times$ as long as wide in δ and $0.7\times$ in ♀ ; sides rounded, widest just before middle in δ , nearly parallel, widest about middle in ♀ ; sides strongly converging anteriorly to sinuous produced anterior margin, gradually converging posteriorly; posterior angles not produced laterally; with coalescent puncture stronger on disc, disc with median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.8\text{--}3.9\times$ as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subtriangular, transverse, apex rounded. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 25A, C): penis about $4.3\times$ as long as broad, apex obtusely rounded, phallobase slightly broader than longer, about $1.2\times$ as long as wide, posterior process about $1.1\times$ as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, inconspicuous; parameres bilobate at apex, hooklike

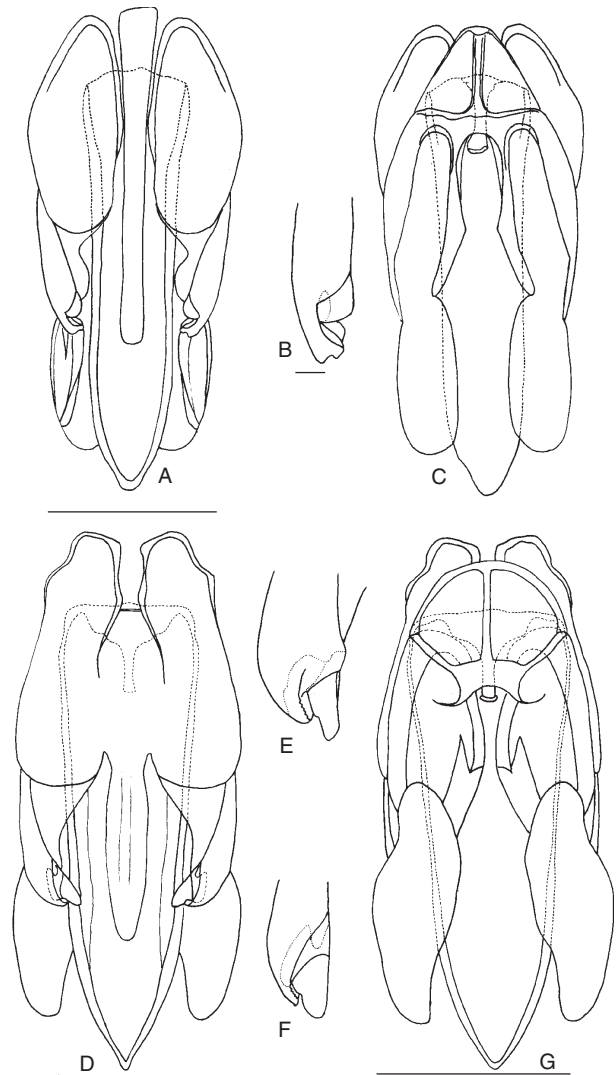


Fig. 25. *Phytoceram* spp., male, genitalia. *P. burakowskii*: A, ventral; B, paramere hook; C, dorsal. *P. cayennense*: D, ventral; E–F, paramere hook; G, dorsal. Scales = 1.0 mm (A, C, D, G); 0.1 mm (B, E, F).

structures formed by 2 lobes, inner lobe truncate, outer lobe bidentate at apex (Fig. 25B).

Examined material. Holotype, δ , TRINIDAD: Simia, 01–15.vii.1962 (J. Maldonado c) (USNM). Paratype, ♀ , same data as holotype (USNM).

Distribution. Only known from type locality.

Etymology. Named after Boleslaw Burakowski (Muzeum i Instytut Zoologii PAN, Warszawa) in recognition of his studies on Coleoptera.

Remarks. *Phytoceram burakowskii* is similar to *P. ingens*. Both species share a very securiform distal palpomere but can be distinguished by body size, larger in *P. ingens*.

***Phytoceram cayennense* (de Bonvouloir, 1870),
comb.n.** (Figs 23A, B, 24C, E, J, K, M, 25D–G)

Cerophytum cayennense de Bonvouloir (1870: 80, 86, table 4, fig. 2) (type locality: Guiane Française, Cayenne); Schenkling (1928: 3) (catalogue); Blackwelder (1944 (2): 275) (catalogue); Soares & Peracchi (1964: 132) (key); Golbach (1983: 132, figs 2 and 3) (redescription).

Redescription. Length: 5.3–7.1 mm. General coloration: dorsum brownish, darker on head and thorax, antennae, legs and venter lighter than dorsum. Interocular distance to head width 0.53 in ♂ and 0.72 in ♀. Frons convex; frontal puncture deep, V-shaped, well marked; anterior carina present; posterior carina present and well distinct from central puncture to dorsum of cranium. Antenna (Fig. 24C, E):

antennomere III pectinate, as long as wide in ♂ and 1.3× in ♀; antennomere IV and V pectinate; antennomere XI 3.3× as long as wide in ♂ and missing in ♀. Apical maxillary palpomere (Fig. 24J, K, M) oval elongate, about 1.1× as long as wide in ♂, securiform, about 0.8× as long as wide in ♀. Pronotum (Fig. 23A, B) strongly convex; subtrapezoidal; about 0.8× as long as wide in ♂ and 0.7× in ♀; sides nearly parallel, widest about middle; strongly converging anteriorly to sinuous produced anterior margin, gradually converging posteriorly; posterior angles not produced laterally; with coalescent puncture stronger on disc, disc with weak median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.8× as long as body length, each one 3.5–3.9× as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subtriangular, transverse, apex rounded. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 25D, G): penis about 3.4× as long as broad, apex acuminate, phallobase elongate, about 1.1× as long as wide, posterior process about 0.8× as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe finely toothed on inner side (Fig. 25E, F).

Examined material. FRENCH GUYANA: 2 ♂ (Fleutiaux) (MNHP). BRAZIL: Minas Gerais, Ipatinga, xi.1994 (A. Bello), 1 ♂, 1 ♀ (AMBC); São Paulo, Piracicaba, 01.xi.1965 (S. Silveira Neto), 1 ♂ (DEES). PARAGUAY: Horqueta, 28.xi.1932 (H.C. Fall), 1 ♂ (MCZC).

Distribution. French Guyana, Brazil (Minas Gerais and São Paulo) and Paraguay.

Remarks. *Phytoceram cayennense* is very similar to *P. golbachi*, but may be distinguished by the notched apical antennomere.

***Phytoceram distinguendum* (Soares & Peracchi,
1964), comb.n.** (Figs 23D–J, 24F, G, L, N, O, 26A–F)

Cerophytum distinguendum Soares & Peracchi (1964: 130, figs 4 and 5) (type locality: Brazil, Minas Gerais, Águia Suja); Golbach (1983: 132) (key).

Redescription. Length: 5.4–6.8 mm. General coloration: light to dark yellowish brown, darker on pronotum, antennae, legs and venter same colour as elytra. Interocular distance to head width 0.52 in ♂ and 0.64 in ♀. Frons weakly convex; frontal puncture deep, V-shaped, well marked in all specimens; anterior carina present; fine, reaching central puncture, weakly evident in some specimens; posterior carina absent. Antenna (Fig. 24F, G, L): antennomere III pectinate, 0.8× as long as wide in ♂ and 1.4× in ♀; antennomere IV and V pectinate; antennomere

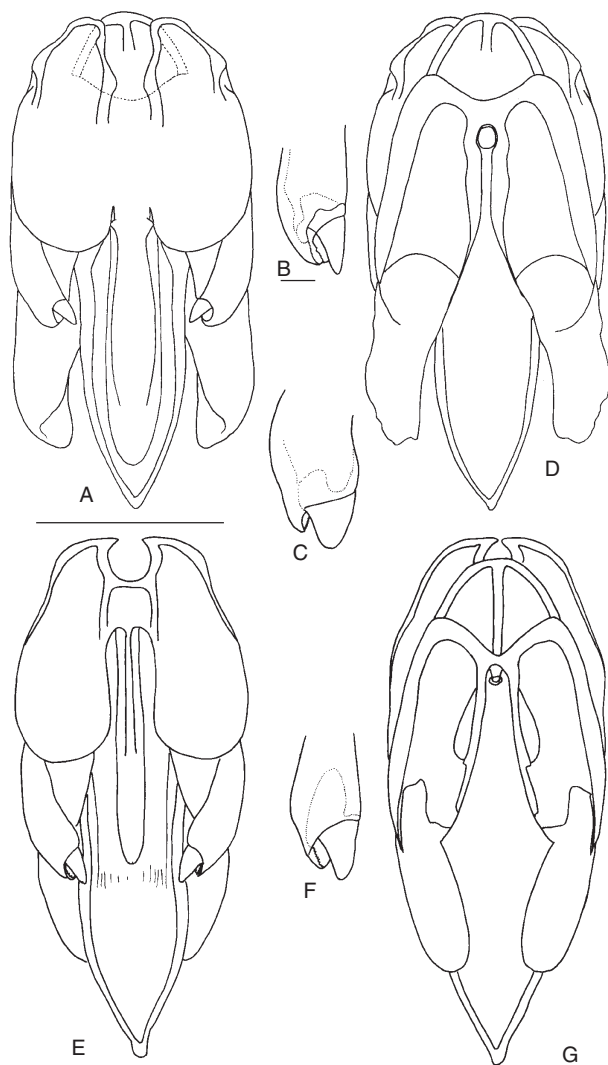


Fig. 26. *Phytoceram* spp., male, genitalia. *P. distinguendum*: A, ventral; B, C, paramere hook; D, dorsal. *P. golbachi*: E, ventral; F, paramere hook; G, dorsal. Scales = 1.0 mm (A, D, E, G); 0.1 mm (B, C, E).

XI 3.1–3.2× as long as wide in ♂ and 3.1× in ♀. Apical maxillary palpomere (Fig. 24N, O) wider in ♀, securiform, about 1.1× as long as wide in ♂ and 0.8× in ♀. Pronotum (Fig. 23D) convex; subtrapezoidal; about 0.7× as long as wide; sides weakly rounded, widest about two-fifths from base; sides strongly converging anteriorly to sinuous produced anterior margin, gradually converging posteriorly; posterior angles (Fig. 23E) not produced laterally; punctuation larger on disc with a few coalescent punctures near centre, median depression on disc absent; without median carina. Prosternum (Fig. 23G, I): chin piece weakly produced and truncated. Elytra 0.7× as long as body length, each one 3.6–3.7× as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Hind wing (Fig. 23J). Scutellum triangular about as long as wide. Profemur (Fig. 23F) without longitudinal carina (posterior surface), upper distal angle acute and produced. Metaleg (Fig. 23H). Aedeagus (Fig. 28A, D): penis about 3.5× as long as broad, apex acuminate, phallobase slightly broader than longer, about as long as wide, posterior process about 1.1× as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe larger, outer lobe finely toothed on inner side (Fig. 26E, F).

Examined material. Holotype, ♂, BRAZIL: Minas Gerais, Água Suja, 1918 (Muschow) (MZSP).

Other examined material. BRAZIL: Distrito Federal, Brasília, x. 1999 (N. Degallier), 1 ♂ (AMBC); Goiás, Jataí (U.R. Martins), 1 ♂ (MZSP); São Paulo, Itu, Faz. Pau d'Alho, 01–05.xi.1961 (U.R. Martins), 2 ♂ (MZSP); Luiz Antonio, Faz. Jataí, 18.i.1972 (E.X. Rabello), 1 ♀ (MZSP); São Paulo, Vila Mariana, xi.1963 (U.R. Martins), 1 ♂ (MZSP). ARGENTINA: Salta, San Martín, Pocitos, xi.1959 (A. Martínez), 1 ♂ (MZSP); Orán Abra Grande, 10.i–01.iii.1967 (R. Golbach), 1 ♂ (IMLA). PARAGUAY: San Pedro, Carumbé, i.1971 (R. Golbach), 1 ♂ (IMLA).

Distribution. Brazil (Goiás, Minas Gerais and São Paulo), Paraguay and Argentina.

Remarks. *Phytoceram distinguendum* can be distinguished by the oval elongate shape of the last palpomere and by the strongly produced third medial of the anterior pronotal margin.

***Phytoceram golbachi*, sp.n.** (Figs 26E–G, 27A–D, I, J, 28A–E, 29A)

Description. Length: 5.4–6.9 mm. General coloration: light to dark yellowish brown, darker on pronotum, antennae, legs and venter usually lighter than dorsum, prosternum and metaventricle darker. Interocular distance to head width 0.40 in ♂ and 0.49 in ♀. Frons convex; frontal

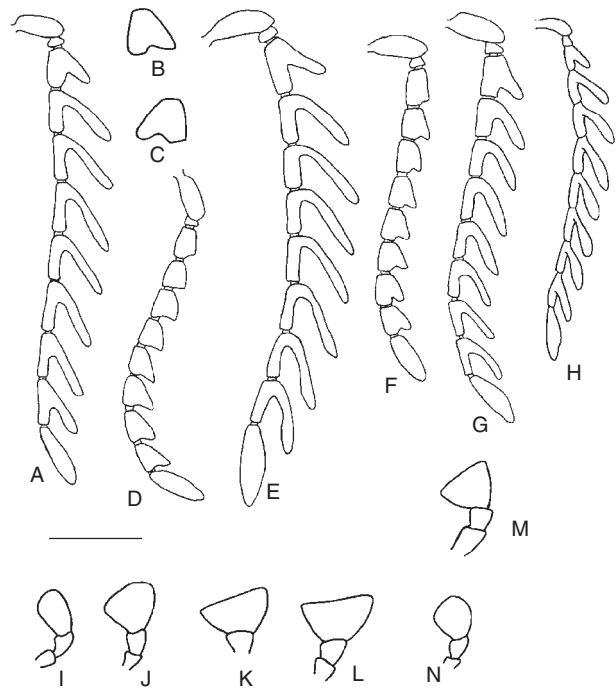


Fig. 27. *Phytoceram* spp. Antenna: A–D, *P. golbachi*, males, female; E, F, *P. ingens*, males, female; G, *P. inpa*, male; H, *P. minutum*, male. Maxillary palpomere: I, J, *P. golbachi*, male, female; K, L, *P. ingens*, male, female; M, *P. inpa*, male; N, *P. minutum*, male. Scales = 1.0 mm (A, D–H); 0.5 mm (B, C, I–N).

puncture deep, U-shaped, well marked in all specimens; anterior carina present; fine, reaching central puncture; posterior carina present and well distinct from central puncture to dorsum of cranium. Antenna (Fig. 27A–D): antennomere III pectinate, serrate at least one specimen, 0.8× as long as wide in ♂ and 1.4× in ♀; antennomere IV and V pectinate; antennomere XI 4.5× as long as wide in ♂ and 3.0× in ♀. Labrum (Fig. 28A) free, well sclerotized, strongly transverse and truncate. Mandibles (Fig. 28B, C) narrow, strongly curved and acute; without mola but with membranous prosthema. Maxillae (Fig. 28D) with both galea and lacinia densely setose at apex, apical maxillary palpomere (Fig. 27I, J) wider in ♀, elongate oval in ♂ and securiform ♀, about 1.5× as long as wide in ♂ (and 0.9× in ♀). Ligula (Fig. 28E) membranous, rounded apically; palps fused at base, apical palpomere securiform. Pronotum (Fig. 29A) convex; subtrapezoidal; about 0.7× as long as wide; sides weakly rounded, widest about two-thirds from base; sides strongly converging anteriorly to weakly produced anterior margin and gradually converging posteriorly; posterior angles not produced laterally; punctuation on disc larger with few coalescent punctures near centre, disc with median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.8× as long as body length, each one 3.6–3.7× as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular

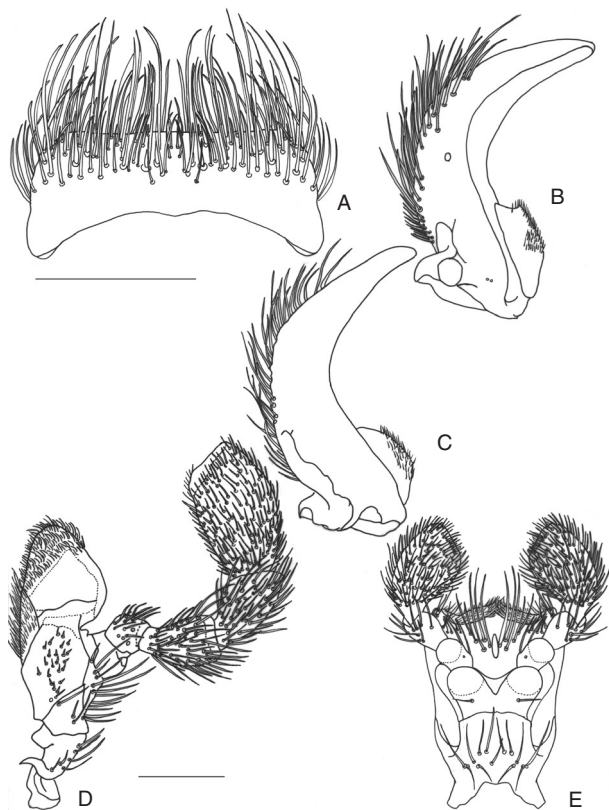


Fig. 28. *Phytoceram golbachi*, male. A, Labrum; B, C, mandible, ventral, dorsal; D, maxilla, ventral; E, labium. Scale = 0.5 mm (A; B–E).

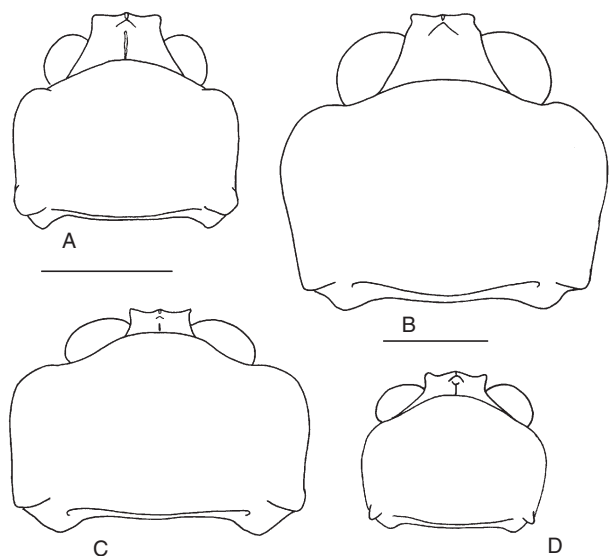


Fig. 29. *Phytoceram* spp. Head and pronotum: A, *P. golbachi*, male; B, *P. ingens*, male; C, *P. inpa*, male; D, *P. minutum*, male. Scale = 1.0 mm (A, D; B, C).

about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 26E, G): penis about $3.2\times$ as long as broad, apex mucronate, phallobase slightly broader than longer about $0.9\times$ as long as wide, posterior process about as long as base length of phallobase, basal almost circular, margins well sclerotized; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe larger, outer lobe minutely toothed on inner side (Fig. 26F).

Examined material. Holotype, ♂, ARGENTINA: Salta, Rosário de Lerma, malaise, 21–23.xii.1983 (M. Wasbauer) (CDAE). Paratypes, 2 ♂, 2 ♀, same data as holotype, 1 ♂ (CDAE); Salta, 10.xii.1974 (S. Durk and P. de Fonollati), 1 ♀ (IMLA); Santa Fé, 1968 (Lanteri and J. Daguerre), 1 ♂ (USNM); Misiones, Apostoles S. José, 04–27.i.1981 (R. Golbach), 1 ♀ (IMLA).

Distribution. Argentina.

Etymology. Named after the late Rodolfo Golbach (Instituto Miguel Lillo, Tucumán) in recognition of his studies on Neotropical Cerophytidae.

Remarks. See remarks under *P. cayennense*.

***Phytoceram ingens*, sp.n.** (Figs 7A–C, 27E, F, K, L, 29B, 30A–C)

Description. Length: 8.4–9.2 mm. General coloration: yellowish brown to reddish brown, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.5 in ♂ and 0.46 in ♀. Frons convex; frontal puncture deep, V-shaped, well marked in all specimens; anterior carina present; strong reaching central puncture; posterior carina absent. Antenna (Fig. 27E, F): antennomere III serrate, $1.0\times$ as long as wide in ♂ and $1.7\times$ in ♀; antennomere IV and V serrate; antennomere XI $3.2\text{--}3.4\times$ as long as wide in ♂ and $2.6\times$ in ♀. Apical maxillary palpomere (Fig. 27K, L) similar in ♂ and ♀, securiform, about $0.5\times$ as long as wide in ♂ and $0.7\times$ in ♀. Pronotum (Fig. 29B) convex; subtrapezoidal; about $0.7\times$ as long as wide in ♂ and $0.6\times$ in ♀; sides rounded, widest about two-thirds from base; strongly converging anteriorly to weakly produced anterior margin and gradually converging posteriorly; posterior angles not produced laterally; with coalescent puncture stronger on disc, disc with median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.6\text{--}3.7\times$ as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subtriangular, transverse, apex rounded. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 30A, C): penis about $4.9\times$ as long as broad, apex obtusely rounded, phallobase slightly broader than long,

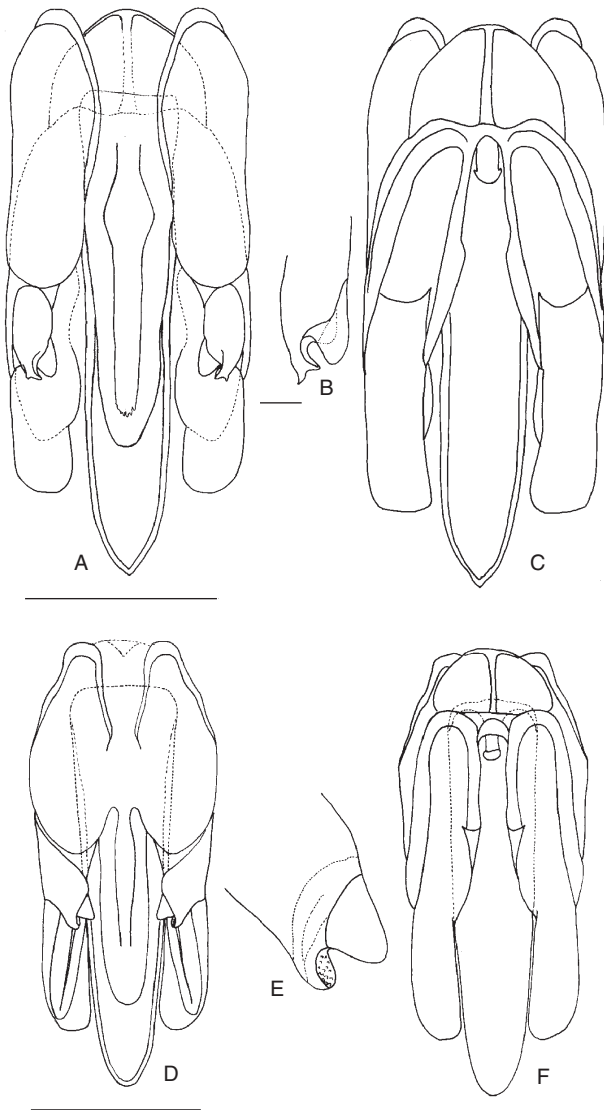


Fig. 30. *Phytocerum* spp., male, genitalia. *P. ingens*: A, ventral; B, paramere hook; C, dorsal. *P. inpa*: D, ventral; E, paramere hook; F, dorsal. Scales = 1.0 mm (A, C; D, F); 0.1 mm (B, E).

about $1.1\times$ as long as wide, posterior process about $0.8\times$ as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe bidentate at apex, outer tooth turned outward (Fig. 30B). Ovipositor long and narrow; coxites not divided, styli short and terminal (Fig. 7A, C), baculi elongate about $4.3\times$ as long as coxites. Internal ♀ tract consisting of elongate vagina, large terminal bursa copulatrix (Fig. 7B) well developed, with 1 pair of small smooth sclerites. Spermatheca absent.

Examined material. Holotype, ♂, BRAZIL: Espírito Santo, Córrego Itá, x.1954 (W. Zikan) (MZSP). Paratypes,

♂, ♀, same data as holotype, 1 ♀ (MZSP); Rio de Janeiro, Miguel Pereira, xii.2000 (J. Carlos), 1 ♂ (AMBC).

Distribution. Brazil (Espírito Santo and Rio de Janeiro).

Etymology. The specific epithet refers to the large size attained by this species.

Remarks. *Phytocerum ingens* is the largest species in the genus, and is probably the biggest Cerophytidae, attaining a length up to 9 mm.

***Phytocerum inpa*, sp.n.** (Figs 27G, M, 29C, 30D–F)

Description. Length: 7.6 mm. General coloration: dorsum brownish, darker on head and thorax, antennae, legs and venter lighter than dorsum. Interocular distance to head width 0.53. Frons convex; frontal puncture deep, V-shaped, well marked; anterior carina present, strong reaching central puncture; posterior carina present and well distinct from central puncture to dorsum of cranium. Antenna (Fig. 27G): antennomere III pectinate, as long as wide; antennomere IV and V pectinate; antennomere XI $3.3\times$ as long as wide. Apical maxillary palpomere (Fig. 27M) securiform, about $0.7\times$ as long as wide. Pronotum (Fig. 29C) strongly convex; subtrapezoidal; about $0.8\times$ as long as wide; sides nearly parallel, widest about middle; strongly converging anteriorly to sinuous produced anterior margin, gradually converging posteriorly; posterior angles not produced laterally; with coalescent puncture stronger on disc, disc with weak median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.9\times$ as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subtriangular, transverse, apex rounded. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 30D, F): penis about $3.7\times$ as long as broad, apex acuminate, phallobase elongate, about $1.1\times$ as long as wide, posterior process about $0.9\times$ as long as base length of phallobase, basal emargination very deep, posterior margin weakly sclerotized but conspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe finely toothed on inner side (Fig. 30E).

Examined material. Holotype, ♂, BRAZIL: Amazonas, Ipanúba, Sítio Maíra (?) 070 (ARM), ix.1995 (Barbosa) (INPA).

Distribution. Brazil (Amazonas).

Etymology. Named after the Instituto Nacional de Pesquisas da Amazônia – INPA (Manaus).

Remarks. See remarks under *P. boliviense*.

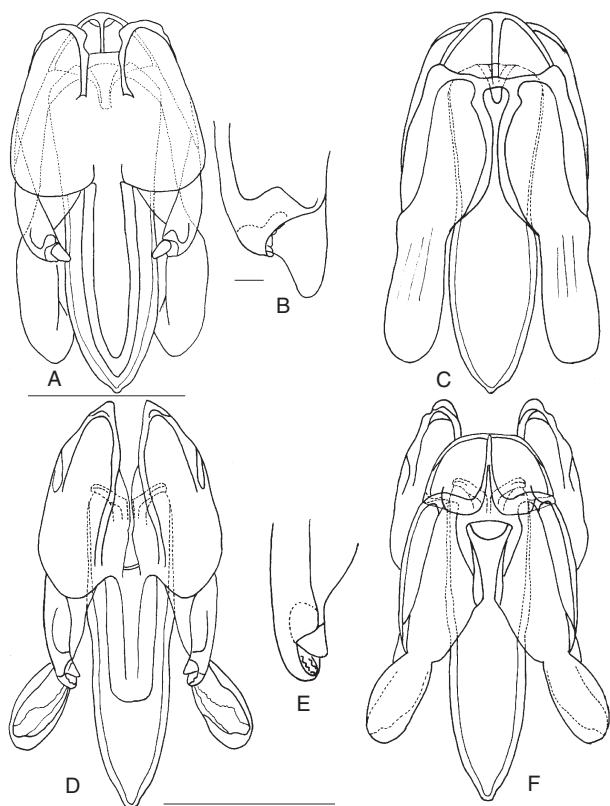


Fig. 31. *Phytocerum* spp., male, genitalia. *P. minutum*: A, ventral; B, paramere hook; C, dorsal. *P. serraticorne*: D, ventral; E, paramere hook; F, dorsal. Scales = 1.0 mm (A, C; D, F); 0.1 mm (B, E).

***Phytocerum minutum* (Golbach, 1983), comb.n.**
(Figs 1, 27H, N, 29D, 31A–C)

Cerophytum minutum Golbach (1983: 133, fig. 7) (type locality: Argentina, Salta, Forestal 50 km Las Lajitas).

Redescription. Length: 4.7–5.1 mm. General coloration: light yellow, darker on pronotum, antennae, legs and venter same colour as elytra. Interocular distance to head width 0.59. Frons weakly convex; frontal puncture deep, V-shaped, transverse, well marked; anterior carina weak or absent; posterior carina present and well distinct from central puncture to dorsum of cranium. Antenna (Fig. 27H): antennomere III pectinate, 0.9× as long as wide in ♂ and 1.6× in ♀; antennomere IV and V pectinate; antennomere XI 3.3× as long as wide in ♂ and 2.9× in ♀. Apical maxillary palpomere (Fig. 27N) similar in ♂ and ♀, securiform, about as long as wide in ♂ and 0.9× in ♀. Pronotum (Fig. 29D) convex; subtrapezoidal; about 0.7× as long as wide; sides weakly rounded, widest about the middle; lateral sides strongly converging anteriorly to rounded anterior margin, weakly converging posteriorly, posterior angles not produced laterally; punctures larger on disc with a few coalescent punctures near centre, disc with weak median depression; without median carina. Pro-

sternum: chin piece weakly produced and truncated. Elytra 0.7× as long as body length, each one 3.8× as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular, about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 31A, C): penis about 3.3× as long as broad, apex mucronate, phallobase about 0.9× as long as wide, posterior process about 1.1× as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, conspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe very small (Fig. 31B).

Examined material. Holotype, ♂, ARGENTINA: Salta, Forestal 50 km Las Lajitas, 27–31.i.1980 (R. Golbach) (IMLA).

Other examined material. ARGENTINA: Tucumán, La Cocha, Dique los Pizarros, 10–13.xii.1982 (R. Golbach), 1 ♂ (IMLA).

Distribution. Argentina.

Remarks. *Phytocerum minutum* is similar to *P. simonkai*. Both species lack the anterior and posterior frontoclypeal carinae, but *P. minutum* differs in having a strongly notched antennomere XI.

***Phytocerum serraticorne*, sp.n.** (Figs 18A, F, 31D–F, 32A)

Description. Length: 6.6 mm. General coloration: dorsum yellowish brown, head, prothorax and venter reddish

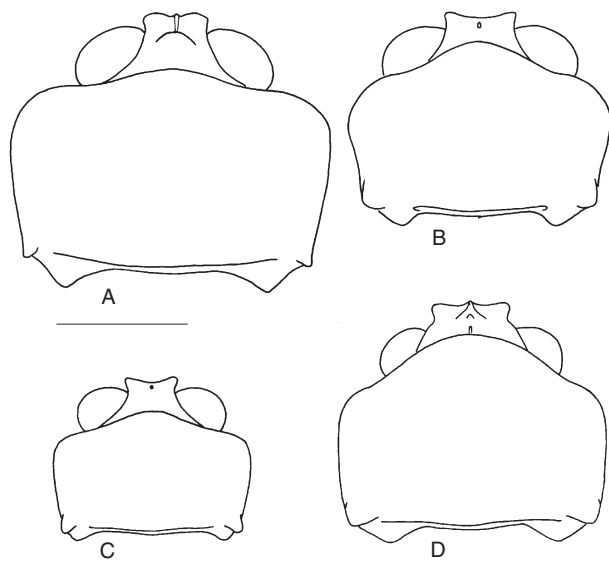


Fig. 32. *Phytocerum* spp. Head and pronotum: A, *P. serraticorne*, male; B, *P. simonkai*, male; C, *P. trinidadense*, male; D, *P. zikani*, male. Scale = 1.0 mm.

brown, antennae and legs yellowish. Interocular distance to head width 0.73. Frons convex; frontal puncture deep, V-shaped, well marked; anterior carina present, strong reaching central puncture, posterior carina absent. Antenna (Fig. 18A): antennomere III serrate, $1.5\times$ as long as wide; antennomere IV and V serrate; antennomere XI $3.5\times$ as long as wide. Apical maxillary palpomere (Fig. 18F) similar, weakly securiform, about $0.9\times$ as long as wide. Pronotum (Fig. 32A) strongly convex; subrectangular; about $0.6\times$ as long as wide; widest about two-thirds from base; lateral margins gradually converging posteriorly, posterior angles not produced laterally, anterior margin sinuous, weakly produced; posterior angles not produced laterally; with uniformly coalescent puncture, disc without median depression; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.5\times$ as long as wide, with additional row not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum subtriangular, transverse, apex rounded. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 31D, F): penis about $3.8\times$ as long as broad, apex mucronate, phallobase slightly broader than long, about $1.6\times$ as long as wide, posterior process about $1.6\times$ as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized but inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe smaller, outer lobe finely toothed on inner side (Fig. 31E).

Examined material. Holotype, ♂, GUATEMALA: Cavuga, v.1915 (Wm Schaus) (USNM).

Distribution. Only known from type locality.

Etymology. The specific epithet refers to the serrate male antennae, unique among species of *Phytocerum*.

Remarks. *Phytocerum serraticorne* is an outstanding species, well characterized by the male antennae being serrate, not pectinate, an exclusive character among *Phytocerum*. The only other known cerophytid species with a similar male antenna is *B. sinchona*. However, the latter is easily identified by the absence of the additional elytral stria.

***Phytocerum simonkai*, sp.n.** (Figs 18B, C, G, H, 32B, 33A–C)

Description. Length: 5.6–6.7 mm. General coloration: elytra yellowish, pronotum and head reddish brown, antennae and legs yellowish, prosternum and metaventricle reddish brown. Interocular distance to head width 0.50 in ♂ and 0.46 in ♀. Frons weakly convex; frontal puncture deep, oval-shaped, well marked in holotype and paratype; anterior carina absent; posterior carina absent. Antenna (Fig. 18B, C): antennomere III pectinate, $0.9\times$ as long

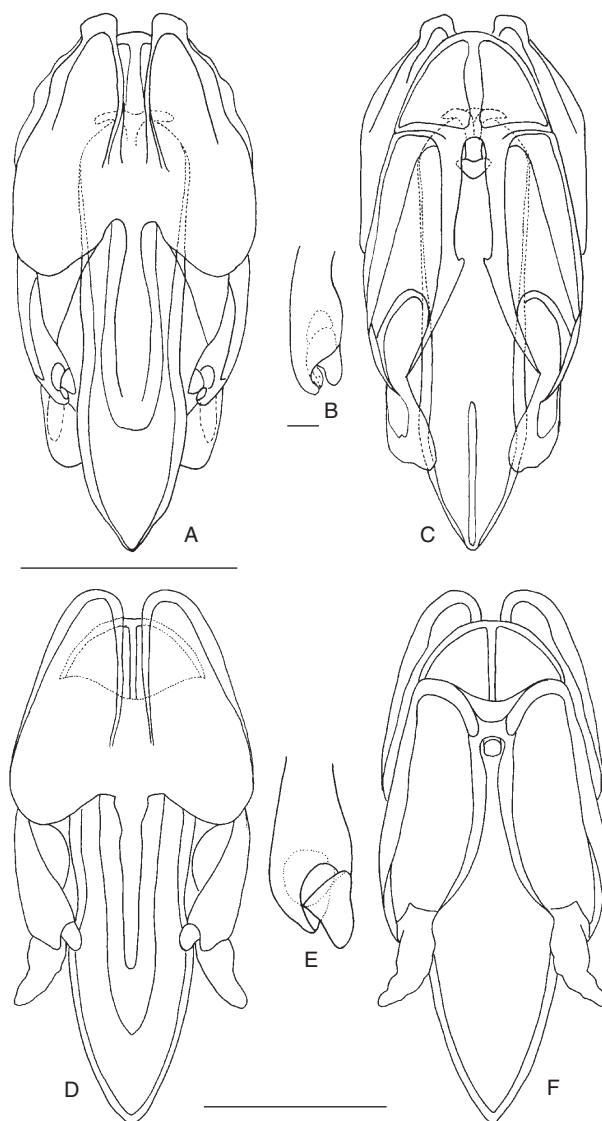


Fig. 33. *Phytocerum* spp., male, genitalia. *P. simonkai*: A, ventral; B, paramere hook; C, dorsal. *P. zikani*: D, ventral; E, paramere hook; F, dorsal. Scales = 1.0 mm (A, C; D, F); 0.1 mm (B, E).

as wide in ♂ and $2.0\times$ in ♀; antennomere IV and V pectinate; antennomere XI $4.8\times$ as long as wide in ♂ and $3.9\times$ in ♀. Apical maxillary palpomere (Fig. 18G, H) similar in ♂ and ♀, securiform, about $0.9\times$ as long as wide in ♂ and $1.0\times$ in ♀. Pronotum (Fig. 32B) strongly convex; subtrapezoidal; about $0.7\times$ as long as wide in ♂ and $0.6\times$ in ♀; sides rounded, widest about anterior third; strongly converging anteriorly to sinuous produced anterior margin, gradually converging posteriorly; posterior angles not produced laterally; with coalescent puncture stronger on disc, disc with weak median depression; without low median carina. Prosternum: chin piece weakly produced and truncated. Elytra $0.8\times$ as long as body length, each one $3.6\text{--}3.7\times$ as long as wide, with additional row

not surpassing posterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 33A, C): penis about 3.7× as long as broad, apex acuminate, phallobase slightly transverse, about 0.8× as long as wide, posterior process about 0.7× as long as base length of phallobase, basal emargination very deep, posterior margin weakly sclerotized but conspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, outer lobe with 2 similar rounded teeth at apex (Fig. 33B).

Examined material. Holotype, ♂, TRINIDAD: Simia, 01–15.vii.1962 (J. Maldonado C) (USNM). Paratype, ♀, same data as holotype (USMN).

Distribution. Trinidad.

Etymology. Named after Carlos Estevão Simonka (São Paulo) in recognition of his helpful assistance in the final art and electronic treatment of some figures of the male genitalia.

Remarks. See remarks under *P. minutum*.

***Phytocерum trinidadense* (Golbach, 1983), comb.n.**
(Figs 18D, I, 32C)

Cerophytum trinidadense Golbach (1983: 134, fig. 4) (type locality: Trinidad, St Augustine).

Redescription. Length: 4.3 mm. General coloration: yellowish brown, except yellowish elytra, antennae, legs and ventrites. Interocular distance to head width 0.63. Frons weakly convex; frontal puncture rounded, deep and small, anterior and posterior carinae absent. Antenna (Fig. 18D): antennomere III pectinate, 0.9× as long as wide; antennomere IV and V pectinate; antennomere XI 4.3× as long as wide. Apical maxillary palpomere (Fig. 18I) weakly securiform, about 0.9× as long as wide. Pronotum (Fig. 32C) convex; subrectangular; about 0.6× as long as wide; widest about two-fifths from base, anterior margin strongly sinuous and produced, lateral margins converging gradually posteriorly; posterior angles not produced laterally; puncture irregular, not coalescent, larger on disc, disc without weak median depression and median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.8× as long as body length, each one 3.5× as long as wide, with additional row just surpassing anterior margin of metacoxal plate, interstria IX weakly convex. Scutellum triangular, about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus: ♂ genitalia not dissected.

Examined material. Holotype, ♂, TRINIDAD: St Augustine, taken at light, 24.v.1959 (CNCI).

Distribution. Trinidad.

Remarks. *Phytocерum trinidadense* is the smallest cerophytid species.

***Phytocерum zikani* (Soares & Peracchi, 1964), comb.n.** (Figs 18E, J, 32D, 33D–F)

Cerophytum zikani Soares & Peracchi (1964: 128, figs 2 and 3) (type locality: Brazil, Minas Gerais, Mar de Espanha); Golbach (1983: 132) (key).

Redescription. Length: 6.9 mm. General coloration: dorsum reddish brown, antennae, legs and venter usually lighter than dorsum. Interocular distance to head width 0.40. Frons convex; frontal puncture deep, V-shaped, well marked in all specimens; anterior carina present; strong reaching central puncture; posterior carina present. Antenna (Fig. 18E): antennomere III pectinate, 0.7× as long as wide; antennomere IV and V pectinate; antennomere XI missing in the holotype. Apical maxillary palpomere securiform, about as long as wide. Pronotum (Fig. 32D) strongly convex; subtrapezoidal; about 0.7× as long as wide; sides nearly parallel, widest about two-fifths from base; sides strongly converging anteriorly to sinuous, produced anterior margin, weakly converging posteriorly; posterior angles not produced laterally; punctation coarser on disc with a few coalescent punctures near centre, median depression on disc present and weak; without median carina. Prosternum: chin piece weakly produced and truncated. Elytra 0.8× as long as body length, each one 4.4× as long as wide, with additional row, interstria IX weakly convex. Scutellum triangular about as long as wide. Profemur without longitudinal carina (posterior surface), upper distal angle acute and produced. Aedeagus (Fig. 33D, F): penis about 3.4× as long as broad, apex acuminate, phallobase slightly broader than longer, about 0.9× as long as wide, posterior process about as long as base length of phallobase, basal emargination very deep, posterior margin not sclerotized, inconspicuous; parameres bilobate at apex, hooklike structures formed by 2 lobes, inner lobe larger, both lobes untoothed (Fig. 33E).

Examined material. Holotype, ♂, BRAZIL: Minas Gerais, Mar de Espanha, 25.x.1910 (J.F. Zikan) (MZSP).

Distribution. Brazil (Minas Gerais).

Remarks. *Phytocерum zikani* is the only species in the genus with the sides of the pronotum almost parallel. Unfortunately, the antennae of the holotype are broken and the distal antennomeres are missing.

Discussion and conclusions

The character matrix (Appendix 2) has missing entries because males of two and females of twelve species are

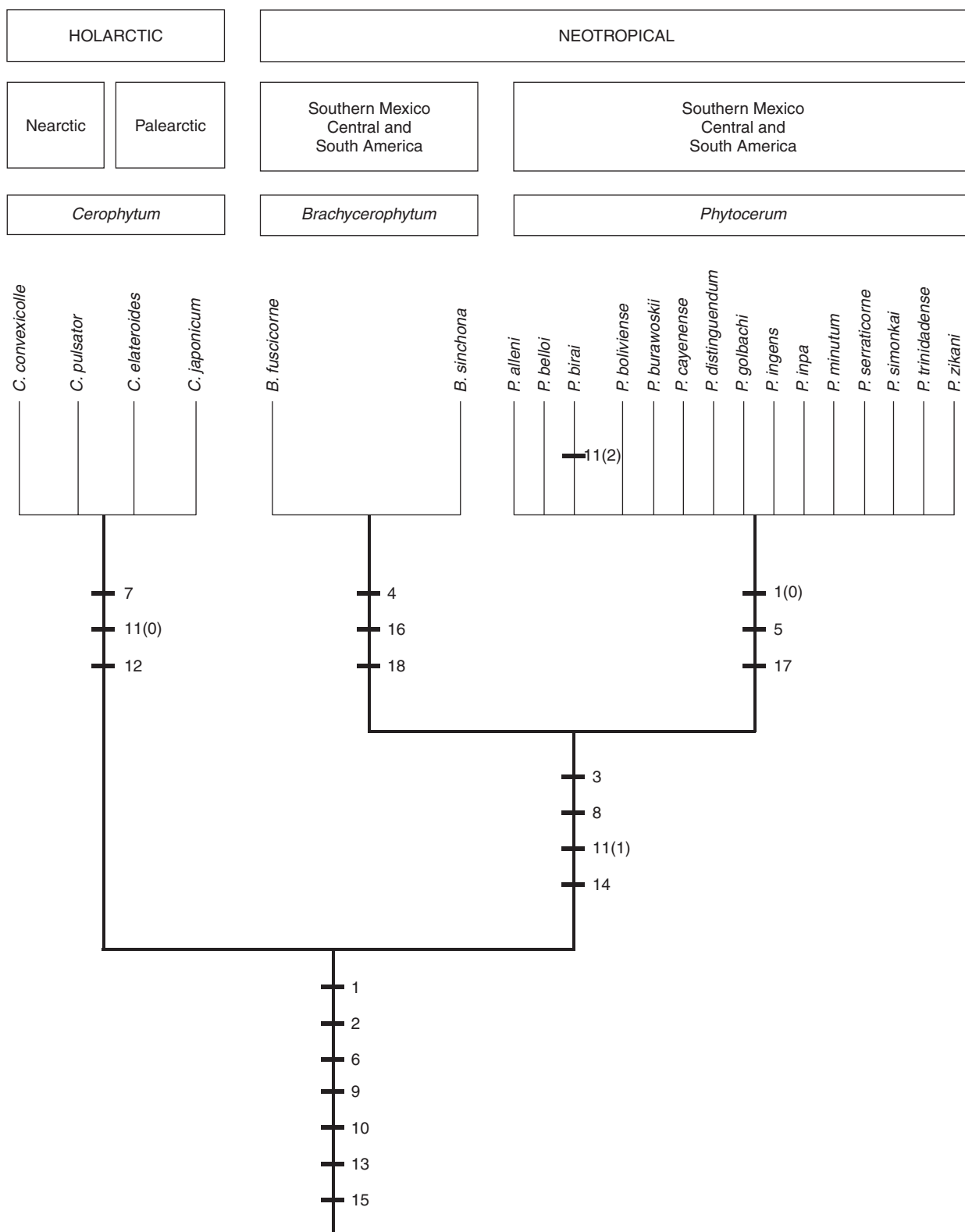


Fig. 34. One of the most parsimonious cladograms of Cerophytidae (consistency index = 0.95, retention index = 0.95), with the same topology as the consensus tree; character states are plotted on the branches and the distribution of the taxa are indicated above the terminals of the cladogram.

unknown or were not available, and relevant characters of the genitalia were not examined. To overcome the obfuscatory effect caused by missing data upon phylogenetic relationships, the taxonomic equivalent terminals were excluded (Wilkinson, 1995). The resulting data matrix, with eight nontaxonomic equivalent terminals, was analysed using the branch-and-bound algorithm, and fourteen minimal length trees were obtained [length=20 steps, consistency index (CI)=0.95, retention index (RI)=0.95]. The strict and semistrict consensus trees obtained were identical, showing the clades Cerophytidae, *Cerophytum*, *Brachycerophytum* and *Phytoceram* as monophyletic.

Figure 34 (outgroup taxa omitted) shows the relationships among Cerophytidae species, the character states plotted in the branches and the geographical distribution of the taxa indicated above the terminals of the cladogram. Three main clades are evident, each one sustained by at least one nonhomoplastic synapomorphy. The most basal, *Cerophytum*, comprises the Holarctic species, two Palaearctic species (*C. elateroides* and *C. japonicum*) and two Nearctic species (*C. convexicollis* and *C. pulsator*). The sister group of *Cerophytum* includes two clades, *Brachycerophytum* with two species (*B. fuscicornis* and *B. sinchona*), and its sister group, *Phytoceram*, with fifteen species. Both clades, *Brachycerophytum* and *Phytoceram*, are Neotropical, ranging from southern Mexico throughout Central to South America. The synapomorphies of the five observed clades include the following.

Cerophytidae

(1) Chin piece present, ventrally directed; (2) posterior angles of pronotum produced laterally; (6) metatrochanters very elongate, more than half as long as metafemora; (9) base of tergite IX and sternite X fused; (10) parameres of male genitalia divided into two regions, the proximal one strongly sclerotized and the distal one weakly sclerotized or membranous; (13) phallobase Y-shaped; and (15) ventral region of parameres projected backwards, under phallobase. The larva of only one cerophytid species, *C. elateroides*, is known. Possible larval synapomorphies of the family could be: sucking mouthparts formed by styliform mandibles and maxillae enclosed in separate lateral channels; bifurcate pretarsi; labium forming a five-toothed plate.

Holarctic clade, or Cerophytum

(7) Profemur with longitudinal carina; (12) dorsal region of parameres fringed.

Neotropical clade, or Brachycerophytum plus Phytoceram

(3) Posterior angles of pronotum reduced; (8) upper distal angle of profemur acute and produced; and (14) lateropos-

terior margin of phallobase protruded over the base of parameres.

Brachycerophytum

(4) Ninth elytral stria strongly convex; (16) basal portion of penis strongly constricted; and (18) bursa copulatrix without smooth and elongate sclerites.

Phytoceram

(1-0) Chin piece absent; (5) elytron with an additional row of punctures between stria VIII and IX; (17) sclerotized spermatheca absent.

We decided not to perform a more detailed analysis of the relationships among the species of the three genera, first because most of the attributes disclosed to identify the species are quantitative (e.g. lengths, proportions), without evident discontinuous patterns of variation, and thus difficult to use in cladistic analyses; and second due to the paucity of specimens examined of each species, which makes it much more difficult to evaluate the variation of continuous characters. However, the observed distributions of the three main clades, each one supported by consistent autapomorphies, justify the recognition of the two new genera.

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Appendix 1. List of phylogenetically relevant characters and comments.

1. *Prothorax, chin piece*: (0) absent (Fig. 23E, I); (1) present, ventrally directed (Figs 4I, J, 14F, H) (CI = 50). Calder *et al.* (1993), Muona (1995), modified.

In Throscidae, the chin piece is absent. In Eucnemidae, the two states occur. In Elateridae, the chin piece may be absent or present, but when present it is cranially directed. In *Cerophytum* and *Brachycerophytum*, the chin piece is present, ventrally directed and the anterior margin is rounded. In *Phytoceram*, the chin piece is absent and the anterior prosternal margin is truncate. This condition in *Phytoceram* is interpreted as a reversal.

2. *Pronotum, posterior angles*: (0) produced backwards; (1) produced laterally (Fig. 4A–C, H) (CI = 100).
 3. *Pronotum, posterior angles*: (0) well developed (Fig. 4A–C, H); (1) reduced (Figs 14A, B, 20F, 23D, E) (CI = 100).

In the outgroup taxa, the posterior angles of the pronotum are acuminate or rounded, well developed, and always directed backwards. In *Cerophytum*, the posterior angles of the pronotum are acuminate, well developed and produced laterally. In *Brachycerophytum* and *Phytoceram*, the posterior angles are weakly produced laterally and reduced.

4. *Elytron, ninth interstria*: (0) moderately convex; (1) strongly convex (CI = 100).

In *Brachycerophytum*, the ninth elytral interstria is strongly convex in the basal portion, more or less cariniform. In the outgroup taxa and remaining Cerophytidae, the ninth interstria is flat or at most moderately convex, not forming a carina.

5. *Elytron, additional subhumeral row of punctures between striae VIII and IX*: (0) absent (Fig. 14G); (1) present (Fig. 23C) (CI = 100).

In *Phytoceram*, there is a conspicuous additional row of punctures between elytral striae VIII and IX. The distal portion of the additional stria may reach as far as the posterior margin of the metacoxa. No similar stria is present in the outgroup taxa or in other Cerophytidae.

6. *Legs, metatrochanters*: (0) not very elongate; (1) very elongate, more than half as long as metafemora (Figs 4G, 14D, 23H) (CI = 100).

Very elongate metatrochanters are a synapomorphy for Cerophytidae. When metatrochanters are more or less elongate in the outgroup taxa, they are not more than half as long as the length of the metafemora.

7. *Legs, longitudinal carina of profemur*: (0) absent (Figs 14C, 23F); (1) present (Fig. 4F) (CI = 100).

In *Cerophytum*, a distinct longitudinal carina is present in the posterior surface of the profemur. In *Brachycerophytum*, *Phytoceram* and in the outgroup taxa, the carina is absent.

8. *Legs, upper distal angle of profemur*: (0) rounded (Fig. 4F); (1) acute and produced (Figs 14C, 23F) (CI = 100).

The distal angle of the profemur is rounded in *Cerophytum* and in the outgroup taxa. In *Brachycerophytum* and *Phytoceram*, the distal angle is acute and produced.

9. *Base of tergite IX and sternite X*: (0) free; (1) fused (Fig. 12A, B) (CI = 100).

In Cerophytidae, tergite IX is fused with the base of sternite X. A similar fusion is not known to occur in any other group of Elateriformia.

10. *Male genitalia, parameres*: (0) not divided; (1) divided into 2 regions, the proximal one strongly sclerotized and the distal one weakly sclerotized or membranous (Fig. 8A–I) (CI = 100).

In the outgroup taxa, the parameres are uniformly sclerotized. Parameres with two distinct regions, differently sclerotized, are found only in Cerophytidae. In most of the examined cerophytids, the distal region is wholly membranous, at most with a weak sclerotized, irregular rod. However, in *P. birai* a large portion of distal paramere is weakly sclerotized.

11. *Male genitalia, distal region of parameres*: (0) trilobate (Fig. 8B, C); (1) bilobate (Fig. 8E, F, H, I); (2) unilobate (Fig. 22D, F) (CI = 100). Nonadditive.

Three very distinct states can be found in the distal region of the parameres of cerophytids. Unilobate (weakly sclerotized) in *P. birai*, bilobate (membranous) in the other species of *Phytoceram* and *Brachycerophytum* and trilobate (membranous) in *Cerophytum*. Because the presence of divided parameres is a synapomorphy of Cerophytidae (character 10), the states of character 11 show an equivocal distribution and have no phylogenetic value.

12. *Male genitalia, dorsal region of parameres*: (0) not fringed (Figs 13B, G, 25C, F, 26C, F); (1) fringed (Figs 6C, F, 12F) (CI = 100).

In *Cerophytum*, an irregular fringe occurs in the dorsal region of the distal sclerotized portion of the parameres. A similar structure is absent in the other cerophytids and in the outgroup taxa.

13. *Male genitalia, phallobase*: (0) not Y-shaped; (1) Y-shaped (Figs 6A, D, 12D, 15A, D, 25D, 30D) (CI = 100).

A very characteristic phallobase, Y-shaped due to the posterior edge being produced in a narrow process, is found in all species of Cerophytidae. A similar condition has not been found in other Coleoptera.

14. *Male genitalia, lateroposterior margin of phallobase*: (0) not protruded over the base of parameres (Figs 6A, D, 12D); (1) protruded over the base of parameres (Figs 15A, D, 30A, D, 31A, D, 33A, D) (CI = 100).

In the outgroup taxa and in *Cerophytum*, the phallobase is more or less transversal and closely fitted to the base of the parameres and penis. In *Brachycerophytum* and *Phytoceram*, the phallobase is more elongate, and the posterolateral margins overhang the base of the parameres.

15. *Male genitalia, ventral region of parameres*: (0) not projected backwards; (1) projected backwards, under phallobase (Fig. 8C, I) (CI = 100).

In the outgroup taxa, the parameres are articulated with the phallobase. In cerophytids, the aedeagus is very modified, with fusion of the phallobase and the parameres. In the ventral region, the fused parameres form a process projected backwards under the main portion of the phallobase.

16. *Male genitalia, basal portion of penis*: (0) not constricted (Figs 6D, F, 12D, 21A, F, 25A, C, D, G); (1) strongly constricted (Fig. 15A, B, D, F) (CI=100).

The penis of *Brachycerophytum* is strongly constricted near the base. A similar condition is not found in *Cerophytum*, *Phytoceram* or the outgroup taxa.

17. *Sclerotized spermatheca*: (0) present (Figs 9A, E, 17Bb, Cb); (1) absent (Fig. 7A) (CI=100). Calder *et al.* (1993), Muona (1995), modified.

A distinctly curved and sclerotized spermatheca is present in *Cerophytum* (*C. elateroides* and *C. pulsator*), whereas a globular sclerotized spermatheca occurs in *Brachycerophytum* (*B. sinchona*). However, a structure that could be considered homologous with a spermatheca has not been found in four species of *Phytoceram* examined (*P. cayennense*, *P. distinguendum*, *P. golbachii* and *P. ingens*). As spermathecae, of different shapes, occur in the outgroup taxa, the absence is interpreted as an apomorphy. This character should be confirmed upon examination of other species of *Phytoceram*.

18. *Bursa copulatrix, smooth elongate sclerites*: (0) absent; (1) present (Fig. 17Bf) (CI=100). Calder *et al.* (1993), modified.

In the bursa copulatrix occur a pair of short spiculate sclerites in *Cerophytum* (Fig. 9A, D) and *Brachycerophytum* (Fig. 17Ba), and smooth sclerites in *Phytoceram* (Fig. 7A, B). In *Brachycerophytum*, there is a very elongate additional pair of smooth sclerites (Fig. 17Bf), appearing hollow after mild treatment with KOH, and with the tip of the more sclerotized extremity strongly curved, hook-shaped, with a diamond-shaped opening. This condition has not been observed in the other Cerophytidae or the outgroup taxa.

Appendix 2. Data matrix for cladistic analyses of Cerophytidae.

The order of the characters follows that presented and numbered in Appendix 1. '?' = unknown data; '-' = inapplicable data.

	Characters																			
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8		
<i>C. convexicollis</i>	1	1	0	0	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0
<i>C. elateroides</i>	1	1	0	0	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0
<i>C. japonicum</i>	1	1	0	0	0	1	1	0	?	?	?	?	?	?	?	?	?	?	?	?
<i>C. pulsator</i>	1	1	0	0	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	0
<i>B. fuscicornis</i>	1	1	1	0	1	0	1	1	1	1	0	1	1	0	1	1	1	0	1	0
<i>B. sinchona</i>	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	0	1	0	1
<i>P. alleni</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. belloi</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. birai</i>	0	1	1	0	1	1	0	1	1	1	2	0	1	1	1	0	?	?	?	?
<i>P. boliviense</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. burakowski</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. cayennense</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0
<i>P. distinguendum</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0
<i>P. golbachii</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0
<i>P. ingens</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0
<i>P. inpa</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. minutum</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. serraticornis</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. simonkai</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. trinidadense</i>	0	1	1	0	1	1	0	1	?	?	?	?	?	?	?	?	?	?	?	?
<i>P. zikani</i>	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	0	?	?	?	?
<i>P. noctilucus</i>	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
<i>P. henningi</i>	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
<i>C. spinicornis</i>	1	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
<i>G. bisulcatus</i>	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
<i>Aulothroscus</i> sp.	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0

