

Lace Bug Genera of the World, I:
Introduction, Subfamily Cantacaderinae
(Heteroptera: Tingidae)

RICHARD C. FROESCHNER

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ABSTRACT

Froeschner, Richard C. Lace Bug Genera of the World, I: Introduction, Subfamily Cantacaderinae (Heteroptera: Tingidae). *Smithsonian Contributions to Zoology*, number 574, 43 pages, 39 figures, 1 table, 1996.—Included is an outline of adult taxonomic anatomy, a key to the two subfamilies. Cantacaderinae Stål and Tinginae Laporte (acceptance of separate family status for the Vianaididae excludes them from this publication), a key to the two tribes of Cantacaderinae: Cantacaderini Stål and Phatnomatini Drake and Davis, and keys to the 10 genera of the tribe Cantacaderini and 26 genera of the tribe Phatnomatini. Each genus is diagnosed, depicted in a dorsal habitus drawing of its type species, and accompanied by a list of currently included species with additions and changes published subsequent to the Drake and Ruhoff (1965) catalog. Where practical at this time, a key to the species within some of the genera is offered.

Fossil forms are excluded except for three fossil species cataloged in modern genera: For two species of the Cantacaderini genus *Cantacader*, the new genus *Paleocader* is proposed with the new combinations *Paleocader avitus* (Drake) (type species) and *P. quinquecarinatus* (Germar and Berendt); the Phatnomatini species *Phatnoma baltica* Drake is transferred to the new combination *Sinalda baltica*.

In the tribe Cantacaderini, the following generic changes have been made since the Drake and Ruhoff (1965a) catalog: increase from five genera to 10; present transfer of the genus *Carldrakeana* Froeschner from the tribe Phatnomatini; description of the new genus *Paleocader* for two fossil species (see paragraph above); and earlier transfers into Cantacaderini from Phatnomatini of *Cyperobia* Bergroth, *Pseudophatnoma* Blöte, and *Stenocader* Drake and Hambleton. For genera within the Cantacaderini keys to two species of *Allocader* Drake, three species of *Carldrakeana*, two species of *Ceratocader* Drake, and two species of *Pseudophatnoma* are provided herein.

In the tribe Phatnomatini generic changes since the Drake and Ruhoff catalog are as follows: herein description of two new genera, *Etesinalda* for type and only species, *E. laticosta*, new species, from the Island of São Tome and *Exulmus* for *Ulmus engaeus* Drake and Ruhoff, type and only species, with new combination *Exulmus engaeus*; two genera described elsewhere by Froeschner, *Carldrakeana*, *Distocader*; eight by Pericart, *Daillea*, *Indocader*, *Microcader*, *Phatnomella*, *Pseudacalyptra*, *Pullocader*, *Taphnoma*, *Thaicader*; one by Stusak, *Phatnocader*; three genera transferred to Cantacaderini (see above); redefinition of *Gonycentrum* Bergroth, with *Sinalda* Distant elevated from synonymy; *Minitingis* Barber elevated from synonymy; and *Phatnoma baltica* Drake herein transferred to genus *Sinalda*. Within the tribe Phatnomatini keys to two species of *Eocader* Drake and Hambleton, two species of *Gonycentrum* Bergroth, two species of *Indocader*, three species of *Microcader*, two species of *Minitingis* Barber, four species of *Plesionoma* Drake, four species of *Taphnoma*, three species of *Ulmus* Distant, two species of *Zetekella* Drake are provided herein.

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Lace Bug Genera of the World, I: Introduction, Subfamily Cantacaderinae (Heteroptera: Tingidae)

Richard C. Froeschner

Introduction

Effective communication, in science as in everyday activities, depends on general acceptance of the meaning of words—their definitions. One of the main aims of the present offering is to establish certain definitions so that all students of lace bugs may have a common point of departure for their studies. Admittedly, some of these presently proposed points will need changing, but that admission is neither a new caution nor a reason to avoid making them, for they are formulated only on the evidences at hand; as more evidences accumulate, those points can be reappraised.

The extent of the taxon encompassing the lace bugs varies with modern authors. Drake and Davis (1960), basing their conclusions on an intensive study of the morphology of the group, considered it to be a family with three subfamilies: Cantacaderinae, Tinginae, and Vianaidinae. This concept was followed in the Drake and Ruhoff (1965a) catalog. Stys and Kerzhner (1975), without detailed explanation but possibly following Scudder's (1959) conclusion based on a study of the female genitalia of the Heteroptera, treated it as a superfamily including two families: Tingidae (with two subfamilies, Cantacaderinae and Tinginae) and Vianaididae. The Stys and Kerzhner arrangement is followed herein. The family Tingidae contains over 2100 species in about 300 genera.

This is the first of a series of papers to be offered as a means of identifying the world's modern lace bugs, at least to genus, by use of keys, diagnoses, and illustrations. To each genus is added a list of known species citing their original proposal and, as an aid in tracing the history of the species (including earlier synonyms), a page reference to location in the Drake and Ruhoff (1965a) catalog. Taxonomic changes made subsequent to that catalog (new combinations, synonymies, etc.) are

incorporated with appropriate citations, and subsequently described taxa are added. Where practical at this time, keys to species of many of the genera are appended.

Numerous fossil tingids have been described, "more than 160" according to Bekker-Migdisova (1962:302). No effort was made to include them comprehensively in this study, but because 3 fossil forms were cataloged in modern genera by Drake and Ruhoff (1965a) it was necessary to consider them: *Cantacader avitus* Drake and *Cantacader quinquecarinatus* (Germar and Berendt) are transferred to the new genus *Paleocader*; *Phatnoma baltica* Drake is transferred to the genus *Sinalda* Distant.

Effective use of a key demands that the user recognize the limits of keys. First, keys operate primarily by serving as a device for eliminating forms from further consideration. Secondly, confidence in the correctness of the name encountered by following the key can be relied upon only to the degree that all constituents of the fauna are represented in the key. After keying, verification is needed. The keyed identification must be checked by comparing the specimen with a good description of the critical characters or, better yet, against authentically identified specimens of the named species. If forms not represented in the key are thus discovered, the key must be expanded to encompass them. It is with the awareness of these limitations that these keys are offered.

OUTLINE OF TAXONOMIC ANATOMY

FIGURES 1-3

Modern classification of the tingids is based almost wholly on the external anatomy of the adults. This practice follows the old philosophy that morphology permits and reflects function and that proper functioning permits continued existence in a particular environment—it is this ability of the individual to maintain and reproduce its kind that is reflected in the concept of a species.

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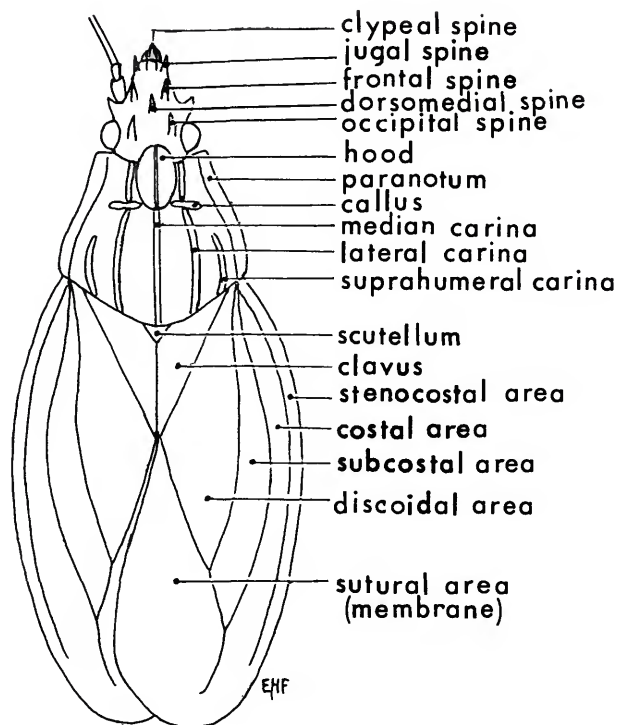


FIGURE 1.—Generalized tingid morphology, dorsal view.

The foundation for understanding tingid anatomy was expanded and summarized by Drake and Davis (1960), and it is on that treatise (with elimination of the Vianaididae) that the present outline of tingid morphology (see Figures 1-3) is based.

Important to interpreting tingid anatomy is the matter of infraspecific differences as shown in sexual dimorphism (such as with differing ratios of certain antennal segments), and the differences shown by macropterous and brachypterous individuals of the same species (see below for discussion of thorax). Although these matters must be considered when interpreting a taxon or describing a new one, it is acknowledged that the descriptions and interpretations must be based on the evidences at hand and must so stand until additional facts come to hand.

The common name "lace bugs" reflects the lacy appearance created by a network of fine, raised lines evident on much of the dorsal surface of the insect. These lines are referred to as "veins," and the spaces enclosed by them are termed "cells" or "areolae."

The head may be porrect (projecting subhorizontally in front of eyes) or variously decurved (appearing shortened in dorsal view) anterior to eyes. The 4-segmented antennae are each inserted in a socket in a variously developed modification of the side of the head capsule; these modifications are referred to as the antennophores or antennal tubercles. The antennophore may be short or long and may have the outer apical angle

variously prolonged as a tubercle or spine, which is sometimes decurved or incurved. Dorsally the head may have 0-9 long or short spines or tubercles, some arranged in pairs (one on each side of midline), some placed individually on the midline. The paired spines (tubercles) consist of the jugal pair (one member on each jugum), the frontal pair (usually near an imaginary line connecting antennal bases), and the occipital pair (located on the occiput or arising a short distance forward so as to be between the eyes). The single spines (which may be subdivided into a left and a right member) on the midline of the head include the dorsomedial (on midline slightly anterior to eyes), the clypeal (arising from the clypeus), and sometimes one arising between the frontals. The pattern and individual development of these spines are much used in tingid taxonomy. The antenna may show significant generic differences in shape, in proportion of, and in vestiture of the individual segments.

Ventrally the head bears two longitudinal laminae, the bucculae, forming a median trough for the first labial segment; these bucculae may extend distinctly anterior to the apex of the head where they may converge, even to become contiguous. The length of the four-segmented labium (beak or rostrum) varies considerably: it may reach only onto the thoracic sterna or it may extend onto the abdomen as far as the genital structures.

All three thoracic segments exhibit characters used in tingid taxonomy. These characters must be used with great caution because, unfortunately, the shape of all three thoracic segments, their armature, and their intersegmental proportions, as well as

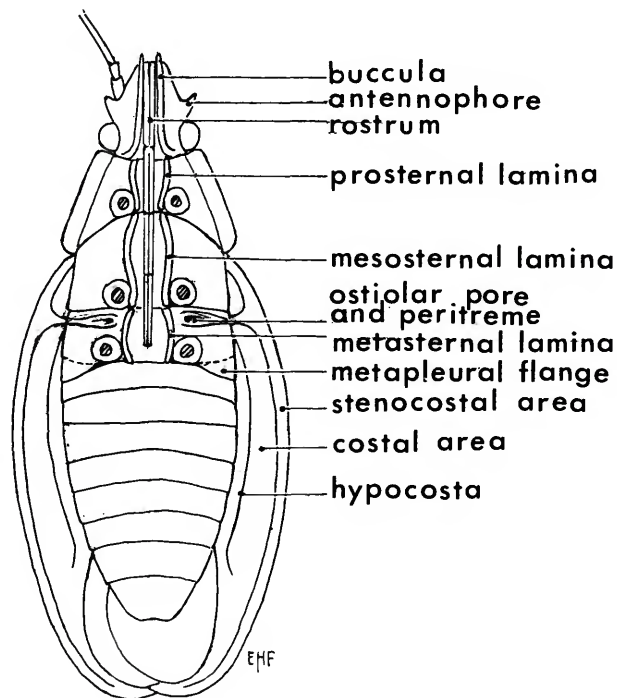


FIGURE 2.—Generalized tingid morphology, ventral view.

the form and sculpture of the wings, may be quite different in brachypterous and macropterous individuals of the same species. When a taxon is known from individuals of only one wing length, there is no way to anticipate the conditions in individuals with the other wing length; such forms must be dealt with as observed until information about the other morph permits reevaluation of the separating characters.

Ventrally, the three thoracic sterna each may have a pair of longitudinal carinae or laminae (that is, with cells), one on each side of the midline, forming a narrow channel in which the labium reposes at rest—these are the sternal laminae and the space between them generally is termed the rostral groove.

The prothorax is variously provided with simple carinae or laminae. The pronotal disc most commonly has three longitudinal carinae (which may be expanded into laminae with the inclusion of one or more rows of cells): the median carina and one on each side of it, the lateral carinae. These carinae may be absent or they may be partially or wholly present and accompanied by another pair, the suprahumeral consisting of a short carina over the pronotal convexity each side of the lateral carinae and next to the humerus. The median carina may have near its anterior end or for full length an enlargement in the form of a weak to strong tectation or an inflated bulb-like structure termed the cyst or hood (the latter term is used especially when the inflation extends over part or all of the head). In a few instances the posterior part of the median carina may also be elevated variously as a second tectation or bulbous cyst distinctly separated from the anterior one. The lateral margin of the pronotum may be smoothly rounded (ecarinate), defined by a simple carina, or marked by an expansion (containing one or more rows of cells) known as the paranotum (plural paranota). The posterior margin of the pronotum may be more or less prominently extended backwards as a triangular or semicircular posterior projection.

The mesothorax bears the first pair of wings, the hemelytra (singular hemelytron), whose modifications are much used in tingid taxonomy. Greater elevation of certain veins of the hemelytron generally divides its surface into four main areas: costal area, subcostal area, discoidal area, and sutural area, the latter often overlapping. These areas offer taxonomic characters in distinctness of delimiting veins, in relative size and shape, and in numbers of cells or rows of cells encompassed. The clavus, which is a prominent part of the hemelytron in some heteropterous families, may be distinct and exposed (as in the subfamily Cantacaderinae) or reduced, depressed, and concealed (as in most members of the subfamily Tinginae) by the triangular posterior projection of the pronotum; in some of the coleopteroid forms, the clavus is fused imperceptibly to the rest of the wing and the hemelytra meet in a straight line for their full length. Ventrally the hemelytron characteristically exhibits the hypocosta, a prominent carina or lamina (most frequently containing one or occasionally two or more rows of cells) that demarks the inner edge of the costal area.

The metathorax bears the hind wings and, on each side opposite the insertion of the hind legs, a single pore, the ostiolar

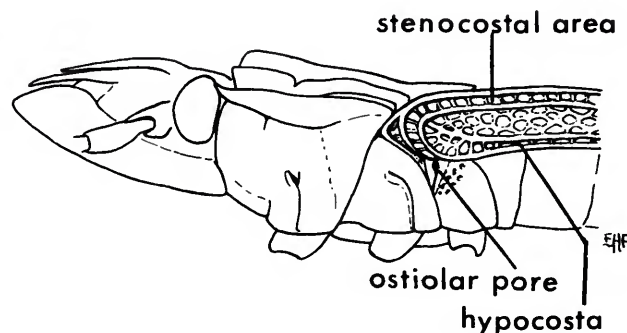


FIGURE 3.—*Cantacaderquadricornis* lateral view showing alignment of peritreme and stenocostal area.

opening, allowing outflow of the fluid from the internal scent gland. The scent fluid is conducted from an internal, midventral chamber to the pore by a closed tube, the vestibular duct. In some forms the vestibular duct extends laterad so far as to place the pore at the edge of the hypocosta. The metapleural surface laterad of the pore may be modified into what is called the peritreme. The peritreme may be very vague or may exhibit a variety of discrete forms. It may consist of a trough formed by two close-set carinae that are parallel or diverging. In another form, the limiting carinae are elevated and form an apically closed loop near or slightly above the ventral margin of the hypocosta. For a further modification associated with the scent-gland opening and its functioning, see the discussion of the stenocostal area in the tribe Cantacaderini.

The three pairs of typically heteropterous legs, but with only two tarsal segments, sometime have modifications of taxonomic use. These modifications will be pointed out where appropriate.

The abdomen, whose first visible segment is morphologically the second segment (the true first being concealed), offers a few surface modifications, such as grooves, projections, and carinae, that are used by the taxonomist.

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This project would have been prohibitively difficult had it not been for ready access to the Carl J. Drake tingid collection now on deposit in the National Museum of Natural History of the Smithsonian Institution, Washington, D.C., where Drake worked for the last eight years of his life, plus the valued assistance of an earlier National Science Foundation grant (NSF grant GB-791) that permitted study of critical materials in several European museums a number of years ago. The generous cooperation of the curators of those museums at that time is appreciated and hereby acknowledged: M. Beier, Naturhistorische Museum, Vienna; L. Brundin and P. Persson, Naturhistoriska Riksmuseet, Stockholm; J. Carayon, Museum National d'Histoire Naturelle, Paris; W.E. China, The Natural History Museum, London; J. Gómez-Menor, Instituto Español

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Family TINGIDAE Laporte

The family name of the lace bugs has appeared in several spellings: Tingidae, Tingideae, Tingidida, Tingididae, Tingiditae, Tingidites (Laporte's original spelling), Tingitidae, etc. The spelling "Tingidae" was adopted by the International Commission on Zoological Nomenclature in its Opinion 143 (1943a:83) and confirmed in its *Bulletin of Zoological Nomenclature* (1943b:13).

Key to Subfamilies of Tingidae

- Clavus of hemelytron more weakly developed than mesocorium and depressed below its surface, usually wholly covered by strongly produced triangular posterior margin of pronotum. Visible abdominal segments I-IV fused **TINGINAE** Laporte
- Clavus of hemelytron developed similarly to mesocorium, not depressed below its surface, seldom with more than its very base covered by weakly produced posterior margin of pronotum. Visible abdominal segments I-II only fused (not III and IV)
 **CANTACADERINAE** Stål

Subfamily CANTACADERINAE Stål

Cantacaderaria Stål, 1873:116.
Cantacaderinae.—Drake and Ruhoff, 1965a:22.

DIAGNOSIS.—Clavus developed equally to and on the same plane with the mesocorium, meeting in a straight line to form a distinct claval commissure with slightly thickened edges.

GEOGRAPHIC DISTRIBUTION.—This subfamily is fundamentally a taxon of the southern land masses (including southern Asia) of the world; of its modern members, none is known from North America and only two of its modern genera are found in the Palearctic Region (one genus restricted to that region and

the other represented there by four of its 30 species). Fossil records are available for three species, in two genera, in the Palearctic Region. Table 1 charts the distribution of modern genera by zoogeographic regions.

COMMENTS.—The subfamily Cantacaderinae appears to be a natural and valid group whose included genera fall into two categories characterized by Drake and Davis (1960:78) as (1) the tribe Cantacaderini, with a stenocostal area visible dorsally (see discussion of characters under tribe Cantacaderini for fuller explanation of extent of stenocostal area), and (2) the tribe "Phatnomini" (emended to Phatnomatini by Froeschner (1981:96)), lacking the stenocostal area.

Key to Tribes of Cantacaderinae

- Hypocosta near base with a trough delimited by a pair of prominently elevated crossveins leading from near apex of ostiolar canal and, in most genera, this elevation of adjacent veins continues along the ventral surface of the costal area to set off a single row of cells, the stenocostal area [Figure 3] **CANTACADERINI** Stål
- Hypocosta not thus interrupted and no stenocostal area present on ventral surface of costal area **PHATNOMATINI** Drake and Davis

TABLE 1.—Geographic distribution of modern Cantacaderinae by tribes and genera (numbers = totals of genera and species).

Taxon	Neotropics	Nearctic	Palaearctic	Oriental	Ethiopian	Madagascan	Australian	New Zealand	Oceania
CANTACADERINAE (35, 135)	6, 22	-	1, 6	16, 35	11, 48	2, 2	5, 10	1, 1	5, 11
CANTACADERINI (9, 53)	2, 2	-	1, 6	3, 11	1, 19	1, 1	4, 9	1, 1	2, 4
<i>Allocader</i> (3)	-	-	-	-	-	-	3	-	-
<i>Cantacader</i> (39)	-	-	6	8	19	1	2	-	3
<i>Carldrakeana</i> (3)	-	-	-	-	-	-	2	-	1
<i>Ceratocader</i> (2)	-	-	-	-	-	-	2	-	-
<i>Cyperobia</i> 1	-	-	-	-	-	-	-	1	-
<i>Nectocader</i> (1)	1	-	-	-	-	-	-	-	-
<i>Pseudophatnoma</i> (2)	-	-	-	2	-	-	-	-	-
<i>Stenocader</i> (1)	1	-	-	-	-	-	-	-	-
<i>Teratocader</i> (1)	-	-	-	1	-	-	-	-	-
PHATNOMATINI (26, 82)	4, 20	-	-	13, 24	10, 29	1, 1	1, 1	-	3, 7
<i>Allooderes</i> (1)	-	-	-	1	-	-	-	-	-
<i>Angiocader</i> (1)	-	-	-	-	1	-	-	-	-
<i>Astolophus</i> (1)	-	-	-	-	1	-	-	-	-
<i>Cnemiandrus</i> (1)	-	-	-	-	1	-	-	-	-
<i>Cyclotynaspis</i> (1)	-	-	-	1	-	-	-	-	-
<i>Daillea</i> (1)	-	-	-	1	-	-	-	-	-
<i>Distocader</i> (1)	-	-	-	-	-	-	-	-	1
<i>Eocader</i> (2)	2	-	-	-	-	-	-	-	-
<i>Etesinalda</i> (1)	-	-	-	-	1	-	-	-	-
<i>Exulmus</i> (1)	-	-	-	-	1	-	-	-	-
<i>Gonycentrum</i> (2)	-	-	-	1	1	-	-	-	-
<i>Indocader</i> (2)	-	-	-	2	-	-	-	-	-
<i>Microcader</i> (3)	-	-	-	3	-	-	-	-	-
<i>Minitingis</i> (2)	2	-	-	-	-	-	-	-	-
<i>Oranoma</i> (1)	-	-	-	-	-	-	-	-	1
<i>Phatnocader</i> (1)	-	-	-	1	-	-	-	-	-
<i>Phatnoma</i> (28)	14	-	-	5	2	1	1	-	5
<i>Phatnomella</i> (2)	-	-	-	2	-	-	-	-	-
<i>Plesionoma</i> (4)	-	-	-	-	4	-	-	-	-
<i>Pseudacalypta</i> (1)	-	-	-	1	-	-	-	-	-
<i>Pullocader</i> (1)	-	-	-	1	-	-	-	-	-
<i>Sinalda</i> (14)	-	-	-	-	14	-	-	-	-
<i>Taphnoma</i> (4)	-	-	-	4	-	-	-	-	-
<i>Thaicader</i> (1)	-	-	-	(1)	-	-	-	-	-
<i>Ulmus</i> (3)	-	-	-	-	3	-	-	-	-
<i>Zetekella</i> (2)	2	-	-	-	-	-	-	-	-

Tribe CANTACADERINI Stål

Cantacaderaria Stål, 1873:116.

Cantacaderini.—Drake and Ruhoff, 1965a:22.

DIAGNOSIS.—This tribe is characterized within the entire family Tingidae by the presence of a “stenocostal area” (see discussion below), which is always visible ventrally and sometimes also dorsally.

COMMENTS.—Certain generalizations can be made: (1) head never with spines (tubercles) on midline; (2) pronotum never with inflated cysts; (3) paranotum never reflexed to form a mesally opening cyst; and (4) hemelytron always with some expression of the stenocostal area (at least on the hypocostrata).

The stenocostal area, whose total structure and location suggest it serves as a trough to convey the scent-gland fluid to

the costal area for evaporation, is much more complex than the original description would suggest—it may or may not involve a dorsal modification of the hemelytron. Morphologically it consists of a narrow trough bordered on each side by a thickened and distinctly elevated vein. In its least development it is a trough only across the hypocostrata between two thickened, subbasal veins just opposite the apex of the peritreme (e.g., genus *Carldrakeana* Froeschner). In the next step of complexity this trough across the hypocostrata lamella joins with a similar trough formed by the outermost row of cells on the ventral surface of the costal area between the thick costal vein and the thickened subcostal vein (e.g., genus *Cyperobia* Bergroth). The most complex expression adds a dorsally evident differentiation of the outermost row of costal area cells into a distinct row that is set off by a thickened subcostal vein (e.g., *Cantacader* Amyot and Serville).

This interfunctioning of structures arising on two body segments—scent-gland peritreme on metathorax and stenocostal area on wing arising from the mesothorax—must be under multiple gene control and hence not easily duplicated. The steps of increasing complexity of this evaporating mechanism can be termed a transformation series in the sense of Hennig (1966:89) and permits the tribe to be adjudged monophyletic.

As treated herein the tribe Cantacaderini contains twice the number of genera cataloged in it by Drake and Ruhoff (1965a). In addition to the five genera included there, three genera have been transferred from the tribe Phatnomatini, where they were cataloged by Drake and Ruhoff: *Cyperobia* Bergroth (transferred by Stusak (1979:149)); *Pseudophatnoma* (transferred by Pericart (1991:49)); and *Stenocader* Drake and Hambleton

(transferred by Froeschner (1968:246)). A fourth additional postcatalog genus, *Carldrakeana* Froeschner (1968:250), was described in Phatnomatini but is herein transferred into the Cantacaderini. A fifth additional genus, *Paleocader* (fossil), is described herein for two fossil species from European ambers: *Cantacader avitus* Drake, type species, and *Tingis quinquecarinatus* Germar and Berendt.

GEOGRAPHIC DISTRIBUTION.—All geographic regions except the Nearctic contain one or more modern members of this tribe. The genus *Cantacader* Amyot and Serville is restricted to the Old World, where it has some of its member species in each of the subregions there. Of the other eight genera, two are confined to the Neotropics, two occur only in the Oriental Region, and four are known from the Australo-New Zealand area (see Table 1).

Key to Genera of Cantacaderini

1. Posterior margin of pronotum convexly to triangularly produced, completely covering scutellum 2
Posterior margin of scutellum medially transverse or partly concave, exposing apex or more of scutellum 4
2. Paranotum strongly explanate, margin forming long, narrow, triangular projection anterolaterally and at midlength *Pseudophatnoma* Blöte
Paranotum explanate or not, never forming large triangular projections 3
3. Hemelytral outline abruptly expanded from base, forming an extremely broad costal area (15–20 row of cells wide) for its full length *Teratocader* Drake
Hemelytral outline gradually widening from base, costal area narrower (less than 10 rows of cells wide) *Cantacader* Amyot and Serville
4. Paranotum with 6–8 long spines (some as long as width of an eye) extending horizontally at right angles to lateral margin *Ceratocader* Drake
Paranotum with not more than 1 long spine, lateral margins sometimes almost serrate 5
5. Lateral margins of paranotum and costa with numerous small but distinct triangular projections appearing as irregular serrations *Stenocader* Drake and Hambleton
Lateral margins of paranotum and costa without projections or serrations 6
6. Costal area with 1–2 rows of cells (including stenocostal row delimited by thickened vein only on ventral side) 7
Costal area with 6 or more rows of cells (including stenocostal row delimited dorsally and ventrally) 8
7. Paranotum on anterior half with 1 row of moderately large cells and deflexed, at least in part, against propleuron. Interocular area on each side of midline with a pair of fine, black, oblique sutures extending from occiput to base of supraclypeal spines *Cyperobia* Bergroth
Paranotum for full length areolate, obliquely elevated. Interocular area of head without fine, black, oblique sutures *Carldrakeana* Froeschner
8. Pronotum dorsally with only 3 distinct longitudinal carinae *Allocader* Drake
Pronotum dorsally with 5 distinct longitudinal carinae 9
9. Costal area abruptly and very much widened from base, with 12 or more rows of cells. Head elongate, preocular part about 5 times as long as horizontal diameter of an eye *Nectocader* Drake
Costal area gradually widening from base, almost continuing outline of paranotum, with 5–6 rows of cells. Head short, preocular part not more than twice as long as horizontal diameter of an eye *Paleocader*, new genus

Genus *Allocader* Drake

FIGURE 4

Allocader Drake, 1950:156 [type species: *Cantacader leai* Hacker, original designation].—Drake and Ruhoff, 1965a:22.

DIAGNOSIS.—Among the tribal members with exposed scutellum and entire (neither spined nor serrate) paranotal margins, this genus can be recognized by its tricarinate (no suprahumeral carinae) pronotal disc and its broad (4–6 rows of cells) costal area. Length 3–9 mm.

GEOGRAPHIC DISTRIBUTION.—All records for this genus are for Australia and its nearby islands.

ETYMOLOGY (masculine).—*allos*, Greek (other), plus the nondescriptive fragment *-cader* from the generic name *Cantacader* denoting another generic type in the taxon containing *Cantacader*.

COMMENTS.—Examination of a paratypic *A. leai* nymph, with the same label information as the paratypic adult at hand, shows the thorax and the abdomen to be spineless except for a posteriorly deflexed, long, stout, sharp spine on the midline of each of the first two abdominal tergites. Its cephalic spines are short and blunt as in the adult. The nymphal prothorax shows the broad (but here nonareolate) paranotal expansions typical of the genus.

The basal pronotal width given as “1.10 mm” in the original description of *A. nesiotis* Drake and Ruhoff must be a typographical error because the accompanying illustration shows it to be equal to half the width of the combined hemelytra described as “5.20 mm.”

Drake and Ruhoff (1962:250) stated in the comparative note for *A. nesiotis*, “The cephalic spines (two pairs in front of eyes) are long as in *A. leai*, whereas they are short, tuberculate in the other species.” Examination of pertinent type material and original descriptions reveals that it is *A. cordatus* (Hacker), as correctly described by Drake with the original description of the genus, which has the long cephalic spines.

List of *Allocader* species

Allocader cordatus (Hacker).

Phatnoma cordata Hacker, 1927:19 [Australia].

Allocader cordata.—Drake and Ruhoff, 1965a:22.

Allocader leai (Hacker).—Drake and Ruhoff, 1965a:23.

Cantacader leai Hacker, 1928:176 [Australia].

Allocader nesiotis Drake and Ruhoff, 1962:249 [Australia]; 1965a:23.

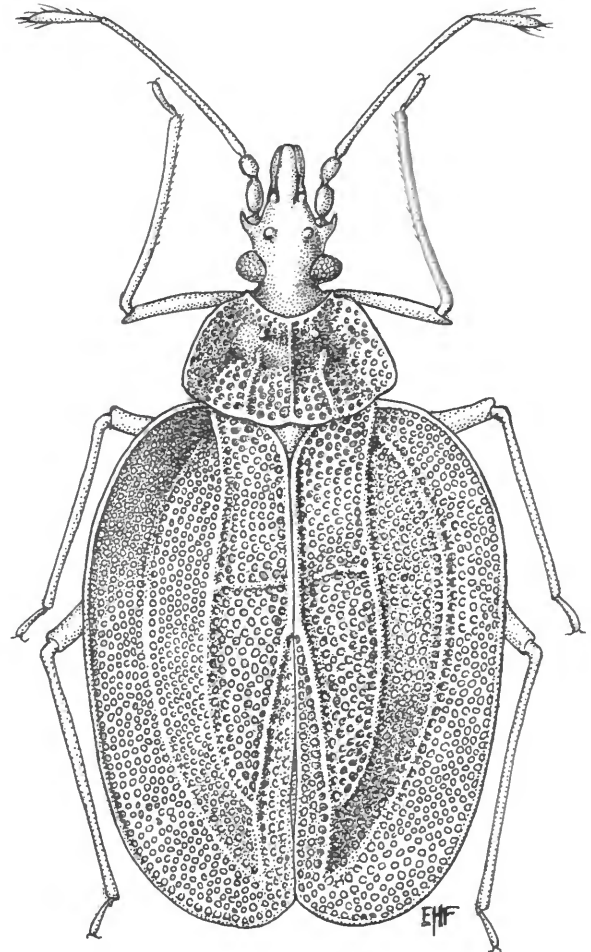


FIGURE 4.—*Allocader leai*, natural length 3 mm.

Key to *Allocader* Species

1. Cephalic spines tapering, as long as or longer than horizontal width of an eye. Posterior margin of pronotum deeply, triangularly emarginate medially *A. cordatus*
- Cephalic spines reduced to short, blunt tubercles less than half as long as the horizontal diameter of an eye. Posterior margin of pronotum not emarginate medially 2
2. Paranotum broad, nearly half as wide as pronotal disc, nearly horizontal and distinctly areolate *A. leai*
- Paranotum less than half as wide as pronotal disc, nearly vertical and vaguely areolate *A. nesiotis*

Genus *Cantacader* Amyot and Serville

FIGURE 5

Cantacader Amyot and Serville, 1843:299 [type species: *Piesma quadricornis* Lepeletier and Serville, only included species].—Drake and Ruhoff, 1965a:23.

DIAGNOSIS.—*Cantacader* differs from all other members of the tribe in the combination of the wholly hidden scutellum, lack of spine-like or angular projections on the paranotal margin, and the costal outline being gradually widened from the base (not abruptly flared). Length 3.3–4.9 mm.

GEOGRAPHIC DISTRIBUTION.—This genus is restricted to the Old World, where it has representatives on all major land masses and numerous remote islands.

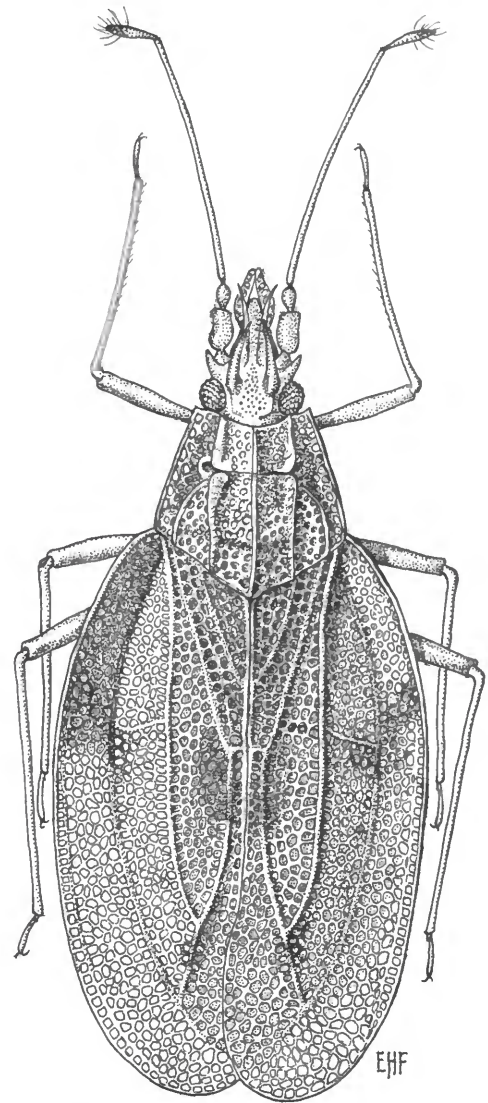
ETYMOLOGY.—The original description states this name is from the Sanskrit words *cantaca* (a spine) and *dri* (to carry), in obvious reference to the presence of the enormous cephalic spines. The *-er* ending makes the name masculine. In subsequent practice the component *-cader* (without meaning in Greek or Latin) is often used in the formation of other generic names in the subfamily Cantacaderinae (e.g., *Allocader*, *Ceratocader*, *Stenocader*, etc.) and is always treated as masculine.

COMMENTS.—The two fossil species cataloged in *Cantacader* by Drake and Ruhoff (1965a), *avitus* Drake and *quinquecarinatus* Germar and Berendt, are unlike all other members of the genus in that they have an exposed scutellum; here they are transferred to the new genus *Paleocader*, where they are discussed further. Now only modern forms remain in *Cantacader*.

The components of this genus, as herein defined, appear to form a very homogeneous group, so much so as to suggest that there may be too many species described in it. Adding to the difficulty in species separation is the existence of sexual dimorphism as well as varying degrees of brachyptery within some species; the brachyptery introduces changes in the shape and proportion of the areas of the hemelytra, changes in pronotal width, and changes in the shape of the longitudinal pronotal carinae. Until the variability of the several characters can be evaluated in several species by larger series from one population, an accurate key to species can not be constructed.

List of *Cantacader* Species

- Cantacader abdivitus* Drake, 1950:161 [Australia].—Drake and Ruhoff, 1965a:23.
Cantacader afzelii Stål, 1873:116 [Sierra Leone].—Drake and Ruhoff, 1965a:23.
Cantacader agilis Drake, 1951:166 [Bismarck Islands].—Drake and Ruhoff, 1965a:24.
Cantacader agilis agilis Drake, 1951:166 [Bismarck Islands].
Cantacader agilis tricarinatus Drake.
Cantacader agilis var. *tricarinatus* Drake, 1951:167 [Bismarck Islands].—Drake and Ruhoff, 1965a:24.
Cantacader allaeri Schouteden, 1965a:169 [Zaire].

FIGURE 5.—*Cantacader quadricornis*, natural length 4.2 mm.

- Cantacader amplicostatus* Duarte-Rodrigues, 1981a:135 [Nigeria].
Cantacader amydis Drake, 1960:343 [D'Entrecasteaux Islands].—Drake and Ruhoff, 1965a:24.
Cantacader angulipennis Horváth, 1906:12 [Spain].—Drake and Ruhoff, 1965a:24.
Cantacader angustecostatus Stusak, 1979:142 [Congo Republic; Ghana].
Cantacader attenuatus Distant, 1902a:238 [South Africa].—Drake and Ruhoff, 1965a:24.
Cantacader basilewskyi Schouteden, 1955b:163 [Ruanda].—Drake and Ruhoff, 1965a:24.
Cantacader bowmansii Schouteden, 1965a:170 [Zaire].
Cantacader clairi Schouteden, 1965a:171 [Zaire].
Cantacader claratis Drake, 1950:160 [Malaya].—Drake and Ruhoff, 1965a:25.

- Cantacader curtulus* Linnavuori, 1977:6 [Yemen].
Cantacader diffidentis Drake and Poor, 1936:141 [India].—Drake and Ruhoff, 1965a:25.
Cantacader divisus Bergroth, 1908:108 [Ethiopia].—Drake and Ruhoff, 1965a:25.
Cantacader formosus Drake, 1950:159 [Formosa].—Drake and Ruhoff, 1965a:25.
Cantacader gerardi Schouteden, 1955b:162 [Congo].—Drake and Ruhoff, 1965a:25.
Cantacader hulstaerti Schouteden, 1965a:171 [Zaire].
Cantacader ilongaensis Duarte-Rodrigues, 1982:326 [Tanzania].
Cantacader infuscatus Distant, 1903:124 [India].—Drake and Ruhoff, 1965a:25.
Cantacader insularis Drake, 1957:399 [Reunion Island].—Drake and Ruhoff, 1965a:25.
Cantacader japonicus Drake, 1947:225 [Japan].—Drake and Ruhoff, 1965a:26.
Cantacader laratanus Drake, 1947:226 [Larat Island].—Drake and Ruhoff, 1965a:26.
Cantacader laicollis Horváth, 1906:11 [Algeria].—Drake and Ruhoff, 1965a:26.
Cantacader letabanus Duarte-Rodrigues, 1981b:202 [South Africa].
Cantacader lethierryi Scott, 1874:291, 443 [Japan].—Drake and Ruhoff, 1965a:26.
Cantacader longicornis Duarte-Rodrigues, 1980:3 [Malawi].
Cantacader nocturnis Hacker.
Cantacader nocturnis Hacker, 1929:324 [Australia].—Drake and Ruhoff, 1965a:26.
Cantacader quadricornis (Lepeletier and Serville).—Drake and Ruhoff, 1965a:26..
Piesma quadricornis Lepeletier and Serville, 1828:653 [Spain].
Cantacader quadricornis nubilus Horváth.
Cantacader quadricornis var. *nubilus* Horváth, 1906:12 [Caucasus; Turkey].—Drake and Ruhoff, 1965a:27.
Cantacader quadricornis quadricornis (Lepeletier and Serville).
Piesma quadricornis Lepeletier and Serville, 1828:653 [Spain].
Cantacader quadricornis quadricornis.—Horváth, 1906:12.
Cantacader quinquecostatus (Fieber).—Drake and Ruhoff, 1965a:27.
Taphrostethus quinquecostatus Fieber, 1844:41 ["Ostindien"].
Cantacader schoutedeni Stusak, 1984:237 [Zaire].
Cantacader sejunctus Duarte-Rodrigues, 1987b:350 [South Africa].
Cantacader tener Bergroth, 1894:167 [Madagascar].—Drake and Ruhoff, 1965a:28.
Cantacader tenuipes Stål, 1865:26 [Sierra Leone].—Drake and Ruhoff, 1965a:28.
Cantacader tenuipes furtivus Drake.
Cantacader tenuipes var. *furtivus* Drake, 1950:153 [Congo].—Drake and Ruhoff, 1965a:28.
Cantacader tenuipes tenuipes Stål.—Drake, 1950:153.
Cantacader uniformis Distant, 1902b:353 [India].—Drake and Ruhoff, 1965a:28.
Cantacader vandenplasi Schouteden, 1923:83 [Congo].—Drake and Ruhoff, 1965a:29.

Genus *Carldrakeana* Froeschner, new tribal assignment

FIGURE 6

Carldrakeana Froeschner, 1968:250 [type species: *Phatnoma tindalei* Hacker, original designation].

DIAGNOSIS.—This genus may be recognized within the tribe by the reduced number of rows of cells in the costal area (either

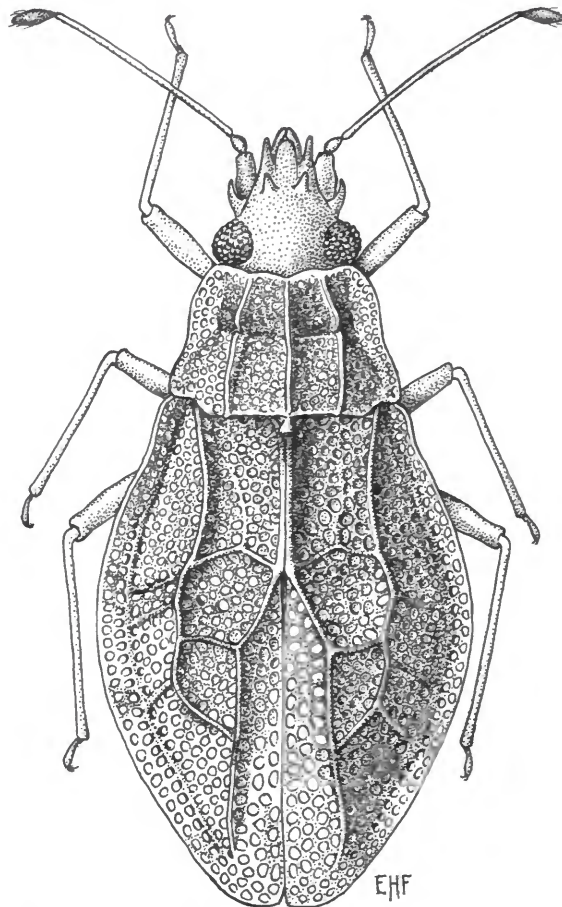


FIGURE 6.—*Carldrakeana tindalei*, natural length 2.2 mm.

a single row in the basal two-thirds or with only 2 rows separated, above and below, by a slender, unspecialized vein) plus lack of serrations on the margins of paranota and costa. Length 2.1–2.6 mm.

GEOGRAPHICAL DISTRIBUTION.—*Carldrakeana* occurs in Australia (including Tasmania), New Guinea, and New Zealand.

ETYMOLOGY.—This name was originally stated to be a patronym dedicated to Carl Drake but was given a feminine ending.

COMMENTS.—This taxon is that part of the genus *Gonycentrum*, in the broad sense of the Drake and Ruhoff (1965a) catalog, characterized by the absence of spines or tubercles between the eyes. Three of the species listed there are currently placed in this genus.

Members of this genus show a partial development of the stenocostal area and they therefore appear to represent the

transition from the tribe Phatnomatini to the tribe Cantacaderini. The costal area of its species with a single row of cells could not show differentiation into an outer and inner part, and the species with a double row do not have the vein between them thickened. Nevertheless, in all three included species the hypocostal lamella does have the subbasal cross veins opposite the small scent-gland opening noticeably thickened to form a narrow transverse trough leading to the costal area. This trough across the hypocosta is unique to the tribe Cantacaderini and must be recognized as the beginning of the transition series leading from the well-developed stenocostal area present in most members of the tribe Cantacaderini, to which *Carldrakeana* is herein newly assigned.

Comparison of the written parts of the original descriptions of *Carldrakeana engista* (Drake and Ruhoff) and *Carldrakeana socia* (Drake and Ruhoff) with their respective holotypes find they agree; the captions for the illustrations, however, are transposed—figure 2 with the double row of cells in the apical

part of the costal area belongs to *C. socia*, and figure 3 with the costal area wholly uniseriate belongs to *C. engista*.

List of *Carldrakeana* Species

- Carldrakeana engista* (Drake and Ruhoff).—Froeschner, 1968:251.
Gonycentrum engistum Drake and Ruhoff, 1961:127 [New Guinea]; 1965a:33. [Note: See "Comment" above correcting figure number in original proposal.]
- Carldrakeana socia* (Drake and Ruhoff).—Froeschner, 1968:251.
Gonycentrum socium Drake and Ruhoff, 1961:128, fig. 2 [Tasmania]; 1965a:33.
- Cyperobia carectorum*.—Woodward, 1961:156 ["subbrachypterous" data only, fig. 19].
[Notes: (1) See "Comment" above correcting figure number in original proposal. (2) Lack of a clear understanding of the true nature of *Cyperobia carectorum* Bergroth led Froeschner (1968) to assign several earlier records of that species to *C. socia*. A corrected full synonymy is given above.]
- Carldrakeana tindalei* (Hacker).—Froeschner, 1968:251.
Phatnoma tindalei Hacker, 1928:177 [Australia].
Gonycentrum tindalei.—Drake and Ruhoff, 1965a:34.

Key to *Carldrakeana* Species

- 1. Pronotum unicarinate, median carinae well developed, lateral carinae absent *C. engista*
Pronotum tricarinate, lateral carinae as well developed as median 2
- 2. Costal area irregularly biseriate to base *C. tindalei*
Costal area biseriate only on apical third or less, uniseriate on basal two-thirds or more *C. socia*

Genus *Ceratocader* Drake

FIGURE 7

Ceratocader Drake, 1950:157 [type species: *Cantacader armatus* Hacker, original designation].—Drake and Ruhoff, 1965a:29.

DIAGNOSIS.—Within the tribe, this is the only genus with several prominent slender spines on margin of paranotum. Length 3.5–4.5 mm.

GEOGRAPHICAL DISTRIBUTION.—Of the two included species, one is known from Australia, the other from Tasmania.

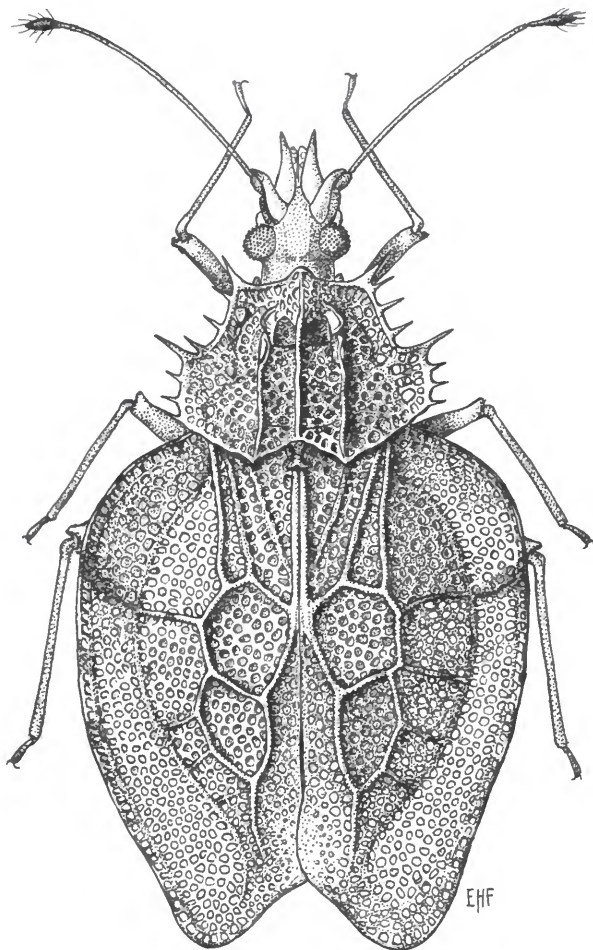
ETYMOLOGY (masculine).—Greek *keratos* (horn), probably referring to the large, thick spines on the head, plus the nondescriptive fragment *-cader* (masculine) from generic name *Cantacader*, denoting another generic type in the taxon containing *Cantacader*.

List of *Ceratocader* Species

- Ceratocader armatus* (Hacker).—Drake and Ruhoff, 1965a:29.
Cantacader armatus Hacker, 1928:174 [Australia].
- Ceratocader dentatus* (Hacker).—Drake and Ruhoff, 1965a:29.
Cantacader dentatus Hacker, 1928:175 [Tasmania].

Key to *Ceratocader* Species

- Lateral margin of paranotum with 7–8 acute spines directed outward, some spines longer than diameter of an eye. Costal area oblique, in no part recurved *C. armatus*
- Lateral margin of paranotum with about 6 shorter spines, all distinctly shorter than diameter of an eye. Costal area on anterior half recurved over itself *C. dentatus*



Genus *Cyperobia* Bergroth

FIGURE 8

Cyperobia Bergroth, 1927:673 [type species: *Cyperobia carectorum* Bergroth, monobasic].—Drake and Ruhoff, 1965a:31.

DIAGNOSIS.—Within this tribe, *Cyperobia* is definable by the following combination of features: posterior margin of pronotum transverse, medially weakly, angularly concave, fully exposing scutellum; and margins of paranota and costae simple, without spines or serrations. Length 3.7–4.3 mm.

GEOGRAPHIC DISTRIBUTION.—The single species of the genus is known only from New Zealand.

ETYMOLOGY (masculine).—Greek *kyperos* (Latin *cyperus*) (sedge), plus Greek *bios* (a manner of life), in reference to the early report of it being found on a sedge plant.

COMMENTS.—The original description of a “vesicle” occu-

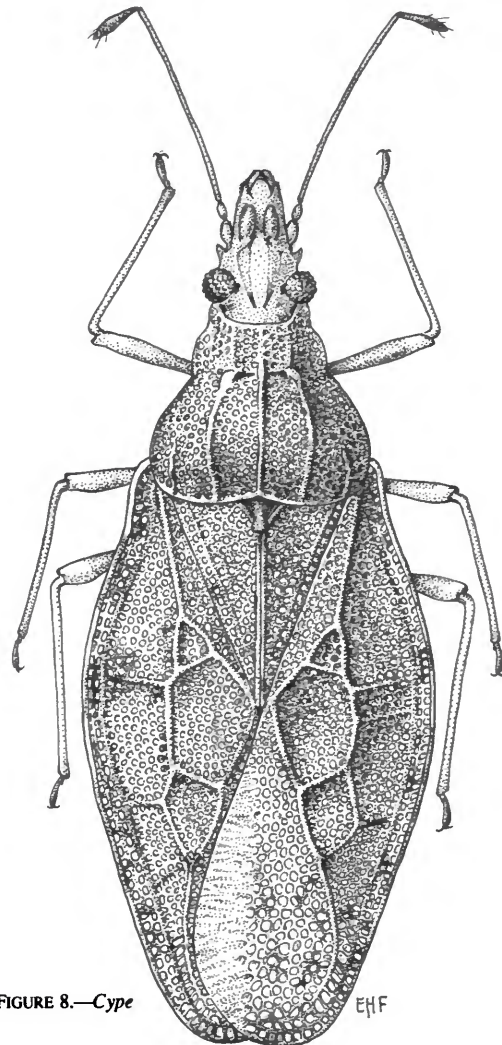


FIGURE 8.—*Cype*

pying the greatest part of the anterior pronotal lobe is misleading in suggesting the existence of a bladder or elevated inflated cyst; actually there is only a slight dorsal convexity on the pronotal collar.

This genus was cataloged under the tribe “Phatnomini” by Drake and Ruhoff (1965a:31), but, as pointed out by Stusak (1979:149) and confirmed by examination of additional New Zealand specimens, its sole member has a strongly developed stenocostal area ventrally and must be placed in the tribe Cantacaderini. Dorsally the subcostal vein is perceptibly wider than the cross veins, but not as markedly elevated as it is on the ventral surface.

List of *Cyperobia* Species

Cyperobia carectorum Bergroth ["species of Tingid"].—Myers, 1922:6 [footnote only; New Zealand]; 1926:477 [*Cassinia leptophylla*].

Cyperobia carectorum Bergroth, 1927:674 [New Zealand].—Myers and China, 1928:380.—Woodward, 1961:154 ["macropterous" data only].—Froeschner, 1968:251 [part].

Carldrakeana species.—Froeschner, 1968:251 [for Woodward's, 1961, fig. 18].

REMARKS.—For this lone species of *Cyperobia* the above listing is given in detail to complete deciphering certain early confusions with *Carldrakeana socia*. Myers (1922:6, footnote) reported this species, without a name, from "swamp vegetation," with the remark that his specimen had been sent to Bergroth for determination. Bergroth (1927:674) described the single adult as *Cyperobia carectorum* and included thereunder Myers' (1926:477) comments as "possibly from *Cassinia leptophylla*."

Through the cooperation of A. Soos and A.C. Eyles, an opportunity to examine 18 specimens of *C. carectorum*, including two macropterous and 16 brachypterous individuals, made it possible to establish the true identity of the species, even without seeing the single specimen on which Bergroth based his original description. Study of a brachypterous male labeled "Sedges. Gollan's V., 5-2-21," in agreement with the collecting data given in the original description, was especially interesting. Bergroth gave the single measurement of a female, so this male cannot be the holotype, unless the sex of the type was reported in error. This specimen is in the Entomology Division of the Department of Scientific and Industrial Research in Nelson, New Zealand, and would be available for neotype designation if one were needed.

Froeschner's (1968) misinterpretation of Bergroth's use of "vesicle" led him to erroneously conclude that Woodward's (1961:155) figure 18 was not of this species. However, his figure 19 of a brachypterous individual was a misidentification of a specimen of *Carldrakeana socia*, and in the text of that paper all references to individuals showing reduced wing development apparently reflect this latter species.

Both parts of the scientific name associate this species with sedges. The generic name translates freely as a dweller on sedges, and the specific name suggests that this insect utilizes plants of the sedge genus *Carex* as a host. However, labels on specimens examined (see list below) reported two plant associations, one a sedge, the other a member of the family Asteraceae.

The following New Zealand specimens examined for this study were mostly brachypterous, only two from the Mt. Harper series were macropterous: Gollan's Valley, 2 Feb 1921, sedges; Mt. Jolloes, 26 Oct 1962, A.C. Eyles, *Celmisia spectabilis*; Dashwood Pass, 5 Mar 1962, *Cassinia leptophylla*; Mt. Harper, 14 Feb 1962, J.I. Townsend, 4000 feet, *Celmisia spectabilis*; Mt. Hutt, Canterbury, 1 Feb 1962, J.I. Townsend; Karori, 8 Mar 1924.

Genus *Nectocader* Drake

FIGURE 9

Nectocader Drake, 1928:41 [type species: *Cantacader gounellei* Drake, monobasic].—Drake and Ruhoff, 1965a:29.

DIAGNOSIS.—The combination of the partially exposed scutellum plus the very broad costal area (broader than subcostal or discoidal areas) dilating abruptly from base marks this genus for ready recognition within the tribe. Length 6.4 mm.

GEOGRAPHIC DISTRIBUTION.—The lone species of the genus

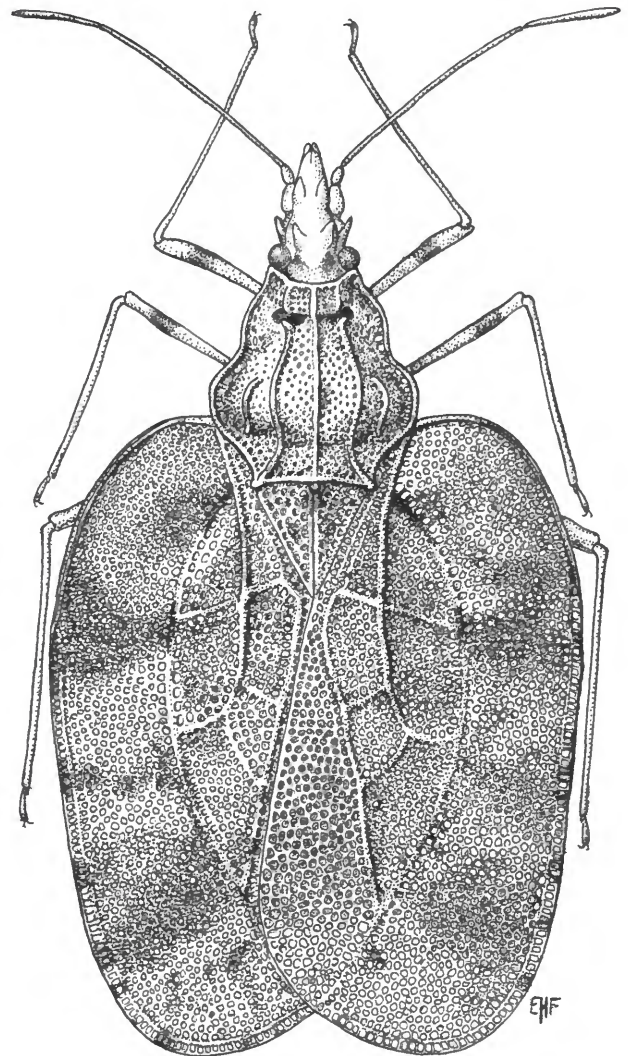


FIGURE 9.—*Nectocader gounellei*, natural length 6.4 mm.

is known only from Brazil.

ETYMOLOGY (masculine).—Latin *necto* (knot), plus the nondescriptive fragment, *-cader* (treated as masculine) from the generic name *Cantacader*, in combination denoting the knitted or lace-like appearance of a genus in the same group as the genus *Cantacader*.

COMMENTS.—This genus appears to be very close to *Teratocader* Drake because of its great size, length of head, number of cephalic spines, angular projection of posterior margin of pronotum at level of clavo-corial suture, shape and relative width of costal area, and long slender legs. The most significant difference between the two lies in the greater prolongation of the pronotal midline of *Teratocader*, where that structure completely covers the scutellum (exposed in *Nectocader*). Except for that point and the great geographic gap between the ranges of the two genera, the two species involved could be placed in one genus with little difficulty. However, if any importance is to be attached to the posterior prolongations of the pronotum as part of a progressive development within the Cantacaderinae, this one character must weigh importantly. If one of the two species (each known from but one specimen) is found to be mislabeled, the matter must be reconsidered.

The original description and subsequent comments about the costal areas of *Nectocader gounellei* (Drake) and the very similar *Teratocader magnificus* (Drake) being uniseriate resulted from misinterpreting the stenocostal area for the costal area. Actually the costal area (laterad of the hypocostal lamella) is quite broad and contains approximately 10–15 rows of small cells, in addition to the single row in the stenocostal area.

List of *Nectocader* Species

Nectocader gounellei (Drake).—Drake and Ruhoff, 1965a:29.

Cantacader gounellei Drake, 1923:81 [Brazil].

Genus *Paleocader* new genus (fossil)

FIGURE 10

DIAGNOSIS.—The smooth, unarmed paranotal margins, the four long slender cephalic spines, plus the exposed scutellum combine to mark this fossil genus within the tribe. All comments given herein concerning *P. quinquecarinatus* were derived from its original description and its accompanying illustration. See discussion of that species below.

CHARACTERS.—Length 3.0–3.9 mm. Macropterous; hemelytral axes subparallel; rounded apices slightly separated.

Head wide, width across eyes greater than length, preocular part about one and one-half times as long as horizontal diameter of an eye, with four long tapering spines (jugals and frontals). Eyes somewhat bulbous, almost half as wide as interocular width. Antenna slender, cylindrical, segment I shorter than interocular width, in *P. avitus* (Drake) slightly longer than II and in *P. quinquecarinatus* (Germar and Berendt) one-third as long as II; IV missing from unique specimen of *P.*

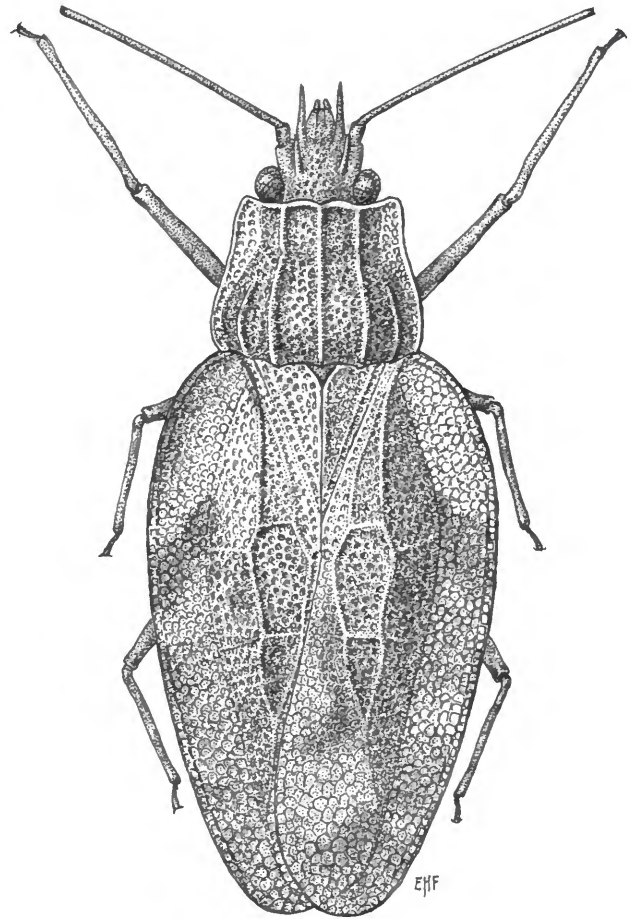


FIGURE 10.—*Paleocader avitus*, natural length 3.9 mm.

avitus (Drake). Bucculae slightly surpassing, and almost contiguous beyond apex of clypeus (not visible in original figures of *P. quinquecarinatus*). Labium reaching to or beyond basal third of abdomen.

Pronotum without inflated cysts; anterior margin sinuately transverse. Disc with five distinctly elevated longitudinal carinae: median and lateral pairs reaching anterior pronotal margin, interrupted at calli; suprahumeral pair somewhat curved, restricted to interhumeral convexity. Paranotum moderately explanate, in *P. avitus* biseriate anteriorly, uniseriate around humerus (not discernible in original figure of *P. quinquecarinatus*). Posterior margin weakly convex, exposing scutellum.

Hemelytra with costal margins diverging from bases, greatest combined width near midlength. Discoidal area reaching apical two-fifths of hemelytron, five to six cells wide,

with one or two distinctly elevated cross veins. Subcostal area weakly oblique, with 5–7 rows of cells and 1 or 2 distinctly elevated crossveins. Costal area in *P. avitus* with five rows of cells in addition to stenocostal row (see discussion below for costal area of *P. quinquecarinatus*). Hypocosta probably uniseriate.

The peritreme and other ventral features were not adequately described or reliably illustrated for either of the species (obscured by opaque cloud in amber around holotype of *P. avitus*; see discussion of *P. quinquecarinatus* below). However, judging from the well-developed stenocostal area dorsally on the holotype of "*Cantacader avitus*," the peritreme might be distinctly formed and elevated to be a part of the ostiolar–stenocostal system, at least in that species.

TYPE SPECIES.—*Cantacader avitus* Drake, present designation.

GEOGRAPHIC DISTRIBUTION.—Both included species were described from European amber: *Paleocader avitus* from "Baltic amber," generally considered to be from Oligocene deposits on the island of Rugen off the Baltic Coast of Germany; and *P. quinquecarinatus* from "Prussian amber," which is also dated as of Oligocene origin.

ETYMOLOGY (masculine).—Greek, *palaios* (ancient), plus *-cader* (masculine) from the generic name *Cantacader* denoting another generic type in the taxon containing *Cantacader*.

COMMENTS.—The virtually unexpanded posterior margin of the pronotum of this otherwise *Cantacader*-like genus suggests that *Paleocader* represents an earlier time in the line leading to the modern genus *Cantacader* wherein the scutellum is always covered by the pronotum. An alternate hypothesis, that *Paleocader* may represent a derived state resulting from loss of the expanded posterior margin of the pronotum, is argued against by the time factor because no true *Cantacader* is known to have occurred in an earlier geological time.

Scudder (1890:359) placed the fossil species "*Tingis quinquecarinata*" Germar and Berendt in his new genus *Eotingis*, which he proposed for his new fossil species, *Eotingis antennata*, from Miocene rocks in North America. That association of these two lace bugs in the same genus undoubtedly was based on the fact that both were fossil forms rather than on comparison of their morphology. The dorsal sketch accompanying the original description of *T. quinquecarinata*, in spite of lacking a head, shows the habitus and many of the structural features of a *Cantacader*-like *Cantacaderinae*; in contrast, the figure accompanying the original description of *E. antennata* presents quite different facies showing the critical structures of members of the subfamily Tinginae. These facts led Drake and Ruhoff (1965a) to keep the two species in two separate genera, each in a different subfamily. Plans are to treat *Eotingis* as a member of the Tinginae in a subsequent part of this series.

A fuller discussion of the two species included herein is given after listing below.

List of *Paleocader* Species

Paleocader avitus (Drake) [new combination].

Cantacader avitus Drake, 1950:161 [fossil! in Baltic amber].—Drake and

Ruhoff, 1965a:24.

Paleocader quinquecarinatus (Germar and Berendt) [new combination].

Tingis quinquecarinata Germar and Berendt, 1856:23 [fossil! in Prussian amber].

Cantacader quinquecarinatus.—Drake and Ruhoff, 1965a:27.

Paleocader avitus (Drake), new combination

Drake's original placement of *avitus* in *Cantacader* was logical because the specimen possessed the following features in common with modern members of that genus: presence of a distinct claval commissure; four long, tapering, cephalic spines; the presence of a stenocostal area dorsally; and several other proper pronotal and hemelytral features. Examination of the holotype confirmed the original illustration showing an exposed scutellum (not covered by an expansion of the posterior pronotal margin). In this instance, the exposed condition must be the ancestral condition that existed before the posterior expansion and hence the species could not belong to a later-appearing genus, *Cantacader*, with a well-marked posterior expansion. Here the unspecialized structure of the pronotum and the earlier geologic occurrence are used to justify its assignment to a new genus.

Paleocader quinquecarinatus (Germar and Berendt), new combination

Tingis quinquecarinatus is transferred herein to this genus, even though no specimens were available for study, and the original presentation described or illustrated features that raise severe doubts as to the wisdom of this assignment. The dorsal habitus, illustrated without a head, is so typically that of a *cantacaderinae* that an effort is made to explain away certain contradicting evidences.

The lack of a stenocostal area in the sketch, and unmentioned in the text, may be explained by many of the cells along the costal margin being shown as half circles, suggesting either a reflexion of that margin, and hence obscuring of a stenocostal area, or, equally likely, a degree of "artistic license" in omitting some of the smaller details and overlooking the restricted outer row of cells. The taxonomic value of the stenocostal area was not known at that time.

The sketch of a ventral view with head attached presents a number and magnitude of much more serious problems, which, if confirmed by study of the actual specimen, could require important revision in thinking about the classification of this part of the Tingidae. The head is unlike that of any other *Cantacaderinae* because it is very short (scarcely exceeding anterior margin of eye), possibly foreshortened due to resting at an angle in the amber, and, unlike any other Tingidae, it has a very long second antennal segment. These two features of the head, plus its absence in the dorsal view illustration, lead to the suspicion that the head was erroneously associated in reconstructing the specimen while drawing. The following characters in the ventral sketch appear unexplainable (except for erroneous depiction) and very much unlike other Tingidae:

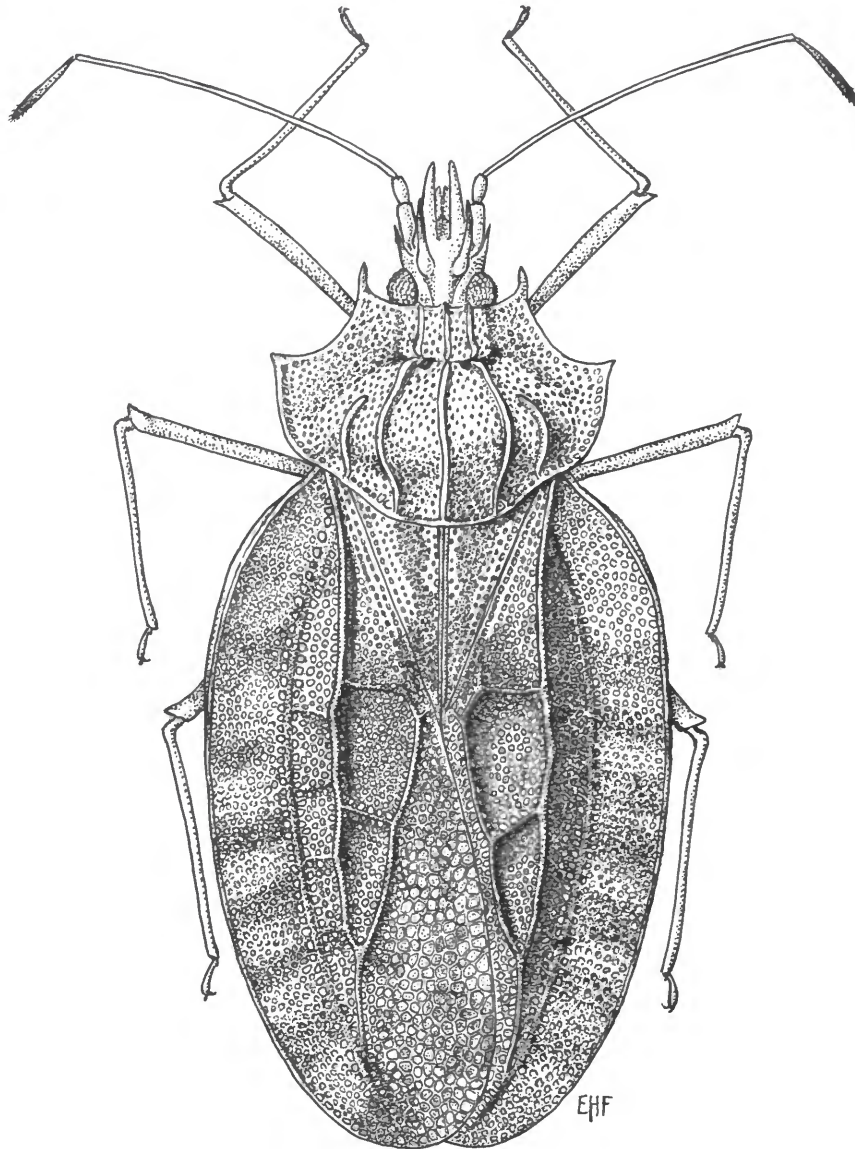


FIGURE 11.—*Pseudophatnoma corniculata*, natural length 6.7 mm.

relative widths of pro- and pterothorax; the prosternum completely surrounding the anterior coxae; and the absence of an indication of a hypocosta.

Genus *Pseudophatnoma* Blöte

FIGURE 11

Pseudophatnoma Blöte, 1945:78 [type species: *Pseudophatnoma corniculata* Blöte, monobasic].—Drake and Ruhoff, 1965a:40.

Froeschnerocader Pericart, 1986:245 [type species: *Froeschnerocader denticollis* Pericart, monobasic. Synonymized by Pericart, 1991:40].

DIAGNOSIS.—The forward-directed spine-like extensions of

the latero-anterior angle of the paranotum, coupled with the strongly and convexly projecting posterior pronotal margin covering the scutellum, identify this genus within the subfamily Cantacaderinae. Length = 6.7 mm.

GEOGRAPHIC DISTRIBUTION.—Reported distribution for this genus includes the Riau Archipelago, off the tip of Malay Peninsula, and the island of Borneo.

ETYMOLOGY (neuter).—*pseudos*, Greek (false), plus generic name *Phatnoma*, suggesting a general similarity to *Phatnoma* but emphasizing that it is not the same as that genus.

COMMENTS.—Due to the lack of specimens for study and the

fact that the strongly reflexed costal area concealed the stenocostal area in the illustration accompanying the original description, this genus was cataloged in the tribe "Phatnomini" by Drake and Ruhoff (1965a:40), a placement that misled Pericart into describing his new genus, *Froeschnerocader*. Pericart's personal examination of Blöte's type discovered the synonymy and the necessity for the transfer to this tribe. My

own examination of that type confirmed those actions.

List of *Pseudophatnoma* Species

- Pseudophatnoma corniculata* Blöte, 1945:78 [Riau Archipelago].—Drake and Ruhoff, 1965a:40.
- Pseudophatnoma denticollis*.—Pericart, 1991:50.
- Froeschnerocader denticollis* Pericart, 1986:246 [Sabah].

Key to *Pseudophatnoma* Species

- Anterior margin of pronotum transverse, not forming an angle above base of head *P. corniculata*
- Anterior margin of pronotum medially forming a prominent angle projecting almost to imaginary line connecting anterior margins of eyes *P. denticollis*

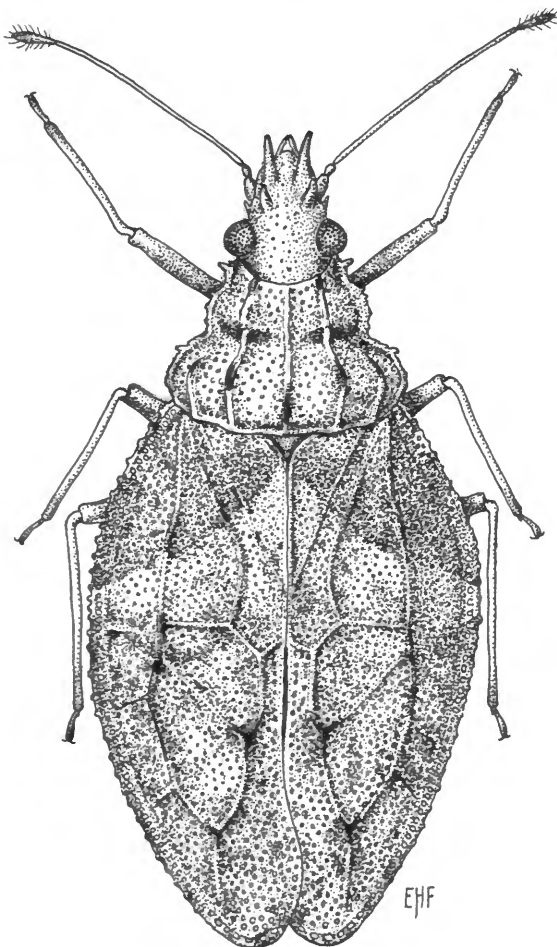


FIGURE 12.—*Stenocader tingidoides*, natural length 3.6 mm.

Genus *Stenocader* Drake and Hambleton

FIGURE 12

Stenocader Drake and Hambleton, 1944:120 [type species: *Piesma tingidoides* Spinola, only included species].—Drake and Ruhoff, 1965a:40.

DIAGNOSIS.—The marginally serrated appearance, resulting from the presence of widely spaced, irregular, subtriangular projections along the edges of the paranota and costae, identifies this genus within the subfamily. Length 3.3–3.8 mm.

GEOGRAPHIC DISTRIBUTION.—The single species of this genus is cataloged only for Chile.

ETYMOLOGY (masculine).—*stenos*, Greek (narrow), plus the nondescriptive *-cader* (masculine) from the generic name *Cantacader* denoting another generic type in the taxon containing *Cantacader*.

COMMENT.—The stenocostal area is not evident dorsally, but it is clearly delimited ventrally, where it is set off by a strongly elevated vein.

List of *Stenocader* Species

- Stenocader tingidoides* (Spinola).—Drake and Ruhoff, 1965a:40.
- Piesma tingidoides* Spinola, 1852:200 [Chile].

Genus *Teratocader* Drake

FIGURE 13

Teratocader Drake, 1950:158 [type species: *Cantacader magnificus* Drake, only included species].—Drake and Ruhoff, 1965a:29.

DIAGNOSIS.—Within the subfamily, members of this genus can be recognized by the combination of the very broad costal area abruptly convexly dilated from base, plus the posterior margin of the pronotum angularly expanded to cover the scutellum. Length 8.6 mm.

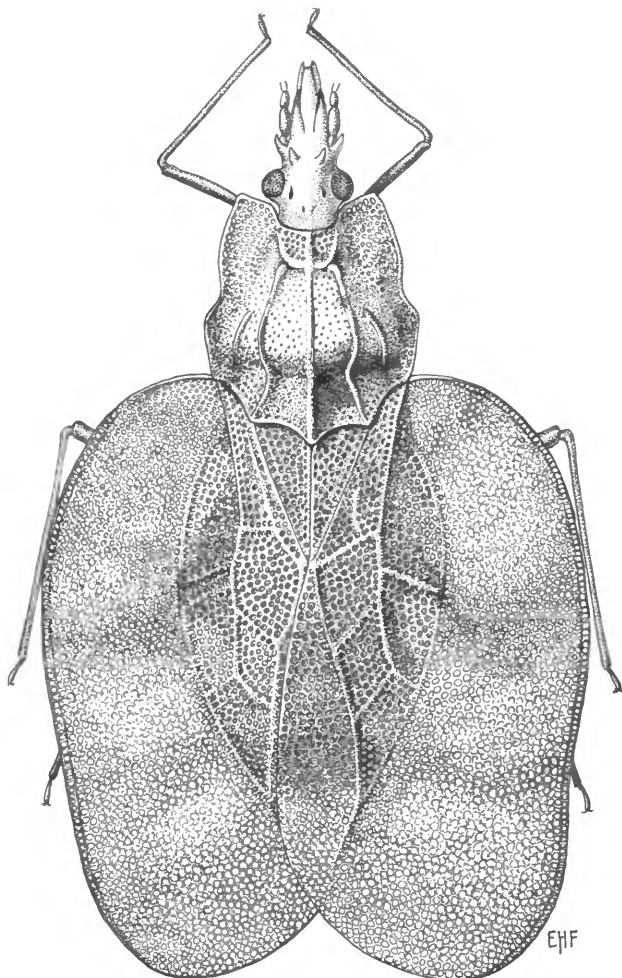
GEOGRAPHIC DISTRIBUTION.—The sole species is known only from the Malay Peninsula.

ETYMOLOGY (masculine).—*teratos*, Greek (monster), plus the nondescriptive *-cader* (masculine) from the generic name *Cantacader* denoting another generic type in the taxon containing *Cantacader*. The unusually large size of this species undoubtedly suggested using the above prefix.

COMMENTS.—See remarks in "Comments" under the genus *Nectocader* about misinterpretations of stenocostal area for costal area and general similarities between the two genera.

List of *Teratocader* Species

- Teratocader magnificus* (Drake).—Drake and Ruhoff, 1965a:30.
- Cantacader magnificus* Drake, 1923:83 [Malaya].



Tribe PHATNOMATINI Drake and Davis

Phatnomini Drake and Davis, 1960:68.—Drake and Ruhoff, 1965a:30.
Phatnomatini.—Froeschner, 1981:96.

DIAGNOSIS.—Within the subfamily this tribe is marked by the total absence (even from the hypocosta) of the stenocostal area.

CHARACTERS.—The characters of this tribe are much as given in the above description for the subfamily Cantacaderinae. Within that description and, unlike the three restrictions described above for the tribe Cantacaderini, members of the Phatnomatini (1) never have an indication of a stenocostal area, (2) may have spines or tubercles on the midline of the head, and (3) may have the paranotum strongly reflexed back over itself (in one genus—*Angiocader* Drake). The hypocosta, unless described otherwise, can be assumed to be 1-seriate.

GEOGRAPHIC DISTRIBUTION.—This is a tribe of the Southern Hemisphere; none of its members enter the Nearctic or Palearctic regions. *Phatnoma* Fieber is the most widespread genus, occurring throughout most of the southern hemisphere. *Gonycentrum* Bergroth is the only other genus reportedly not restricted to one zoogeographic area; it is known from Asia and Africa. Each of the remaining 24 genera is restricted to a single zoogeographic region: 13 in the Oriental; 10 in the Ethiopian; 4 in the Neotropics; and 3 in Oceania.

COMMENTS.—Several generic changes from the Drake and Ruhoff (1965a) cataloging of this tribe will be noticed: *Cyperobia* Bergroth, *Pseudophatnoma* Blöte, and *Stenocader* Drake and Hambleton are no longer listed herein, having been transferred to the tribe Cantacaderini earlier in the present paper. Postcatalog publications restored *Minitingis* Barber to generic status and added *Daillea* Pericart, *Distocader* Froeschner, *Indocader* Pericart, *Microcader* Pericart, *Phatnocader* Stusak, *Phatnomella* Pericart, *Pseudacalypta* Pericart, *Pullocader* Pericart, *Taphnoma* Pericart, and *Thaicader* Pericart. In addition, two new genera are described herein: *Etesinalda* for the new and only species, *E. laticosta*, and *Exulmus* for its type and only species, *Ulmus engaeus* Drake and Ruhoff.

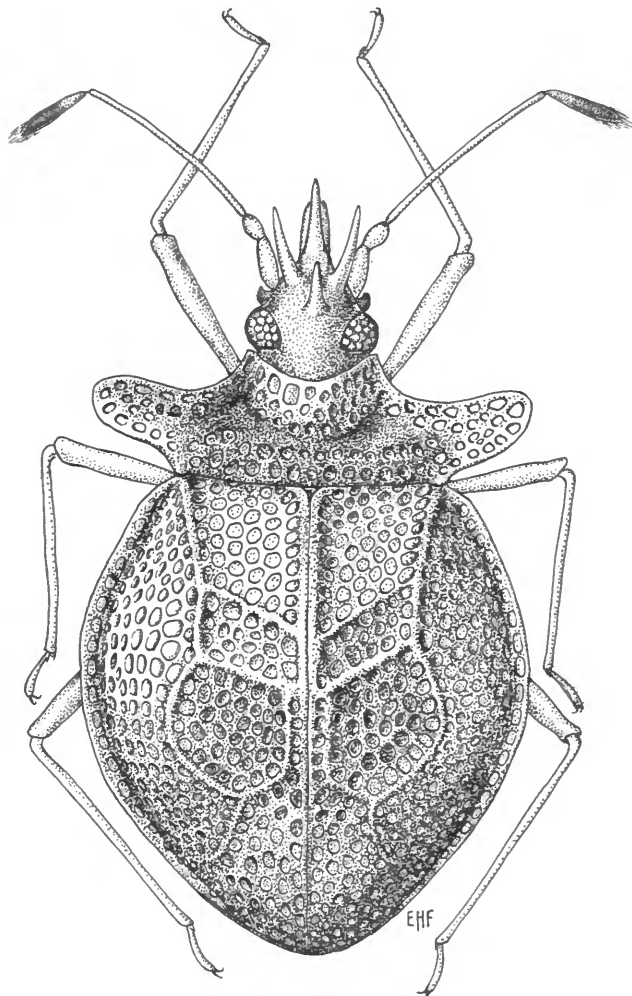
The nominate genus name, *Phatnoma*, as pointed out to me several years ago by George Steyskal, is based on the neuter Greek noun *phatnoma* (genitive *phatnomatos*, stem *phatnomat-*); thus, the tribal name derived from it must be Phatnomatini as first used in publication by Froeschner (1981).

Key to Genera of Phatnomatini

1. Interocular area of head distinctly depressed, eyes appearing obliquely elevated above it. Costal margin a carina basally, thence abruptly expanded a short distance from base *Eocader* Drake and Hambleton
- Interocular area of head not depressed, eyes not appearing elevated. Costal margin forming a continuous line to base 2
2. Head with a dorsomedial spine or tubercle (not to be confused with spine near base of clypeus) 3
- Head without a dorsomedial spine or tubercle 18
3. Head with a pair of jugal spines 4
- Head with no jugal spines 16

4. Head with a pair of interocular or occipital spines or tubercles (sometimes greatly reduced and requiring careful examination) 5
Head without interocular or occipital spines or tubercles 14
5. Paranotum and costal area very broad, in large part curved upward and back over themselves *Angiocader* Drake
Paranotum and costal area narrow or broad, never curved upward and back over themselves 6
6. Head with an elongate median spine between frontals (anterior to dorsomedial) *Ulmus* Distant
Head without median spine between frontals 7
7. Paranotum extremely narrow, on posterior lobe becoming obsolete around humerus *Etesinalda* new genus
Paranotum with 1 or more rows of cells around humerus 8
8. Paranotum with lateral margin convex, straight, or slightly sinuate, with no lobular or spined projections 9
Paranotum with lateral margin forming rounded, angulate, or spined projections, at least at anterior end 11
9. Peritreme not forming an elevated, apically closed loop *Sinalda* Distant
Peritreme strongly developed as an apically closed loop 10
10. Paranotum 3-seriate, greatest width across paranota distinctly anterior to humeri. Labium not reaching metacoxae *Daillea* Pericart
Paranotum 1- or 2-seriate, greatest width across paranota at level of humeri. Labium reaching or surpassing posterior margin of metasternum *Microcader* Pericart
11. Pronotal disc 3-carinate 12
Pronotal disc 1-carinate 13
12. Posterior paranotal lobe narrow, 2-seriate *Phatnomella* Pericart
Posterior paranotal lobe very wide, 5-6-seriate *Plesionoma* Drake
13. Shape ovate, width almost two-thirds of length. Paranotum with 3 or more rows of cells *Indocader* Pericart
Shape elongate, width slightly less than half of length. Paranotum 1seriate, except on anterior third *Phatnocader* Stusak
14. Pronotal disc 3-carinate *Distocader* Froeschner
Pronotal disc 1-carinate 15
15. Form (brachypters only known) broadly oval, width more than half of length. Paranotum with lateral margin irregular, anteriorly forming an angle, thence abruptly dilated to form truncate 3-seriate lobe *Exulmus* new genus
Form (macropters only known) elongate, width less than half of length. Paranotum with lateral margin simply convex or forming a large angle opposite humerus *Taphnoma* Pericart
16. Buccula, in profile, strongly triangular, 5-6 cells high posteriorly, tapering to 1 cell anteriorly *Pseudacalypta* Pericart
Buccula subequal in height for full length, with 1 row of cells 17
17. Pronotum across lobular expansions of paranota wider than width of combined hemelytra. Pronotal disc with no longitudinal carina *Alloeoderes* Drake
Pronotum without lobular expansions of paranota, narrower than combined width of hemelytra. Pronotal disc with percurrent median carinae *Thaicader* Pericart
18. Spines on dorsum of head nearly as long as or longer than length of head *Oranoma* Drake
Spines on dorsum of head not more than half as long as head 19
19. Abdomen ventrally on basal half or more with a distinctly impressed mediolongitudinal groove. Paranotum narrowest opposite humerus, thence widened cephalad to 4 or more rows of cells *Phatnoma* Fieber
Abdomen ventrally without mediolongitudinal groove. Paranotum anteriorly not or only slightly (1-2 cells) widened 20

- 20. Head with a clypeal spine 21
 Head without a clypeal spine 25
- 21. Occipital spines nearly or quite as long as horizontal diameter of an eye 22
 Occipital spines absent or much shorter than an eye 23
- 22. Paranotal margin with 3 acutely angled projections *Minitingis* Barber
 Paranotal margin simple (without angular projections)
 *Gonycentrum* Bergroth
- 23. Ostiolar pore a conspicuous hole whose rim overlaps marginal vein of hypocosta
 *Zetekella* Drake
 Ostiolar pore confused with pleural surface, not evident 24
- 24. Pronotal disc 3-carinate (macropters only known). Eyes normal size, width of 1
 slightly more than one-third of interocular space *Pullocader* Pericart
 Pronotal disc 1-carinate (brachypters only known). Eyes much reduced, width of 1
 about one-fifth as wide as interocular space *Cyclotynaspis* Montandon
- 25. Pronotal disc 1-carinate, with median carina becoming evanescent in posterior third.
 Without paranota *Astolophos* Distant
 Pronotal disc 3-seriate, median carina percurrent, lateral carinae evident only on
 posterior and anterior slopes of posterior lobe. Paranotum with a single row of
 distinct cells continuing around humerus *Cnemiandrus* Distant



Genus *Allooederes* Drake

FIGURE 14

Allooederes Drake, 1961:115 [type species: *Allooederes davao* Drake, monobasic].—Drake and Ruhoff, 1965a:30.

DIAGNOSIS.—The members of this genus can be recognized by either of two features unique within the tribe: the broad lateral expansion of the paranota making the pronotal width more than three times that of head; or the complete absence of longitudinal carinae on the pronotal disc. Length 2.0 mm.

GEOGRAPHIC DISTRIBUTION.—The single specimen was collected on Mindanao in the Philippine Islands.

ETYMOLOGY (feminine).—*alloio*, Greek (another kind), plus *dere*, Greek (neck), plus adjectival ending *es*; doubtlessly given in reference to the unusual collar-like appearance of the uniquely expanded side margin of the paranotum.

COMMENTS.—The above description was prepared wholly from the original description because no specimens were available for examination; the holotype being the only known specimen.

In describing this genus and its only included species, Drake (1961) commented on the abdomen being withdrawn well into the cavity of the convex hemelytra.

List of *Allooederes* Species

Allooederes davao Drake, 1961:116 [Philippine Islands].—Drake and Ruhoff, 1965a:30.

FIGURE 14 (left).—*Allooederes davao*, natural length 2.0 mm.

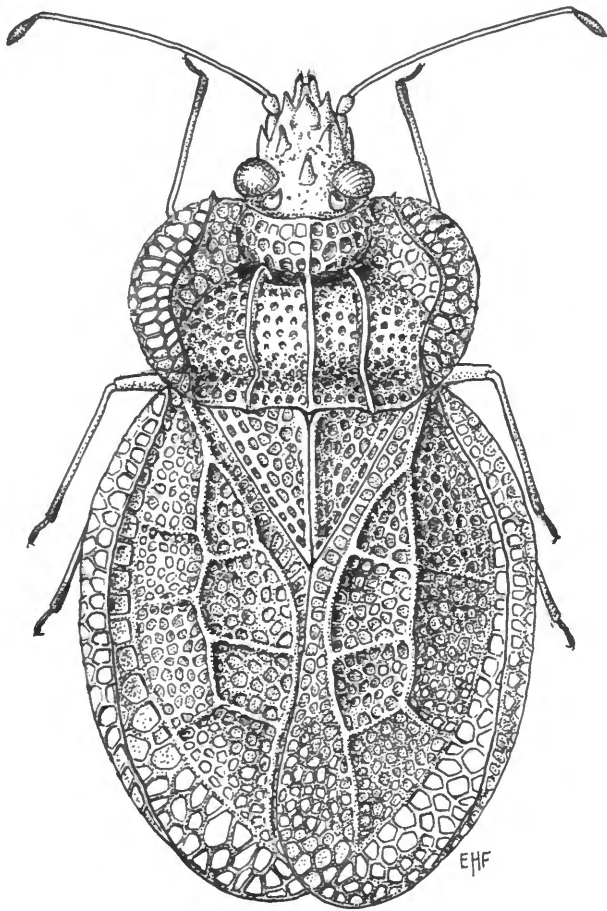


FIGURE 15.—*Angiocader obesa*, natural length 3.0 mm.

Genus *Angiocader* Drake

FIGURE 15

Angiocader Drake, 1950:159 [type species: *Phatnoma obesa* Distant, monobasic].—Drake and Ruhoff, 1965a:30.

DIAGNOSIS.—This genus is well marked within the tribe by the shape of the paranota and costae, which are strongly recurved upward and back over themselves. Length 3.0 mm.

GEOGRAPHIC DISTRIBUTION.—The lone species is known only from Cape Colony in South Africa.

ETYMOLOGY (masculine).—*angeion*, Greek (a receptacle), plus *-cader* from the name *Cantacader*, denoting another generic type in the taxon containing *Cantacader*—probably given in reference to the dish-like shape produced by the elevated margins.

COMMENTS.—It is worth noting that this is the only genus in the subfamily Cantacaderinae exhibiting the recurved paranota and costal area, a development that is exhibited by several genera in the subfamily Tinginae.

List of *Angiocader* Species

Angiocader obesus (Distant).—Drake and Ruhoff, 1965a:30.
Phatnoma obesa Distant, 1902a:239 [South Africa].

Genus *Astolophos* Distant

FIGURE 16

Astolophos Distant, 1904b:428 [type species: *Astolophos capitatus* Distant, monobasic].—Drake and Ruhoff, 1965a:30.

DIAGNOSIS.—In combination, the lack of cephalic spines on the dorsum of the head anterior to the eyes plus the lack of areolate paranota on posterior pronotal lobe distinguish this genus from all others in the tribe. Length 3.1–3.5 mm.

GEOGRAPHIC DISTRIBUTION.—This is one of several tingid genera whose lone species occurs only in South Africa.

ETYMOLOGY (masculine).—The origin and application are unclear. G.E. Steyskal suggested the possible derivation from *asty*, Greek (city), and *lophos* Greek (crest).

List of *Astolophos* Species

Astolophos capitatus Distant, 1904b:429 [South Africa].—Drake and Ruhoff, 1965a:30.

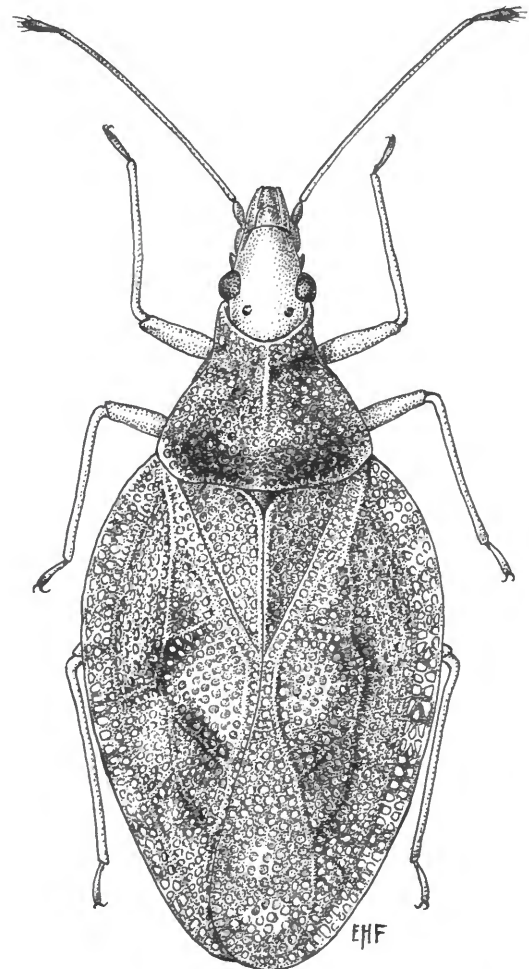


FIGURE 16.—*Astolophos capitatus*, natural length 3.1 mm.

Genus *Cnemiandrus* Distant

FIGURE 17

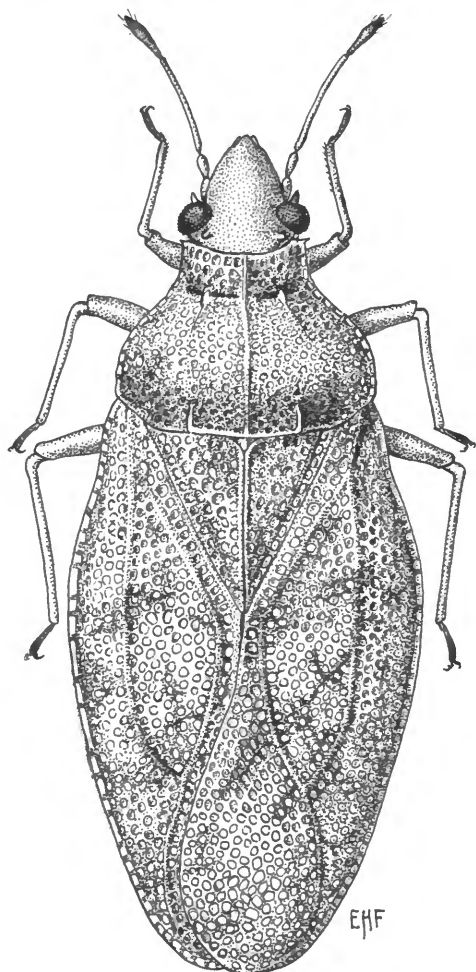
Cnemiandrus Distant, 1902a:239 [type species: *Cnemiandrus typicus* Distant, monobasic].—Drake and Ruhoff, 1965a:31.

DIAGNOSIS.—The absence of cephalic spines or tubercles anterior to the eyes, combined with the presence of a distinct, though narrow, uniseriate paranotum around humeral angle, permit separation of this genus from all others in the tribe. Length 3.0 mm.

GEOGRAPHIC DISTRIBUTION.—The only species of the genus is restricted to South Africa.

ETYMOLOGY (masculine).—Origin of this name is obscure. G.E. Steyskal suggested the Greek *knemia* (variant), might suggest “another kind” but that *andros*, Greek (man), seems inappropriate for a tiny insect, plus masculine ending *-us*.

COMMENTS.—The only species in this genus is noteworthy for having numerous, well-separated, stellate hairs on all thoracic pleurae and on the venter of the first abdominal segment.

FIGURE 17.—*Cnemiandrus typicus*, natural length 3.0 mm.

The original card containing the type series (in The Natural History Museum, London) once held six specimens and now has only four, with the original first and fourth missing. Here the second specimen from the right end (fifth from the left in the original series) is chosen lectotype—it shows the heaviest sclerotization; the other three, now considered paralectotypes, are quite teneral.

List of *Cnemiandrus* Species

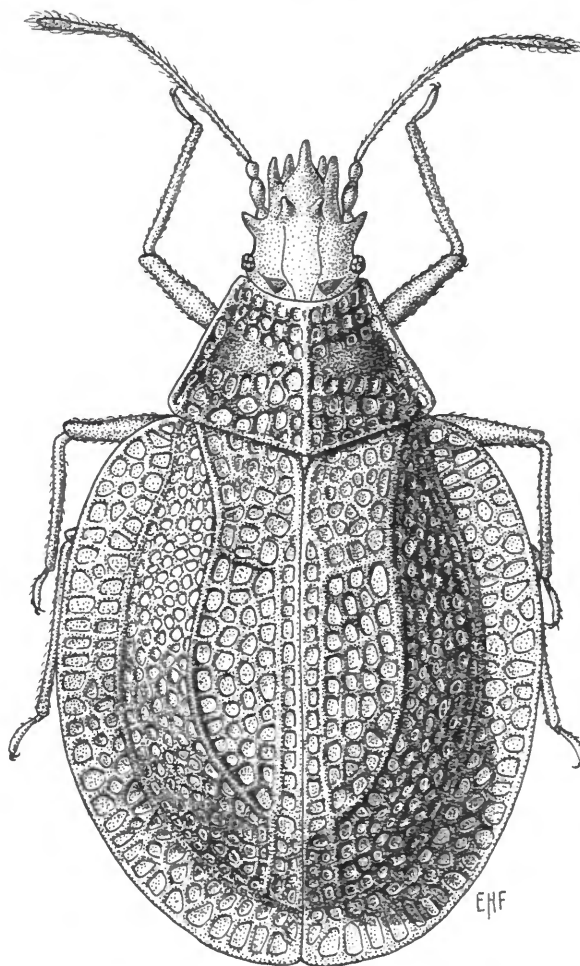
Cnemiandrus typicus Distant, 1902a:240 [South Africa].—Drake and Ruhoff, 1965a:31.

Genus *Cyclotynaspis* Montandon

FIGURE 18

Cyclotynaspis Montandon, 1892:265 [type species: *Cyclotynaspis acalyptoides* Montandon, monobasic].—Drake and Ruhoff, 1965a:31.

DIAGNOSIS.—Among the Phatnomatini genera with a long, stout spine on the clypeus between the jugal spines, this genus is uniquely marked by greatly reduced eyes and the obscure peritreme for the scent-gland opening. Length 1.7–1.8 mm.

FIGURE 18.—*Cyclotynaspis acalyptoides*, natural length 1.7 mm.

GEOGRAPHIC DISTRIBUTION.—The lone species in this genus has been reported only from Singapore.

ETYMOLOGY (feminine).—*kykl*, Greek (circle), plus *aspis*, Greek (shield), referring to the rounded shield-like shape of the hemelytra.

COMMENTS.—The holotype was the only known specimen of this genus until specimens were discovered in 1967 in forest floor litter in Singapore by D.H. Murphy of the University of Singapore (see Froeschner, 1968:246).

List of *Cyclotynaspis* Species

Cyclotynaspis acalyptoides Montandon, 1892:265 [Singapore].—Drake and Ruhoff, 1965a:31.

Genus *Daillea* Pericart

FIGURE 19

Daillea Pericart, 1991:47 [type species: *Daillea tricostata* Pericart, monobasic].

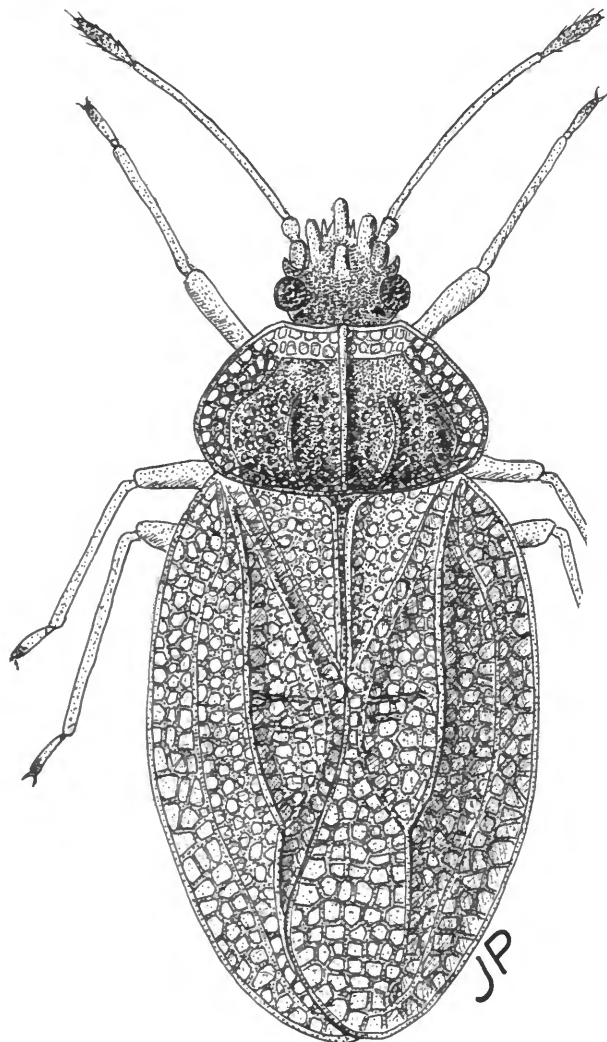


FIGURE 19.—*Daillea tricostata*, natural length 1.9 mm.

DIAGNOSIS.—Among the genera with 8–9 head spines (or tubercles) and the occipital pair shorter than the diameter of an eye, *Daillea* is defined by the paranotum being flat and continued with rows of cells around the humerus and its outer margin simple (no spines or prominent angles), the labium not reaching the posterior coxae, and the peritreme forming an apically closed loop. Length 1.9 mm.

GEOGRAPHIC DISTRIBUTION.—The lone species is known only from Sabah.

ETYMOLOGY (feminine).—A patronym for Lucien Daillé, a French coleopterist. Original description treated this name as feminine by ending the species name with the letter “a.”

COMMENTS.—None.

List of *Daillea* Species

Daillea tricostata Pericart, 1991:48, figs. 19–21 [Sabah].

Genus *Distocader* Froeschner

FIGURE 20

Distocader Froeschner, 1968:248, 249 [type species: *Malula charieis* Drake and Ruhoff, monobasic].

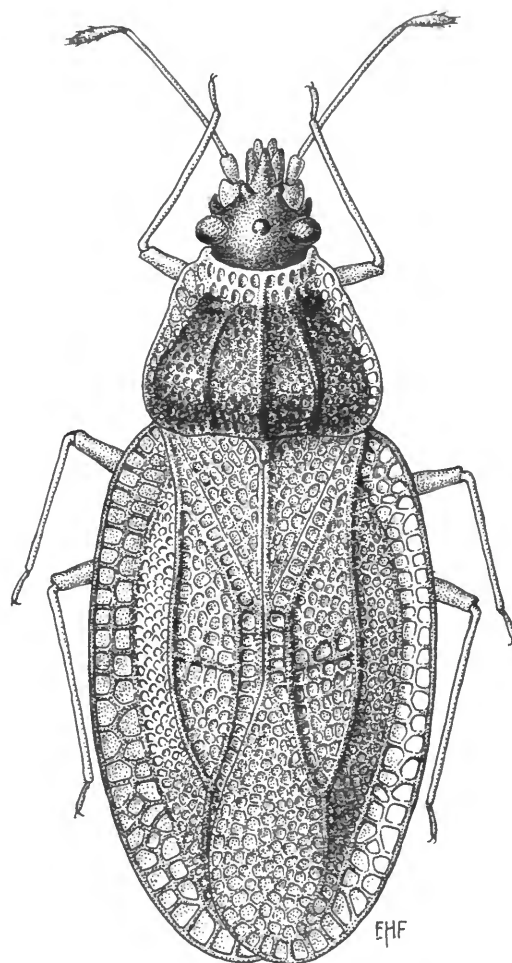


FIGURE 20.—*Distocader charieis*, natural length 2.1 mm.

DIAGNOSIS.—Among those genera of the tribe Phatnomatini bearing a dorsomedial spine or tubercle, *Distocader* can be recognized by the absence of occipitals plus no lobular or spine-like projection on the free margin of the oblique paranotum. Length 2.1 mm.

GEOGRAPHIC DISTRIBUTION.—The single specimen of the only species was described from New Guinea.

ETYMOLOGY (masculine).—Derivation originally stated to be the Latin *disto* (be different), plus nondescriptive *-cader*, fragment from *Cantacader*, indicating another genus in the taxon containing that genus.

COMMENTS.—The species *Malala charieis*, on the basis of the taxonomically important cephalic spines, is generically distinct from the type species of the genus *Malala* and so could not follow it into the genus *Gonycentrum*—the above genus had to be proposed to contain it.

List of *Distocader* Species

Distocader charieis (Drake and Ruhoff).—Froeschner, 1968:250.

Malala charieis Drake and Ruhoff, 1965b:244 [New Guinea].

Genus *Eocader* Drake and Hambleton

FIGURE 21

Eocader Drake and Hambleton, 1934:436 [type species: *Eocader vergrandis* Drake and Hambleton, monobasic].—Drake and Ruhoff, 1965a:31.

Montea Bruner, 1940:246 [type species: *Montea bouclei* Bruner, monobasic. Synonymized by Monte, 1942:104].

DIAGNOSIS.—Within the tribe Phatnomatini, this genus can be recognized by either of the characters stated in the first couplet of the above key. Length 2.0–2.3 mm.

GEOGRAPHIC DISTRIBUTION.—Two species are known, one each from Brazil and Cuba.

ETYMOLOGY (masculine).—*eos*, Greek (early), plus nondescriptive *-cader* to indicate another generic type in the taxon containing the genus *Cantacader*. The significance of the name is unclear.

COMMENTS.—The shape of the vertex is especially noteworthy. The area between the eyes of all the adults and the single nymph studied is distinctly lower than the eyes and the convex anteocular part of the head; this depression extends obliquely forward and outward as a sulcus in front of each eye. The general impression created by this modification is that the vertex failed to develop fully.

In the original description of the synonym *Montea*, Bruner pointed out its closeness to *Eocader*, but held the two distinguishable on the 1-carinate pronotum of *Eocader* and the 3-carinate pronotum of *Montea*. Later Monte (1942:104) reported a series of *E. vergrandis* from Rio de Janeiro in which some individuals were 3-carinate and some 1-carinate, thus eliminating the only important separating feature. The brachypterous specimens are 1-carinate with the posterior pronotal lobe concave, and the macropterous specimens are 3-carinate with the posterior pronotal lobe convex, the lateral carinae extending from the calli to the posterior margin of the pronotum.

The single available nymph of *E. bouclei* can readily be

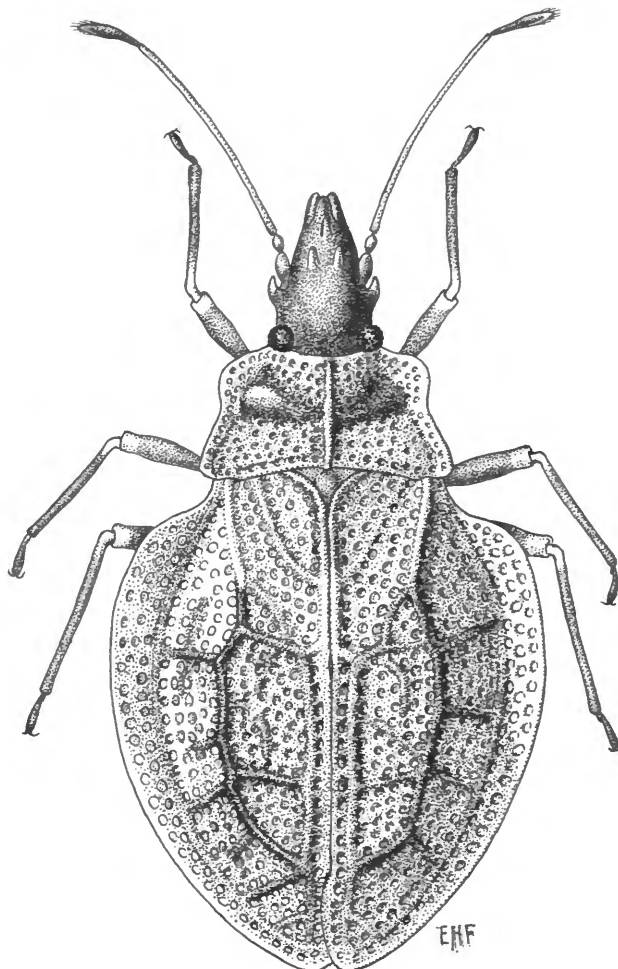


FIGURE 21.—*Eocader vergrandis*, natural length 2.1 mm.

recognized to genus by the unique, depressed vertex and the supraclypeal and clypeal tubercles. In general appearance the nymph is elongate oval, without spines, and closely covered with tiny, flat, stellate vestiture.

List of *Eocader* Species

Eocader bouclei (Bruner).—Drake and Ruhoff, 1965a:32.

Montea bouclei Bruner, 1940:246 [Cuba].

Eocader vergrandis Drake and Hambleton, 1934:436 [Brazil].—Drake and Ruhoff, 1965a:32.

Key to *Eocader* Species

- Paranotum on anterior lobe strongly, subtriangularly explanate, its width there greater than transverse width of an eye *E. vergrandis*
- Paranotum not explanate on anterior lobe, its width there distinctly less than transverse diameter of an eye *E. bouclei*

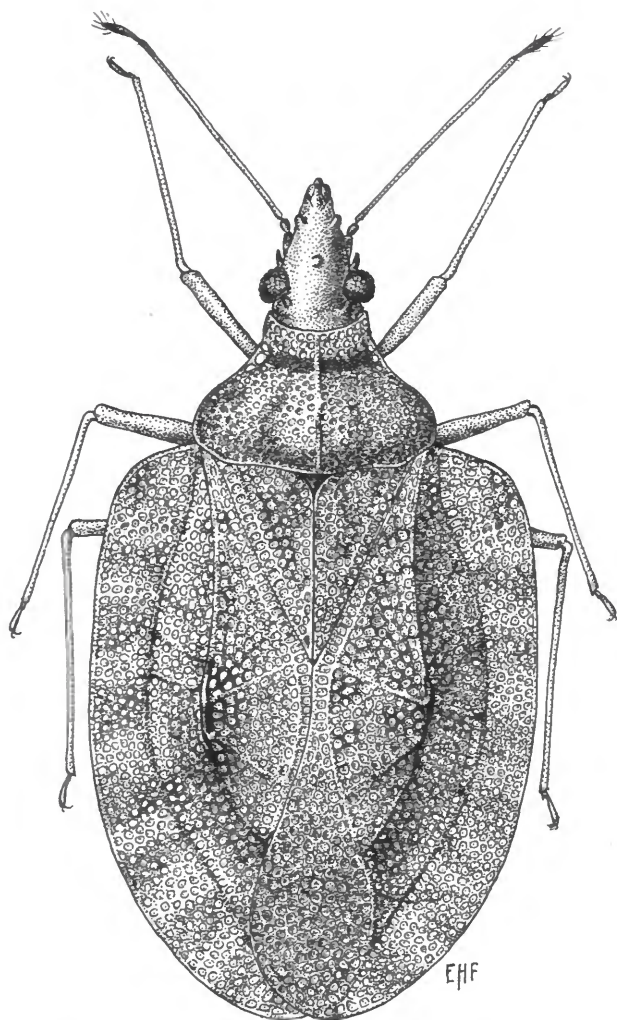


FIGURE 22.—*Etesinalda laticosta*, new species, natural length 4.0 mm.

Genus *Etesinalda*, new genus

FIGURE 22

DIAGNOSIS.—The presence of dorsomedial, jugals, frontals, and occipitals, the virtual lack of paranotum except opposite the calli, plus the extremely broad costal area expanding abruptly from base combine to mark this genus as distinct within the tribe Phatnomatini.

CHARACTERS.—Length 4 mm; macropterous; hemelytra axes subparallel, apices broadly overlapping.

Head with 9 tubercles (jugals, frontals, occipitals, dorsomedial, and 1 each at midlength and apex of clypeus). Eye about half as wide as interocular space. Bucculae surpassing and

incurved, but not contiguous, beyond apex of clypeus. Labium extremely long, reaching base of genital structures. Antennal segment I slightly longer than II, I plus II about as long as IV.

Pronotum without elevated cyst. Anterior margin concave, laterally weakly convex behind eyes. Median carina percurrent, areolate only between calli virtually absent. Paranotum extremely narrow, with distinct cells only at level of calli. Posterior margin transverse, faintly convex medially. Scutellum exposed.

Hemelytra conjointly convex, areas well defined by elevated veins, with 2 or 3 distinctly elevated cross veins in discoidal and subcostal areas. Discoidal area reaching apical fourth of hemelytron. Subcostal area 5–7 cells wide (except at extreme base). Costal margin abruptly expanding from very base, thence broadly, convexly curved. Costal area 5–6 cells wide.

Peritreme elevated, an apically closed loop. Sternal laminae present on all 3 sterna, lateral carinae virtually straight, widely separated and somewhat outcurved at posterior apex. Abdomen broadly but shallowly impressed along midventral line of pregenital segments.

TYPE OF GENUS.—*Etesinalda laticosta*, new species, herein designated.

GEOGRAPHIC DISTRIBUTION.—The holotype, the only known specimen, came from the island of São Tome off the west coast of Africa.

ETYMOLOGY (feminine).—*etes*, Greek (a neighbor), plus the generic name *Sinalda* Distant, alluding to the fact that this new genus is a taxonomic as well as a geographic neighbor of *Sinalda*.

COMMENTS.—This genus appears to be quite close to *Sinalda* and is undoubtedly an insular offshoot thereof. The alliance is marked by the tribal features plus the identical pattern of cephalic tubercles and the broadly auriculate peritreme apex. The important differences lie in the extreme reduction in the paranotal width, the virtual lack of lateral carinae, the extremely broad costal area that is abruptly and broadly expanded from its very base, and the very prominent postmedian tectation along the lateral discoidal vein. The latter tectation has no counterpart in *Sinalda* or other Phatnomatini genera except that it is sometimes weakly shown in *Phatnoma*.

Etesinalda laticosta, new species

DIAGNOSIS.—As the only member of the genus, *laticosta* must be diagnosed by the generic characters.

CHARACTERS.—Length 4.0 mm. Shining, yellow brown with antennal IV, eyes, scutellum, and apex of elytral tectation virtually black; remainder of surface with weak fuscous markings.

TYPE.—Holotype female; Lagoa Amelia, São Tome, 9 Sep 1949, 5200 feet; The Nat. Hist. Mus., London.

DISTRIBUTION.—Island of São Tomé, off west coast of Africa.

HOST PLANT.—Unrecorded.

COMMENT.—The specific name was suggested by the very broad costal area.

Genus *Exulumus*, new genus

FIGURE 23

DIAGNOSIS.—Among the genera of Phatnomatini with jugals, frontals, dorsomedial, and no occipitals, this genus may be recognized by the broad paranotum with a strong marginal sinuation subapically.

CHARACTERS.—Length 2.4–2.7 mm; brachypterous; hemelytra meeting in a straight line for full length, axes weakly converging posteriorly.

Head with 6 long, erect, spines (jugals, frontals, dorsomedial, and 1 on clypeus). Eye about half as wide as interocular space. Bucculae surpassing and parallel beyond apex of clypeus. Labium reaching second abdominal sternite. Antenna slender, cylindrical: segment I almost 3 times as long as II, and as long as IV.

Pronotum without inflated or elevated cyst. Anterior margin shallowly concave. Disc 1-carinate, median carina percurrent, slightly projecting beyond anterior margin. Paranotum broad, abruptly constricted in anterior third. Posterior margin transverse, feebly 2-sinuate. Scutellum exposed.

Hemelytra meeting in a straight line for full length, conjointly convex, costal margin horizontal. Areas clearly marked by elevated veins, discoidal area reaching apical third of hemelytron, with 1 or 2 elevated crossveins. Subcostal area 5–7 cells wide, with 3–4 elevated crossveins. Costal margin strongly convexly curved from base to apex. Costal area regularly 2-seriate almost to apex.

Peritreme elevated, forming a broad, apically closed loop. Metapleural flange not expanded. Sternal laminae present, straight, and narrowly separated on all 3 sterna. Abdomen without mediolongitudinal groove.

TYPE OF GENUS.—*Ulmus engaeus* Drake and Ruhoff, herein designated.

DISTRIBUTION.—Congo.

ETYMOLOGY (feminine).—*ex*, Latin (from or out of), plus generic name *Ulmus*, referring to the removal of this species from *Ulmus*.

COMMENTS.—The importance of head spine arrangement in this tribe forces generic isolation of this species. The absence of occipital spines or tubercles separates it from the geographically nearby South African genus *Ulmus*.

List of *Exulumus* Species

Exulumus engaeus (Drake and Ruhoff) [new combination].

Ulmus engaeus Drake and Ruhoff, 1961:129 [Congo]; 1965a:41.

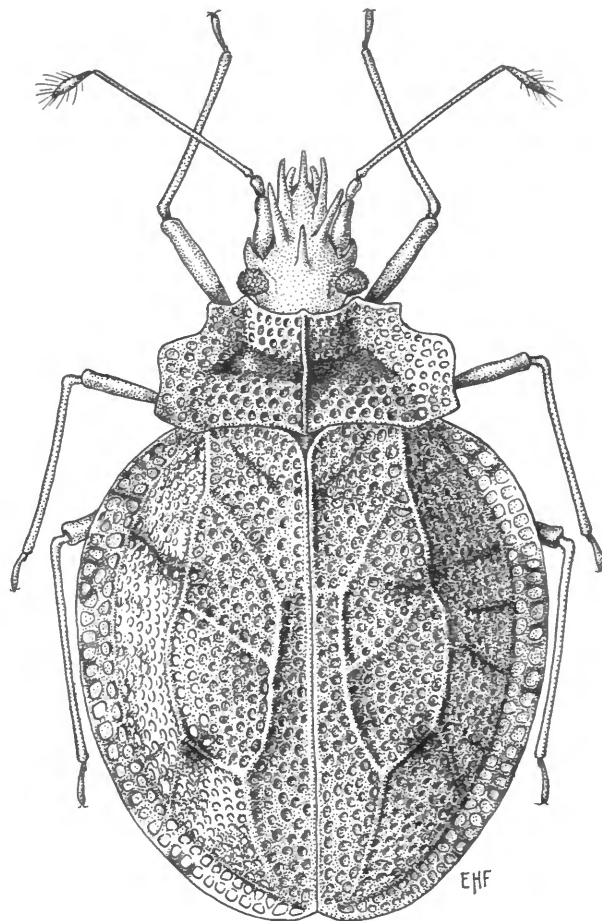


FIGURE 23.—*Exulumus engaeus*, natural length 2.6 mm.

Genus *Gonycentrum* Bergroth

FIGURE 24

Teleia Fieber, 1844:56 [preoccupied; type species: *Teleia coronata* Fieber, monobasic].

Gonycentrum Bergroth, 1898:9 [new name for preoccupied *Teleia* Fieber, hence takes the same type species].—Drake and Ruhoff, 1965a:32.

Malala Distant, 1910:101 [type species: *Malala bulliens* Distant, monobasic].—Drake and Ruhoff, 1965a:34 [synonymized by Froeschner, 1968:246].

DIAGNOSIS.—Among the genera of Phatnomatini without a dorsomedial spine or tubercle, this is the only genus with the combination of jugals, frontals, occipitals, and a clypeal, the occipitals at least as long as an eye, and the outer margin of the paranotum without angles or spines. Length 2.0–2.3 mm.

GEOGRAPHIC DISTRIBUTION.—Of the two species of this

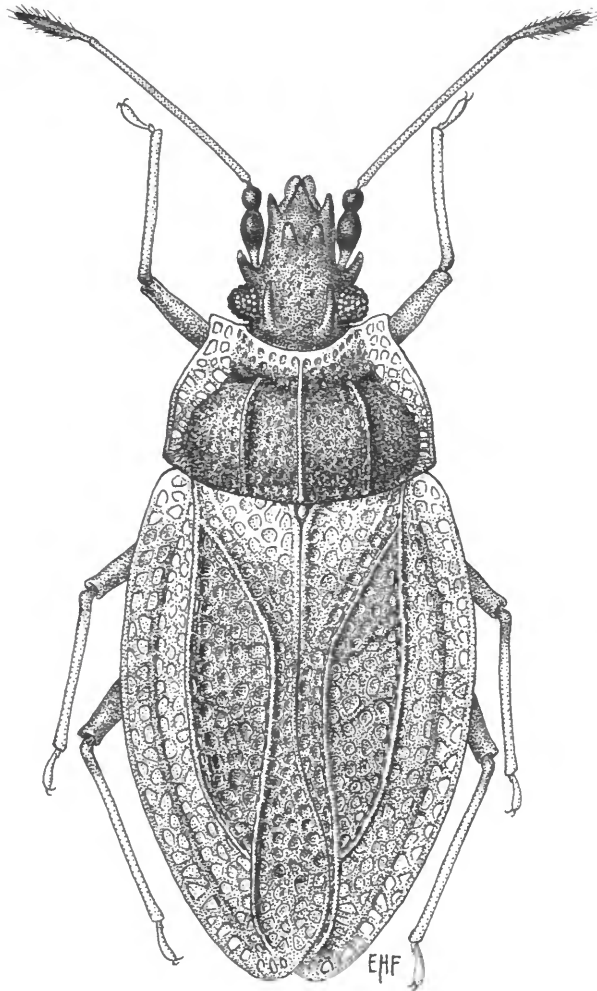


FIGURE 24.—*Gonycentrum coronatum*, natural length 2.3 mm.

genus, one is known only from India and Ceylon (Fieber's original locality given as "Ostindien" probably should be translated as eastern India); the other was described from the African country of Chad.

ETYMOLOGY (neuter).—*gony*, Greek (a joint or node), plus *centrum*, Latin (100), of unclear application.

COMMENTS.—Froeschner (1968:246–248) showed the traditional *Gonycentrum* of the Drake and Ruhoff (1965a:32–34) catalog to be composed of three morphological groups, each occurring in a different zoogeographic region. In that concept *Gonycentrum* reverted to a monobasic Indian genus; Distant's name *Sinalda* was resurrected for the African species; the species of the Australian region were placed in the new genus *Carldrakeana*; and the type species of *Malala*, *M. bulliens*, was shown to be conspecific with the type species of *Gonycentrum*, and thus was synonymized under the latter name. Later, however, Linnavuori (1977:6) described *G. sinuaticolle*, which was transferred to *Sinalda* by Duarte-Rodrigues (1981b:207). The latter author (1978:13) described an African species in *Gonycentrum* in this restricted sense. Then Jing (1980:400, 403) described *Malala tuberculum*, which is herein transferred to the genus *Taphnoma* Pericart.

Two specimens from the Distant collection in The Natural History Museum, London, were examined, and the one bearing a label "Malala bulliens Dist. Type; Distant Coll. 1911-383," apparently in Distant's handwriting, is herein designated the lectotype of that species. It also bears the following additional labels: (a) [a red circled label reading] "Type. H. T.;" (b) Peredeniya, Ceylon, 6-09, 2406; the other specimen is to be considered a paralectotype.

List of *Gonycentrum* Species

- Gonycentrum chadense* Duarte-Rodrigues, 1978:13 [Chad].
- Gonycentrum coronatum* (Fieber).—Drake and Ruhoff, 1965a:33.
- Teleia coronata* Fieber, 1844:56 ["Ostindien"].
- Malala bulliens* Distant, 1910:101 [Ceylon].—Drake and Ruhoff, 1965a:34 [synonymized by Froeschner, 1968:248].

Key to *Gonycentrum* Species

- Collar and hemelytron basad of claval midlength white. Subcostal area 4-seriate *G. chadense*
- Collar and hemelytra uniformly colored, without white areas described above. Subcostal area irregularly 3-seriate *G. coronatum*

Genus *Indocader* Pericart

FIGURE 25

Indocader Pericart, 1981:596 [type species: *Indocader loebli* Pericart, monobasic].

DIAGNOSIS.—Among the Phatnomatini with 8–9 spines or tubercles on the head, *Indocader* is recognized by the occipitals being shorter than an eye, paranotum wide, 3-seriate and with outer margin distinctly undulate or 2-lobed, pronotal disc 1-carinate, and peritreme an apically

closed loop. Length 1.9–2.4 mm.

ETYMOLOGY (masculine).—*Indo*, for India the country of origin, plus nondescriptive *-cader*, from *Cantacader*, indicating another generic type in the taxon containing that genus.

GEOGRAPHIC DISTRIBUTION.—India and Nepal.

COMMENTS.—The type series of both included species were taken at altitudes of 1500 to 3100 meters.

List of *Indocader* Species

- Indocader besucheti* Pericart, 1983:593 [Nepal].
- Indocader loebli* Pericart, 1981:597 [India].

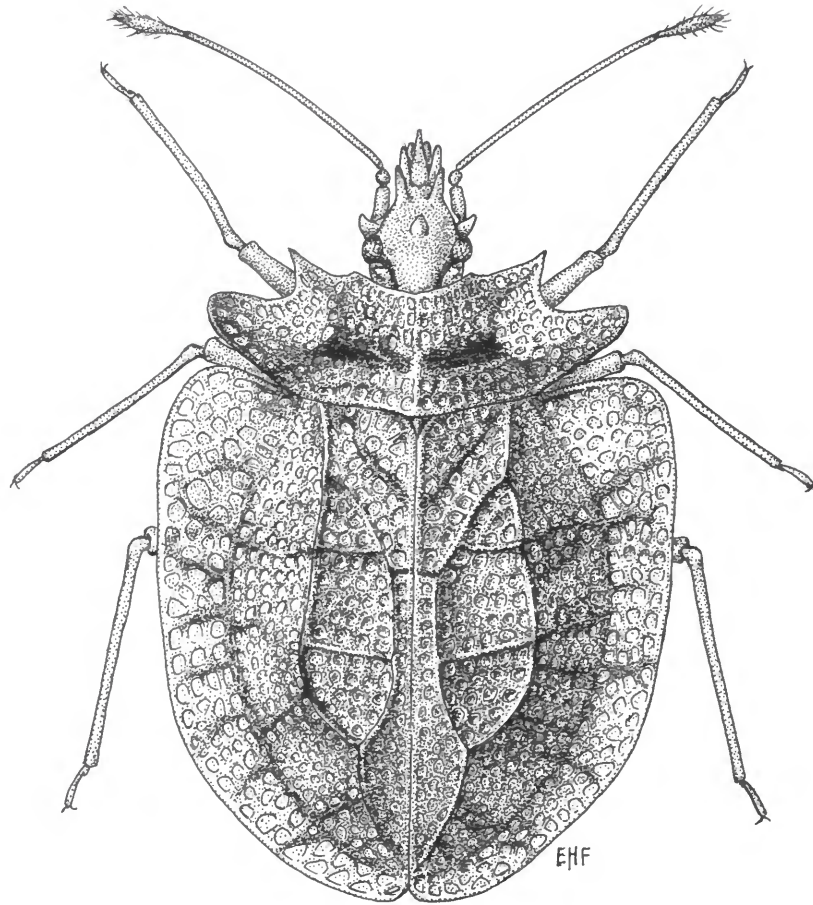


FIGURE 25.—*Indocader loebli*, natural length 2.3 mm.

Key to *Indocader* Species

- Paranotum along lateral margin deeply incised, forming two unequal lobes. Costal area distinctly widening in basal third *I. loebli*
- Paranotum along lateral margin very slightly concave, not forming prominent lobes. Costal area of equal width virtually to base *I. besucheti*

Genus *Microcader* Pericart

FIGURE 26

Microcader Pericart, 1981:601 [type species: *Microcader unicastatus* Pericart, original designation].

DIAGNOSIS.—Among the genera of Phatnomatini with 8–9 head spines or tubercles and the occipitals being shorter than an eye, *Microcader* can be defined by the paranotum being seriate around the humerus with outer margin simple (no spines or lobes), the labium surpassing posterior coxae, and peritreme

forming an apically closed loop. Length 1.6–1.8 mm.

GEOGRAPHIC DISTRIBUTION.—India; Thailand.

ETYMOLOGY (masculine).—*micro*, Greek (small), plus *-cader*, nondescriptive, from genus *Cantacader*, to indicate yet another genus in the taxon containing that genus, in reference to the small size.

List of *Microcader* Species

- Microcader thai* Pericart, 1991:37 [Thailand].
- Microcader unicastatus* Pericart, 1981:601 [India].
- Microcader variegatus* Pericart, 1981:603 [India].

Key to *Microcader* Species

- 1. Costal area 2-seriate *M. thai*
 Costal area 1-seriate 2
- 2. Pronotum 1-carinate (median only) *M. unicastatus*
 Pronotum 3-carinate (median and 2 laterals) *M. variegatus*

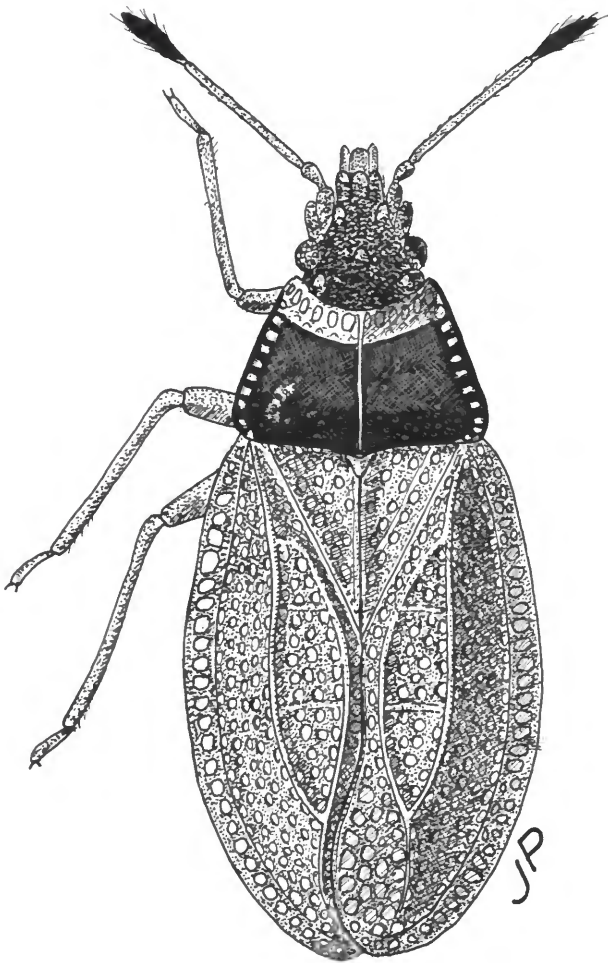


FIGURE 26.—*Microcader unicastatus*, natural length 1.8 mm.

Genus *Minitingis* Barber

FIGURE 27

Minitingis Barber, 1954:7 [type species: *Minitingis minusculus* Barber, monobasic].

Zetekella.—Drake and Ruhoff, 1965a:41 [part]. [Note: This taxon was cataloged as a junior synonym of *Zetekella* Drake by Drake and Ruhoff (see above) but was returned to generic status by Froeschner (1968:251).]

DIAGNOSIS.—Among the genera of Phatnomatini having no

dorsomedial spine or tubercle, *Minitingis* can be recognized by its seven short head spines (only jugals, frontals, and elongate occipitals, plus one on clypeus) plus the short, acute angulations on the paranotal margin. Length 1.7–2.6 mm.

GEOGRAPHIC DISTRIBUTION.—The two species of the genus are known only from the Bahamas and Greater Antilles in the West Indies.

ETYMOLOGY (feminine).—*minus*, Latin (least), plus *tingis*, from the generic name *Tingis* Fabricius, to indicate this was one of the smallest lace bugs known at that time.

COMMENTS.—Considering only the three species cataloged by Drake and Ruhoff under the generic name *Zetekella* Drake,

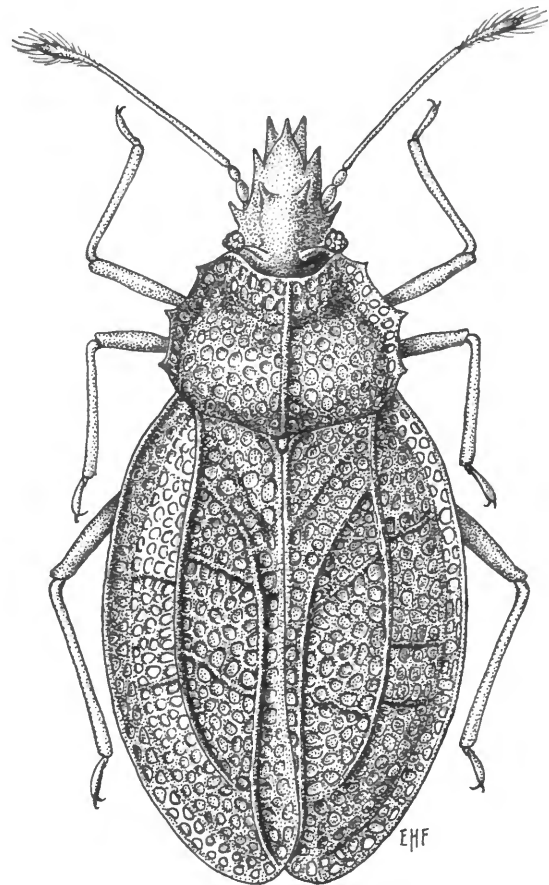


FIGURE 27.—*Minitingis minusculus*, natural length 1.7 mm.

the tendency was to follow them in treating *Minitingis* as a synonym of that genus. However, the appearance of a second West Indies species agreeing with *minusculus* Barber in the narrow form, head armature, long labium, paranotal development, and grooved abdomen created a distinct morphological pattern of West Indies versus continental America species. This pattern appears to have true zoogeographic significance and led

Froeschner (1968:251) to resurrect Barber's genus for the West Indies forms.

List of *Minitingis* Species

- Minitingis elsae* Froeschner, 1968:253 [Jamaica].
- Minitingis minusculus* Barber, 1954:7 [Bahamas].—Froeschner, 1968:251, 253.
- Zetekella minuscula*.—Drake and Ruhoff, 1965a:41.

Key to *Minitingis* Species

- Costa with alternate, conspicuous black and white quadrate marks, and with 4 rows of areolae *M. elsae*
- Costa without alternate black and white marks, and with 2 rows of areolae *M. minusculus*

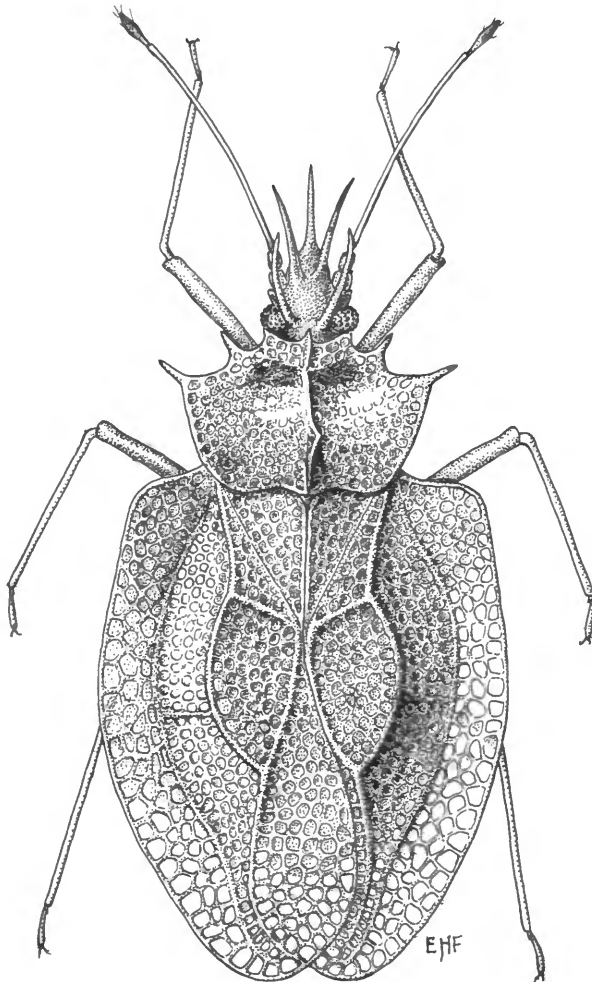


FIGURE 28.—*Oranoma biroi*, macropterous, natural length 2.5 mm.

Genus *Oranoma* Drake

FIGURE 28

Oranoma Drake, 1951:165 [type species: *Oranoma biroi* Drake, monobasic].—Drake and Ruhoff, 1965a:34.

DIAGNOSIS.—Among those genera of the tribe Phatnomatini with the forward-projecting spiniform prolongation of the antero-lateral angle of the paranotum, this one may be characterized as lacking a dorsomedial but having five other head spines nearly or quite as long as the head (frontal, occipitals, and one on clypeus). Length 2.5 mm.

GEOGRAPHIC DISTRIBUTION.—The single specimen of this species was from New Guinea.

ETYMOLOGY (neuter).—*ora*, Latin (rim or edge), possibly referring to the broad costal margin, plus *-noma* (meaningless), and probably derived from the generic name *Phatnoma* Fieber (and so neuter) to indicate a degree of relationship thereto.

COMMENTS.—The original generic description listed the 1-carinate pronotal disc as a feature for separating this genus from *Phatnoma*; however, the existence of two taxa of *Phatnoma* with 1-carinate pronotal disc (*P. agviates* and *P. varians unicarinata*) negates that condition as a distinguishing generic feature. The important cephalic spine development (five on *Oranoma*, seven on *Phatnoma*) remains an effective separating feature for these two genera.

List of *Oranoma* Species

- Oranoma biroi* Drake, 1951:166 [New Guinea].—Drake and Ruhoff, 1965a:34.

Genus *Phatnocader* Stusak

FIGURE 29

Phatnocader Stusak, 1976:13 [type species: *Phatnocader froeschneri* Stusak, monobasic].

DIAGNOSIS.—Among the genera with 8–9 head spines or tubercles (occipital shorter than an eye) this one is recognized by the combination of the paranotum being mostly 1-seriate

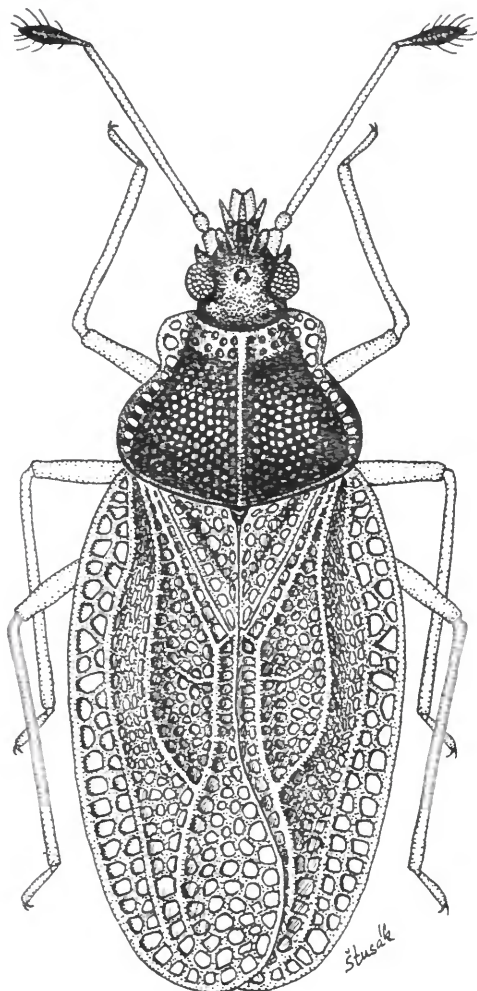


FIGURE 29.—*Phatnocader froeschneri*, natural length 2.1 mm.

around the humerus and forming a weak lobe opposite the end of the collar, plus the peritreme forming an apically closed loop. Length 2.0–2.1 mm.

GEOGRAPHIC DISTRIBUTION.—Known only from Java.

ETYMOLOGY (masculine).—Fragments of two generic names, *Phatnoma* Fieber and *Cantacader*, combined to indicate the present genus belongs to the subfamily Cantacaderinae.

List of *Phatnocader* Species

Phatnocader froeschneri Stusak, 1976:14 [Java].

Genus *Phatnoma* Fieber

FIGURE 30

Phatnoma Fieber, 1844:57 [type species: *Phatnoma laciniata* Fieber, monobasic].—Drake and Ruhoff, 1965a:35.

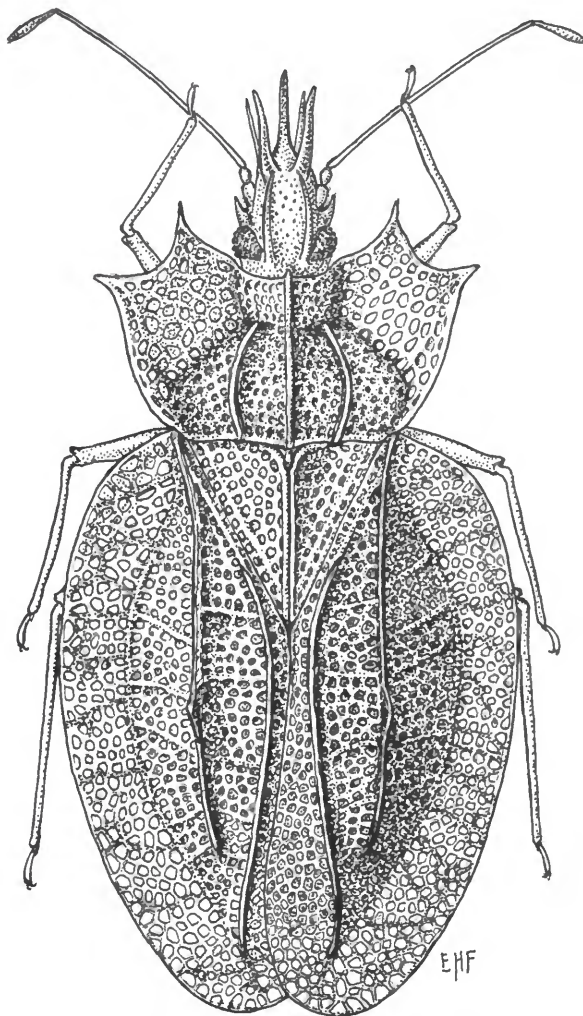


FIGURE 30.—*Phatnoma laciniatum*, natural length 4.0 mm.

DIAGNOSIS.—Among the Phatnomatini genera with no dorsomedial spine and the anterolateral paranotal angle projecting as a distinct angle or spiniform process, *Phatnoma* differs in having seven spines (jugals, frontals, occipitals, and one on clypeus) on head. Length 3.0–4.5 mm.

GEOGRAPHIC DISTRIBUTION.—This genus occurs in southern Asia (Oriental region), Africa, Malagasy, Australia, the Papuan and Oceanic regions, and the Neotropics.

ETYMOLOGY (neuter).—The definition of the Greek neuter noun, *phatnoma* (sunken panel or framed structure), aptly describes the appearance of the dorsal surface that is broken into small areas surrounded by distinctly elevated veins. Unfortunately, Fieber treated the name as feminine as evidenced by his use of the feminine ending in his species

"laciniata." Subsequent authors, including Drake and Ruhoff (1965a:35), followed Fieber. In the following list of species the endings are thus emended. In practice the component "-noma" at the end of *Phatnoma* has been used in the formation of other generic names to indicate relationship to the genus *Phatnoma* (neuter) rather than using the Greek -oma, which signifies "an eating sore"—as in "carcinoma."

COMMENTS.—*Phatnoma*, like *Cantacader*, is unusual among the Cantacaderinae in occupying a range that extends into several geographic regions of the world; the other genera of the subfamily have their species restricted to one or only two such regions. Most of the species of *Phatnoma* are similar in structure and variability and therefore are difficult to separate; because only about half of the 27 described species are available for study, no key to them is offered at this time.

The specimen of *P. baltica* described from "Baltic amber" is clearly not a member of this genus. In spite of Drake's statement (1950:153) with the original description that the difference in cephalic spines "does not seem to be of generic importance," subsequent studies found these structures in the Cantacaderinae to be very valuable at the generic level; therefore, the pattern of cephalic armature in *baltica* causes its present transfer to the genus *Sinalda*, which Froeschner (1968:248) resurrected from synonymy.

List of *Phatnoma* Species

- Phatnoma agviates* Drake and Ruhoff, 1961:130 [Solomon Islands]; 1965a:35.
Phatnoma ainatum Drake and Ruhoff [emendation].
Phatnoma ainata Drake and Ruhoff, 1965b:246 [New Guinea].
Phatnoma amazonicum Drake and Hambleton [emendation].
Phatnoma amazonica Drake and Hambleton, 1944:120 [Brazil].—Drake and Ruhoff, 1965a:35.
Phatnoma annulipes Champion, 1897:4 [Panama].—Drake and Ruhoff, 1965a:35.
Phatnoma annulipes annulipes Champion.—Drake, 1948b:21.
Phatnoma annulipes var. *concisum* Drake [emendation].
Phatnoma annulata [sic] var. *concisus* Drake, 1948b:21 [Venezuela].
Phatnoma annulipes var. *concisus*.—Drake and Ruhoff, 1965a:35.
Phatnoma barberi Drake, 1941:141 [Colombia].—Drake and Ruhoff, 1965a:36.
Phatnoma biordinatum Froeschner, 1976:183 [Galápagos Islands].
Phatnoma costalis Distant, 1909:113 [Burma].—Drake and Ruhoff, 1965a:36.
Phatnoma coyazana Drake, 1948a:15 [Brazil].—Drake and Ruhoff, 1965a:36.
Phatnoma ecuadore Drake [emendation].
Phatnoma ecuadoris Drake, 1941:141 [Ecuador].—Drake and Ruhoff, 1965a:36.
Phatnoma eremaeum Drake and Froeschner [emendation].
Phatnoma eremaea Drake and Froeschner, 1967:83 [Galápagos Islands].
Phatnoma guatemalana Drake, 1948b:20 [Guatemala].—Drake and Ruhoff, 1965a:36.
Phatnoma hackeri Drake, 1950:154 [Australia].—Drake and Ruhoff, 1965a:36.
Phatnoma hova Schouteden, 1957:82 [Madagascar].—Drake and Ruhoff, 1965a:37.
Phatnoma jinjana Drake, 1956:13 [Uganda].—Drake and Ruhoff, 1965a:37.
Phatnoma laciniatum Fieber, 1844:57 [emendation; "Ostindien"].—Drake and Ruhoff, 1965a:37.
Phatnoma maculatum Monte [emendation].
Phatnoma maculata Monte, 1946:252 [Brazil].—Drake and Ruhoff, 1965a:37.
Phatnoma marmoratum Champion [emendation].
Phatnoma marmorata Champion, 1897:3 [Panama].—Drake and Ruhoff, 1965a:37.
Phatnoma maynei Schouteden, 1916:289 [Congo].—Drake and Ruhoff, 1965a:37.
Phatnoma ovatum Champion [emendation].
Phatnoma ovata Champion, 1897:4 [Guatemala].—Drake and Ruhoff, 1965a:38.
Phatnoma pacifica Kirkaldy, 1908:363 [Fiji Islands].—Drake and Ruhoff, 1965a:38.
Phatnoma takasago Takeya, 1933:32 [Taiwan].—Drake and Ruhoff, 1965a:38.
Phatnoma togulare Drake [emendation].
Phatnoma togularis Drake, 1950:154 [India].—Drake and Ruhoff, 1965a:38.
Phatnoma tonkinana Drake and Maa, 1955:1 [Viet Nam].—Drake and Ruhoff, 1965a:38.
Phatnoma trinidadana Drake, 1948:21 [Trinidad].—Drake and Ruhoff, 1965a:38.
Phatnoma uichancoi Drake, 1950:155 [New Guinea].—Drake and Ruhoff, 1965a:38.
Phatnoma varians Drake, 1922:352 [French Guiana].—Drake and Ruhoff, 1965a:39.
Phatnoma varians var. *unicarinatum* Drake [emendation].
Phatnoma varians var. *unicarinata* Drake, 1922:353 [French Guiana].—Drake and Ruhoff, 1965a:39.
Phatnoma varians var. *variens* Drake.
Phatnoma varians Drake, 1922 [see above].
Phatnoma varians var. *variens*.—Drake, 1922:353.
Phatnoma veridicum Drake and Maa [emendation].
Phatnoma veridica Drake and Maa, 1955:2 [Palau].—Drake and Ruhoff, 1965a:39.
Phatnoma vernoniae Drake and Hambleton.
Phatnoma veroniae [sic] Drake and Hambleton, 1938:51 [Brazil].
Phatnoma vernoniae.—Drake and Ruhoff, 1965a:39. [NOTE.—The species name, derived from the generic name of the host plant, was originally misspelled because it was based on the misspelled plant genus name given (as "Veronia") with the original description of this insect.]

Genus *Phatnomella* Pericart

FIGURE 31

Phatnomella Pericart, 1981:598 [type species: *Phatnomella cristata* Pericart, monobasic].

DIAGNOSIS.—Among the genera with 8–9 head spines or tubercles (occipitals much shorter than eye) this one can be recognized by the outer margin of the paranotum forming a distinct, slightly acute angle anteriorly, and one opposite humerus (this one with only 2 rows of cells) plus the 3-carinate pronotal disc. Length 1.8 mm.

DISTRIBUTION.—India.

ETYMOLOGY (feminine).—*Phatnom*-, a fragment of the generic name *Phatnoma* Fieber, plus *ella*, Latin (diminutive), indicating a "small *Phatnoma*."

List of *Phatnomella* Species

- Phatnomella cristata* Pericart, 1981:599 [India].
Phatnomella variabilis Pericart, 1991:35 [Thailand].

Key to *Phatnomella* Species

- Costal area on apical half 5-seriate. Dorsal margin of median pronotal carina equally high anterior and posterior to a deep rectangular or acute indentation near midlength *P. variabilis*
- Costal area (except at base) 3-seriate. Dorsal margin of median pronotal carina shallowly concave, anterior part distinctly higher than posterior part *P. cristata*

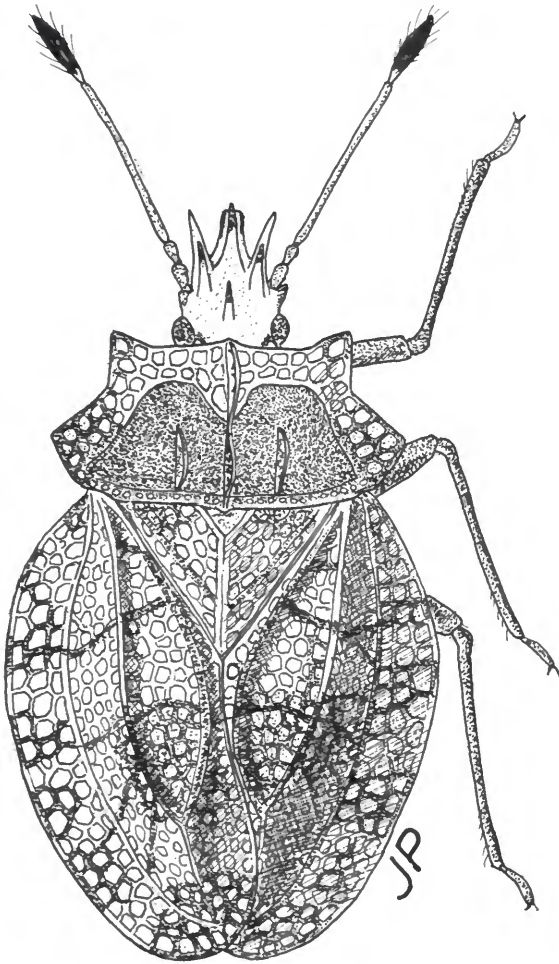


FIGURE 31.—*Phatnomella cristata*, natural length 1.8 mm.

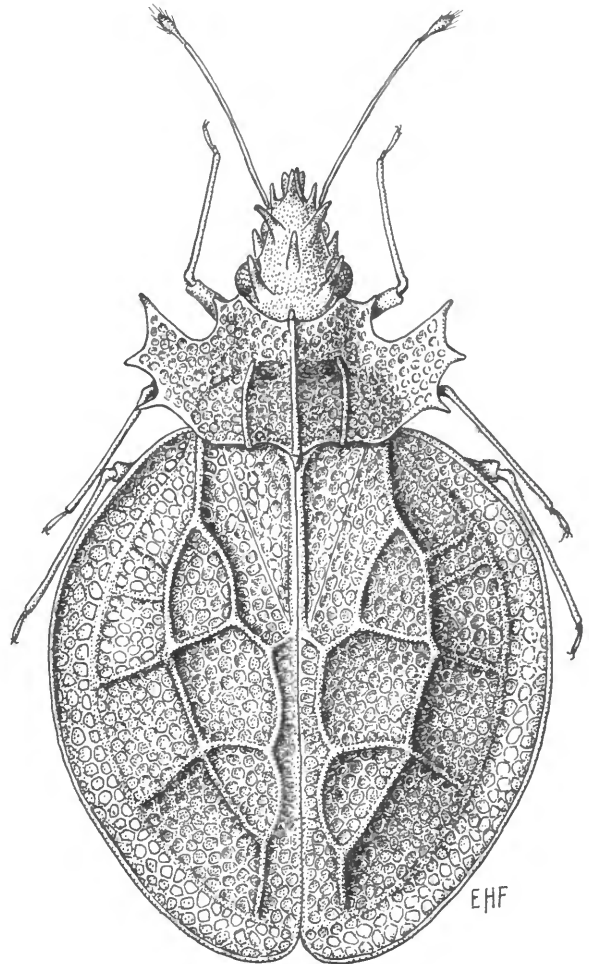


FIGURE 32.—*Plesionoma humeralis*, natural length 3.5 mm.

Genus *Plesionoma* Drake

FIGURE 32

Plesionoma Drake, 1950:157, 166 [type species: *Phatnoma humeralis* Distant, monobasic].—Drake and Ruhoff, 1965a:39.

DIAGNOSIS.—Among the genera with 8–9 head spines and/or tubercles this one can be recognized by the posterior two-thirds of the paranotum being broadly expanded (5–6 cells

wide) into a prominent lobe. Length 3.1–3.5 mm.

GEOGRAPHIC DISTRIBUTION.—This genus has been reported only from Congo and South Africa in the southern half of Africa.

ETYMOLOGY (neuter).—*plesios*, Greek (near), plus fragment *-noma* from neuter generic name *Phatnoma* Fieber, suggesting a relationship with *Phatnoma*.

COMMENTS.—Examination of the type of all species cataloged in this genus by Drake and Ruhoff (1965a:39–40)

revealed that *eteosa* Drake was misassigned; it is herein transferred to the genus *Ulmus* Distant.

List of *Plesionoma* Species

- Plesionoma biseriatum* Duarte-Rodrigues [emendation].
- Plesionoma biseriatum* Duarte-Rodrigues, 1987a:176 [South Africa].

- Plesionoma capeneri* Duarte-Rodrigues, 1981b:203 [South Africa].
- Plesionoma humerale* (Distant) [emendation].
- Phatnoma humeralis* Distant, 1902a:239 [South Africa].
- Plesionoma humeralis*.—Drake and Ruhoff, 1965a:40.
- Plesionoma leroyi* Schouteden, 1955a:25 [Congo].—Drake and Ruhoff, 1965a:40.

Key to *Plesionoma* Species

1. Head armature consisting of sharp spines as long as or longer than horizontal diameter of an eye. Lateral margin of paranotal dilation with 1 or more acute, prolonged spines 2
- Head armature reduced to blunt tubercles shorter than horizontal diameter of an eye. Lateral margin of pronotum without spines 3
2. Costal area 3-seriate. Lateral projection of paranotum with 3 acute angulations *P. humeralis*
- Costal area 2-seriate. Lateral projection of paranotum with 1 acute angulation and 1 rounded lobe *P. biseriatum*
3. Costal area 6-seriate to apex of clavus, 4-seriate beyond *P. leroyi*
- Costal area 4-seriate to apex of clavus, 3-seriate beyond *P. capeneri*

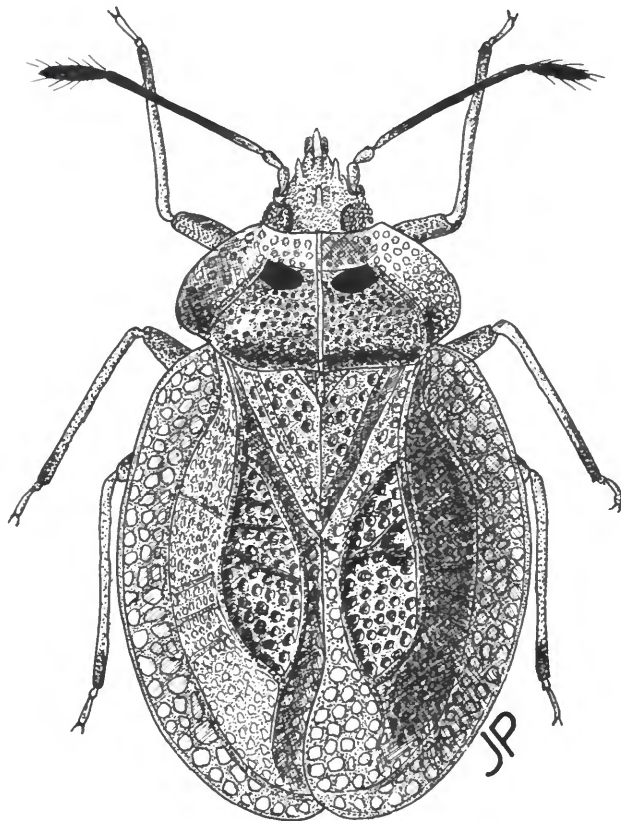


FIGURE 33.—*Pseudacalypta nepalensis*, natural length 2.4 mm.

Genus *Pseudacalypta* Pericart

FIGURE 33

Pseudacalypta Pericart, 1983:595 [type species: *Pseudacalypta nepalensis* Pericart, only included species].

DIAGNOSIS.—The arrangement of head spines or tubercles (presence of a dorsomedial and jugals and absence of occipitals and frontals) coupled with the strongly triangular bucculae (5–6 cells posteriorly, tapering to 1 cell anteriorly) mark this genus within the Phatnomatini. Length 2.4–2.5 mm.

GEOGRAPHIC DISTRIBUTION.—The only species was reported from Nepal.

ETYMOLOGY (feminine).—*pseudo*, Greek (false), plus *Acalypta*, generic name of small lace bugs in subfamily Tinginae that the member of the present genus resembles.

List of *Pseudacalypta* Species

- Pseudacalypta nepalensis* Pericart, 1983:596 [Nepal].

Genus *Pullocader* Pericart

FIGURE 34

Pullocader Pericart, 1991:38 [type species: *Pullocader borneensis* Pericart, monobasic].

DIAGNOSIS.—Among the genera with neither dorsomedial nor occipital armature, this genus will be recognized by bearing five tubercles (jugals, frontals, and a clypeal) on head, costal area widening from base, and 3-seriate pronotum. Length 1.7 mm.

GEOGRAPHIC DISTRIBUTION.—Sabah.

ETYMOLOGY (masculine).—*pullus*, Latin (dark colored),

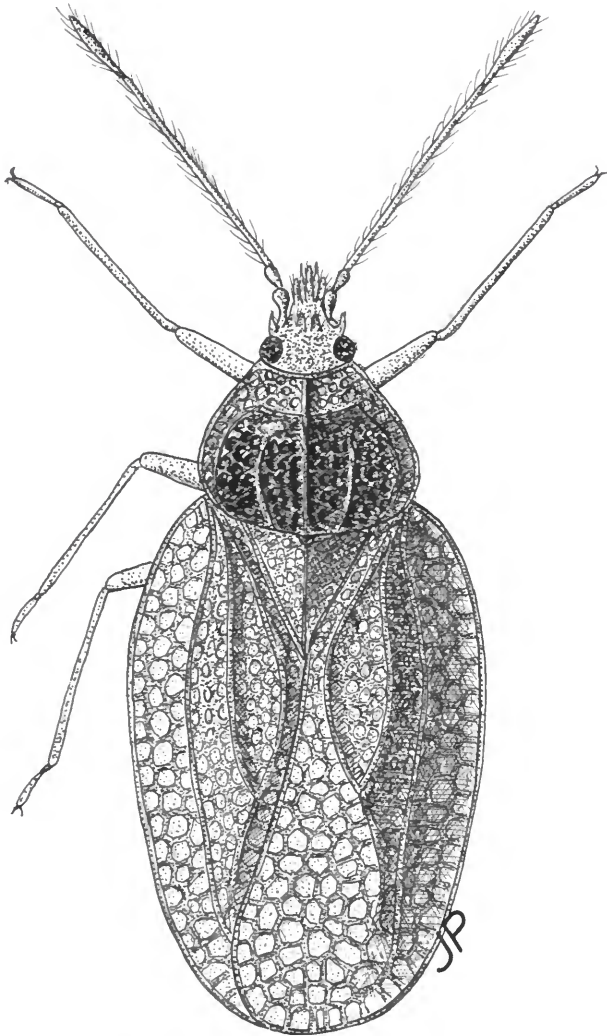


FIGURE 34.—*Pullocader borneensis*, natural length 1.7 mm.

plus nondescriptive *-cader*, fragment of generic name *Cantacader* to indicate another genus in the taxon containing that genus, a comment on a *Cantacader*-related taxon of dark color.

List of *Pullocader* Species

Pullocader borneensis Pericart, 1991:38 [Sabah].

Genus *Sinalda* Distant

FIGURE 35

Sinalda Distant, 1904b:426 [type species: *Sinalda elegans* Distant, subsequent designation by Monte, 1947:4]. [Note: This taxon was cataloged by Drake and Ruhoff (1965a:32) as a junior synonym of *Gonycentrum* but was returned to genus status by Froeschner (1968:248). See "Discussion" under *Gonycentrum*.]

DIAGNOSIS.—Among those genera of the tribe Phatnomini bearing 8–9 spines or tubercles on the head, *Sinalda* may be

recognized by having the paranotum somewhat oblique (not recurved above itself) and with outer margin simple (no spines or angular projections, and the peritreme obscure, not forming a distinctly elevated, apically closed loop. Length 2.5–3.9 mm.

GEOGRAPHIC AND GEOLOGIC DISTRIBUTION.—The modern species of this genus are confined to southern Africa, where their range extends from Kenya south to the southern tip of the continent. A fossil specimen imbedded in amber designated as "Baltic" in the original description (but without supporting evidence) may indicate a wider geographic range earlier or may be mislabeled as to origin.

ETYMOLOGY (feminine).—G.E. Steyskal interpreted this term as a newly coined word.

COMMENTS.—Two species not appearing in the Drake and Ruhoff list for *Gonycentrum* are added to this genus: a recently described species, *G. haplotaxis* Froeschner, and the present transfer of the fossil species *baltica* Drake from *Phatnoma*; the latter move was made necessary when examination revealed that the head of the type specimen in amber clearly shows a dorsomedial tubercle, a structure not present in species of the genus *Phatnoma*, the presence of occipitals, three carinae on pronotal disk, and the 1- or 2-seriate paranotum.

List of *Sinalda* Species

Sinalda aethiops (Distant).—Froeschner, 1968:249. [Note: Distant's (1904b:427) assignment of this species to the genus *Sinalda* was supported by Froeschner's (1968, above) studies.]

Phatnoma aethiops Distant, 1902:238 [South Africa].

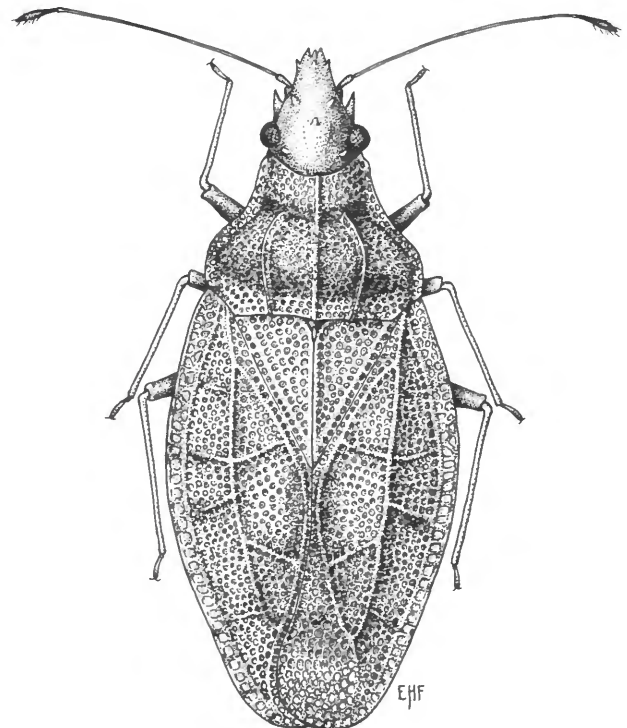


FIGURE 35.—*Sinalda elegans*, natural length 2.5 mm.

- Gonycentrum aethiops*.—Drake and Ruhoff, 1965a:32.
Sinalda afra (Drake and Ruhoff).—Froeschner 1968:249.
Gonycentrum afrum Drake and Ruhoff, 1961:126 [South Africa]; 1965a:31.
Sinalda angustata (Drake).—Froeschner, 1968:249.
Gonycentrum angustatum Drake, 1956:15 [Tanzania].—Drake and Ruhoff, 1965a:32.
Sinalda baltica (Drake) [fossil! new combination].
Phatnoma baltica Drake, 1950:153 [Baltic amber].—Drake and Ruhoff, 1965a:35.
Sinalda capensis Duarte-Rodrigues, 1988:494 [South Africa].
Sinalda cristata Duarte-Rodrigues, 1988:495 [South Africa].
Sinalda dilatata Duarte-Rodrigues, 1988:496 [South Africa].
Sinalda elegans Distant, 1904b:427 [South Africa].—Froeschner 1968:249.
Gonycentrum elegans.—Drake and Ruhoff, 1965a:33.
Sinalda haplotaxis Froeschner, 1968:249 [Transvaal].
Sinalda helichrysumae Duarte-Rodrigues, 1981b:206 [South Africa].
Sinalda nebulosa Distant, 1904b:428 [South Africa].—Froeschner, 1968:249.
Gonycentrum nebulosum.—Drake and Ruhoff, 1965a:33.
Sinalda reticulata Distant, 1904b:427 [South Africa].—Froeschner, 1968:249.
Gonycentrum reticulatum.—Drake and Ruhoff, 1965a:33.
Sinalda sinuaticollis (Linnavuori).—Duarte-Rodrigues, 1981:207.
Gonycentrum sinuaticolle Linnavuori, 1977:6 [Ethiopia].
Sinalda testacea (Distant).—Froeschner, 1968:249.
Phatnoma testacea Distant, 1902a:238 [South Africa].
Gonycentrum testaceum.—Drake and Ruhoff, 1965a:34.
Sinalda thomasi (Drake).—Froeschner, 1968:249.
Gonycentrum thomasi Drake, 1956:14 [Kenya].—Drake and Ruhoff, 1965a:34.

Genus *Taphnoma* Pericart

FIGURE 36

Taphnoma Pericart, 1991:42 [type species: *Taphnoma brunneicornis* Pericart, original designation].

DIAGNOSIS.—Among those genera of Phatnomatini with jugals, frontals, dorsomedial, and one on clypeus, but no evident occipitals, *Taphnoma* is recognized by the 1-carinate pronotal disc plus the free margin of the paranotum simple or forming a prominent angulation opposite humerus. Length 2.3–3.1 mm.

GEOGRAPHIC DISTRIBUTION.—Known only from southern China and the island of Borneo.

ETYMOLOGY (neuter).—This name is an anagram of the generic name *Phatnoma*.

COMMENT.—The present assignment of *Malala tuberculum* Jing to this genus resulted from personal examination of the holotype.

Lists of *Taphnoma* Species

- Taphnoma acutispinis* Pericart, 1991:44 [Sabah].
Taphnoma brunneicornis Pericart, 1991:43 [Sabah].

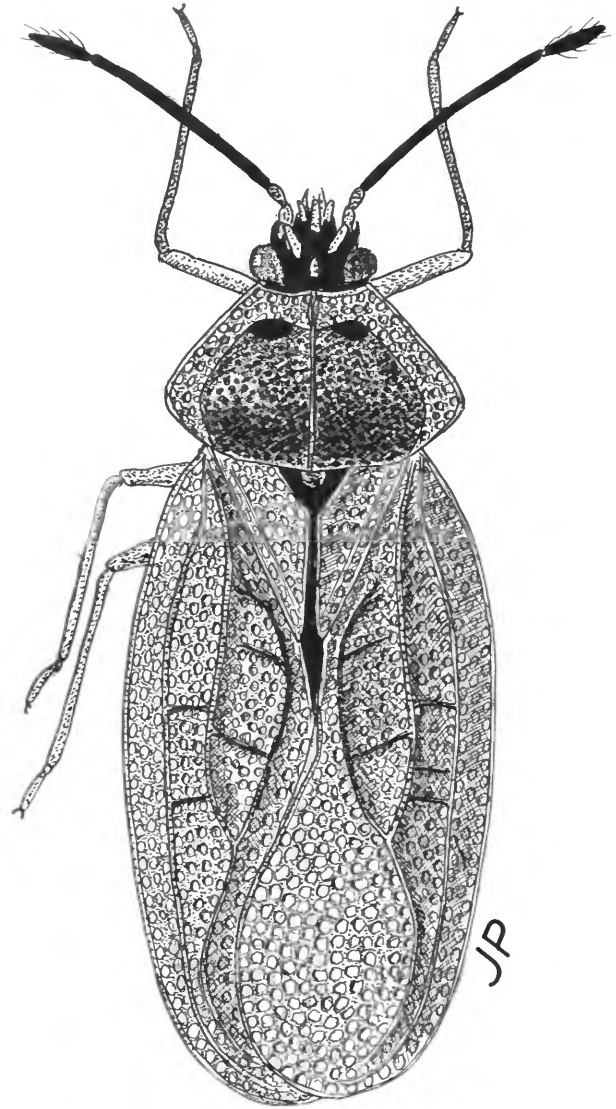


FIGURE 36.—*Taphnoma brunneicornis*, natural length 3.1 mm.

- Taphnoma elegans* Pericart, 1991:46 [Sabah].
Taphnoma tuberculum (Jing) [new combination].
Malala tuberculum Jing, 1980:400, 403 [China].

Key to *Taphnoma* Species

1. Costal area 3-seriate on basal two-thirds or more. Paranotal margin distinctly angled opposite humerus 2
- Costal area mostly 2-seriate, 3-seriate only in basal fifth. Pronotal margin broadly, convexly rounded opposite humerus 3

- 2. Head black, pronotum (except calli) yellow brown. Discoidal and subcostal areas with 2-3 darkened elevated cross veins *T. brunneicornis*
 Head and anterior thirds of pronotum and paranota pale; posterior lobe of pronotum and posterior two-thirds of paranotum black *T. acutispinis*
- 3. Paranotum narrower than an eye; its free margin virtually straight except for curving inward opposite humerus *T. tuberculum*
 Paranotum distinctly wider than an eye; its free margin broadly convex for full length *T. elegans*

Genus *Thaicader* Pericart

FIGURE 37

Thaicader Pericart, 1991:40 [type species: *Thaicader burckhardti* Pericart, monobasic].

DIAGNOSIS.—The presence of a single carina on the pronotal disc and a dorsomedial spine, coupled with the absence of jugals, combine to separate this genus from all other Phatnomatini genera except *Pseudacalypta* Pericart; the latter genus has a broadly triangular buccula (4-5 cells wide posteriorly, tapering to a single cell anteriorly) while in *Thaicader* the buccula is 2-seriate for nearly full length. Length 2.3-2.6 mm.

GEOGRAPHIC DISTRIBUTION.—This genus is known only from Thailand.

ETYMOLOGY (masculine).—*Thai-*, from Thailand, country of origin, plus *-cader*, nondescriptive, from genus *Cantacader* to indicate yet another genus in the taxon containing that genus.

List of *Thaicader* Species

Thaicader burckhardti Pericart, 1991:40 [Thailand].

Genus *Ulmus* Distant

FIGURE 38

Ulmus Distant, 1904b:426 [type species: *Ulmus testudineatus* Distant, monobasic].—Drake and Ruhoff, 1965a:41.

DIAGNOSIS.—Among the genera of the tribe Phatnomini, with 8-9 cephalic spines or tubercles (each occipital at least as long as an eye), *Ulmus* may be recognized by the presence of a spine on midline of head between the frontals (anterior to dorsomedial). Length 2.2-3.7 mm.

GEOGRAPHIC DISTRIBUTION.—This genus has been reported from Africa south of the Sahara Desert.

ETYMOLOGY (feminine).—*ulmus*, Latin (elm), of unknown significance as applied to these insects.

COMMENTS.—Redefinition of genera brought about several changes in the cataloged contents of this genus. Of the two species listed by Drake and Ruhoff (1965a:41) only the type species *testudineatus* Distant remains; Drake and Ruhoff's *U. engaeus* is herein removed to become the type species of the new genus *Exulmus*. In addition, two species, *Plesionoma eteosa* Drake and *P. drakei* Schouteden, are herein added by

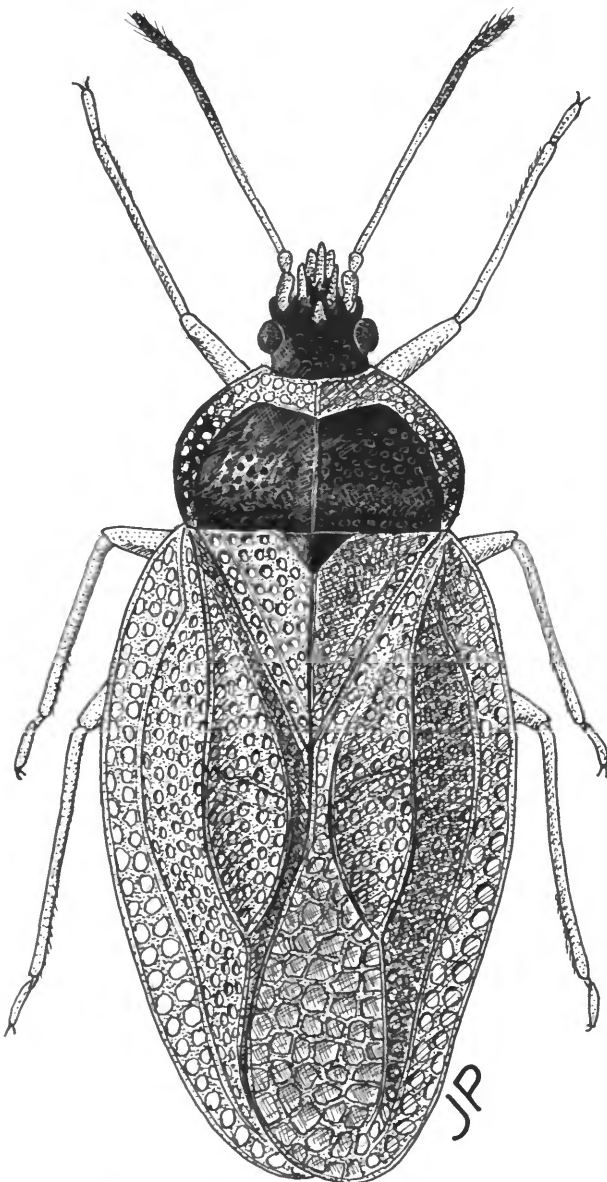


FIGURE 37.—*Thaicader burckhardti*, natural length 2.3 mm.

transfer from the genus *Plesionoma*.

List of *Ulmus* Species

Ulmus drakei (Schouteden) [new combination].
Plesionoma drakei Schouteden, 1965b:353 [Kenya].

Ulmus eteosa (Drake) [new combination].
Plesionoma eteosa Drake, 1954:2 [South Africa].—Drake and Ruhoff, 1965a:39.
Ulmus testudineatus Distant, 1904b:426 [Transvaal].—Drake and Ruhoff, 1965a:41.

Key to *Ulmus* Species

1. Margin of paranotum with an acute, spine-like projection anterolaterally 2
 Margin of paranotum obtusely angled (no prolonged spine) *U. testudineatus*
2. Clypeus with two long, erect spines (midlength and subapically). Costal area 4-seriate on basal third, 3-seriate beyond *U. eteosa*
 Clypeus with 1 erect spine (midlength). Costal area mostly 3-seriate, 2-seriate at midlength and apex *U. drakei*

Genus *Zetekella* Drake

FIGURE 39

Zetekella Drake, 1944:139, 142 [type species: *Zetekella zeteki* Drake, monobasic].—Drake and Ruhoff, 1965a:41.

DIAGNOSIS.—Among those genera of the tribe Phatnomatini lacking the dorsomedial spine or tubercle, *Zetekella* can be recognized by its ostiolar pore being so close to the hypocosta that its rim overlaps the ventral vein of the hypocosta (no extended peritreme present). Length 1.8–2.0 mm.

GEOGRAPHIC DISTRIBUTION.—The known species occur only in tropical America.

ETYMOLOGY (feminine).—A patronym for James Zetek, collector of the type material, plus *-ella*, Latin (diminutive).

COMMENTS.—The present treatment differs from the Drake and Ruhoff Catalog (1965a:41) by considering *Zetekella* and *Minitingis* as separate and valid genera, the latter being a West Indies genus, the former confined to continental tropical America. Additional discussion is presented under the treatment of *Minitingis*.

The present illustration of the type species was made from the sketch accompanying the original description of *Z. zeteki*; the holotype of that species was subsequently badly damaged (now lacks head and both paranota) by dermestids.

Dr. Karol Leno, São Paulo, Brazil, in a personal note, reported the observation that *Zetekella pulla* Drake and Hambleton is “very common in the nests of ants *Camponotus rufipes* and *Odontomachus affinis* as well as in the forest humus.”

List of Species of *Zetekella*

Zetekella pulla Drake and Plaumann, 1956:17 [Brazil].—Drake and Ruhoff, 1965a:41.
Zetekella zeteki Drake, 1944:140 [Panama].—Drake and Ruhoff, 1965a:41.

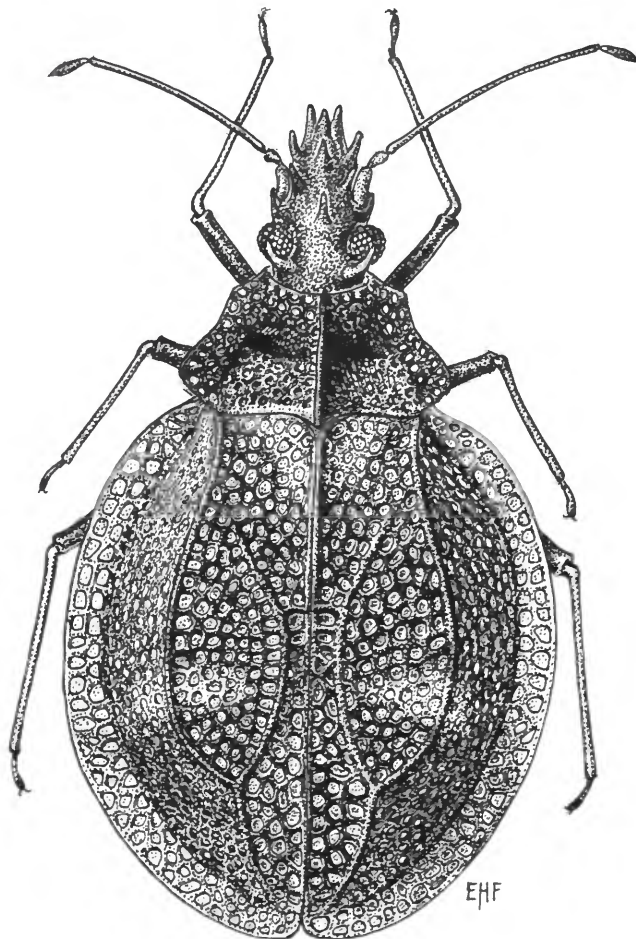


FIGURE 38.—*Ulmus testudineatus*, natural length 2.7 mm.

Key to *Zetekella* Species

- Paranota very wide, width subequal to width of head, with 4 to 5 rows of cells; costal area with 4 rows of cells for full length *Z. zeteki*
 Paranotum much narrower, about half as wide as head, with only 2 rows and a few intercalary cells; costal area with only 2 rows of cells *Z. pulla*

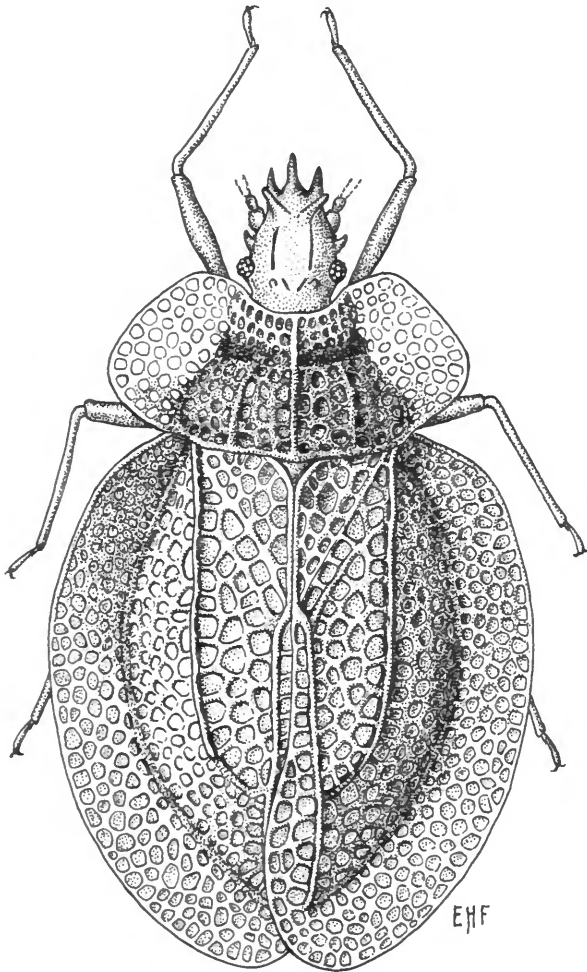


FIGURE 39.—*Zetekella zeteki*, natural length 2.0 mm.

Literature Cited

- Amyot, C.J.B., and J.G.A. Serville
1843. *Histoire naturelle des insectes: Hémiptères*. lxxvi + 675 + 8 pages, 12 plates. Paris: Fain et Thunot.
- Barber, H.G.
1954. A Report on the Hemiptera-Heteroptera from the Bimini Islands, Bahamas, British West Indies. *American Museum Novitates*, 1682:1-18.
- Bekker-Migdisova, E.E.
1962. [Order Heteroptera; True Bugs.] In B.B. Rohdendorf, editor, *Fundamentals of Paleontology*, 9:289-317. [In Russian; translated into English, 1991, edited by D.R. Davis. Translations Publishing Program, Smithsonian Institution Libraries, Natural History Building, Washington, D.C. 20560].
- Bergroth, E.
1894. Tingidae tres Madagascariensis. *Revue d'Entomologie*, 13:167-168.
1898. Eine neue Tingide. *Wiener Entomologische Zeitung*, 17:9.
1908. Neue Hemiptera aus Sud-Abyssinien. *Revue Russe d'Entomologie*, 1907:106-110.
1927 ("1926"). Hemiptera Heteroptera from New Zealand. *Transactions and Proceedings of the New Zealand Institute*, 57:671-684.
- Blöte, H.C.
1945. Catalogue of the Berytidae, Piesmidæ and Tingidae in the Rijksmuseum van Natuurlijke Historie. *Zoologische Mededeelingen*, 25:72-92.
- Bruner, S.C.
1940. A New Tingitid from Cuba (Hemiptera). *Memorias de la Sociedad Cuba de Historia Natural*, 14:245-247.
- Champion, G.C.
1897. Tingitidae. In Godman and Salvin, editors, *Biologia Centrali-Americana*, 2:1-48.
- Distant, W.L.
1902a. Rhynchotal Miscellanea. *Annals of the South African Museum*, 2:237-254, plate XV.
1902b. Rhynchotal Notes, XI11; Heteroptera: Families Tingitidae, Phymatidae, and Aradidae. *Annals and Magazine of Natural History*, series 7, 9(59):353-362.
1903-1904a. Rhynchota. In William T. Blanford, editor, *The Fauna of British India, Including Ceylon and Burma*. Volume 2: 1-242 (1903); 143-503 (1904). London: Taylor and Francis.
1904b. On the South African Tingitidae and Other Heteropterous Rhynchota. *Transactions of the South African Philosophical Society*, 14:425-436, 1 plate.
1909. New Oriental Tingitidae. *Annales de la Société Entomologique de Belgique*, 53:113-123.
1910. Rhynchota (Heteroptera: Appendix). In William T. Blanford, editor, *The Fauna of British India, Including Ceylon and Burma*. Volume 5: 100-126. London: Taylor and Francis.
- Drake, C.J.
1922. Neotropical Tingitidae with Descriptions of Three New Genera and Thirty-two New Species and Varieties (Hemiptera). *Memoirs of the Carnegie Museum*, 9:351-377, plate 39.
1923. Two New Species of Cantacaderia (Hemip. Tingitidae). *Bulletin of the Brooklyn Entomological Society*, 18:81-84.
1928. New and Little Known Neotropical Tingitidae. *Iowa State College Journal of Science*, 3:41-56.
1941. New American Tingitidae (Hemiptera). *Journal of the Washington Academy of Sciences*, 31:141-145.
1944. Concerning the American Cantacaderinids (Hemiptera: Tingidae). *Boletín de Entomología Venezolana*, 3:139-142.
1947. Tingidae (Hemiptera) from the Orient and South Pacific. *Musee Heude, Notes d'Entomologie Chinoise*, 11:225-231.
1948a. Five New American Tingidae (Hemiptera). *Boletín de Entomología Venezolana*, 7:15-19.
1948b. New American Tingidae (Hemiptera). *Boletín de Entomología Venezolana*, 7:20-25.
1950. Concerning the Cantacaderinae of the World (Hemiptera: Tingidae). *Arthropoda*, 1:153-166.
1951. New Genera and Species of Tingidae (Hemiptera) in the Hungarian National Museum. *Annales Historico-Naturales Musei Nationalis Hungarici*, 1:165-178.
1954. Tingidae: Descriptions and Synonymic Data (Hemiptera). *Great Basin Naturalist*, 14:1-10.
1956. Three New Species of Cantacaderinae from Africa (Hemiptera: Tingidae). *Revue de Zoologie et de Botanique Africaines*, 53:13-16.
1957. Quelques Tingidae de la Reunion (Hemiptera). *Memoirs de l'Institut Scientifique de Madagascar*, 8:399-405.
1960. Tingidae of New Guinea (Hemiptera). *Pacific Insects*, 2:339-380.
1961. A New Genus and Species of Cantacaderine Lace-bug from the Philippines (Hemiptera: Tingidae). *Fieldiana (Zoology)*, 42:115-118.
- Drake, C.J., and N.T. Davis
1960. The Morphology, Phylogeny, and Higher Classification of the Family Tingidae, Including the Description of a New Genus and Species of the Subfamily Vianaidinae (Hemiptera: Heteroptera). *Entomologica Americana*, 39:1-100.
- Drake, C.J., and R.C. Froeschner
1967. Lacebugs of the Galápagos Archipelago (Hemiptera: Tingidae). *Proceedings of the Entomological Society of Washington*, 69:82-93.
- Drake, C.J., and E.J. Hambleton
1934. Brazilian Tingitidae (Hemiptera), Part I. *Revista de Entomologia, Rio de Janeiro*, 4:435-451.
1938. Brazilian Tingitoidea (Hemiptera), Part IV. *Revista de Entomologia, Rio de Janeiro*, 5:51-57.
1944. Concerning Neotropical Tingitidae (Hemiptera). *Journal of the Washington Academy of Sciences*, 34:120-129.
- Drake, C.J., and T. Maa
1955. Chinese and Other Oriental Tingitoidea (Hemiptera), 111. *Quarterly Journal of the Taiwan Museum*, 8:1-11.
- Drake, C.J., and F. Plaumann
1956. A New Cantacaderid from Brazil (Hemiptera: Tingidae). *Bulletin of the Southern California Academy of Sciences*, 55:14-18.
- Drake, C.J., and M.E. Poor
1936. New Indian Tingitidae (Hemiptera). *Indian Forest Records*, 2:141-145.
- Drake, C.J., and F.A. Ruhoff
1961. New Genera and New Species of Lacebugs from the Eastern Hemisphere (Hemiptera: Tingidae). *Proceedings of the United States National Museum*, 113:125-183.
1962. Some Tingidae (Hemiptera) in the South Australian Museum. *Records of the South Australian Museum*, 14:249-252.

- 1965a. Lacebugs of the World, a Catalog (Hemiptera: Tingidae). *United States National Museum Bulletin*, 243:i-viii, 1-634, frontispiece, plates 1-56.
- 1965b. Lacebugs from New Guinea, Borneo, Solomons, and Other Islands of the South Pacific and Indian Oceans (Hemiptera: Tingidae). *Pacific Insects*, 7:243-290.
- Duarte-Rodrigues, P.
1978. African Tingidae, II: Descriptions of Three New Species (Heteroptera). *Boletim Sociedade Portuguesa de Ciencias Naturais*, 18:13-18.
1980. African Tingidae, XIII: A New Species of *Cantacader* Amyot and Serville from Malawi (Heteroptera). *Arnoldia Zimbabwe*, 80(40):1-3.
- 1981a. African Tingidae, XXI: Lacebugs in the British Museum (Natural History) (Heteroptera). *Arquivos do Museu Bocage*, series C, 1:133-200.
- 1981b. African Tingidae, XXII: Lacebugs in the Plant Protection Institute (Pretoria) (Heteroptera). *Arquivos do Museu Bocage*, series C, 1:201-256.
1982. African Tingidae, XXV: A New *Cantacader*, Three New *Agramma* and New Data (Heteroptera). *Arquivos do Museu Bocage*, series A, 1:325-334.
- 1987a. African Tingidae, XVIII: Three New Species and New Data from South and Southwest Africa (Heteroptera). *Arquivos do Museu Bocage*, series B, 2(21):175-185.
- 1987b. New Species and Records of Lacebugs (Heteroptera: Tingidae) from Southern Africa. *Annals of the Transvaal Museum*, 34:349-369.
1988. African Tingidae, XXVIII: New Species and New Data from South and South West Africa. *Boletim da Sociedade Portuguesa de Entomologia*, 67:493-515 (1984).
- Fieber, F.X.
1844. *Entomologische Monographien*. 138 pages, 10 plates. Leipzig: J.A. Barth.
- Froeschner, R.C.
1968. Notes on the Systematics and Morphology of the Lacebug Subfamily Cantacaderinae. *Proceedings of the Entomological Society of Washington*, 70:245-254.
1976. Galápagos Lace Bugs: Zoogeographic Notes and a New Species of *Phatnoma* (Hemiptera: Tingidae). *Proceedings of the Entomological Society of Washington*, 78:181-184.
1981. Heteroptera or True Bugs of Ecuador: A Partial Catalog. *Smithsonian Contributions to Zoology*, 322:1-147.
- Germar, E.F., and G.C. Berendt
1856. Die im Bernstein befindlichen Hemiptera und Orthopteren der Vorwelt. In G.C. Berendt, *Die im Bernstein befindlichen organischen Reste der Vorwelt*, 2:1-40, plates 1-4.
- Hacker, H.
1927. New Tingitoidea (Hemiptera) in the Queensland Museum. *Memoirs of the Queensland Museum*, 9:19-22, plates 6-10.
1928. New Species and Records of Australian Tingitoidea (Hemiptera). *Memoirs of the Queensland Museum*, 9:174-188, plates 20-23.
1929. New Species of Australian Tingitidae (Hemiptera). *Memoirs of the Queensland Museum*, 9:324-334, plates 32-35.
- Henning, W.
1966. *Phylogenetic Systematics*. ii + 263 pages. Urbana, Illinois: University of Illinois Press.
- Horváth, G.
1906. Synopsis Tingitidarum Regionis Palaearcticae. *Annales Musei Nationalis Hungarici*, 4:1-118.
- International Commission of Zoological Nomenclature
- 1943a. Opinion 143: On the Method of Forming the Family Name for *Tingis* Fabricius, 1803 (Insecta. Hemiptera). *Opinions and Declarations Rendered by the International Commission on Zoological Nomenclature*, 2:83-87.
- 1943b. Form of Family Name to be Formed from the Name *Tingis* Fabricius (Hemiptera). *Bulletin of Zoological Nomenclature*, 1:13.
- Jing, X.-L.
1980. [New Species of Chinese Tingidae (Hemiptera: Heteroptera).] *Acta Zootaxonomica Sinica*, 5:395-403. [In Chinese, with English summary on pages 402-403.]
- Kirkaldy, G.W.
1908. A Catalogue of the Hemiptera of Fiji. *Proceedings of the Linnean Society of New South Wales*, 33:345-391.
- Lepeletier, A.L.M., and J.G.A. Serville
- 1825-1828. [Articles on Hemiptera.] In G.A. Olivier, editor, *Encyclopédie Méthodique*, volume 10, 833 pages. Paris: Agasse. [Pages 1-344 published in 1825; 345-833 in 1828.]
- Linnavuori, R.
1977. Hemiptera of the Sudan, with Remarks on Some Species of the Adjacent Countries, 5: Tingidae, Piesmididae, Cydnidae, Thaumastelidae and Plataspididae. *Acta Zoologica Fennica*, 147:1-81.
- Montandon, A.L.
1892. Hémiptères-Hétéroptères nouveaux. *Revue d'Entomologie*, 11: 265-273.
- Monte, O.
1942. Crítica sobre alguns generos e espécies de Tingitideos. *Papéis Avulsos do Departamento de Zoologia, São Paulo*, 2:103-115.
1946. Sobre o genero *Phatnoma* com a descrição de uma nova espécie e a lista da suas espécies (Hem. Tingidae). *Revista Brasileira de Biologia*, 6:247-254.
1947. Gêneros e génotipos dos Tingitideos do mundo. *Papéis Avulsos do Departamento de Zoologia, São Paulo*, 8:1-22.
- Myers, J.G.
1922. The Order Hemiptera in New Zealand, with Special Reference to Its Biological and Economic Aspects. *The New Zealand Journal of Science and Technology*, 5:1-12.
1926. Biological Notes on New Zealand Heteroptera. *Transactions of the New Zealand Institute*, 56:449-511.
- Myers, J.G., and W.E. China
1928. A List of New Zealand Heteroptera with Description of a Remarkable Green Aradid Representing a New Genus. *Annals and Magazine of Natural History*, series 10, 1:377-394.
- Pericart, J.
1981. Quatre espèces nouvelles de Cantacaderinae du Nord de l'Inde, représentant trois genres nouveaux (Hemiptera: Tingidae). *Revue Suisse de Zoologie*, 88:595-605.
1983. Deux Cantacaderinae nouveaux du Népal de la tribu des Phatnomini (Hemiptera: Tingidae). *Revue Suisse de Zoologie*, 90:593-597.
1986. *Froeschnerocader denticollis* (Heteroptera: Tingidae): A New Genus and Species of Cantacaderinae from Borno. *Journal of the New York Entomological Society*, 94:245-248.
1991. Cantacaderinae de Thaïlande, Borneo et Palawan: Genres nouveaux, espèces nouvelles ou intéressantes ainsi qu'une nouvelle synonymie (Hemiptera, Tingidae). *Revue Suisse de Zoologie*, 98:33-50.
- Schouteden, H.
1916. Tingides du Congo Belge. *Revue de Zoologie Africaine*, 4:288-297.
1923. Nouvelles notes sur les Tingidae du Congo Belge. *Revue de Zoologie Africaine*, 11:82-110.
- 1955a. Tingides nouveaux du Congo Belge. *Revue de Zoologie et de Botanique Africaines*, 52:25-32.
- 1955b. Tingides nouveau des collections du Musee Royal du Congo Belge. *Revue de Zoologie et de Botanique Africaines*, 52:162-168.
1957. Tingides de Madagascar. *Revue de Zoologie et de Botanique Africaines*, 55:82-89.
- 1965a. Tingides Africaines nouveaux de genre *Cantacader* Amyot et Serville. *Revue de Zoologie et de Botanique Africaines*, 72:168-172.
- 1956b. *Plesionoma Drakei* nov. spec. Tingide nouveau d'Afrique orientale (Hem.). *Revue de Zoologie et de Botanique Africaines*, 72:353-354.

- Scott, J.
1874. On a Collection of Hemiptera Heteroptera from Japan; Descriptions of Various New Genera and Species. *Annals and Magazine of Natural History*, series 4, 14:289-304, 360-365, 426-452.
- Scudder, G.G.E.
1959. The Female Genitalia of the Heteroptera: Morphology and Bearing on Classification. *Proceedings of the Royal Entomological Society of London*, 111:405-467.
- Scudder, S.H.
1890. The Tertiary Insects of North America. *United States Geological Survey Bulletin*, 71:1-663.
- Spinola, M.
1852. Hemipteros. In C. Gay, editor, *Historia fisica y politica de Chile. Zoologia*, 7:113-320.
- Stål, C.
1865-1866. *Hemiptera Africana*. Volumes 1-4. Holmie: Officina Norstedtiana [1865, i:iv + 256; 1866, 2:1-181; 3:1-200; 4:i + 275 + 1].
1870-1876. *Enumeratio Hemipterorum: Bidrag till en Foreteckning ofver alla hittills kända Hemiptera, jemte systematiska meddelanden*, Parts 1-5. *Kongliga Svenska Vetenskaps-Akademiens Handlingar*, part 1 (1871), 9(1):1-232; part 2 (1872), 10(4):1-159; part 3 (1873), 11(2):1-163; part 4 (1874), 12(1):1-186; part 5 (1876), 14(4):1-162.
- Stusak, J.M.
1976. A New Genus and Species of Cantacaderinae from Java (Heteroptera, Tingidae). *Acta Entomologica Bohemoslovaca*, 73:13-16, plate 1.
1979. Cantacaderinae Collected by the Hungarian Expedition to West Afrika with Some Notes on Cantacaderinae (Heteroptera, Tingidae). *Opuscula Zoologica Budapest*, 16:141-149.
1984. Two New Species of Afrotropical Tingidae (Heteroptera). *Acta Faunistica Entomologica Musei Nationalis, Prage*, 17:237-243.
- Stys, P., and I.M. Kerzhner
1975. The Rank and Nomenclature of Higher Taxa in Recent Heteroptera. *Acta Entomologica Bohemoslovaca*, 72(2):65-79.
- Takeya, C.
1933. New or Little-known Lace Bugs from Japan, Korea and Formosa (Hemiptera: Tingiidae). *Mushi*, 6:32-39.
- Woodward, T.
1961. The Heteroptera of New Zealand, Part III: Coreidae, Berytidae, Tingidae, Cimicidae. *Transactions of the Royal Entomological Society of New Zealand*, 1:145-158.

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