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## THE *ADELOPSIS* OF COSTA RICA AND PANAMA (COLEOPTERA, LEIODIDAE, CHOLEVINAE, PTOMAPHAGINI)

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### ABSTRACT

*No species of Adelopsis were previously reported from Costa Rica or Panama. We here describe 17 new species in Adelopsis and related Paulipalpina n.gen. (type species: Adelopsis claudicans Szymczakowski, 1980, from Brazil; the genus is easily distinguished from other Ptomaphagini by having the last segment of the maxillary palp much smaller than the penultimate). The following new species are described: A. albipinna, A. confluens, A. elephas, A. pileata, A. stella, from Costa Rica; A. dybasi, A. galea, A. sinuosa, A. vallicola, from Panama; and A. coronaria, A. gilli, A. howdenorum, A. perimeces, A. rostrata, P. clavigera, P. devexa, P. parvicuspis, from Costa Rica and Panama.*

**Keywords:** Coleoptera, Cholevinae, Costa Rica, Panama, *Adelopsis*, *Paulipalpina*, gen. n.

### INTRODUCTION

As presently understood, the tribe Ptomaphagini contains 7 described genera: *Ptomaphaginus* and *Pandania* (Oriental), *Proptomaphaginus* (Neotropical - West Indies and Mexico), *Ptomaphagus* (with four subgenera - *Ptomaphagus*, Palearctic; *Merodiscus*, Palearctic; *Adelops*, Nearctic and

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Mexico; and *Tupania*, Neotropical), two myrmecophilous genera *Echinocoleus* (Nearctic) and *Synaulus* (Palearctic), and *Adelopsis* (Neotropical and Appalachians of USA).

*Adelopsis* was defined by Jeannel (1936) to contain species of Neotropical Ptomaphagini which are characterized by the tip of the aedeagus being highly variable and different from the almost constant aedeagus of *Ptomaphagus*. Another characteristic cited by Jeannel (1936) was the tendency towards a globose aedeagus, different from the elongated aedeagus of the other genera of the tribe. This definition has been followed by subsequent authors. Peck (1973, 1978) enlarged the geographic distribution of the genus by describing several new species from the Southeastern United States. He also somewhat changed the definition of the genus, because the U.S. species have a somewhat more elongate aedeagus.

Because of the generic characterization, which is based on a lack of apomorphies and on geographic distribution, it was suggested (Gnaspini, 1993) that *Adelopsis* might be a paraphyletic genus. Hence, a revision of the genus was needed to solve the question. This paper is the first in a proposed series dealing with a revision of "*Adelopsis*" and is based mainly on the very large Neotropical collections of one of us (SBP), which includes more than 100 new species.

As presently understood in the literature, the genus *Adelopsis* contains 25 described Neotropical species (one of them with 6 subspecies) (Blas, 1980; Jeannel, 1936, 1964; Gnaspini, 1993; Szymczakowski, 1961, 1963, 1968, 1969, 1970, 1975, 1980; Zoia, 1992), and 16 Appalachian species (Peck, 1973, 1978). No species have previously been recorded for Costa Rica or Panama. We start this study of *Adelopsis* with Costa Rica and Panama because of the amount of material available, because these two countries form a natural biogeographic unit of an upland of mountains surrounded by lowlands, and because of their intermediate location for past faunal connections between North and South America. Herein we describe 17 new species from these two countries and a new genus (based both on previously described and new species).

#### METHODS AND MATERIALS

The specimens used in this study were either maintained in 70% alcohol or dried specimens mounted on cards fixed on entomological pins. To dissect the genitalia, the specimens were relaxed by being boiled in water. Some structures with much adhered tissue were cleaned for a few minutes in hot 10% KOH. The dissected genitalia were mounted in PVA on a microslide,

which was attached to the same pin. Drawings were made with a camera lucida microscope and measurements were taken from these drawings. Proportions of antennomeres were taken based on the length of the 9th segment, both because proportions of club segments are somewhat conservative, and because measurements of the 1st segment are sometimes imprecise due to breakage when detaching it from the head.

The holotypes or representatives of the species studied herein are deposited in the following collections: S. B. Peck collection (SBP), Field Museum of Natural History, Chicago (FMNH), Museu de Zoologia da Universidade de São Paulo, São Paulo (MZSP), United States Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM), and Muséum National d'Histoire Naturelle, Paris (MNHN).

In the list of material for each species, when not otherwise noted, data such as locality, altitude and collector are the same as the previously cited data. When not noted, the specimens are deposited in the SBP collection.

#### SYSTEMATICS

We follow the suprageneric classification proposed by Newton & Thayer (1992).

Family Leiodidae Fleming, 1821  
Subfamily Cholevinae Kirby, 1837  
Tribe Ptomaphagini Jeannel, 1911

#### **Adelopsis** Portevin 1907

The following species are characterized, except when noted, by the following typical characters of the tribe: Shape oblong. Pubescence golden, with many short recumbent setae, setalsockets forming strigae on the head, pronotum and elytra. Antenna 11-segmented, segment 8 smaller than 7 and 9. Pronotum transverse with transverse strigae. Sutural striae entire. Mesosternum with longitudinal carina. Apex of tibia armed with a comb of many short and equal fixed spines. Anterior tarsi laterally expanded in males. Except when noted, the species treated here also have the following characters: Eye large. Antenna normal, reaching base of elytra when laid back. Pronotum transverse, widest at base, with closely distributed transverse strigae; posterior angles acute. Elytron regularly rounded, with transverse strigae, as dense as that of the

pronotum. Metathoracic wing fully developed. Protibia apex about three times as wide as base. Mesotibia curved inwards in both sexes. Male ventrites normal. Aedeagus broad; base curved downwards, with the orifice somewhat facing ventrally, at an angle of  $45^\circ$  from the horizontal axis; apical orifice dorsally subterminal and cutting the left side of aedeagus; ventral blade of tegmen trapezoidal; flagellum elongate, strong. Paramere flat, curved, shorter than aedeagus, bearing 3 small terminal setae, inserted close to each other. Genital segment globular, slightly longer than broad; lateral lobes bearing several long and short setae. Spermatheca varies among species; it may be simple or coiled, but always ends with a distinct bulb.

In the following descriptions, only the specific characters will be listed.

The first four species are not placed in a species group at this time because they are so distinctive that creating a group for them (together or separately) would be premature. In turn, the species that follow these four have particular features of the tip of the aedeagus which suggest the recognition of species groups.

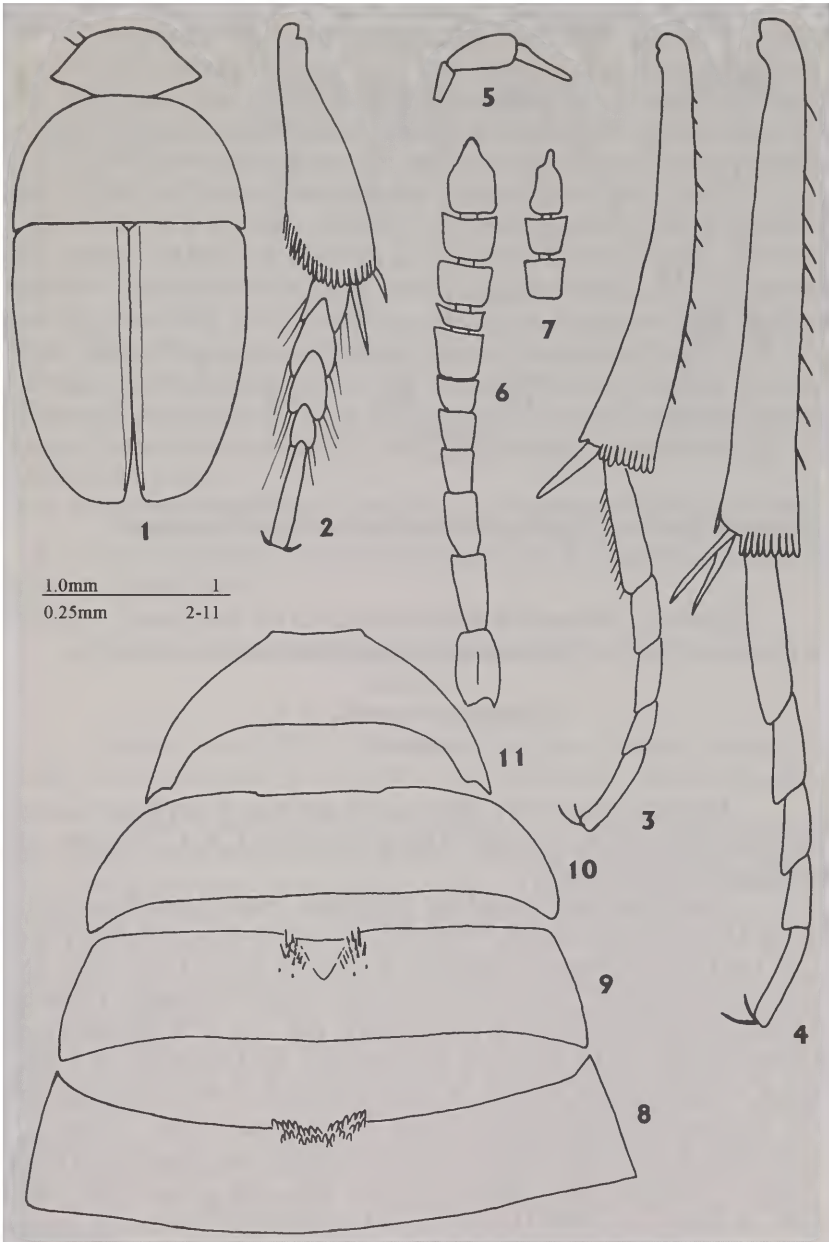
### ***Adelopsis confluens*, sp. n.**

(figs. 1-17)

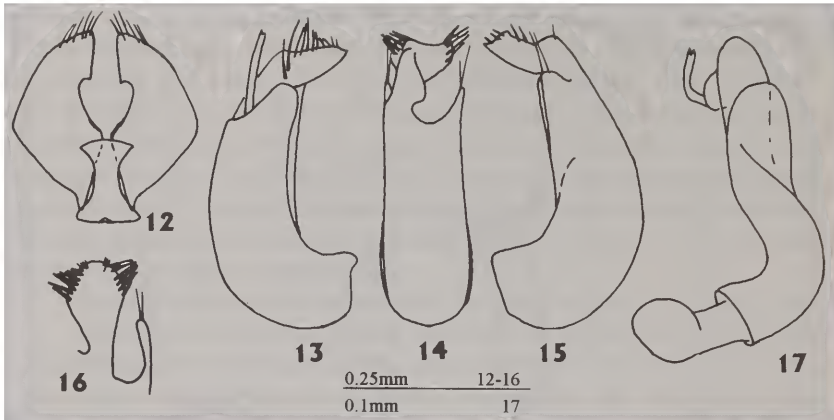
Holotype, male (SBP). Type locality and data: Costa Rica: Puntarenas: San Vito de C.B., Las Cruces, 1200m, vii.1982, B. Gill.

Paratypes (SBP, FMNH, MZSP): Costa Rica: Puntarenas: San Vito de C.B., Las Cruces, 1200m, 09.vii-07.viii.1982, malaise trap, 1M; 07-14.viii.1982, 3M 3F; 22.ii-03.iii.1983, 7M 2F.

*Diagnosis and Description.* Length: 2.05-2.85 mm; width: 1.05-1.35 mm. General characteristics as listed above, differing in the following characters: Color dark brown; last three antenna segments pale; first two segments slightly pale. Antenna (figs. 6-7) 1.15 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 1.75, 1.55, 1.4, 0.9, 0.9, 0.75, 1.0, 0.45, 1.0, 0.95, 1.6; proportions of length and width of each segment of the club, from 7th to 11th: 0.95, 0.4, 0.8, 0.7, 1.25. Elytra together 1.25 times as long as wide; with dense oblique strigae. Male protarsi (fig. 2) somewhat slender but armed with very long setae; first segment of male protarsus 0.55 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.3, 1.55, 1.8, 1.65, 6.25. Posterior margins of male ventrites (figs. 8-11): 3rd bearing rows of tubercles, 4th bearing v-shaped row of thick setae. Aedeagus (figs. 13-16) with basal orifice almost ventral, apex with two rows of five thick setae which meet at their tip. Spiculum gastrale (fig. 12) flattened, widening towards base. Spermatheca (fig. 17) J-shaped.



Figures 1-11. *Adelopsis confluens*, sp. n., male. 1, habitus, dorsal view; 2, protarsus and protibia, dorsal view; 3, mesotarsus and mesotibia; 4, metatarsus and metatibia; 5, maxillary palp; 6-7, antenna, dorsal and apical lateral views; 8-11, 3rd to 6th ventrites, ventral view.



Figures 12-17. *Adelopsis confluens*, sp. n., 12-16, male. 12, genital segment, ventral view; 13-16, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 17, female spermatheca.

*Etymology.* The name is derived from Latin for “confluence”, referring to the setae at the tip of the aedeagus, which come together at their tips.

***Adelopsis coronaria*, sp. n.**

(figs. 18-27)

Holotype, male (SBP). Type locality and data: Costa Rica: Cartago: Turrialba, Catie, 600m, 19.v.1979, 8 dung cuptraps, H.F. & A.T. Howden. 1M paratype with the same data.

Other paratypes: Costa Rica: Puntarenas: Monte Verde Reserve, 18-20.viii.1987, FIT, 1M; 1400m, 04.vi.1979, 5 dung cuptraps, 1M; San Vito de C.B., Las Cruces, 1200m, vii.1982, FIT, B. Gill, 4M 2F; 07-14.viii.1982, 1M; 13.viii-12.ix.1982, FIT, 1M; 22.ii-03.iii.1983, 1M 4F; Cartago: Turrialba, CATIE, 600m, undated, H.F. & A.T. Howden, 1M; 19.v.1979, florencía area, 8 dung cuptraps, 1M 1F; 20.v.1979, cup dung traps, 4M 4F (MZSP); 28.ii.1980, ravine, 2 days cuptraps, 4M 3F; 28.ii.1980, florencía forest, 2 days cuptraps, 4M. Panama: Chiriquí: Cerro Pelota, 4kmN Santa Clara, 1500m, 01-14.vii.1982, B. Gill, 2M; viii.1982, 1M; 4kmN Santa Clara, Hartmann’s Finca, 1500m, 27.vi-03.vii.1981, 1M 1F; Cocle: El Valle, trail to Las Minas, 2400-2600', in dung, 20.ii.1959, H.S. Dybas, 2M 2F (FMNH); Panama: El Llano - Carti Road, 400m, vi.1982, FIT, B. Gill, 1F; Madden Forest, 23.vii.1966, S.B. Peck, 1M 1F.

*Diagnosis and Description.* Length: 1.85-2.25 mm; width: 0.9-1.1 mm. General characteristics as listed above, differing in the following characters: Color dark brown, antenna color lightening from 9th segment onward, with last two segments pale, and first segment slightly pale. Antenna (figs. 21-22) 1.15 times as long as pronotum; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 1.75, 1.7, 1.0, 0.7, 0.75, 0.5, 0.9, 0.4, 1.0, 0.85, 1.5; proportions of length and width of each segment of the club, from 7th to 11th: 0.85, 0.35, 0.7, 0.55, 1.0. Elytra together 1.2 times as long as wide; with dense oblique strigae. First segment of male protarsus (fig. 19) 0.8 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.4, 1.4, 1.2, 1.25, 4.0. Aedeagus (figs. 24-26) with apex transversally produced, bearing two medial emarginations, which gives a shape of a crown; flagellum slightly sinuate. Spiculum gastrale (fig. 23) short and straight. Spermatheca (fig. 27) coiled with 2-turns.

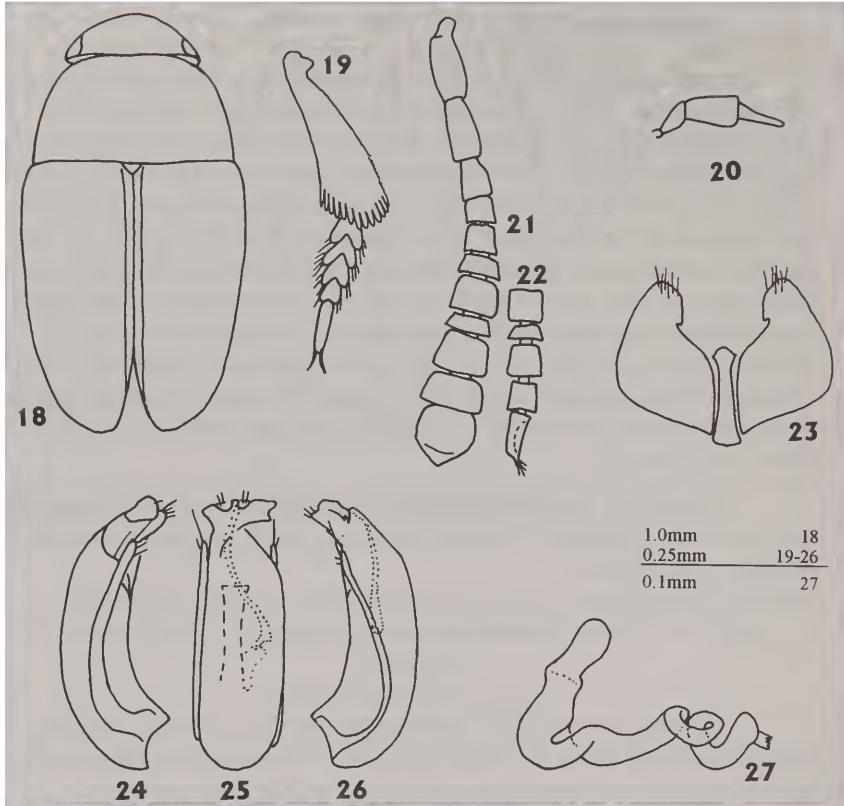
*Etymology.* The name is derived from Latin for "crown" ("coronaria" = of a crown), referring to the tip of aedeagus, which resembles a crown, in posterior (frontal) view.

**Adelopsis galea, sp. n.**

(figs. 28-38)

Holotype, male (SBP). Type locality and data: Panama: Panama: El Llano - Carti Road, 400m, vi.1982, FIT, B. Gill. 1F paratype with the same data.

*Diagnosis and Description.* Length: 1.75-1.85 mm; width: 0.85-0.9 mm. General characteristics as listed above, differing in the following characters: Color light brown. Antenna (figs. 31-32) 1.1 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 2.05, 1.9, 0.95, 0.65, 0.7, 0.6, 0.9, 0.45, 1.0, 1.05, 1.85; proportions of length and width of each segment of the club, from 7th to 11th: 0.8, 0.35, 0.7, 0.65, 1.0. Elytra together 1.2 times as long as wide; with dense oblique strigae. First segment of male protarsus (fig. 28) 0.8 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 0.75, 0.9, 0.9, 0.85, 3.75. Metafemur (fig. 29) slightly emarginate at middle. Aedeagus (figs. 34-37) with apex elongate, bearing an apical medial emargination; flagellum short and strong. Spiculum gastrale (fig. 33) somewhat widened at base. Spermatheca (fig. 38) coiled with 3-turns, with short globose apical bulb.



Figures 18-27. *Adelopsis coronaria*, sp. n., 18-26, male. 18, habitus; 19, protarsus and protibia; 20, maxillary palp; 21-22, antenna, dorsal and apical lateral views; 23, genital segment; 24-26, aedeagus, left lateral, dorsal, and right lateral views; 27, female spermatheca.

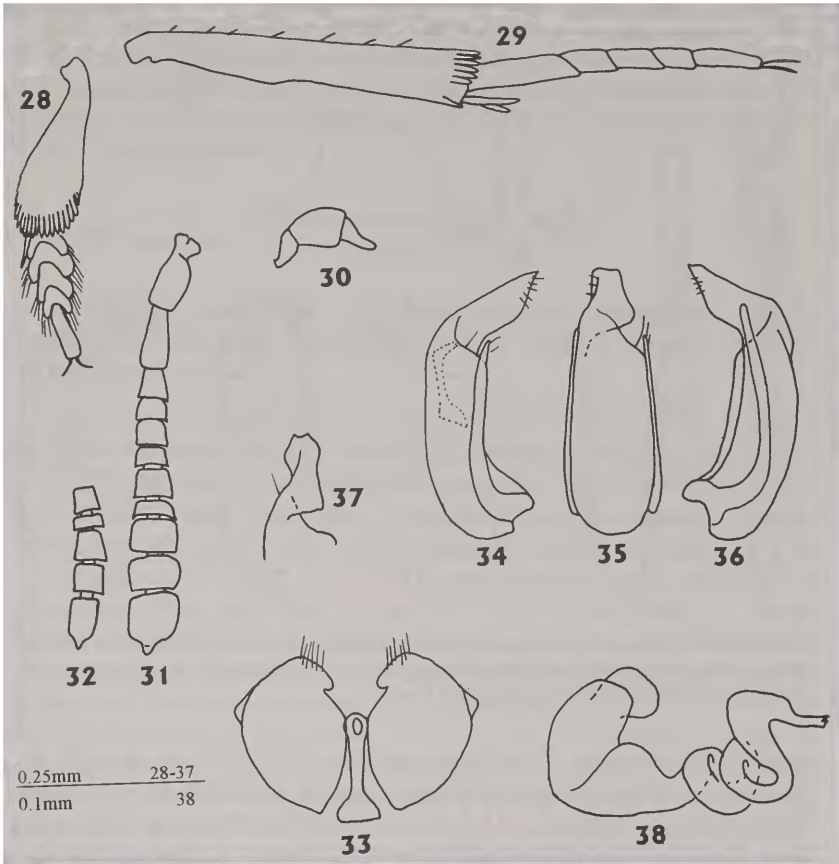
*Etymology.* The name is derived from Latin for "helmet", referring to the tip of aedeagus, which resembles a hood, in posterior (frontal) view.

***Adelopsis sinuosa*, sp. n.**

(figs. 39-48)

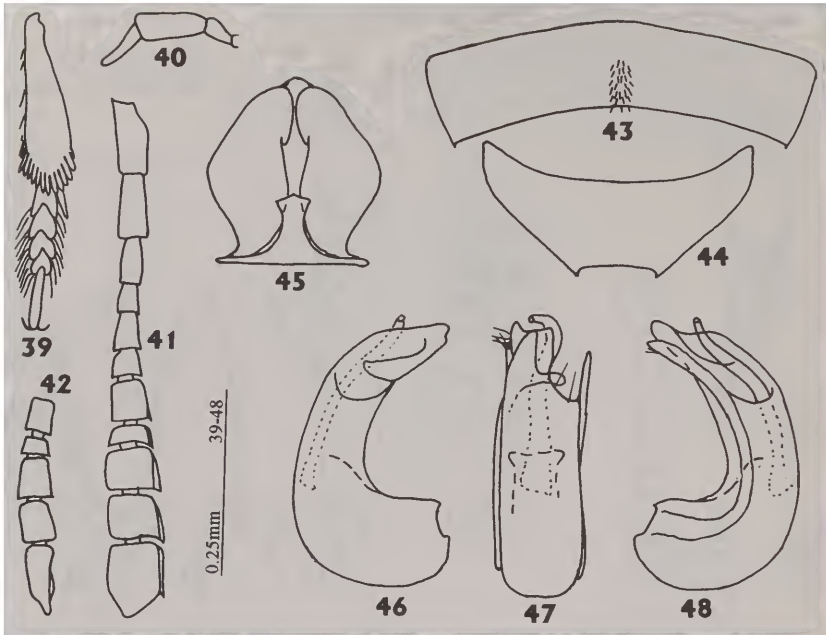
Holotype, male (FMNH). Type locality and data: Panama: Cocle: El Valle, trail to Las Minas, 2400-2600', 23.ii.1959, berlese #B-348, ground debris, H.S. Dybas, FM(HD) #59-220.





Figures 28-38. *Adelopsis galea*, sp. n., 28-37, male. 28, protarsus and protibia; 29, metatarsus and metatibia; 30, maxillary palp; 31-32, antenna, dorsal and apical lateral views; 33, genital segment; 34-37, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 38, female spermatheca.

*Diagnosis and Description.* Length: 1.7 mm; width: 0.95 mm. General characteristics as listed above, differing in the following characters: Color light brown. Antenna (figs. 41-42) 1.25 times as long as pronotum and bearing external keel from segments 7th to 11th; last segment concave ventrally; proportions of length of each segment and that of the 9th respectively from 1st to 11th: 1.85, 1.65, 1.2, 0.7, 0.85, 0.7, 0.95, 0.5, 1.0, 1.1, 1.8; proportions of length and width of each segment of the club, from 7th to 11th: 1.05, 0.5, 0.85, 0.9, 1.4. Elytra together 1.25 times as long as wide; with dense oblique



Figures 39-48. *Adelopsis sinuosa*, sp. n., male. 39, protarsus and protibia; 40, maxillary palp; 41-42, antenna, dorsal and apical lateral views; 43-44, 4th and 6th ventrites; 45, genital segment; 46-48, aedeagus, left lateral, dorsal, and right lateral views.

strigae. First segment of male protarsus (fig. 39) 0.55 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.25, 1.2, 1.15, 1.35, 4.0. Posterior margins of male ventrites (figs. 43-44): 4th bearing a middle row of thick setae. Aedeagus (figs. 46-48) C-shaped with basal orifice ventral and apex sinuate. Spiculum gastrale (fig. 45) divided at apex, typical of the subgenus *Iutururuca* (Gnaspini, 1993). Female unknown.

*Etymology.* The name is derived from Latin for “winding”, referring to the sinuate margin of the tip of the aedeagus.

#### group *elephas* nov.

The species of this group are characterized by the pointed tip of the aedeagus bent ventrally, giving a beaked impression in lateral view; 1-2 lateral setae at the right side of the tip, and 2-3 at the left side, facing posteriorly; the spiculum gastrale divided at the apex as in the other species of the subgenus

*Iutururuca* (see Gnaspini, 1993). Most of them have the last antenna segment concave ventrally; projections on male ventrite III and an emargination on the last three ventrites; and female spermatheca with a globose bulb before the coil (which is generally narrowly coiled) in addition to the typical apical bulb. The following species belong to this group, and will be described by giving only the specific characters.

***Adelopsis albipinna*, sp. n.**

(figs. 49-62)

Holotype, male (SBP). Type locality and data: Costa Rica: Alajuela: Penas Blancas River Valley, 500-1000m, 05.iv-06.v.1985, B. Lyon. 2F paratypes with the same data.

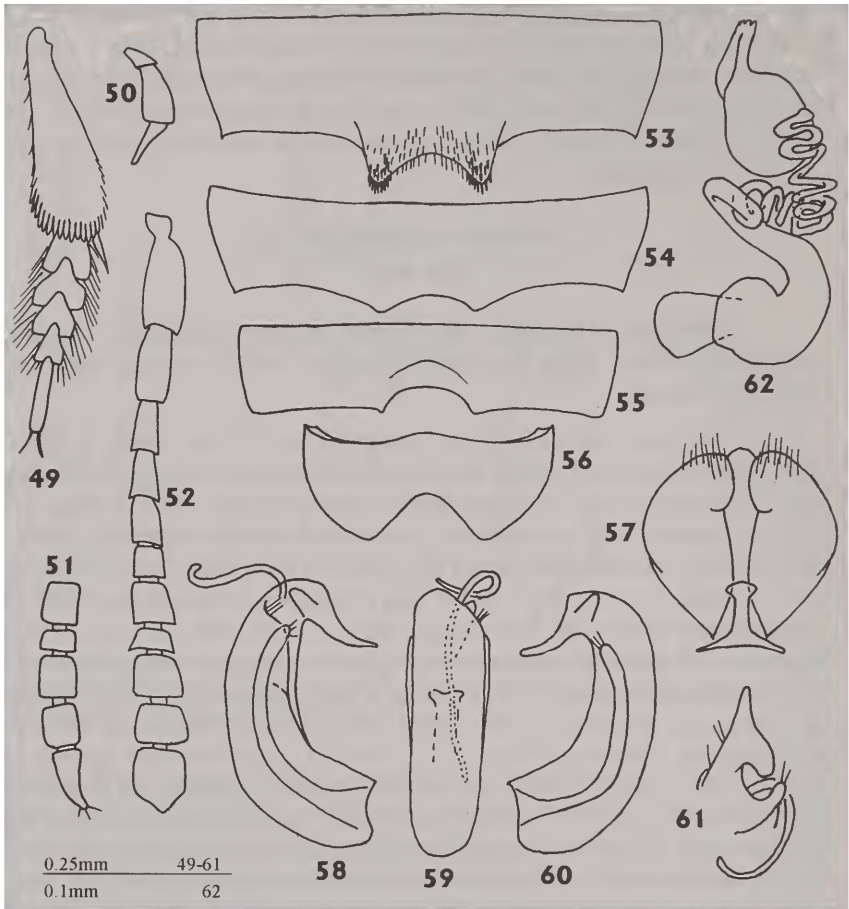
*Diagnosis and Description.* Length: 2.0-2.35 mm; width: 1.15-1.2 mm. General characteristics as listed above, differing in the following characters: Color light brown; last three antenna segments pale. Antenna (figs. 51-52) 1.4 times as long as pronotum; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 2.05, 1.55, 1.15, 1.1, 1.0, 0.8, 1.0, 0.5, 1.0, 1.0, 1.5; proportions of length and width of each segment of the club, from 7th to 11th: 1.1, 0.55, 0.85, 0.85, 1.2. Elytra together 1.35 times as long as wide; with dense strigae, oblique from one fourth the length onwards. First segment of male protarsus (fig. 49) 0.9 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.0, 1.05, 1.05, 1.2, 4.8. Posterior margins of male ventrites (figs. 53-56): 3rd to 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination, 4th and 5th bearing rows of large setae following emargination. Aedeagus (figs. 58-61) with basal orifice almost ventral; flagellum long, ending with a one-turn coil, outside the aedeagus. Spermatheca (fig. 62) finely coiled with 10-turns, preceded by a globose bulb.

*Etymology.* The name is derived from Latin for "white feather" ("albus" = white, "pinna" = feather), referring to the type locality ("Penas Blancas" = white feathers, from Spanish).

***Adelopsis dybasi*, sp. n.**

(figs. 63-74)

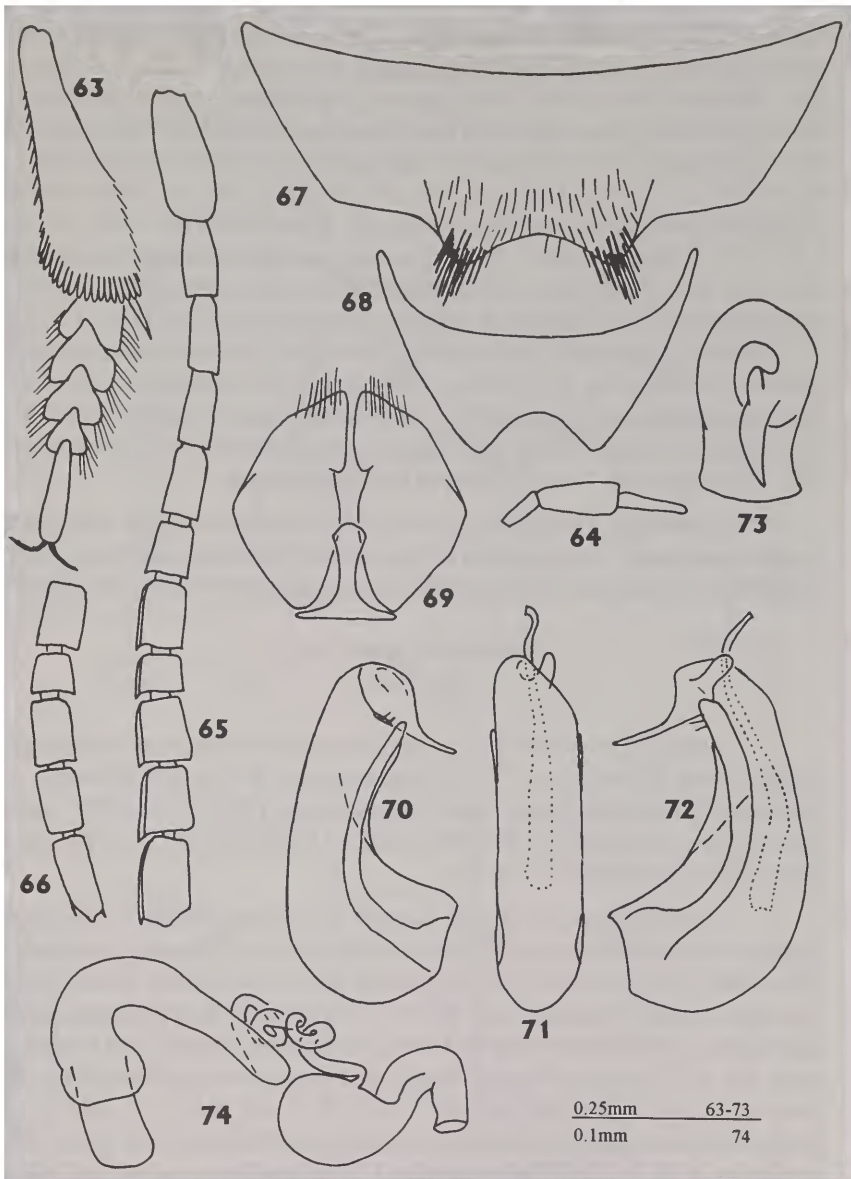
Holotype, male (FMNH). Type locality and data: Panama: Chiriquí: Finca Lerida, near Boquete, 6900', 17.iii.1959, debris in damp ravine, H.S. Dybas. 1M 1F paratypes with the same data.



Figures 49-62. *Adelopsis albipinna*, sp. n., 49-61, male. 49, protarsus and protibia; 50, maxillary palp; 51-52, antenna, dorsal and apical lateral views; 53-56, 3rd to 6th ventrites; 57, genital segment; 58-61, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 62, female spermatheca.

**Other paratypes:** Panama: Chiriquí: Cerro Punta (on trail to Boquete), 7000', 07.iii.1959, berlese B-425, floor debris on steep wooded slope, 1F (FMNH); Finca Lerida, near Boquete, 7750', 19.iii.1959, forest litter under palms, 3M 7F (FMNH, SBP, MZSP); Finca Palo Santo, W of Nueva California, 4900', 06.iii.1959, ravine floor litter, 1M 1F (FMNH); 09.iii.1959, Berlese B-433, floor litter in damp ravine, FM(HD) #59-239, 2M 2F.

*Diagnosis and Description.* Length: 2.0-2.9 mm; width: 0.95-1.1 mm.



Figures 63-74. *Adelopsis dybasi*, sp. n., 63-73, male. 63, protarsus and protibia; 64, maxillary palp; 65-66, antenna, dorsal and apical lateral views; 67-68, 3rd and 6th ventrites; 69, genital segment; 70-73, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 74, female spermatheca.

General characteristics as listed above, differing in the following characters: Eyes somewhat reduced. Color light brown, last segment of antenna slightly pale. Antenna (figs. 65-66) twice as long as pronotum; somewhat elongate, passing pronotum base when laid back; bearing external keel from segments 6th to 11th; proportions of length of each segment and that of the 9th from 1st to 11th: 1.9, 1.25, 1.1, 1.1, 1.15, 0.8, 1.0, 0.65, 1.0, 1.0, 1.4; proportions of length and width of each segment of the club, from 7th to 11th: 1.45, 1.0, 1.3, 1.25, 1.95. Elytra together 1.35 times as long as wide. First segment of male protarsus (fig. 63) 0.9 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 0.85, 1.05, 1.1, 1.3, 4.3. Posterior margins of male ventrites (figs. 67-68): 3rd to 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination; 6th bearing a pair of perforate plates at base. Aedeagus (figs. 70-73) with basal orifice almost ventral. Spermatheca (fig. 74) coiled with 4-turns, preceded by a globose bulb.

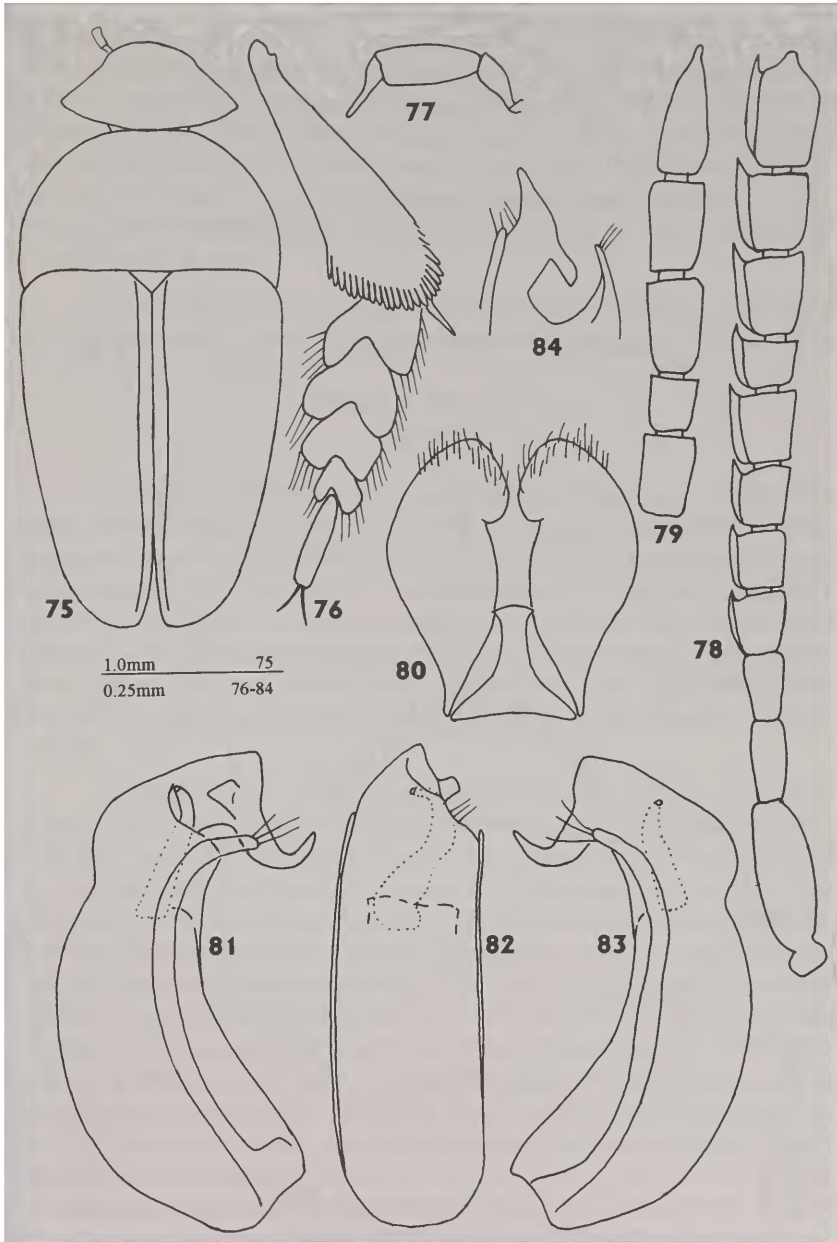
*Etymology.* The species is named for the late Henry Dybas, collector of the type specimens, in recognition of his extensive field work and large collections from Panama, and for his professional encouragement to one of us (SBP).

### **Adelopsis elephas, sp. n.**

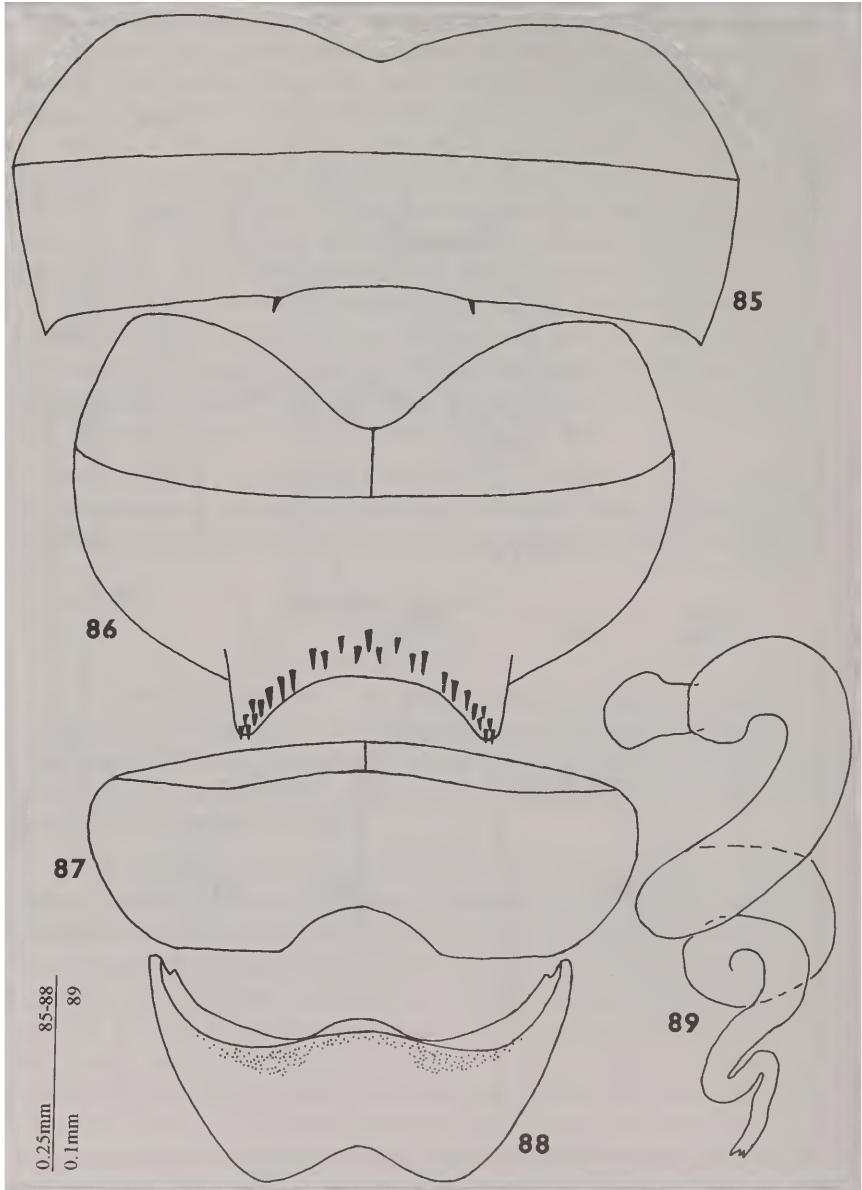
(figs. 75-89)

Holotype, male (SBP). Type locality and data: Costa Rica: Puntarenas: Monte Verde, 1500m, 01.vi.1979, 1 megadungtrap, H.F. & A.T. Howden. Paratypes: Costa Rica: Puntarenas: Monte Verde, 1700m, 27.v.1979, cloud forest, 3 days cuptraps, 2M 1F (SBP, MZSP); 1500m, 21.ii-01.iii.1983, cloud forest, FIT, D. Lindemann, 1M 2F.

*Diagnosis and Description.* Length: 2.5-3.0 mm; width: 1.15-1.2 mm. General characteristics as listed above, differing in the following characters: Color dark brown, antenna color lightening from 10th segment onward, with last segment pale. Antenna (figs. 78-79) 2.15 times as long as pronotum, passing the base of pronotum when laid back, and bearing external keel from segment 4th to 11th; proportions of length of each segment and that of the 9th from 1st to 11th: 1.9, 1.05, 0.85, 0.75, 0.75, 0.75, 0.9, 0.55, 1.0, 1.05, 1.15; proportions of length and width of each segment of the club, from 7th to 11th: 1.25, 0.85, 1.25, 1.3, 2.0. Elytra together 1.5 times as long as wide; with dense strigae, tending to be oblique from the middle onwards. First segment of male protarsus (fig. 76) 1.1 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.0, 0.95, 1.0, 0.85,



Figures 75-84. *Adelopsis elephas*, sp. n., male. 75, habitus, dorsal view; 76, protarsus and protibia; 77, maxillary palp; 78-79, antenna, dorsal and apical lateral views; 80, genital segment; 81-84, aedeagus, left lateral, dorsal, right lateral and tip frontal views.



Figures 85-89. *Adelopsis elephas*, sp. n., 85-88, male, 3rd to 6th ventrites; 89, female spermatheca.



4.7. Posterior margins of male ventrites (figs. 85-88): 3rd slightly cut, bearing 1 tubercle laterally at cut; 4th to 6th emarginate at middle; 4th projecting and bearing 2 rows of thick tubercles following emargination; 6th bearing a pair of perforate plates at base. Anterior margin of male ventrites projecting internally, almost the size of the visible ventrite from 1st to 4th and smaller on 5th and 6th. Aedeagus (figs. 81-84) bearing a medial dorsal depression and a strongly curved tip projection; flagellum short and strong. Spermatheca (fig. 89) coiled with 2-turns.

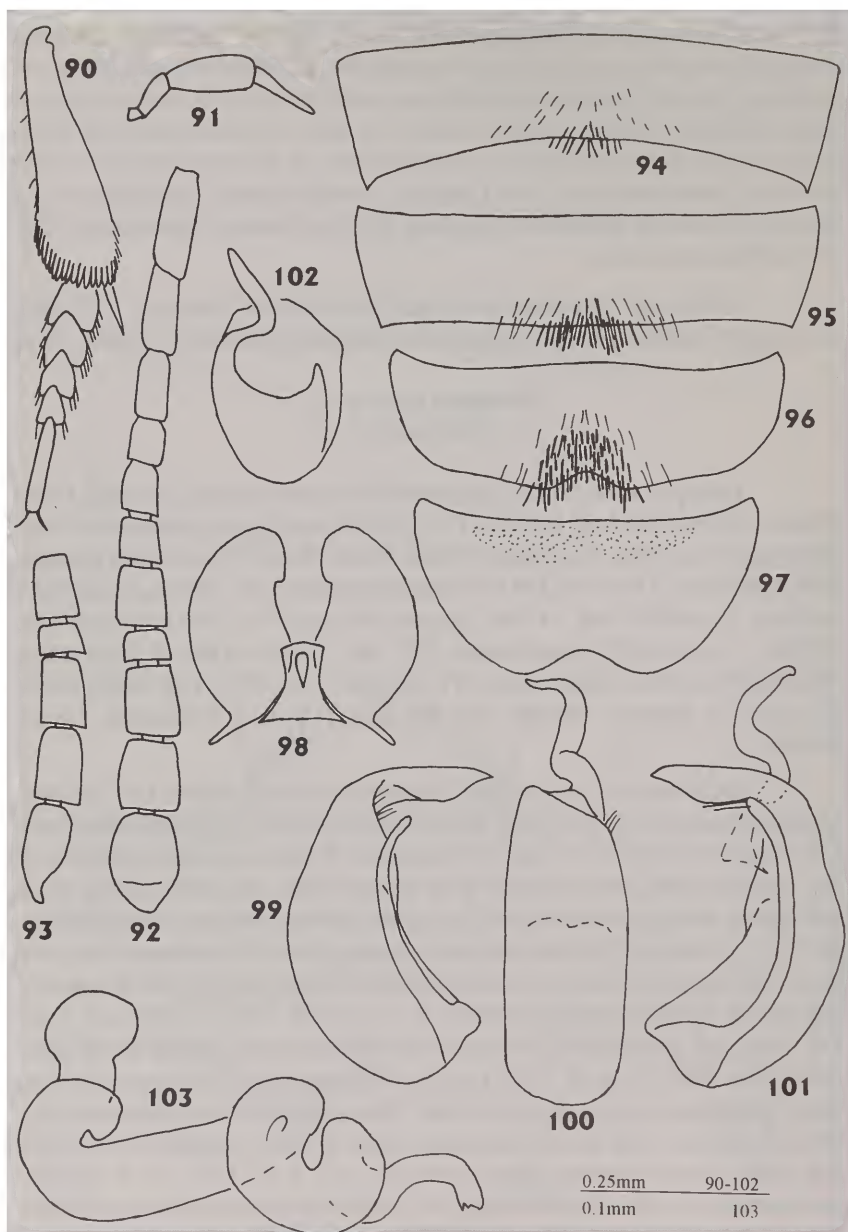
*Etymology.* The name is derived from Latin for "elephant", referring to the tip of aedeagus, which resembles an elephant proboscis, in lateral view.

**Adelopsis gilli, sp. n.**

(figs. 90-103)

Holotype, male (SBP). Type locality and data: Panama: Chiriquí: Cerro Pelota, 1500m, 01-14.vii.1982, B. Gill. 2M 1F paratypes with the same data. Paratypes: Costa Rica: Puntarenas: Monte Verde, 28.vi.1983, unbaited pittraps, D.H. Lindeman, 1F; 03.vii.1983, 10 unbaited pittraps, 1F; 1450m, Campbell's bull pen, 23.vi.1983, 1M; 1475m, Campbell's Farm, 07.vii.1983, 1M (MZSP); 1520m, 11-18.vi.1983, cloud forest, FIT, 4M; 13-18.vi.1983, 6 dung traps, 1M; 02-09.vii.1983, cloud forest, FIT, 1M; 09-13.vii.1983, FIT, 1M; 1700m, 29.v.1979, 7 cuptraps, old bait, 4th+5th days, H.F. & A.T. Howden, 1M 2F (MZSP).

*Diagnosis and Description.* Length: 2.2-2.5 mm; width: 1.0-1.25 mm. General characteristics as listed above, differing in the following characters: Color dark reddish brown, last two segments of antenna slightly pale, tip of last segment pale; dark elongate spots on the elytra, and dark colored areas paralleling the elytral sutures and the elytral internal margins. Antenna (figs. 92-93) 1.65 times as long as pronotum, passing base of pronotum when laid back; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 1.5, 1.15, 0.85, 0.65, 0.7, 0.6, 0.9, 0.45, 1.0, 1.05, 1.4; proportions of length and width of each segment of the club, from 7th to 11th: 1.3, 0.65, 1.25, 1.2, 1.5. Elytra together 1.35 times as long as wide; with dense slightly oblique strigae. First segment of male protarsus (fig. 90) 0.7 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.25, 1.25, 1.25, 1.6, 5.3. Posterior margins of male ventrites (figs. 94-97): 4th to 6th emarginate at middle; 3rd to 5th bearing rows of large setae following emargination; 6th bearing a pair of perforate plates at base. Aedeagus (figs. 99-102) with apex strongly downward produced; flagellum short and strong. Spiculum gastrale (fig. 98)



Figures 90-103. *Adelopsis gilli*, sp. n., 90-102, male. 90, protarsus and protibia; 91, maxillary palp; 92-93, antenna, dorsal and apical lateral views; 94-97, 3rd to 6th ventrites; 98, genital segment; 99-102, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 103, female spermatheca.

with an upsidedown drop-shaped light area medially. Spermatheca (fig. 103) coiled with 2-turns.

*Etymology.* The species is named for Bruce Gill, collector of the type specimens, in recognition of his extensive field work and large collections from Costa Rica and Panama.

**Adelopsis howdenorum, sp. n.**

(figs. 104-115)

**Holotype, male (SBP).** Type locality and data: Costa Rica: Puntarenas: Monte Verde, 1700m, 29.v.1979, H.F. & A.T. Howden. 3M 2F paratypes with the same data.

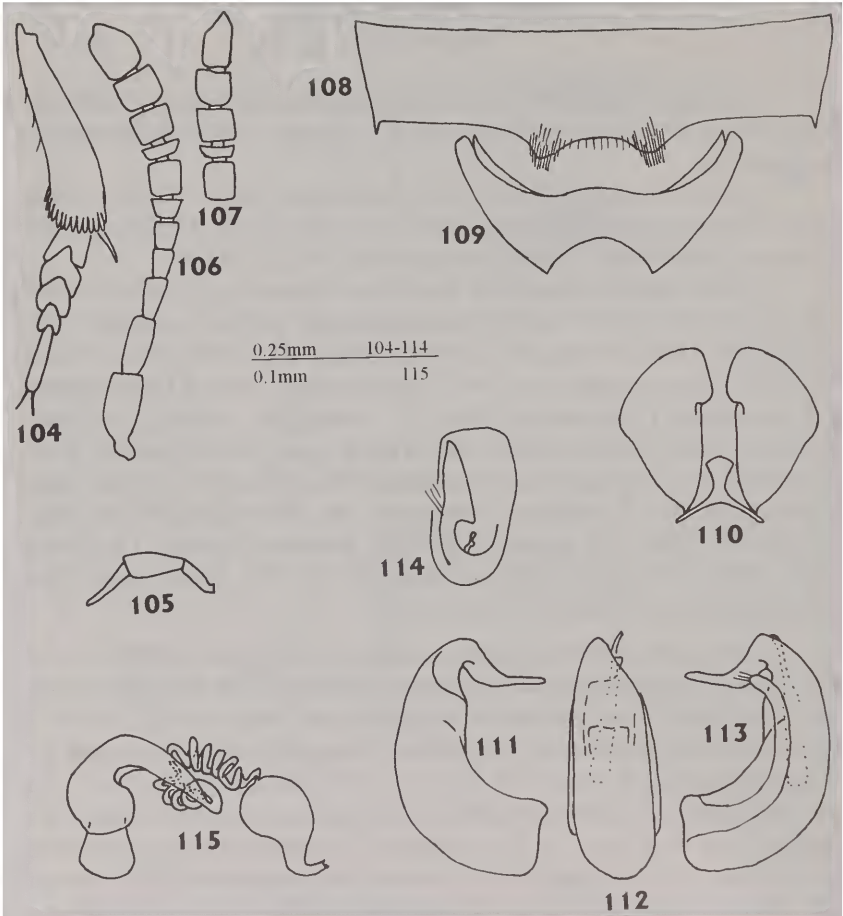
**Other paratypes:** Costa Rica: Puntarenas: Monte Verde, 1400m, 23.v.1979, 6 dung cuptraps, 24hrs, 4M 3F; 24.v.1979, 3M 4F (MZSP). Panama: Chiriquí: Cerro Pelota, 1500m, 01-14.vii.1982, B. Gill, 6M 5F.

**Other material:** Costa Rica: Puntarenas: Monte Verde, 18-20.viii.1987, FIT; 21.viii.1987, FIT; 04.vi.1979, 5 dung cuptraps; 1450m, 14.viii.1987, FIT; 24.viii.1987, FIT; 1500m, 27.v.1979, cuptraps; 25.ii.1991, FIT; 1700m, 27.v.1979, 3 days cuptraps; 01.vi.1979, 3 days cuptraps; 23-28.ii.1980, cuptraps, R.S. Anderson; 15.xii.1985-05.i.1986, A. Forsyth Pt.; 1400m, 27.ii.1980, W.R.M. Mason; 1520m, 13-18.v.1983, 6 dung traps, D.H. Lindeman; 25.vi-02.vii.1983, FIT; Cartago: Turrialba, Catie, 600m, 28.ii.1980, ravine, 2 days cuptraps, H.F. & A.T. Howden; Cartago-San Jose: Cerro de la Muerte, 4800', 30.vii-03.viii.1966, T16 carrion, S.B. Peck. Panama: Chiriquí: La Fortuna Dam, 1200m, 14.vi-16.vii.1982, wet forest, FIT, B. Gill; 4kmN Santa Clara, Hartmann's Finca, 1500m, 27.vi-03.vii.1981.

*Diagnosis and Description.* Length: 2.15-2.6 mm; width: 1.15-1.4 mm. General characteristics as listed above, differing in the following characters: Color dark brown, last antenna segment pale. Antenna (figs. 106-107) 1.2 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 1.95, 1.75, 1.2, 0.85, 0.8, 0.7, 1.0, 0.4, 1.0, 1.05, 1.8; proportions of length and width of each segment of the club, from 7th to 11th: 1.9, 0.4, 0.85, 0.85, 1.5. Elytra together 1.35 times as long as wide; with dense strigae, oblique from middle onwards. First segment of male protarsus (fig. 104) 0.8 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.05, 1.1, 1.05, 1.05, 4.5. Posterior margins of male ventrites (figs. 108-109): 3rd to 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination. Aedeagus (figs. 111-114) with basal ori-

face almost ventral. Spermatheca (fig. 115) coiled with 9-12-turns, preceded by a globose bulb.

*Comments:* *A. howdenorum*, sp.n. is difficult to tell from *A. rostrata*, sp.n. Only after analysis of the male genitalia are slight differences evident. Moreover, some specimens from different localities show some external differ-



Figures 104-115. *Adelopsis howdenorum*, sp. n., 104-114, male. 104, protarsus and protibia; 105, maxillary palp; 106-107, antenna, dorsal and apical lateral views; 108-109, 3rd and 6th ventrites; 110, genital segment; 111-114, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 115, female spermatheca.

ences which are considered to be within species variation instead of between different species, because of the similarity of the aedeagus. Finally, the female spermatheca also shows variation in the number of turns in the coil, even at the same locality and date, contrary to the other species analysed, where the number of turns is constant. The variation also seems to overlap that of *A. rostrata*. Because of these facts, except for the types, the other listed material should be considered to be tentative, and will be further studied more carefully.

*Etymology.* The species is named for Henry and Ann Howden, from Carleton University, Canada, the collectors of the type specimens, in recognition of their extensive field work and collections from Costa Rica.

***Adelopsis perimeces*, sp. n.**

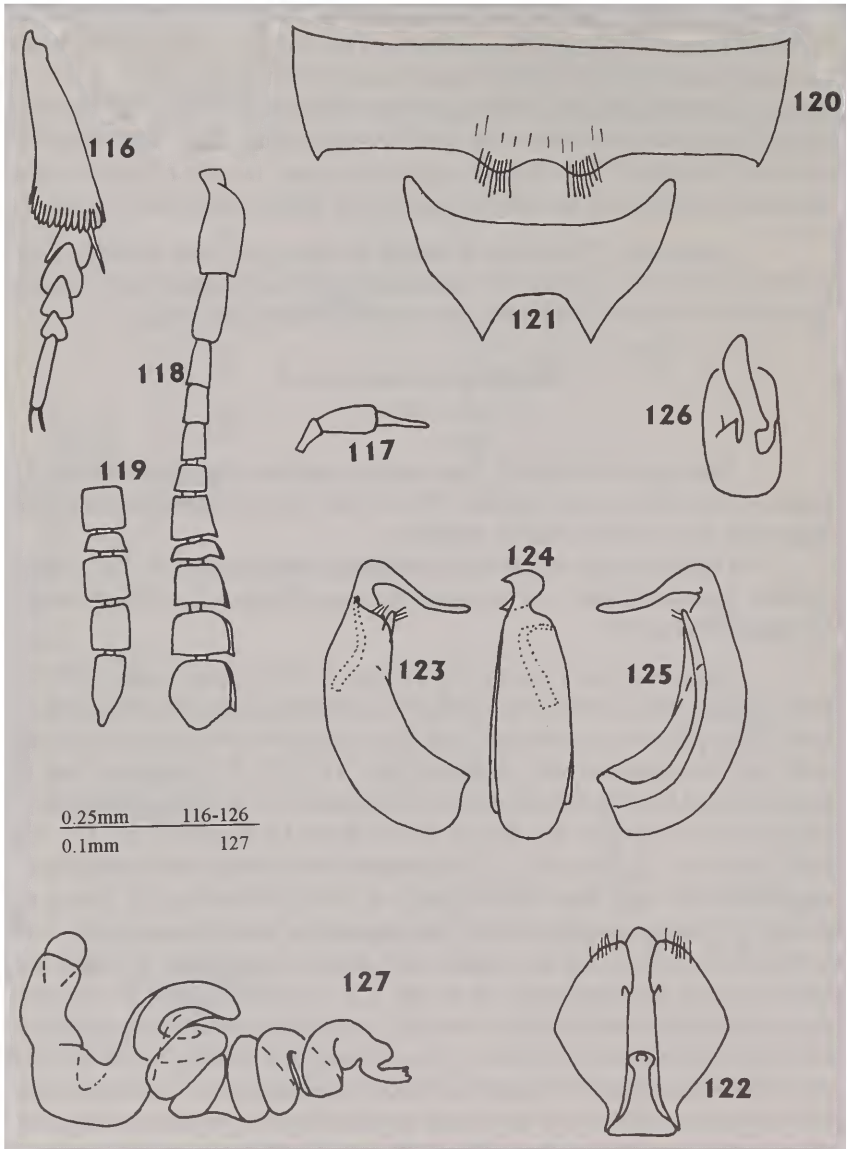
(figs. 116-127)

Holotype, male (SBP). Type locality and data: Panama: Panama: El Llano - Carti Road, 400m, vi.1982, FIT, B. Gill. 30M 13F paratypes with the same data (SBP, MZSP, FMNH, MNHN).

Other paratypes: Costa Rica: Puntarenas: San Vito de C.B., Las Cruces, 1200m, 22ii-03.iii.1983, 1M. Panama: Panama: Chepo - Carti Road, 400m, vi.1982, FIT, 2M 1F.

*Diagnosis and Description.* Length: 1.75-2.4 mm; width: 0.85-1.1 mm. General characteristics as listed above, differing in the following characters: Color dark brown, antenna color lightening from 9th segment onward, with last two segments pale. Antenna (figs. 118-119) 1.35 times as long as pronotum and bearing external keel from segments 7th to 11th; proportions of length of each segment and that of the 9th from 1st to 11th: 2.15, 1.7, 1.2, 0.85, 0.85, 0.6, 1.1, 0.5, 1.0, 1.1, 1.65; proportions of length and width of each segment of the club, from 7th to 11th: 1.0, 0.45, 0.8, 0.85, 1.25. Elytra together 1.25 times as long as wide. First segment of male protarsus (fig. 116) 0.75 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.2, 1.2, 1.15, 1.25 3.8. Posterior margins of male ventrites (figs. 120-121): 3rd and 6th emarginate at middle; 4th slightly emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination. Aedeagus (figs. 123-126) thin, with a long downward produced apical projection; flagellum short and strong. Spermatheca (fig. 127) coiled with 6-turns, and bearing a very small apical bulb.

*Etymology.* The name is derived from Greek for "very long" (= "perimekes"), referring to the tip of aedeagus, which has a very long beak like projection, in lateral view.



Figures 116-127. *Adelopsis perimeces*, sp. n., 116-126, male. 116, protarsus and protibia; 117, maxillary palp; 118-119, antenna, dorsal and apical lateral views; 120-121, 3rd and 6th ventrites; 122, genital segment; 123-126, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 127, female spermatheca.

**Adelopsis pileata**, sp. n.

(figs. 128-141)

Holotype, male (SBP). Type locality and data: Costa Rica: Puntarenas: Monte Verde, 1700m, 27.v.1979, cloud forest, 3 days cuptraps, H.F. & A.T. Howden. 7M 3F paratypes with the same data (SBP, MZSP).

Other paratypes: Costa Rica: Puntarenas: Monte Verde, 1700m, 29.v.1979, 1M 1F; 01.vi.1979, 3 days cuptraps, 2M (FMNH); Alajuela: Volcan Poas (near Poasito), 1840m, 20.vii-04.viii.1966, carrion trap 12, S.B. Peck, 1M.

*Diagnosis and Description.* Length: 2.2-2.65 mm; width: 1.1-1.25 mm. General characteristics as listed above, differing in the following characters: Color light brown, antenna color lightening from 10th segment onward, with last segment pale. Antenna (figs. 130-131) 1.45 times as long as pronotum and bearing external keel from segments 5h to 11th; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 2.1, 1.3, 1.3, 1.0, 1.0, 0.75, 1.0, 0.6, 1.0, 0.95, 1.45; proportions of length and width of each segment of the club, from 7th to 11th: 1.2, 0.7, 1.0, 1.0, 1.45. Elytra together 1.4 times as long as wide. Wings vestigial, only slightly developed. Tibia tip twice as wide as base. First segment of male protarsus (fig. 128) 0.95 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.0, 0.9, 0.95, 1.15, 4.3. Posterior margins of male ventrites (figs. 132-135): 3rd to 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination. Aedeagus (figs. 137-140) with basal orifice almost ventral. Spermatheca (fig. 141) coiled with 3-turns, preceded by bulb (which is more a dilatation), which is preceded by another coil.

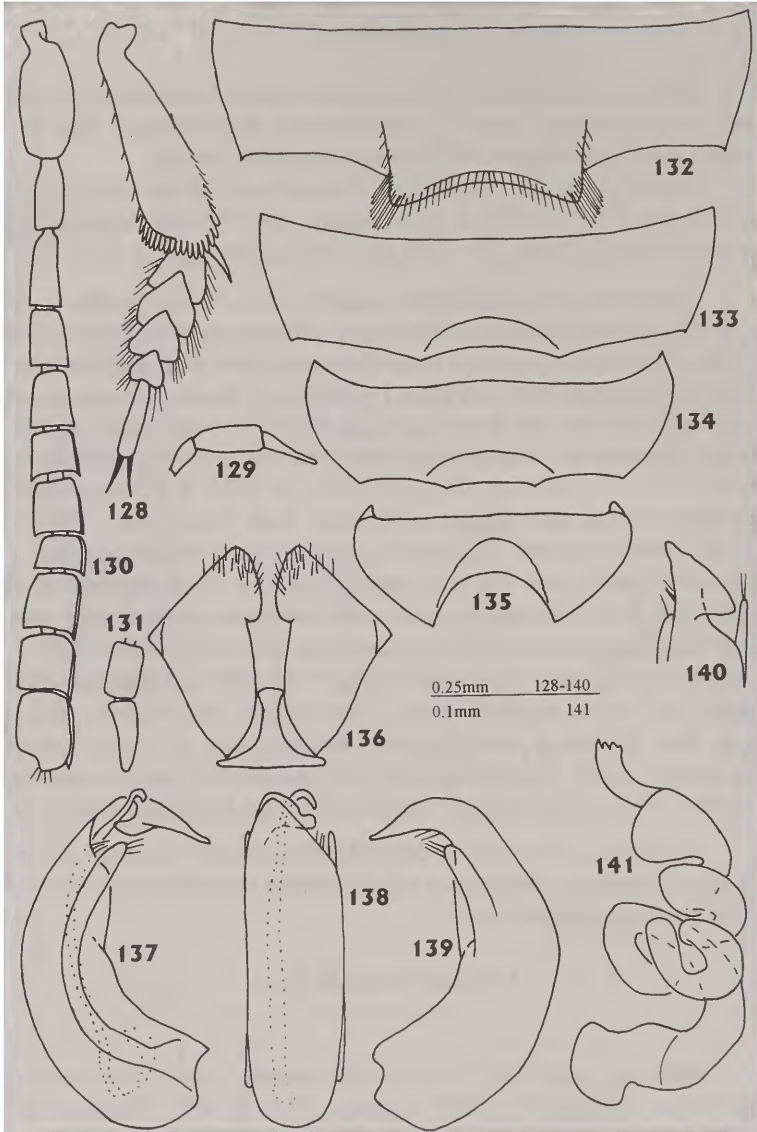
*Etymology.* The name is derived from Latin for "capped", referring to the tip of aedeagus, which has a cap-like shape in lateral view, and a hood shape in posterior (frontal) view.

**Adelopsis rostrata**, sp. n.

(figs. 142-153)

Holotype, male (SBP). Type locality and data: Costa Rica: Puntarenas: Monte Verde, 1500m, 27.v.1979, cuptraps, H.F. & A.T. Howden. 5M 5F paratypes with the same data.

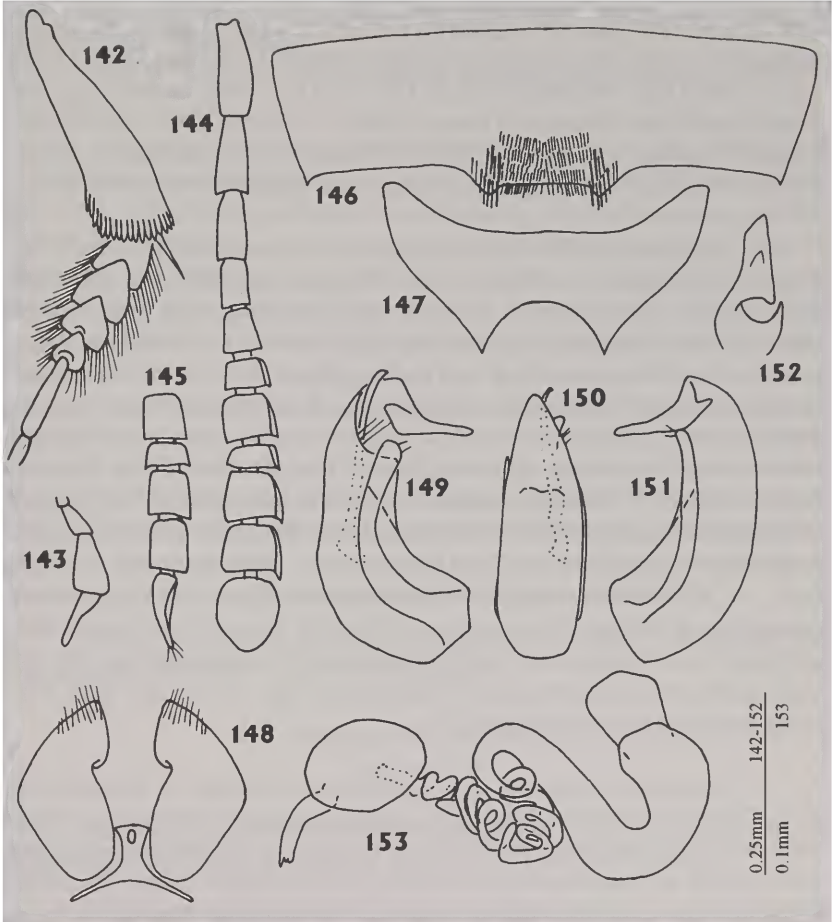
Other paratypes: Costa Rica: Alajuela: Penas Blancas, 700m, 05.iii.1988, FIT, E. Cruz, 1M; Puntarenas: Monte Verde, 1400m, 27.v.1979, 2 carrion traps, H.F. & A.T. Howden, 3M 1F; 1700m, 01.vi.1979, 3 days cuptraps, 3M 6F (MZSP).



Figures 128-141. *Adelopsis pileata*, sp. n., 128-140, male. 128, protarsus and protibia; 129, maxillary palp; 130-131, antenna, dorsal and apical lateral views; 132-135, 3rd to 6th ventrites; 136, genital segment; 137-140, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 141, female spermatheca.



Other material: Costa Rica: Puntarenas: Monte Verde, 1500m, 23-27.ii.1991, dung traps; 21.ii-01.iii.1983, cloud forest, FIT, D.H. Lindeman; 1520m, 11-18.vi.1983, cloud forest, FIT; 08.vii.1983, sifting; Heredia: La Selva,



Figures 142-153. *Adelopsis rostrata*, sp. n., 142-152, male. 142, protarsus and protibia; 143, maxillary palp; 144-145, antenna, dorsal and apical lateral views; 146-147, 3rd and 6th ventrites; 148, genital segment; 149-152, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 153, female spermatheca.

Puerto Viejo, 18.ii.1980, cuptrap, R.S. Anderson; 19.ii.1980, 1 day dung cuptrap; 10kmNW Puerto Viejo, 170m, 03.iii.1991, FIT, H.F. & A.T. Howden; Cartago: Turrialba, Catie, 600m, undated, H.F. & A.T. Howden; 19.v.1979; 20.v.1979, cup dung traps; 28.ii.1980, florenzia forest, 2 days megatrap; 28.ii.1980, ravine, 1 megatrap 2 days. Panama: Chiriquí: 2kmE Cerro Punta, 2200m, 1.vi.1977, Ber. 377, oak litter, S.B. & J.K. Peck; Cerro Punta (on trail to Boquete), 5600', 08.iii.1959, H.S. Dybas (FMNH); La Fortuna Dam, 1200m, 14.vi-16.vii.1982, wet forest, FIT, B. Gill; 15-21.vi.1982; minicup, vi.1982; 4kmN Santa Clara, Hartmann's Finca, 1500m, 27.vi-03.vii.1981; Cerro Hornito, 15kmNE Gualaca, 1200m, viii.1982, FIT; Bocas del Toro: La Fortuna, Robalo, 2500m, 18-21.vi.1982; Panama: El Llano - Carti Road, 400m, vi.1982, FIT.

*Diagnosis and Description.* Length: 2.1-2.7 mm; width: 1.05-1.3 mm. General characteristics as listed above, differing in the following characters: Color slightly reddish brown, antenna color lightening from 10th segment onward, with last segment pale. Antenna (figs. 144-145) 1.25 times as long as pronotum and bearing external keel from segments 6th to 10th; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 1.9, 1.55, 1.3, 0.95, 0.85, 0.7, 1.5, 0.5, 1.0, 1.0, 1.5; proportions of length and width of each segment of the club, from 7th to 11th: 1.0, 0.55, 0.95, 0.95, 1.15. Elytra together 1.4 times as long as wide. First segment of male protarsus (fig. 142) 0.85 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.1, 0.95, 0.95, 1.2, 4.9. Posterior margins of male ventrites (figs. 146-147): 3rd to 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination. Aedeagus (figs. 149-152) with basal orifice almost ventral. Spermatheca (fig. 153) coiled with 7-11 turns, preceded by a globose bulb.

*Comments:* *A. rostrata*, sp.n., is difficult to tell from *A. howdenorum*, sp.n. Only after analysis of the male genitalia are slight differences evident. Moreover, some specimens from different localities show some external differences which are considered to be within species variation instead of between different species, because of the similarity of the aedeagus. Finally, the female spermatheca also shows variation in the number of turns in the coil, even at the same locality and date, contrary to the other species analysed, where the number of turns is constant. The variation also seems to overlap that of *A. howdenorum*. Because of these facts, except for the types, the other listed material should be considered to be tentative, and will be further studied more carefully.

*Etymology.* The name is derived from Latin for "beaked", referring to the tip of aedeagus, which is beaked, in lateral view.

**Adelopsis stella, sp. n.**

(figs. 154-165)

Holotype, male (SBP). Type locality and data: Costa Rica: Limon: Pandora, Estrella Valley, 19.ii.1984, dung & carrion traps, H.F. Howden. 1F paratype with the same data.

Other paratypes: Costa Rica: Limon: Pandora, Estrella Valley, 20.ii.1984, FIT, 2M.

*Diagnosis and Description.* Length: 1.6-1.95 mm; width: 0.85-0.95 mm. General characteristics as listed above, differing in the following characters: Color light brown, antenna color lightening from 9th segment onward, with last 2 segments pale. Antenna (figs. 156-157) 1.55 times as long as pronotum; last segment concave ventrally; proportions of length of each segment and that of the 9th from 1st to 11th: 2.2, 1.9, 1.2, 1.05, 1.05, 0.7, 1.05, 0.45, 1.0, 1.15, 1.6; proportions of length and width of each segment of the club, from 7th to 11th: 0.8, 0.35, 0.65, 0.75, 1.0. Elytra together 1.25 times as long as wide. First segment of male protarsus (fig. 154) 0.75 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.0, 1.1, 0.9, 1.1, 3.7. Posterior margins of male ventrites (figs. 158-159): 3rd, 4th and 6th emarginate at middle; 3rd projecting and bearing 2 rows of thick setae laterally, and rows of large setae following emargination. Aedeagus (figs. 161-164) with basal orifice almost ventral. Spermatheca (fig. 165) coiled with 6-turns, preceded by a globose bulb.

*Etymology.* The name is derived from Latin for "star", referring to the type locality ("Estrella" = star, from Spanish).

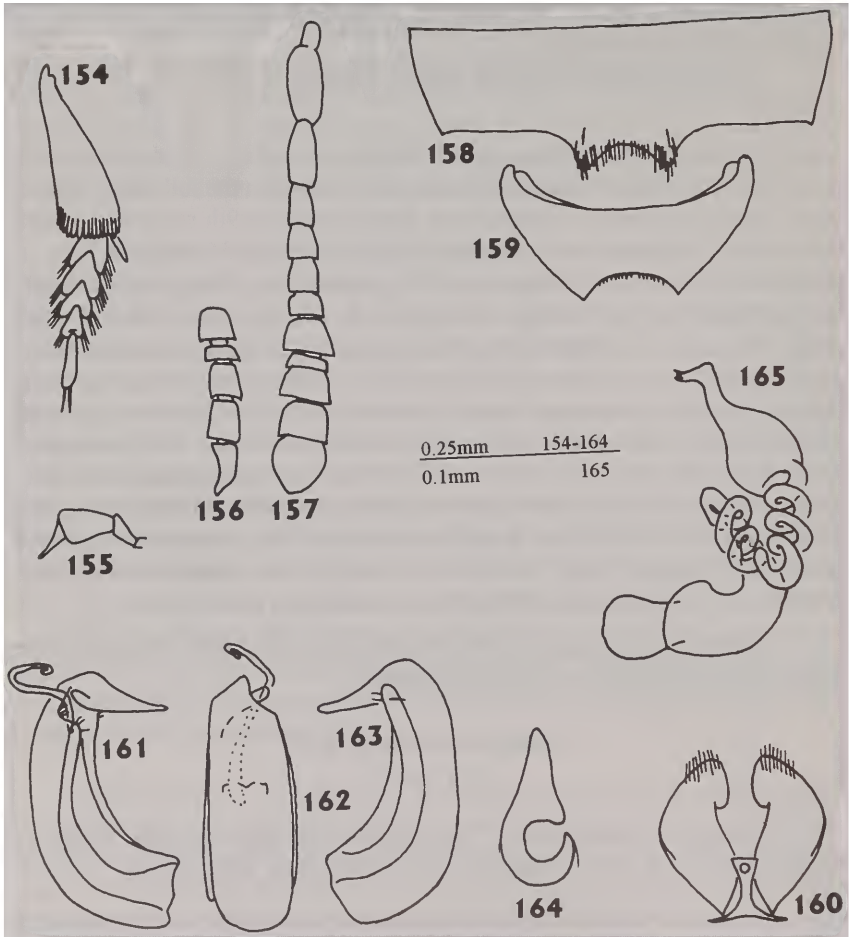
**Adelopsis vallicola, sp. n.**

(figs. 166-177)

Holotype, male (FMNH). Type locality and data: Panama: Cocolé: El Valle, trail behind Club Campestre, 2200', 20.ii.1959, H.S. Dybas.

*Diagnosis and Description.* Length: 2.35 mm; width: 1.1 mm. General characteristics as listed above, differing in the following characters: Color dark brown. Antenna (figs. 171-172) 1.15 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 1.85, 1.5, 1.15, 0.7, 0.7, 0.5, 0.95, 0.4, 1.0, 1.1, 1.75; proportions of length and width of each

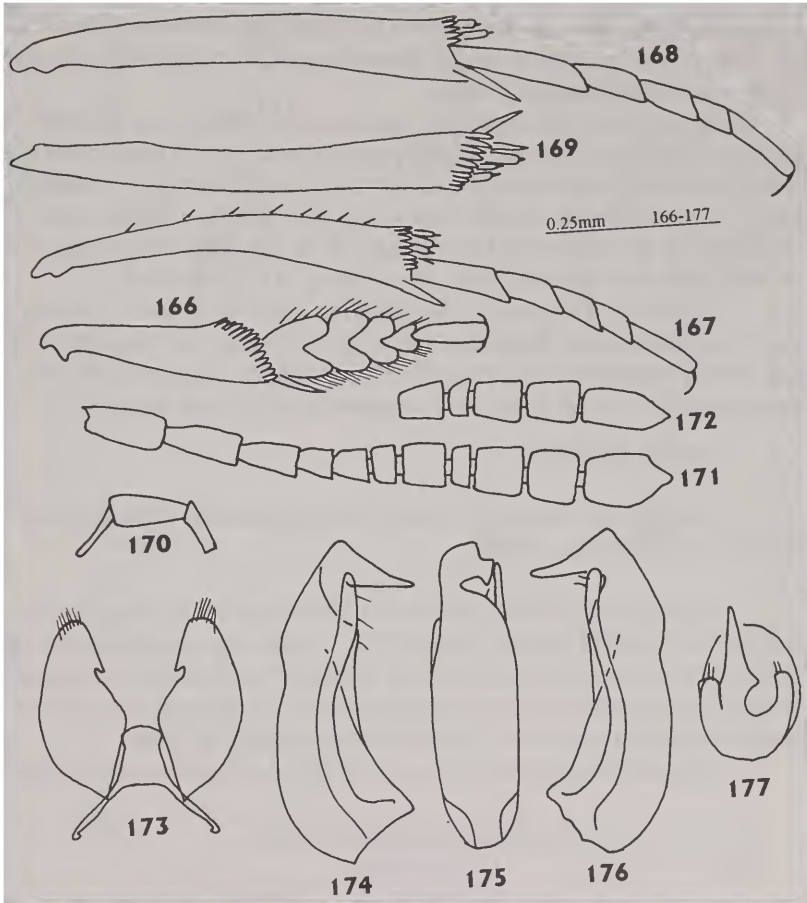
segment of the club, from 7th to 11th: 1.0, 0.5, 1.0, 1.05, 1.6. Elytra together 1.35 times as long as wide; with dense strigae, oblique from one third the length onwards. First segment of male protarsus (fig. 166) as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.05, 1.0, 0.95, 1.1, 4.6. Male metatibia (figs. 168-169) laterally de-



Figures 154-165. *Adelopsis stella*, sp. n., 154-164, male. 154, protarsus and protibia; 155, maxillary palp; 156-157, antenna, dorsal and apical lateral views; 158-159, 3rd and 6th ventrites; 160, genital segment; 161-164, aedeagus, left lateral, dorsal, right lateral and tip frontal views; 165, female spermatheca.

pressed at middle; meso- and metatibial (figs. 167-169) apex bearing “candle-shaped” setae instead of normal setae. Posterior margins of male ventrites 6th emarginate at middle. Aedeagus (figs. 174-177) bearing a medial dorsal depression. Female unknown.

*Etymology.* The name is derived from Latin for “from the valley”, referring to the type locality (“Valle” = valley, from Spanish, and Latin).



Figures 166-177. *Adelopsis vallicola*, sp. n., male. 166, protarsus and protibia; 167, mesotarsus and mesotibia; 168, metatarsus and metatibia; 169, metatibia, lateral view; 170, maxillary palp; 171-172, antenna, dorsal and apical lateral views; 173, genital segment; 174-177, aedeagus, left lateral, dorsal, right lateral and tip frontal views.

**Paulipalpina, gen. n.**

*Diagnosis and Description.* Besides the typical characters of the tribe, cited above: Color dark brown. Antenna slim, giving the impression of being elongate; last segment lighter. Last segment of the palp about half the length of the previous segment. Posterior angles of pronotum acute. Protibia tip about three times as wide as base. Aedeagus elongate, apical orifice dorsally subterminal and cutting the apex of the aedeagus slightly left from the median axis; the dorsal opening being somewhat oval in shape; flagellum somewhat elongate, from 0.5 to 0.8 times as long as the aedeagus. Genital segment globular, spiculum gastrale straight and short.

In several of the species studied, the male mesotibia is bent medially (in which case, the female mesotibia is generally curved), and in some cases it is not bent but rather curved (and the female tibia is either straight or curved).

In most species, the spermatheca has 5 (or 4) turns, the first three (or two) following the longitudinal axis and the other two following a transverse axis, which are followed by a long curve, ending in a kind of bulb.

*Etymology.* The name is derived from Latin for "Paulus" (small) + palp + "ina" (diminutive feminine), referring to the small last segment of the palp, when compared to the previous one, and when compared to the other Ptomaphagini, which have the last two segments of the palp subequal.

*Gender:* Feminine.

*Type Species.* *Adelopsis claudicans* Szymczakowski 1980, from Nova Teutonia, Santa Catarina, Brazil.

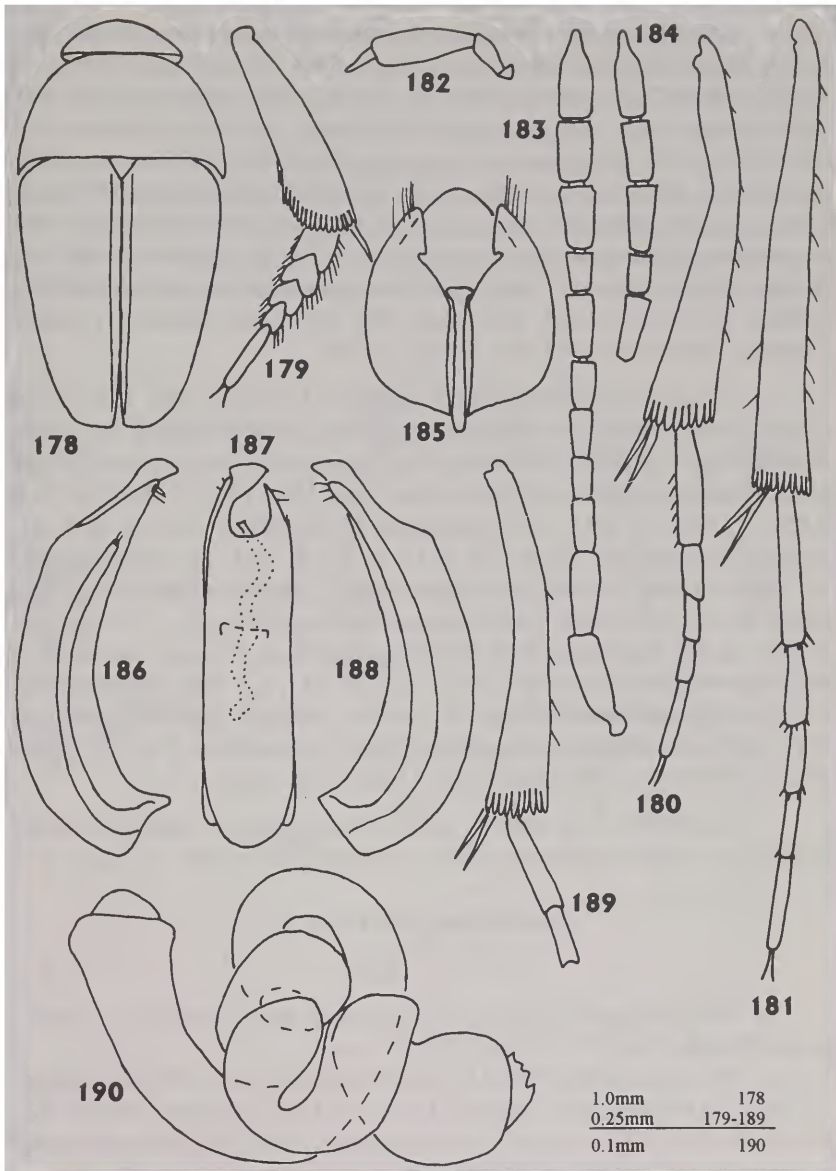
Although other already described *Adelopsis* species will later be transferred to *Paulipalpina*, we have decided not to define the type species as the oldest described species, because they were generally based on single type specimens and their genitalia are not available for study. In contrast, *P. claudicans* is easily recognized and several specimens are available for study.

In the following descriptions, only the specific characters will be listed.

**Paulipalpina clavigera, sp. n.**

(figs. 178-190)

Holotype, male (SBP). Type locality and data: Panama: Chiriquí: Cerro Pelota, 1500m, 01-14.vii.1982, B. Gill, 11M 12F paratypes with the same data (SBP, MZSP, FMNH, MNHN).



Figures 178-190. *Paulipalpina clavigera*, sp. n., 178-188, male. 178, habitus; 179, protarsus and protibia; 180, mesotarsus and mesotibia; 181, metatarsus and metatibia; 182, maxillary palp; 183-184, antenna, dorsal and apical lateral views; 185, genital segment; 186-188, aedeagus, left lateral, dorsal, and right lateral views; 189-190, female. 189, mesotarsus and mesotibia; 190, spermatheca.

Other paratypes: Costa Rica: Puntarenas: Monte Verde, 17.viii.1981, H.F. Howden, FIT, 1M 4F (MZSP), 18-20.viii.1987, FIT, H.F. & A.T. Howden, 2M; 21.viii.1987, FIT, 12M; 1450m, 14.viii.1987, FIT, 6M; 24.viii.1987, FIT, 1M; 1500m, 25.ii.1991, FIT, 1M 1F; 1700m, 24.v.1979, carrion, 1M; 03.vii.1983, D.H. Lindeman, 10 unbaited pittraps, 1M; 1475m, Campbell's Farm, 07.vii.1983, 1M 1F; 1500m, 21.ii-01.iii.1983, cloud forest, FIT, 4M 6F; 1520m, 11-18.vi.1983, FIT, 1F; 25.vi-02.vii.1983, FIT, 1M 1F; 02-09.vii.1983, cloud forest, FIT, 1M 1F; San Vito de C.B., Las Cruces, 1200m, vii.1982, FIT, B. Gill, 2M 4F; 22.ii-03.iii.1983, 1M 2F. Panama: Chiriquí: La Fortuna Dam, 1200m, 14.vi-16.vii.1982, wet forest, FIT, 2M; Cerro Hornito, 15kmNE Gualaca, 1200m, viii.1982, FIT, B. Gill, 1M 1F.

*Diagnosis and Description.* Length: 2.2-2.45 mm; width: 1.0-1.1 mm. General characteristics as listed above, differing in the following characters: Antenna (figs. 183-184) 1.65 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 1.5, 1.3, 0.8, 0.65, 0.8, 0.75, 1.0, 0.6, 1.0, 0.95, 1.35; proportions of length and width of each segment of the club, from 7th to 11th: 2.15, 1.35, 1.8, 1.65, 2.6. Elytra together 1.4 times as long as wide; with dense strigae, somewhat oblique from one fourth the length onwards. First segment of male protarsus (fig. 179) 0.8 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.05, 1.15, 1.2, 1.45, 4.2. Male mesotibia (fig. 180) bent. Female mesotibia (fig. 189) curved. Aedeagus (figs. 186-188) bearing a wide club-shaped tip; flagellum sinuate. Spermatheca (fig. 190) coiled with 2+2-turns (= 2 longitudinal plus 2 transversal turns).

*Etymology.* The name is derived from Latin for "bearing a club", referring to the tip of aedeagus, which is enlarged like a club.

### **Paulipalpina devexa, sp. n.**

(figs. 191-199)

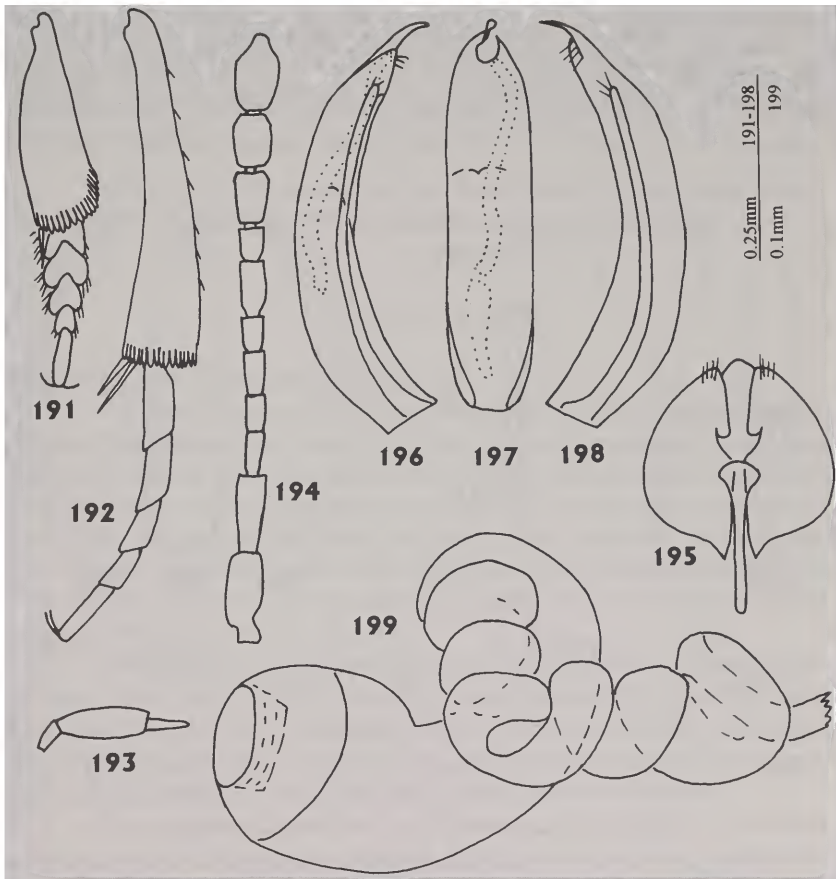
Holotype, male (SBP). Type locality and data: Costa Rica: Alajuela: Penas Blancas, 700m, 05.iii.1988, FIT, E. Cruz.

Paratypes: Costa Rica: Alajuela: Penas Blancas, x.1986, 1F. Panama: Chiriquí: La Fortuna Dam, 1200m, 14.vi-16.vii.1982, wet forest, FIT, B. Gill, 3M 2F (SBP, MZSP); Panama: Cerro Campana, 2500', 17.ii.1959, sift leaves in stream bed, H.S. Dybas, 1M (FMNH).

*Diagnosis and Description.* Length: 1.9-2.15 mm; width: 1.0-1.1 mm. General characteristics as listed above, differing in the following characters: Antenna (fig. 194) 1.5 times as long as pronotum; proportions of length of



each segment and that of the 9th from 1st to 11th: 1.6, 1.55, 0.8, 0.7, 0.85, 0.65, 0.95, 0.65, 1.0, 1.0, 1.5; proportions of length and width of each segment of the club, from 7th to 11th: 1.75, 1.35, 1.4, 1.35, 1.85. Elytra together 1.4 times as long as wide; with dense strigae, oblique from one fourth the length onwards. First segment of male protarsus (fig. 191) 0.75 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 0.95, 1.0, 1.1, 1.15, 3.5. Mesotibia (fig. 192) curved in both sexes. Aedeagus (figs. 196-198) bearing an elongate downward curved tip; flagellum somewhat sinuate. Spermatheca (fig. 199) coiled with 3+2-turns.



Figures 191-199. *Paulipalpina devexa*, sp. n., 191-198, male. 191, protarsus and protibia; 192, mesotarsus and mesotibia; 193, maxillary palp; 194, antenna; 195, genital segment; 196-198, aedeagus, left lateral, dorsal, and right lateral views; 199, female spermatheca.

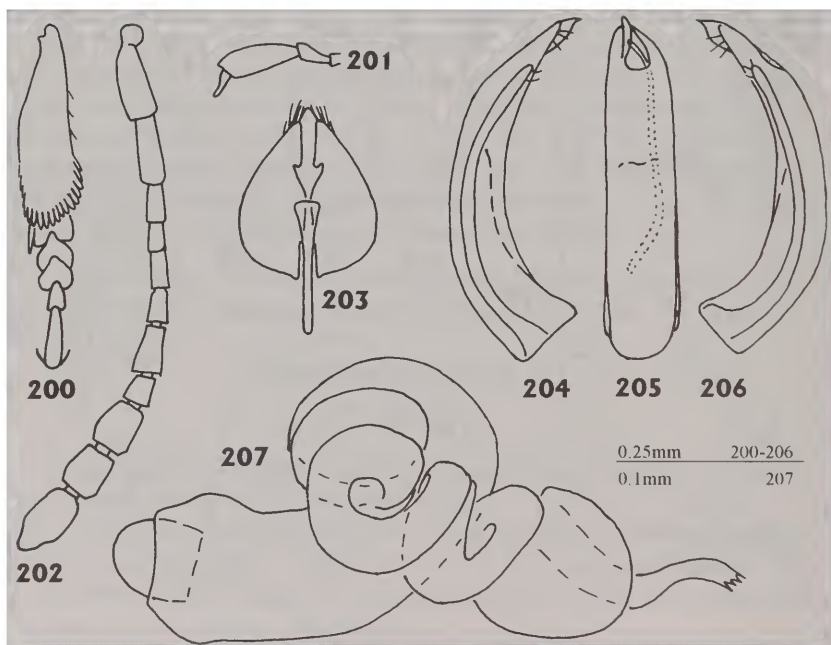
*Etymology.* The name is derived from Latin for “inclined, descending”, referring to the tip of aedeagus, which bears a thin projection curved downwards.

***Paulipalpina parvicuspis*, sp. n.**

(figs. 200-207)

Holotype, male (FMNH). Type locality and data: Costa Rica: Limon: Reventazon, Hamburg Farm, 11.x.34, sifting dry forest, F. Nevermann, Z-13812.

Paratypes: Panama: Cocle: El Valle, trail to Las Minas, 2400-2600', 23.ii.1959, berlese B-348, ground debris, H.S. Dybas, FM(HD) 59-220 (MZSP), 1M; Canal Zone: Paraiso, 22.i.1911, E.A. Schwarz, 1M (USNM); Barro Colorado Island, vii-viii.1942, J. Zetek, no 4988, 1F (MZSP); vi-x.1943, Z-5104,



Figures 200-207. *Paulipalpina parvicuspis*, sp. n., 200-206, male. 200, protarsus and protibia; 201, maxillary palp; 202, antenna; 203, genital segment; 204-206, aedeagus, left lateral, dorsal, and right lateral views; 207, female spermatheca.

1F (USNM); i-iii.1944, Z-5123, 1F (USNM); i-ii.1945, 5175, 45-13433, 1M 3F (USNM, SBP); Panama: Cerro Campana: 2400', 17.ii.1959, sifting leaves in stream bed, H.S. Dybas, 1M (FMNH).

*Diagnosis and Description.* Length: 1.65-1.9 mm; width: 1.0-1.05 mm. General characteristics as listed above, differing in the following characters: Antenna (fig. 202) 1.45 times as long as pronotum; proportions of length of each segment and that of the 9th from 1st to 11th: 1.55, 1.4, 0.75, 0.55, 0.75, 0.8, 0.95, 0.55, 1.0, 1.0, 1.6; proportions of length and width of each segment of the club, from 7th to 11th: 1.65, 0.9, 1.2, 1.2, 1.9. Elytra together 1.2 times as long as wide; with dense strigae, oblique from one third the length onwards. First segment of male protarsus (fig. 200) 0.7 times as wide as the maximum width of tibia; proportions of length and width of each segment, from 1st to 5th: 1.05, 1.0, 1.1, 1.25, 3.8. Mesotibia curved in both sexes. Aedeagus (figs. 204-206) bearing a vertical flat apical projection ventrally produced; flagellum sinuate. Spermatheca (fig. 207) coiled with 3+2-turns.

*Etymology.* The name is derived from Latin for "little point", referring to the tip of aedeagus, which is simple, ending as a little point.

## DISCUSSION

### *Geographical and altitudinal distribution*

We here summarize the distributional data, to try to understand the ranges of the species. Nine of the 17 studied species were collected in only one locality (or two, in only two cases, but these were not more than 60km apart from each other on the same mountain ridge). Five of the species are exclusively from the tropical lowlands (less than 700m in altitude) and four are from tropical highlands (more than 1200m). Among the highland species, some of them were collected at different altitudes, with a maximum vertical range of 1000m for a single species.

Among the eight species which were collected over a large geographical range (from 280 to 700km in length), two were collected in low to intermediate altitudes, and two in highlands. These species also showed a maximum altitudinal range of 500m. The other four species were collected from low to high altitudes, with elevational ranges varying from 800 to 1900m.

The number of species at one locality varied generally in relation with the number of specimens collected. In sites where very large collections were made, several species were found, the numbers varying more commonly from three to four species at one site. For instance, in Monte Verde, in Costa

Rica, where the collection effort was very high, seven species are recorded. In these cases, several species are found in the same collection series.

In some places the number of specimens collected is high, in others, only few individuals were collected. Moreover, the collection activity focused on only few specific areas in the studied countries. It should be noted that the large collections with representatives of several species were especially based on the use of flight intercept traps (FIT). Thus, probably the more frequent use of these traps in other areas of these and other Neotropical countries will lead to an increase in the number of species of Neotropical cholevines.

#### *Systematic remarks*

Although other species of the *elephas* group have been collected from other nearby countries (e.g. Colombia, Venezuela, Ecuador, for which we have large unpublished collections), it is worth noting that the number of species is higher in the area of Costa Rica and Panama. In these countries the group seems to have undergone more diversification, including the number of species and habitats occupied by them.

The newly described genus *Paulipalpina* includes several species formerly recognized as belonging to *Adelopsis* and distributed from Mexico to Southern Brazil. We found that specimens previously identified as belonging to a single species (*A. simoni*) actually belong to at least four different species. This misidentification occurred because the species of the genus *Paulipalpina* are difficult to distinguish from each other based only on external characters, and have a somewhat conservative shape of the aedeagus, which is also the case for the genus *Ptomaphagus*. Only recently, Szymczakowski (1980) recognized a new species from the group of specimens formerly identified as *A. simoni*, and described *A. claudicans*, from Southern Brazil (herein assigned as type species of *Paulipalpina*). However, the tip of the aedeagus has good characters, and when combined with the features of external morphology and the female spermatheca serves to distinguish the species of *Paulipalpina* from each other.

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