

Description of the external male genitalia of some
Neotropical Tenebrionidae (Col. Heteromera)

By

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(Received December 2, 1982)

Abstract: The external morphology of phallus of 56 species of Neotropical Tenebrionids (Col. Heteromera) belonging to three subfamilies, 5 tribes and 16 genera is described and illustrated. Often some comparisons are made with closely allied species. In one case also a different, new subspecies is illustrated (*Austrocaribius venezuelensis araguae* ssp.n.). The morphology of phallus proves to be of great importance for a differentiation of some genus inside a tribe (e.g. *Stictoderia* among Epitragini) and of some groups of species within a genus (e.g. Antillean and South Caribbean *Diastolinus*). In both cases an agreement with what we know of geology and paleogeography of the inhabited territory is very remarkable. General comments are made about the importance male genitalia can have in cladistic and phenetic classifications; also the bearing of geographic distribution of some taxa in phylogenetic trees is stressed. The research is still in progress.

The scarcity of descriptions of male genitalia in Neotropical Tenebrionids, compared with several other zoogeographical regions, has advised to represent here the first results the author has had in the study of this Coleopterous family, which began in 1948, and which brought to the description of several new species and genera, coming mainly from the Caribbean area.

In the Caribbean area the first author who illustrated the external male genitalia is probably CHAMPION who in his *Biologia Centrali Americana* draws the extremity of the parameres in the genus *Hapsida* (tribus Diaperini) which show great differences and therefore have a good systematic use; CHAMPION draws also the complete tegmen of *Oxidates* (tribus Misolampini) (Pl. 11, Fig. 19 c) where the basale embraces laterally the parameres; quite different is *Saziches* (Pl. 11, Fig. 22 c) seen from the ventral side, with a large VI segment with the form of two valvae which receive the copulatory organ. For *Hapsida* (p. 214) CHAMPION speaks of a corneous sheath of aedeagus which includes a second sheath, divided at apex in two very long spiniform processes, each furnished at the sides with some setae. From the figure however it is not possible to recognize the two sheaths: theoretically they could correspond to the phallobase (external sheath) and to parameres (internal sheath). A further contribution to the study of *Apsida* is due to TRIPLE-HORN in recent times.

To CHAMPION in North America several authors follow, first of all BLAISDELL (1909), followed by LA RIVERS (1943) and others. The first author who dealt with Neotropical and more particularly South American species is MARCUZZI (1954) who has illustrated the male genitalia of some new genus coming from the Caribbean area (*Hummelinckia*, *Austrocaribius* and *Trichotoides*), followed by ESPAÑOL (1960) who illustrated the tegmen (only apical part, seen in ventral view) of a new Phalerini from Peru; KULZER (1961) who draws the aedeagus (or as he says

aedeagus) of some Nycterinus (tribus Eleodini) without specifying that what we see is the dorsal side; the same author in 1962 has illustrated the aedeagus of some Neotropical Ulosonia; in 1963 SPILMAN has illustrated the phallus (only tegmen) of some American, also Caribbean Ulomini of genus Mycotrogus, offering some very good drawings. In more recent years a number of students deal with the external male genitalia, such as FREUDE (1967), ARDOIN (1967), TRIPLEHORN (1970), PEÑA (1974), and several other of whom we will say something in the Comments.

The nomenclature of the male copulatory organ - also limited to Coleoptera or even to Tenebrionidae - is not at all uniform among the various authors who have dealt with this organ. According to SNODGRASS penis or median intromittent organ is the same of phallus (practically the greek translation of "penis"), including the phallobase, the aedeagus, the endophallus and various processes of the phallobase (i.e. the parameres) and the aedeagus (laciniae, clavae). The name laciniae is used by G.MEDVEDEV 1968, clavae by BLAISDELL 1909 or by DOYEN & TSCHINKEL. According to KOCH 1955 lacinia would be different from clava.

The aedeagus is typically a sclerotic tube. It may lack in some Tenebrionid genus. The phallobase is practically the basal piece of G.MEDVEDEV and of DOYEN and co-workers; the basale of KOCH 1958 and of LA RIVERS 1943; the parameres (which can be sometimes fused) correspond to apical sclerite or apicale of KOCH 1958 and to apical sclerite of TRIPLEHORN 1965. DOYEN (1973) speaks of parameres. Also DOYEN 1973 and DOYEN & TSCHINKEL speak of basal piece. Basale and apicale constitute the so called tegmen (KOCH, 1958; G.MEDVEDEV, 1968, p. 24, fig. 63), but not the tegmen as defined by SHARP & MUIR, which is synonym of phallobase.

G.MEDVEDEV's penis corresponds to aedeagus of SNODGRASS; at the base of this organ in Opatrinae sometimes two apophyses are recognizable. KOCH's (1958) penis corresponds to aedeagus and aedeagus to phallus. Limiting to a few examples of authors who use other terminologies I quote DOYEN & TSCHINKEL (1982) according whom in Coleocnemis (p. 144) the median lobe or penis is adnate to the basal piece of aedeagus, so admitting that aedeagus is somewhat more complex and comprehensive than penis. Actually, according to SNODGRASS, penis is something more comprehensive than aedeagus. WIGGLESWORTH (1953) considers aedeagus the same as intromittent penis ad not a part of penis. BLAISDELL (1909) speaks of eedeagophore (recte aedeagophore) instead of tegmen; the terms apicale and eedeagus (recte aedeagus) are used in the correct sense (Pl.1, n.3 and 19; Pl.2, N.1 and 8). LA RIVERS (1943) following BLAISDELL, speaks for Eleodes of eedeagophore instead of tegmen; SPILMAN, in his accurate description of the Ulomine Doliodesmus charlesi uses SNODGRASS' nomenclature, though instead of phallobase and aedeagus he speaks (figs 4-7, p.150) of ventral part and dorsal part respectively. In SPILMAN's work on Salpingidae (1967) penis is aedeagus; in WATT's work on Perimylopidae (1967) aedeagus is tegmen; from the figure (fig. 11, p.112) aedeagus is apparently visible at apex. In his work of 1970 he calls aedeagus the tegmen and penis the aedeagus (p. 248, figs 13-14). In TRIPLEHORN's work on Megasida (1967) "male" aedeagus (probably a lapsus) is tegmen (indeed the author speaks of "apical sclerite"); the same holds for his work on Diaperini of 1965 (aedeagus). TRIPLEHORN & WATROUS (1979) studying some American Phaleria use the name penis for aedeagus. It should be useless to go on with this review.

In this paper the term aedeagus will be used in SNODGRASS's sense; phallobase will be called basale; let us mention that according to SNODGRASS the phallobase is often a sclerotic ring and sometimes forms a cylindrical theca completely investing the aedeagus. In some species here described the basale is fused with the apicale to form a tegmen; the apicale very often is represented by the parameres, in some cases completely fused.

MATERIAL AND TECHNIQUE

The material utilized in this work mainly comes from author's personal collection; only partly it belongs to some European Museums such as British Museum (N.H.), Munich Staatsammlung, Hungarian National Museum of Natural History (Budapest) etc. Most of species of Caribbean Islands have been collected by Dr.P.W.HUMMELINCK of the Utrecht University (Antilles, Colombian and Venezuelan coast, Leeward Ids.) and by the author (Venezuelan mainland and Venezuelan islands). All species have been determined by the author, though in some instances previously determined by other specialists (Dr.KASZAB, Mr.KULZER); many of them have also been described as new by the author.

For the extraction of male genitalia the specimens were previously kept in a humidifier for

a various number of days; then the last abdominal sterna or sometimes all the abdomen was removed and the male genitalia were extracted under a stereoscopic binocular (Galileo, Milano). Very often the abdomen underwent a short boiling in diluted alkali (10 % KOH solution) in order to have all not cuticular parts destroyed and removed. The male genitalia (or better the phallus) once isolated were thoroughly washed with destiled water and let to dry up. Only in one case (Stictoderia subseriata) the transparence of the phallus has advised to make microscopic preparates. In this case, after treatment with weak alkali, followed by washing in destiled water and drying up, the piece was transferred in glacial acetic acid for dehydration, then in terpinol for diaphanization and finally mounted in Canada balsam.

All drawings have been made using a "camera lucida" of the ABBE-APÁTHY model (Koristka, Milano), with direct illumination. The original drawing have been made by Miss MARINIA-CELINA DAL MASO during the preparation of her thesis for the Doctor degree (Nat. Sciences), then the drawings have been inked by Mr. RENZO MAZZARO, technician in the Institute in which the research has been carried out. All the drawings have been made at the heighth of the stage of the microscope in order to calculate directly the exact enlargment, knowing the enlargment of oculars and objectives used for each drawing. The drawings in which lighted and shadowy parts are visible have been done by the author and inked by Mr. CLAUDIO FRISO, technician of the Institute, to whom I am much indebted.

It is a pleasure for me to thank here particularly Dr. Z. KASZAB, Director of the Hungarian Natural History Museum, Budapest, for all the help and advice he gave me since many years, and for having accepted the present paper for publication. I should mention also a visit to that Museum, in which I found the greatest liberality, since I was allowed to examine all the Tenebrionid materials and choose all the species and specimens I wished to bring with me for study. A part of the material has been already published in *Anns hist. - nat. Mus. natn. hung.*, 68, 1976: 117-140.

DESCRIPTION OF EXAMINED MATERIAL

Tentyriinae - Epitragini

Epitragus emarginatus Champion, 1884 (Fig. 1)

CHAMPION (1884): *Biologia cent.-am.*, 4 (1): 24.

Examined specimen: Los Encontrados, Maracaibo basin, near Rio Onia, leg. L. CROIZAT.

Basale well separate from apicale, both of similar length ($A:B = 1,0$). Basale only slightly broader than apicale, with almost parallel sides, though not uniformly. Apicale restricted a little after the base, then slightly widened up distal $2/3$, to restrict itself again up to apex; this is only scarcely pointed. The tip is furnished with several setae of different length and disposed somewhat irregularly. Lateral view: basale very flattened, only scarcely thicker towards the apex, apicale regularly bent dorsally, wide at the base, then rather thin up to the apex. This is apparently scarcely pointed and furnished on dorsal side with some setae. Aedeagus a little longer than apicale, gradually narrower towards apex, which is bent dorsally and quite pointed.

Epitragus roscidus Erichson, 1848 (Fig. 2)

ERICHSON (1848): *Schomburgks Reise in British-Guiana*, Leipzig, Weber, 3: 565.

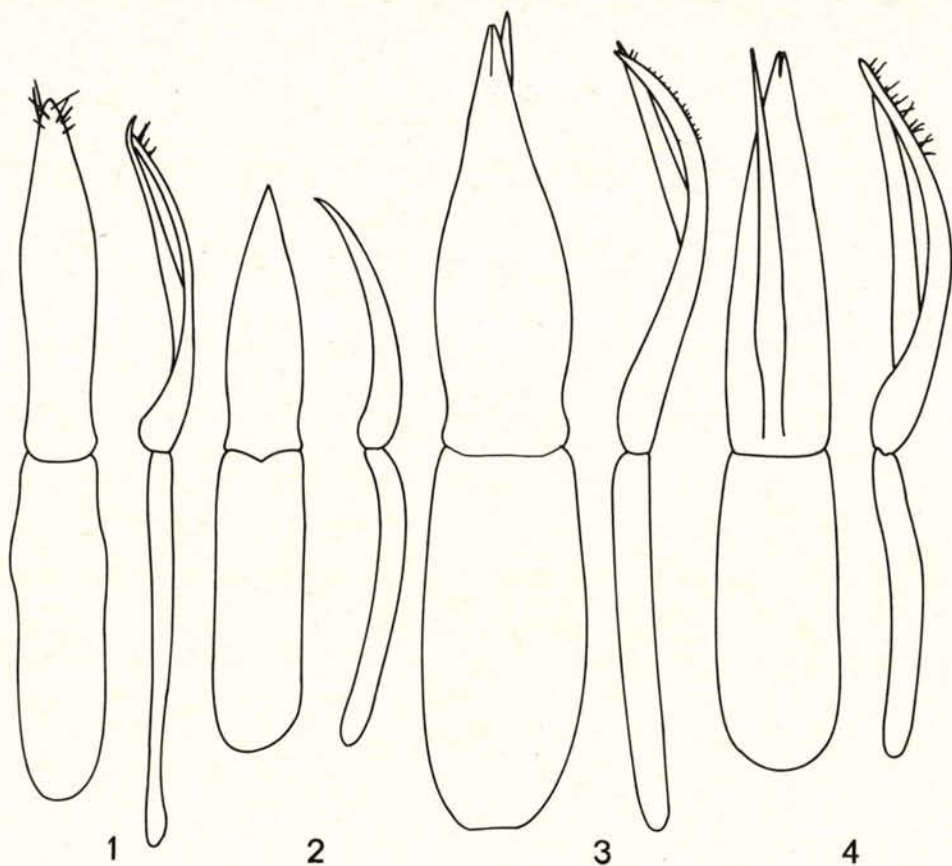
Examined specimen: Maiquetia, near Caracas, D.F., 1948, leg. G. MARCUZZI.

Highly characteristic because of apparent lack of aedeagus. Basale scarcely longer than apicale ($A:B = 0,91$), with parallel sides, apicale a little sinuate at the base, then gradually narrowed up to the apex, which is sharply pointed, lanceolate. In lateral view convex dorsally, both basale and still more apicale. Thickness of basale very uniform, that of apicale decreasing gradually and regularly from base to apex, which is a little bent ventrally and sharply pointed. Slightly sclerotized, rather transparent, relatively small compared with body size (1,66 mm long).

Epitragopsis parumpunctatus (Fairmaire, 1892) (Fig. 3)

FAIRMAIRE (1892): *Anns Soc. ent. Fr.*, 61: 78 (*Epitragus*).

Examined specimen: Aguas Negras, D.F. Venezuela.



Figs 1-4. Aedeagus in dorsal and lateral view: *Epitragus emarginatus* Champion (1), *E. roscidus* Erichson (2), *E. parumpunctatus* (Fairmaire) (3) and *E. llanensis* Marcuzzi (4)

Slightly sclerotized, pale, rather shining. Basale only scarcely separated from apicale, apparently limited to the sides (lateral view), both of the same length (A:B = 1,0). Basale with slightly curved sides, equally restricted towards base and apex; apicale a little widened near the suture, then sinuate and regularly lanceolate up to the apex, which is pointed. Interparameric suture present only at the apex. Aedeagus visible only at the apex (in dorsal view) and pointed. In lateral view the basale is flattened, with perfectly uniform thickness, well separated from apicale. This is first a little convex ventrally, then gradually narrowed and distinctly bent dorsally up to the apex, which is pointed. The apex is dorsally furnished with many very short setae, quite invisible in dorsal vision because of their erect position and extreme thinness. Aedeagus well visible in the apical part, straight, gradually narrowed up to the pointed tip.

Epitragopsis llanensis Marcuzzi, 1961 (Fig. 4)

MARCUZZI (1961): Publ. Istituto di Zoologia, Università di Trieste, No. 2: 6, fig. 8.

Examined specimen: Caucagua, Miranda (N. Venezuela).

Moderately sclerotized, basale quite separated from apicale, the latter longer than the former (A:B = 1,2). Basale broad, rounded at the base, with almost parallel sides, at the apex truncate; apicale regularly lanceolate, restricted to the pointed apex. A small short interparameric scissure is present only at the tip; aedeagus well visible, very long and thin, a little widened in the first fourth, then strictly lanceolate with sharply pointed apex. In lateral view basale a little bent with dorsal convexity, apicale regularly bent dorsally, wider at the base, then gradually narrowed. The apex is pointed, the dorsal surface is furnished with a number of setae of different length, perfectly erect so that they are not visible in dorsal view (as in *E. parumpunctatus*). Aedeagus straight, rather thin, the point (in the examined specimen) is masked by the apicale.

Stictoderia subseriata (Gebien, 1928) (Fig. 5)

GEBIEN (1928): Stettin. ent. Ztg, 89: 101 (Stictodere).

Examined specimen: Los Roques.

Very little sclerotized, light yellow, practically transparent. Apicale only partially divided from basale. Parameres almost completely fused, each of them furnished near the apex with two symmetrical setae. Length 1,4 mm.

Tapinocomus relictus Marcuzzi, 1954 (Fig. 6)

MARCUZZI (1954): Studies on the fauna of Curacao and other Caribbean Islands, No. 22: 4.

Examined specimen: Paraguaná, Las Piedras, 1948 leg. G. MARCUZZI.

Little sclerotized, transparent; very similar to the primitive forms (*Epitragus*, *Epitragopsis*) because of the completely fused parameres and a long well visible aedeagus. There is no apparent distinction between basale and apicale; sides rather parallel in the hind 2/3., then narrowed towards the point, which is slightly rounded, furnished with some long, not quite symmetrical setae (apparently three on each side). Aedeagus very long, narrow, gradually restricted up to the apex; this is pointed. In lateral view the tegmen is straight at the base, convex ventrally, and then convex dorsally before the apex. This is gradually and regularly narrowed up the tip, which is a little rounded. On the dorsal side before the apex there is a number of setae, most short, only the apical one long. These setae are not visible in dorsal vision because of their quite erect position. Aedeagus well visible, at the extremity pointed.

Tapinocomus subnudus Gebien, 1928 (Fig. 7)

GEBIEN (1928): Stettin. ent. Ztg, 89: 103.

Examined specimen: Curacao, 1948.

Very similar to *T. relictus*, from which it is easily distinguished because of aedeagus very narrow in all its length and not pointed at the apex, and because of the apex of the tegmen, widely rounded, almost truncate, furnished with only one seta on each side. In lateral vision aedeagus with rounded apex. The short setae on dorsal side are fewer than in *T. relictus*; the apical setae (two) are very long (it is difficult to establish whether these setae are the same seen in dorsal vision due to their position).

Asidini

Rhyasma costicollae Marcuzzi, 1976 (Fig. 8)

MARCUZZI (1976): Anns hist.-nat. Mus. natn. hung., 68: 119.

Examined specimen: Bolivia (East of Andes), Guyaramerin, N-Beni, 1966, leg. BALOGH, MAHUNKA & ZICSI.

Very small (0,94 mm), transparent. Apicale long (A:B = 0,37), ovoidal though narrow restricted both towards base and apex, this only a little wider than apicale. This is gradually narrowed towards the apex, which is slightly rounded; parameres well developed; aedeagus not visible. In lateral view distinctly bent by the basal 1/3; thickness almost uniform all throughout its length;

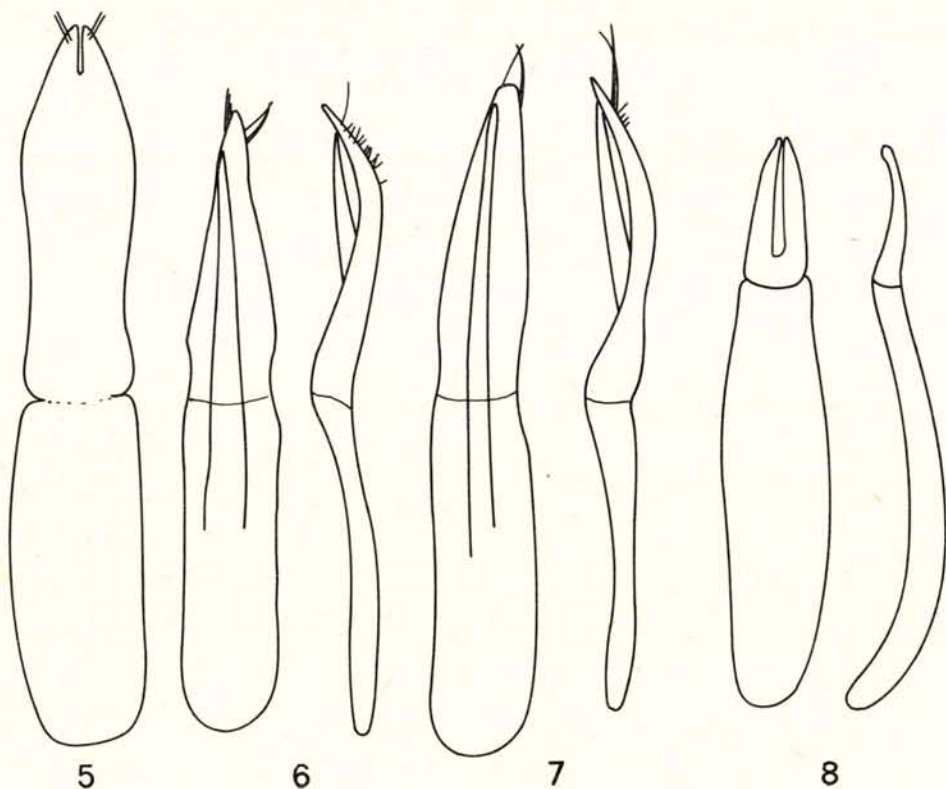


Fig. 5. *Stictoderia subseriata* (Gebien), aedeagus in dorsal view. - Figs 6-8. Aedeagus in dorsal and lateral view: *Tapinicomus relictus* Marcuzzi (6), *T. subnudus* Gebien (7) and *Rhyasma costicolle* Marcuzzi (8)

apical only slightly bent dorsally at the base, then restricted with the tip a little dilated and rounded.

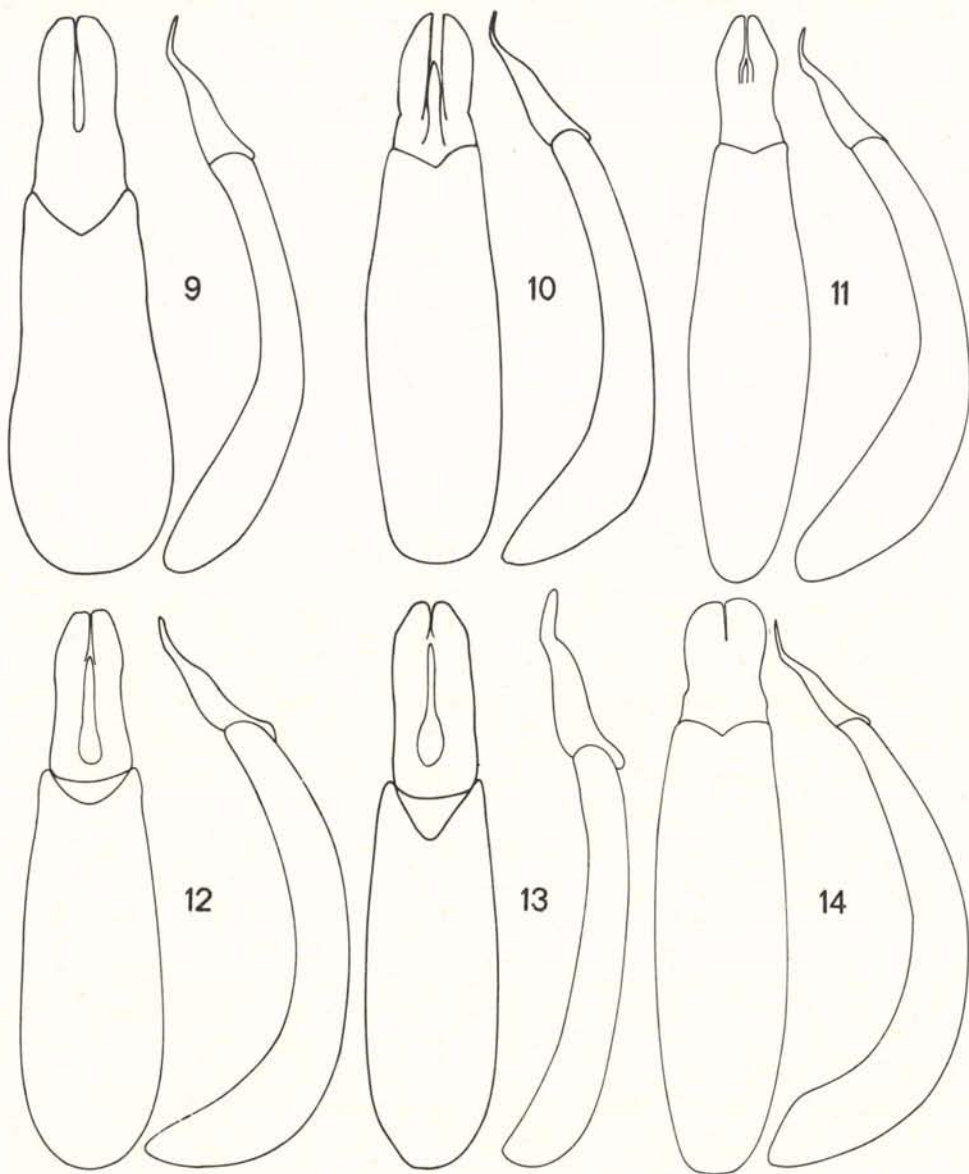
Tenebrioninae - Pedinini

Diastolinus puncticollis Mulsant & Rey, 1859 (Figs 9-12)

MULSANT & REY (1859): Opusc. ent., 9: 83.

Examined specimens: 1, Saba, Level, south slope (Fig. 9); 2 & 3, Saba, The Bottom (Figs 10-11); 4, Antigua (Fig. 12).

Strongly sclerotized, dark, dorsally convex. Basale slender, apicale much shorter ($A:B = 0,30-0,40$) than basale, abruptly narrowed at tip and bent upward in a point. Very variable also in the same locality. Parameres (dorsal view) apparently well separated so to receive the aedeagus of which a very variable portion is visible. Anyway the aedeagus is narrow, lanceolate, rather pointed at the apex. The sides of parameres also somewhat variable, from almost rectilinear to distinctly dilated at the middle (N^o2, Fig. 10).



Figs 9-12. *Diastolinus puncticollis* Mulsant & Rey: aedeagus in dorsal and lateral view; Hispaniola, Saba, Level, south slope (9), Saba, the Bottom (10, 11), Antigua (12). - Figs 13-14. Aedeagus in dorsal and lateral view - *D. sallei* Mulsant & Rey (13) and *Diastolinus* sp. (14)

Diastolinus sallei Mulsant & Rey, 1859 (Fig. 13)

MULSANT & REY (1859): Opusc. ent., 9: 80.

Examined specimen: Anguilla.

Length 2,6 mm; strongly sclerotized, dark, not very convex dorsally, the apicale long compared with the basale (A:B = 0,45). The apicale rather thick, sinuate (in lateral view), at the apex very little narrowed, with a rounded apex through which it is easily distinguishable from *D. puncticollis*. Parameres rectilinear, narrowed before the apex, this is rather rounded. Aedeagus well visible, broad at the base and then abruptly narrowed towards the apex, which is rather pointed (though less than in *D. puncticollis*).

Note. In the figure the length of the basale due to its dorsal convexity is possibly a little inferior to the real one.

Diastolinus sp. (Fig. 14)

Examined specimen: La Désirade, Pointe Doublé.

Length 3,4 mm; strongly sclerotized, dark, very convex dorsally, with a slender sinuate apicale narrowed at tip and bent upward. Basale much longer than apicale (A:B = 0,29); parameres short, broad, with slightly curved sides, at the apex almost truncate, separated only near the apex (i.e. almost interely fused). Aedeagus not visible (in dorsal view).

Diastolinus minor Marcuzzi, 1977 (Fig. 15)

MARCUZZI (1977): Studies on the fauna of Curacao and other Caribbean Islands, No.170: 18, pl.2e-f.

Examined specimen: Little Cayman, NE point, Bluff at Callabash Spot.

Sclerotized, rather long (2,78 mm long), with a body size of 6,5 mm. Dorsally convex, slender, the apicale well developed, rather broad, narrowed towards the apex which is abruptly bent upwards and pointed. Basale with rather parallel sides, apicale long, with the sides sinuate in the middle, then dilated towards the apex; the latter is subtruncate. The parameres seem to be separated only at the apex, so that the aedeagus is well visible, long, lanceolate, pointed at the tip.

Diastolinus mulsanti Marcuzzi, 1971 (Fig. 16)

MARCUZZI (1971): Anns zool.-ecol.anim., 3 (1): 79, nom.n. for *D. hummelinchi* Marcuzzi, 1962, nec *D. hummelinchi* Marcuzzi, 1950.

Examined specimen: St. Thomas, Bolongo Bay.

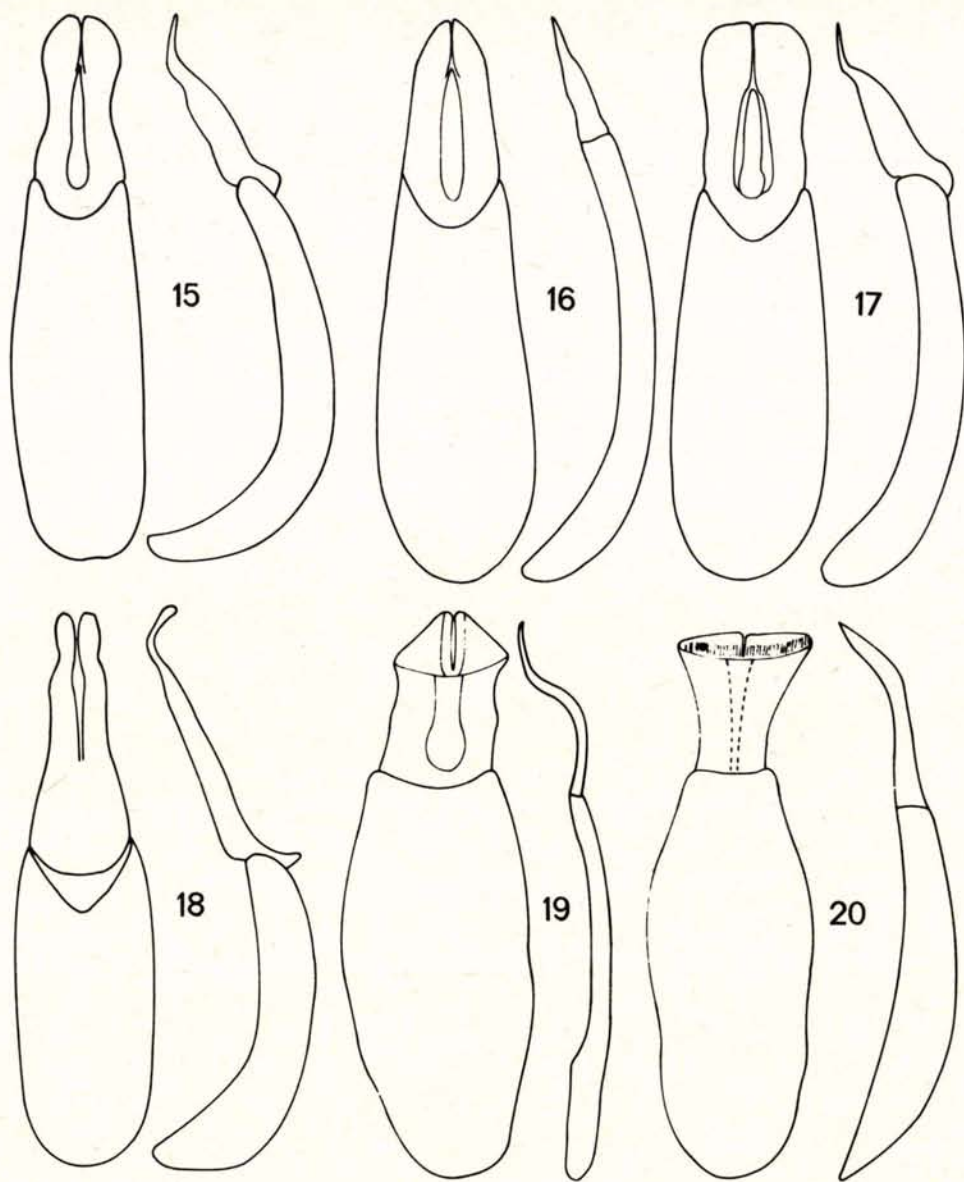
Normally developed (2,76 mm), sclerotized, very little convex dorsally, slender, with an apicale gradually narrowed towards the apex; this is pointed but not bent upwards. Basale in dorsal view rather broad, gradually and little narrowed towards apex. Apicale gradually narrowed in a continuous line with basale up to the apex, where it is somewhat pointed. Parameres apparently separated only near the apex. Aedeagus well visible, long, lanceolate, pointed at the tip. A specimen from St. John shows a quite similar aedeagus.

Diastolinus perforatus (C.R.Sahlberg, 1823) (Fig. 17)

SAHLBERG, C.R. (1823): Peric. ent. spec. ins. nondum descr. propos.: 15 (Opatrum).

Examined specimen: St. Martin, Mildrum Cul de Sac.

Normally developed (2,47 mm long), sclerotized, only slightly convex dorsally, slender. Apicale highly characteristic because of a widening near the base, after which first gradually, then abruptly narrowed, a little bent towards the apex; this is quite pointed. Basale broad and rather short (A:B = 0,45), only slightly narrowed towards the apex. Apicale gradually widened towards apex, slightly sinuate and rounded before apex; the latter is truncate as in no other species of the genus. Parameres well divided, the aedeagus is visible between, lanceolate, only feebly pointed.



Figs 15-20. Aedeagus in dorsal and lateral view: *Diastolinus minor* Marcuzzi (15), *D. mulsanti* Marcuzzi (16), *D. perforatus* (C.R.Sahlberg) (17), *D. puertoricensis* Marcuzzi (18), *D. barbudensis barbudensis* Marcuzzi (19) and *D. curtus* Mulsant & Rey (20)

Diastolinus puertoricensis Marcuzzi, 1977 (Fig. 18)

MARCUZZI (1977): Studies on the fauna of Curacao and other Caribbean Islands, No. 170: 20.

Examined specimen: Puerto Rico.

Highly sclerotized, shining, dark brown, very different from all other antillean species. Apicale only scarcely shorter than basale ($A:B = 0,88$ ca.). Basale in lateral view scarcely convex, apicale broadened at the base, then gradually narrowed, abruptly bent upwards before the apex, the latter not pointed as in most species. In dorsal view basale much wider than apicale, with the sides rather rectilinear. Apical long, in the hind half gradually narrowed, in the apical half with rather parallel sides; the latter a little sinuate before the apex, which is rounded as in no other species. Parameres well developed in the apical portion, aedeagus not visible (dorsal view). It should be difficult today to attribute the peculiar habitus of the aedeagus to the long age *Diastolinus puertoricensis* must have, compared with the rest of species, present generally on two or more islands and often generated after the isolation of Puerto Rico from other Caribbean islands.

Diastolinus barbudensis barbudensis Marcuzzi, 1962 (Fig. 19)

MARCUZZI (1962): Studies on the fauna of Curacao and other Caribbean Islands, No. 57: 29, pl. 1, fig. 8.

Examined specimen: Nevis, Mosquito Bay.

Different from all other species of *Diastolinus*, both of the Antillean islands and the Southern Caribbean ones. Very broad, basale much longer and wider than apicale ($A:B = 0,47$), wider almost twice as the apicale, in lateral view extremely flattened, almost horizontal, slender, only the apicale convex in the basal half and then bent upwards, with a rather pointed apex. Apicale tubular apparently as in the South Caribbean species, with a division only in the ventral side. Aedeagus apparently visible inside the apicale. The small size of the unique examined specimen, in dry condition (a paratypus), does not allow a better vision of details. Basing on both the original description (MARCUIZZI, 1962, p. 29, Pl. I 8) and on phallus external morphology, one would be induced to think of this species, endemic of a small group of islands distant one from another only 50 km, as of a different genus or subgenus, but at the present state of knowledge it should be risky to describe a new taxon.

Diastolinus curtus Mulsant & Rey, 1859 (Fig. 20)

MULSANT & REY (1859) Opusc. ent., 9: 93.

Examined specimen: Paraguaná, Pueblo Nuevo.

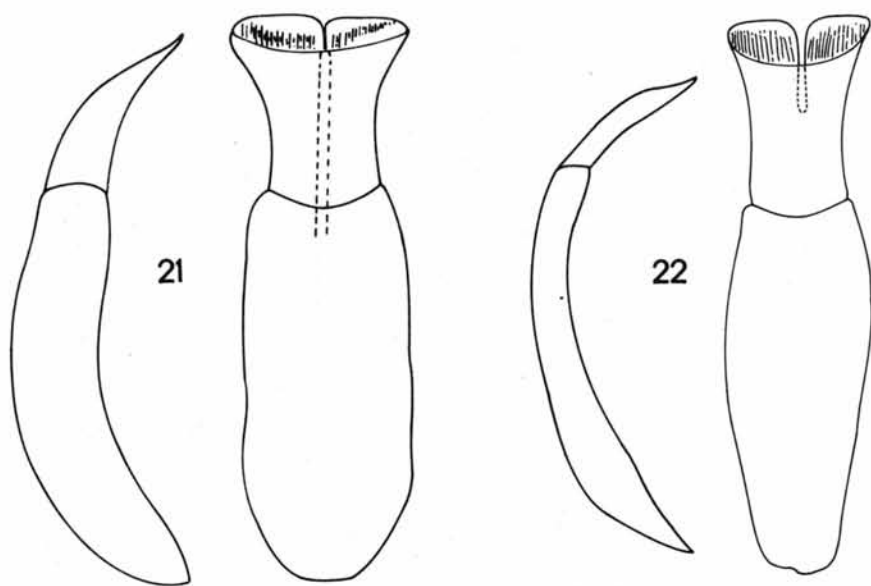
Quite different from all above described Antillean species and very similar to the other South-Caribbean elements. Basale much longer and wider than apicale ($A:B = 0,5$ ca.), maximum width of basale more than double that of apicale at its middle. Basale ovoidal, narrowed both at base and apex; apicale funnel like (a little as in *D. barbudensis*, but much more clearly and regularly) divided only a little on ventral side, towards the apex furnished with a highly characteristic micro-sculpture represented by short, narrow, longitudinal ridges, common to the other South-Caribbean species (see later). In lateral view basale only slightly convex dorsally, apicale only slightly bent towards the apex, which is pointed.

Diastolinus fairmairei Marcuzzi, 1949 (Fig. 21)

MARCUZZI (1949): Méms Soc. Cienc. nat. 'La Salle', 9: 336, 338, 344.

Examined specimen: Margarita, El Valle.

Very similar to *D. curtus* ($A:B = 0,46$) but not so wide (maximum width of basale only $1 \frac{1}{2}$ the width of apicale). The latter is also funnel-like, but not so narrow at the base as in *D. curtus*. Also in this species a very characteristic sculpture is visible before the margin of the apicale (limited apparently to ventral side). In lateral view much wider than *D. curtus*, the basale distinctly wider than the apicale, more convex dorsally, the apicale regularly and gradually narrowed towards the apex, which is well pointed.



Figs 21-22. Aedeagus in dorsal and lateral view: *Diastolinus fairmairei* Marcuzzi (21) and *D. margaritensis* Marcuzzi (22)

Diastolinus margaritensis Marcuzzi, 1949 (Fig. 22)

MARCUZZI (1949): Méms Soc.Cienc.nat. 'La Salle', 9: 338, 339, 344.

Examined specimen: Margarita, El Valle.

Very similar to that of *D. fairmairei*, but basale more developed (A:B = ca.0,40), basale in dorsal view more ovoidal, narrowed posteriorly, apicale more tubular, not so funnel-like as in *fairmairei*, with the microsculpture more extended than in the previous species. Parameres on the ventral side more widely separated than in *D. curtus* and *D. fairmairei*. In lateral view rather slender, posteriorly pointed, the apicale also slender, gradually restricted towards the apex, which seems less pointed than in *D. fairmairei* and *D. curtus*.

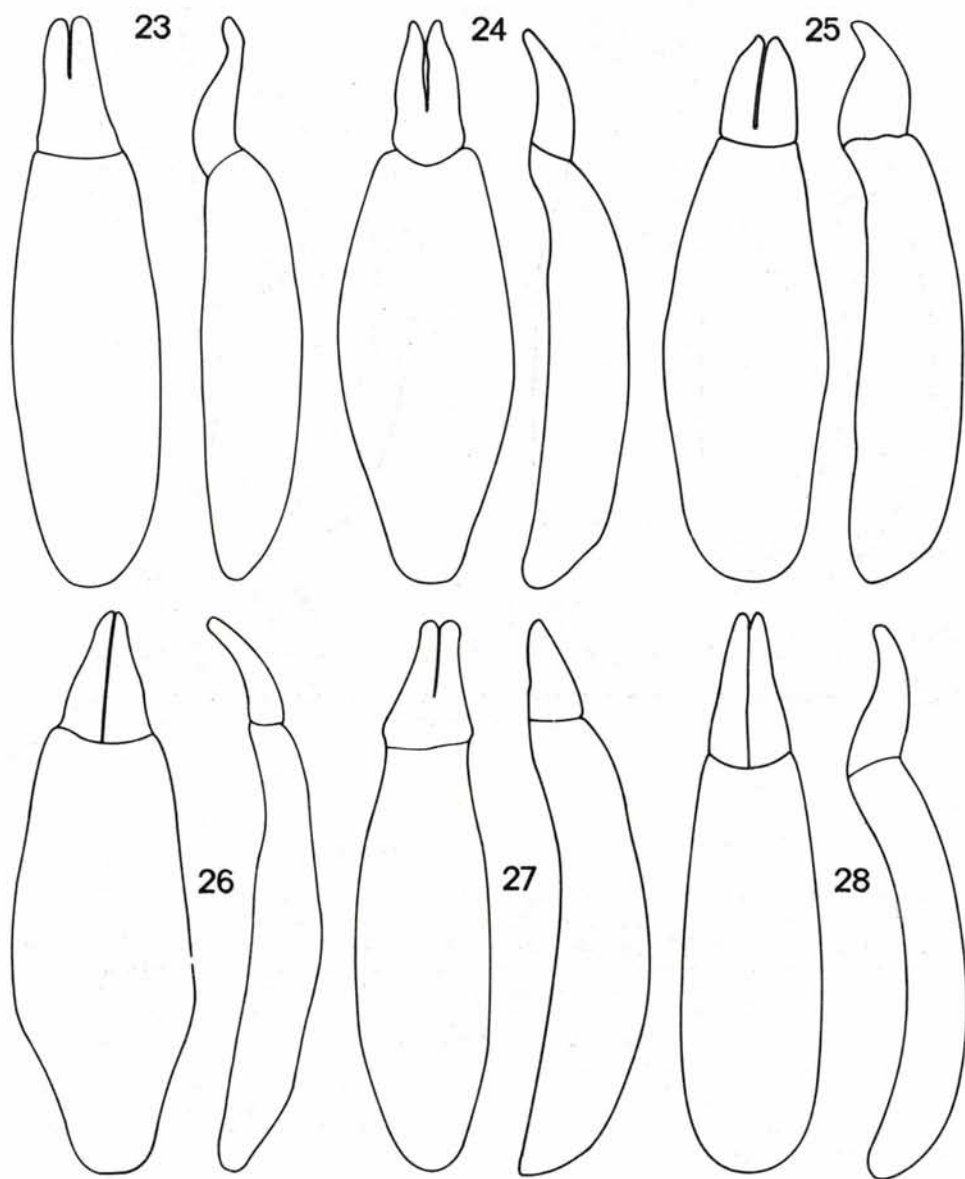
The last three species, South-Caribbean, are very different in the form of the phallus from all the true Antillean species because of the form of the apicale and the presence on the ventral edge of the parameres of a very characteristic microsculpture. This feature, associated to outer (skeletal) morphology points to a possible systematic divergence between South Caribbean and Antillean species (see Comments).

Opatrinus gemellatus (Olivier, 1795) (Fig. 23-27)

OLIVIER (1795): Entomologie, 3. No. 60: 9, pl. 8, Fig. S (Blaps).

Examined specimens: 1) Tacagua, Caracas, D.F. (Fig.23); 2) Margarita, El Valle (Fig.24); 3) Margarita, Salamanca (Fig.25); 4) St.Lucia (Fig.26); 5) Grenadines, Mustique Id. (Fig.27).

General aspect of South American and Caribbean Pedinini, very variable. Basale much more developed than apicale (A:B = 0,18-0,37), ovoidal (in a specimen from St.Lucia very wide in the



Figs 23-27. *Opatrinus gemellatus* (Olivier): aedeagus in dorsal and lateral view, Tacagua, Caracas, (23), Margarita, El Valle (24), Margarita, Salamanca (25), St. Lucia (26), Grenadines, Mustique Id. (27). - Fig. 28. *Opatrinus gridellii* Marcuzzi: aedeagus in dorsal and lateral view

hind 2/3); apicale gradually narrowed from the base, in some instances (one specimen from Margarita) sinuate before the apex, parameres constantly divided, in some instances up to the base (specimen from St. Lucia), with the apex variable from rounded to slightly pointed. Aedeagus never visible in dorsal view. In lateral view the basale is rather thick (particularly in one specimen from Margarita Id., Salamanca) gradually narrowed both towards apex and base, little convex, the apicale very variable, from rather thin, gradually narrowed and slightly convex dorsally (specimen from St. Lucia) to very short, plump, convex dorsally and then bent ventrally. The apex is constantly somewhat rounded. The great variability of both phallus and external, skeletal parts demonstrates that this species has not undergone a subspecific differentiation; sufficient to see the differences we find in two specimens from Margarita (Salamanca and El Valle, distant only a few km one from another). At the present state of knowledge one should say that O. gemellatus is the most variable as far as the phallus is concerned, unparalleled by external morphology.

Opatrinus gridellii Marcuzzi, 1949 (Fig. 28)

MARCUZZI (1949): Méms Soc. Cienc.nat. 'La Salle', 9: 338, 342.

Examined specimen: "Venezuela", coll. BRÈME.

This closely related, partially sympatric species is scarcely distinguishable from O. gemellatus by means of the phallus, which shows a regular ovoidal basale, narrowed very regularly from base to apex, an apicale also gradually narrowed from base to tip. In this species the parameres are completely divided, rather rounded at the tip. In lateral view also very similar to O. gemellatus, regularly convex dorsally, of the same thickness from base to apex, and very gently bent downwards. The point is distinctly rounded; also the length of phallus compared with that of the body is the same as in O. gemellatus (see Comments).

Opatrinus lüderwaldti Gebien, 1928 (Fig. 29)

GEBIEN (1928): Stettin. ent. Ztg., 89: 112.

Examined specimen: Brasil, Victoria (a not sufficiently localized place).

Different from the above species because of the broad ovoidal basale, widest at the middle, the apicale whose base embraces the apical part of basale, entirely divided up to the base, somewhat liguliform, with the apex gently and regularly rounded. In lateral view the basale is very flattened, very long (A:B = 0,33), the apicale at the base dilated, then gradually narrowed up to the point, which is a little obtuse.

Opatrinus laticollis Latreille, 1833 (Fig. 30)

LATREILLE (1833): in Humboldt & Bonpland Voy. reg. équinox. nouv. cont., 2: 66.

Examined specimen: "Colombia", leg. LEBAS.

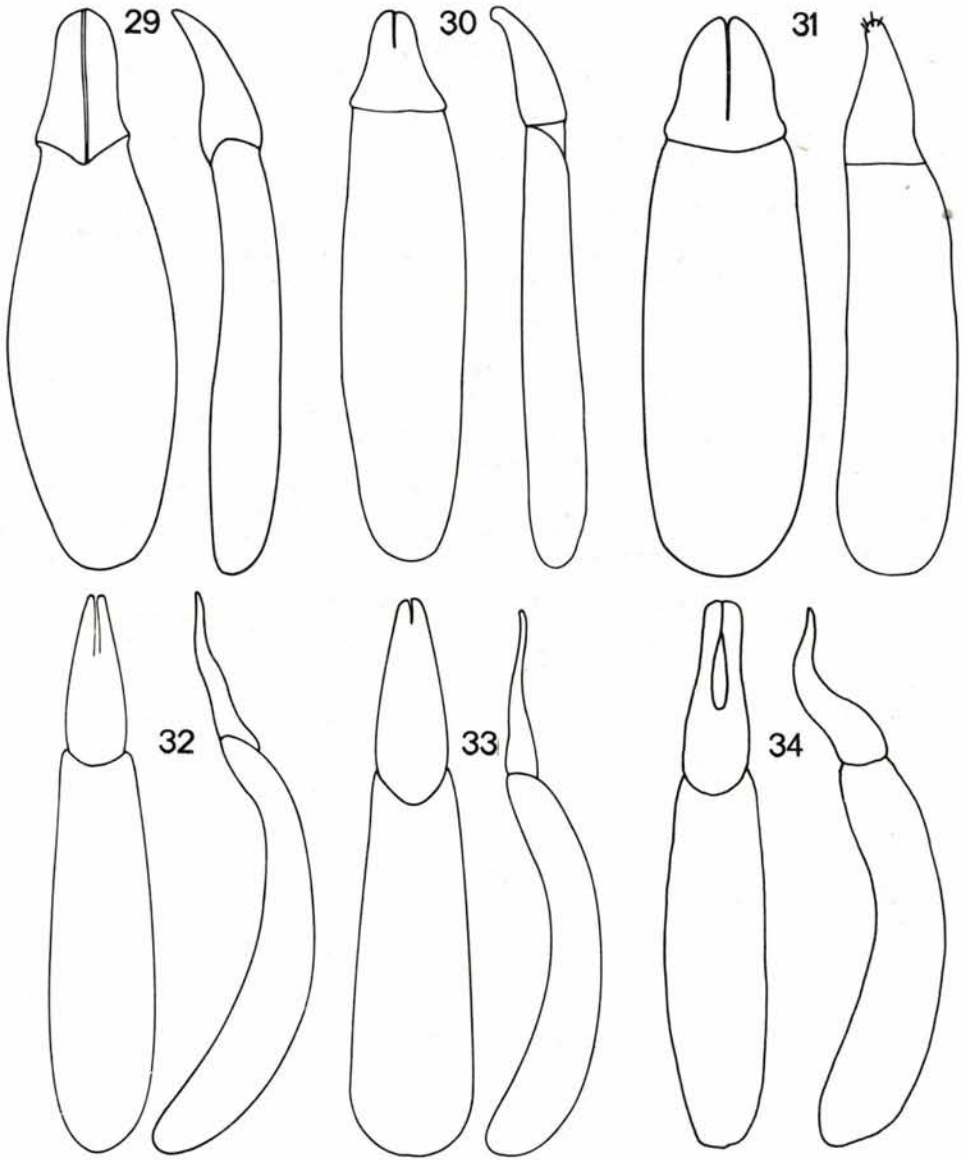
Very small (1,48 mm) and narrow, basale with almost straight, parallel, sides, rounded at the base, truncate at the apex; apicale subtriangular, with the sides of parameres sinuate, and regularly rounded at the tip; very short and narrow separation between the two parameres in lateral view the basale is perfectly flattened, gently curved at the base, very long (A:B = 0,29). Apicale gradually narrowed towards the apex, the latter gently bent ventrally and rounded. Though surely allied to O. gemellatus because of external features and geographical distribution, it is easily distinguished from it because of the triangular form of apicale and the ratio A:B.

Opatrinus puertoricensis Marcuzzi, 1977 (Fig. 31)

MARCUZZI (1977): Studies on the fauna of Curacao and other Caribbean Islands, No.170: 23, pl. 1, fig. a.

Examined specimen: Jamaica, Long Mts near Mona Reservoir.

Rather wide, basale with almost parallel sides, rounded at the base, long compared with apicale (A:B = 0,34), apicale a little widened at the base, then gradually narrowed towards the apex, which is rather rounded. Division between parameres reaching the basal fourth. In lateral view it is highly characteristic, because of the presence of some setae on the apex of the apicale, not visible in dorsal view. Basale flattened though thick, rounded at the base, truncate at the apex. Apicale regularly narrowed from base to tip. The latter distinctly rounded. It can be immediately



Figs 29-34. Aedeagus in dorsal and lateral view: *Opatrinus lüderwaldti* Gebien (29), *O. laticollis* Latreille (30), *O. puertoricensis* Marcuzzi (31), *Ulus margaritensis* Marcuzzi (32), *U. venezuelensis* Marcuzzi (33) and *Notibius rugipes* Champion (34)

distinguished from all other species of Lesser Antilles or South-Caribbean islands because of the presence of setae on the tip of apicale.

Ulus margaritensis Marcuzzi, 1954 (Fig. 32)

MARCUZZI (1954): Studies on the fauna of Curacao and other Caribbean Islands, No. 22: 10, pl. 1, figs 1-2.

Examined specimen: Coro sand dunes, Estado Falcon.

Typical habitus of Neotropical Pedinini. Basale very long (A:B = ca.0,39), only slightly narrowed from base to apex, the latter long, slender, then gradually narrowed towards the apex, which is truncate. Parameres divided only in the anterior part. In lateral view convex dorsally, gradually narrowed towards apex, with a long, sinuate flattened apicale, narrowed only gently towards the apex. The latter only scarcely pointed.

Ulus venezuelensis Marcuzzi, 1954 (Fig. 33)

MARCUZZI (1954): Studies on the fauna of Curacao and other Caribbean Islands, No. 22: 11, pl. 1, fig. 3.

Examined specimen: Maiquetia.

Similar to *U. margaritensis*, from which it can be easily distinguished because of shorter basale (A:B = ca.0,5), regularly narrowed from base to apex, apicale long, ovoidal, regularly narrowed towards apex, which is less truncate than in *U. margaritensis*, the division between parameres very short and narrow. In lateral view less bent than in *U. margaritensis*, gradually narrowed towards apex; this is long similar to that of the allied species, but not sinuate and narrow before the apex.

Notibius rugipes Champion, 1885 (Fig. 34)

CHAMPION (1885): Biol. cent.-am., 4 (1): 132.

Examined specimen: Tehuacan, Puebla.

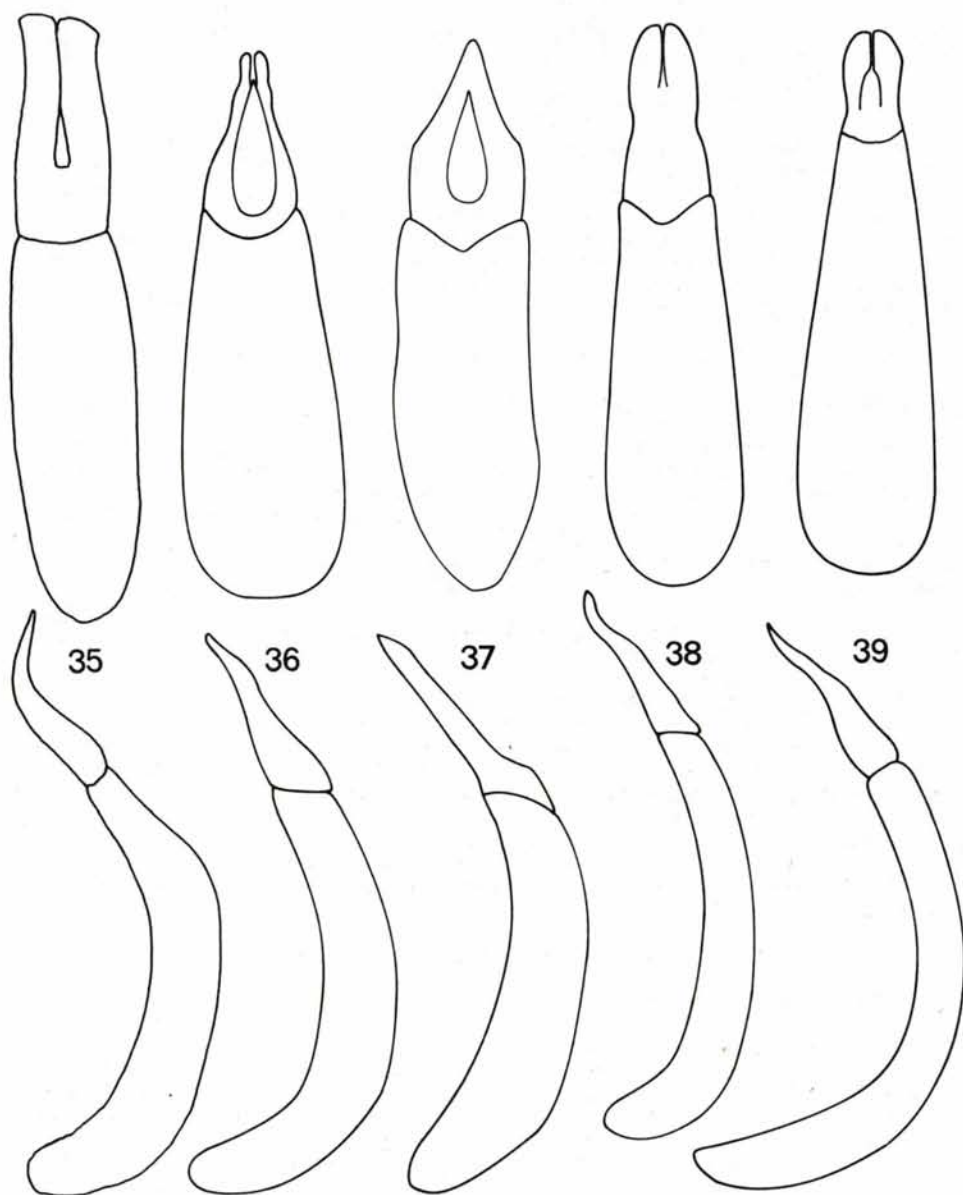
Very long and slender; basale rather long (A:B = 0,4, apicale and basale measured apart), with sides scarcely narrowed towards apex from the base, which is rounded, at apex deeply sinuate to receive the base of apicale. This is long and slender, wide at the base, then narrowed, with sides of parameres practically parallel up to the apex which is a little truncate. Aedeagus visible between the parameres in the median part, very long and pointed at tip. In lateral view extremely characteristic compared with South American genus and species because of apicale. Basale not strongly convex, with its thickness gradually lesser from base to apex; apicale wide at the base, then abruptly narrowed and very strongly bent first ventrally, then a little dorsally up to the pointed tip.

Hummelinckia caraibica Marcuzzi, 1954 (Fig. 35)

MARCUZZI (1954): Studies on the fauna of Curacao and other Caribbean Islands, No. 22: 19, pl. 7, figs 2g-1.

Examined specimen: Los Hermanos.

Very characteristic because of the straight limit between apicale and basale, which seems to be a unique feature among Caribbean Pedinini. Apicale long, very slightly narrowed from base to apex, at base scarcely rounded, at apex perfectly rectilinear, very long compared with apicale (A:B = 0,29). Apicale constituted by the parameres very long, fused only near the base, then with a suture which scarcely allows to see the aedeagus between. Sides of parameres almost of the same width at base as at apex, this is truncate, only gently curved towards the sides. Aedeagus very small, thin and pointed. In lateral view resembling very much *Notibius rugipes*, but basale much more strongly convex dorsally, apicale convex ventrally only in the basal 1/3, then rather straight; thickness of basale gradually decreasing from base to apex (which is truncate), thickness of apicale first slightly, then abruptly narrowed up to the tip, which is not quite pointed.



Figs 35-39. Aedeagus in dorsal and lateral view: *Hummelinckia caraibica* Marcuzzi (35), *Blaps* *opatrinoidea* Fairmaire (36), *B. cf. interstitialis* Champion (37), *B. brunnipes* Marcuzzi (38) and *B. relictus* Marcuzzi (39)

Blapstinus opatrinoides Fairmaire, 1892 (Fig. 36)

FAIRMAIRE (1892): *Annls Soc. ent. Fr.*, 61: 81.

Examined specimen: Colombia, leg. Moritz, coll. HAAG-RUTENBERG.

Basale wide at base, then gradually narrowed towards apex. Apicale with a rounded base, rather strongly narrowed though not regularly from base to apex, which is a little rounded. Between the two separated parameres the aedeagus is well visible, with a characteristic ovoidal shape, pointed at apex. In lateral view very bent, but with rather constant thickness all throughout its length; apicale gradually narrowed (though not regularly) with a rather rounded apex. The ratio A:B, though difficult to estimate due to the convexity of basale, is near 0,44.

Blapstinus cf. interstitialis Champion, 1886 (Fig. 37)

CHAMPION (1886): *Biol. cent.-am.*, 4 (1): 526. - *Spec. propria acc. to Blair, Gebien Kat. 439, foot note.*

Examined specimen: Mexico, Deyrolle, coll. HAAG-RUTENBERG.

Very strongly built, with a little rounded tip. Aedeagus well visible, ovoidal, with acute point. In lateral view only little bent, thickness only slightly decreasing towards the apex; apical long, straight, at the base enlarged, then of the same thickness until the tip, which is rather pointed. In the habitus it reminds a little *B. fortis*, with which it is perhaps systematically allied.

Blapstinus brunripes Marcuzzi, 1951 (Fig. 38)

MARCUZZI (1951): *Atti Mus. civ. Stor. nat. Trieste*, 18: 61, pl. 2, fig. 5.

Examined specimen: Colombia, coll. HAAG-RUTENBERG.

Rather large compared with body size (1,84 mm), lanceolate, narrowed almost uniformly from base to apex. Basale long, ovoidal, apicale gradually though not uniformly narrowed towards the tip, the apex a little truncate, the division between parameres short and rather narrow. Aedeagus not visible from dorsal side. In lateral view strongly bent at the base, then gently curved and narrowed. The apicale long, narrowed though not uniformly towards the apex, the latter a little bent upwards and only scarcely pointed.

Blapstinus relictus Marcuzzi, 1951 (Fig. 39)

MARCUZZI (1951): *Atti Mus. civ. Stor. nat. Trieste*, 18: 70, pl. 2, fig. 9.

Examined specimen: San Fernando de Apure, Venez. Llanos, 1897, leg. LAGLAIZE.

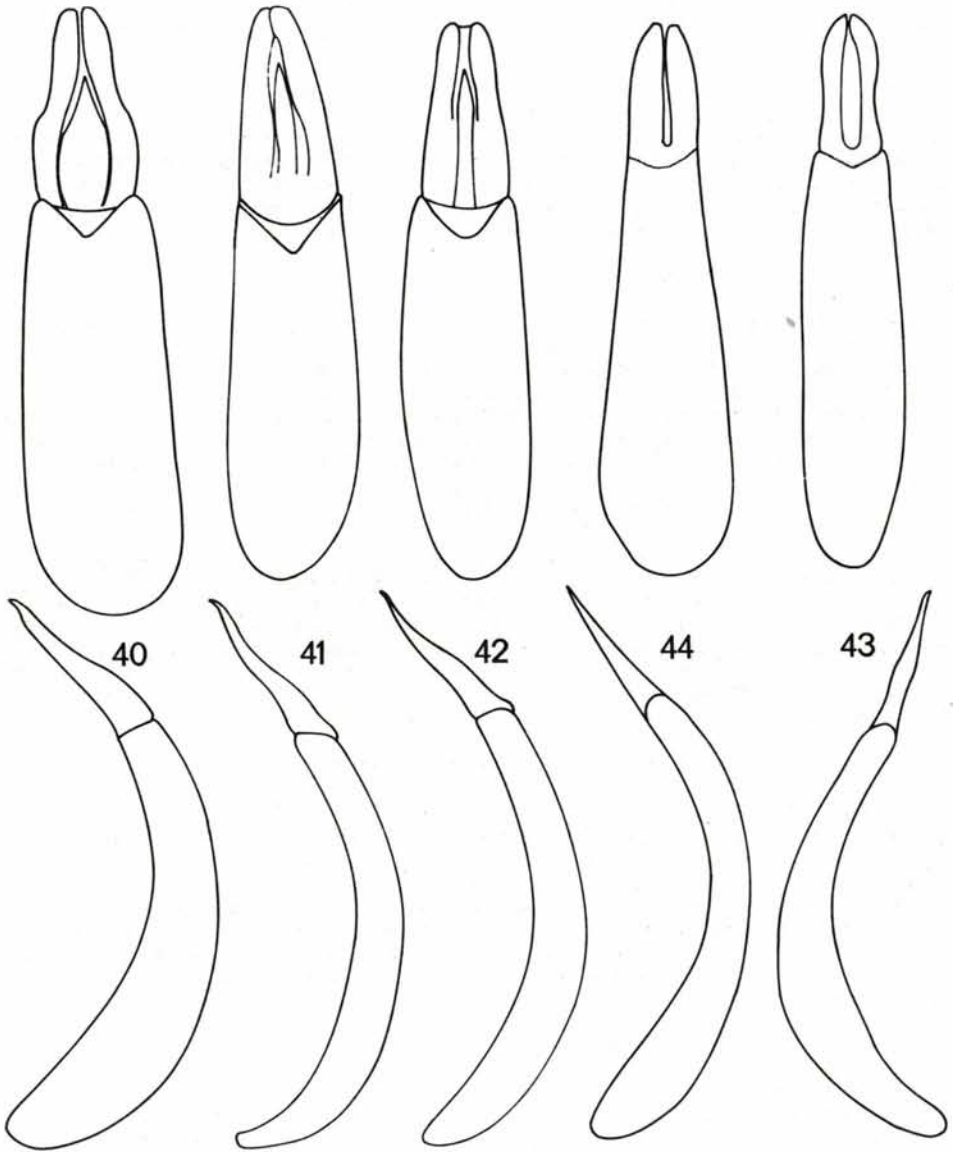
Rather large compared with body size (1,49 mm), ovoidal, regularly narrowed from base to apex, from which dorsally the basale is hardly distinct from apicale. The latter widened up to the half of its length, then narrowed up to the tip which is truncate. Interparameric division well visible but short. Aedeagus hardly visible. In lateral view strongly bent (as in no other examined species of the genus), the thickness however rather uniform from base to apex. Apicale long, narrowed first gently, then strongly towards apex; the latter is pointed. Easily distinguished from all other species.

Blapstinus buqueti Champion, 1885 (Fig. 40)

CHAMPION (1885): *Biol. cent.-am.*, 4 (1): 128, pl. 6, fig. 17 ♂.

Examined specimen: Tacagua, near Caracas, D.F., leg. G. MARCUZZI.

Short, basale sub-ovoidal with rather straight sides, apicale first slightly enlarged, then narrowed to apex, which is a little truncate. Parameres apparently quite separate by the aedeagus, ovoidal with a very sharp point. In lateral view only slightly bent, thickness gradually decreasing towards apex; apicale long, slender, scarcely bent, only the tip seems to be bent downwards and pointed. A certain resemblance in habitus with *B. fortis* is present, which has a different distribution and also a different external morphology; this is possible a sign of primitivity, supposed of course that the phallus in *Blapstinus* is a character good for systematics. We must not forget that both *fortis* and *buqueti* are among the species with the widest distribution, the former in Northern and Central America up to Cuba, the latter in Central and Southern America up to Tobago, what can be a sign of antiquity.



Figs 40-44. Aedeagus in dorsal and lateral view: *Blapstinus buqueti* Champion (40), *B. punctatus* (Fabricius) (41), *B. opacus* Mulsant & Rey (42), *B. ilanensis* Marcuzzi (43) and *B. pseudoaeneus* Fairmaire (44)

Blapstinus punctatus (Fabricius, 1792) (Fig. 41)

FABRICIUS (1792): Ent. Syst., 1: 109 (Blaps)

Examined specimen: St. John, 1955, leg. P.W. HUMMELINCK.

Long, basale narrow and much longer than the apicale ($A:B = 0,38$ c.); sides almost parallel, sinuate at the apex, parameres gradually narrowed towards the apex, which is somewhat truncate and wide. Parameres well divided; the aedeagus is well visible between: it is long, lanceolate, with a sharp point. In lateral view basale strongly bent dorsally, (so that the measure of $A:B$ is rather difficult); thickness rather uniform; apicale gradually narrowed up to the apex, which is a little bent downwards and acute.

Blapstinus opacus Mulsant & Rey, 1859 (Fig. 42)

MULSANT & REY (1859): Opusc. Ent., 9: 122.

Examined specimen: Without locality.

Extremely similar to the phallus of *B. punctatus*, which seems to be a closely allied species, allopatric with exception of St. John, where they live together. It differs because of parameres with the sides a little sinuate at the middle, separated also at the apex (whereas in *B. punctatus* they adhere); aedeagus visible up to the base of the apicale, whereas in *B. punctatus* it reaches the basal $1/4$. Parameres at the apex distinctly rounded. In lateral view very similar to *B. punctatus*; only the thickness of basale is a little narrowed from base (more dilated) to apex. Apicale long, slender, at the apex scarcely bent, pointed; $A:B = 0,36$. It is the unique case in which two species of *Blapstinus* share so much of the morphology of male genitalia.

Blapstinus llanensis Marcuzzi, 1951 (Fig. 43)

MARCUZZI (1951): Atti Mus. civ. Stor. nat. Trieste, 18: 72, pl. 2, fig. 3.

Examined specimen: San Fernando de Apure, leg. LAGLAIZE, 1897.

Very characteristic. Basale very long ($A:B = 0,38$), practically with quite parallel sides, apicale in the basal half slightly sinuated, then dilated, to restrict before the apex, which is only scarcely pointed. Parameres separated, though the aedeagus is not well visible. In lateral view strongly bent, maximum thickness at the basal $1/3$, then decreasing up to the apex, basis rounded. Apicale long, narrowed though not uniformly from base to apex, the latter is slightly pointed.

Blapstinus pseudoaeneus Fairmaire, 1892 (Fig. 44)

FAIRMAIRE (1892): Anns Soc. ent. Fr., 61: 81.

Examined specimen: Maiquetía, Caracas, 1948, leg. G. MARCUZZI.

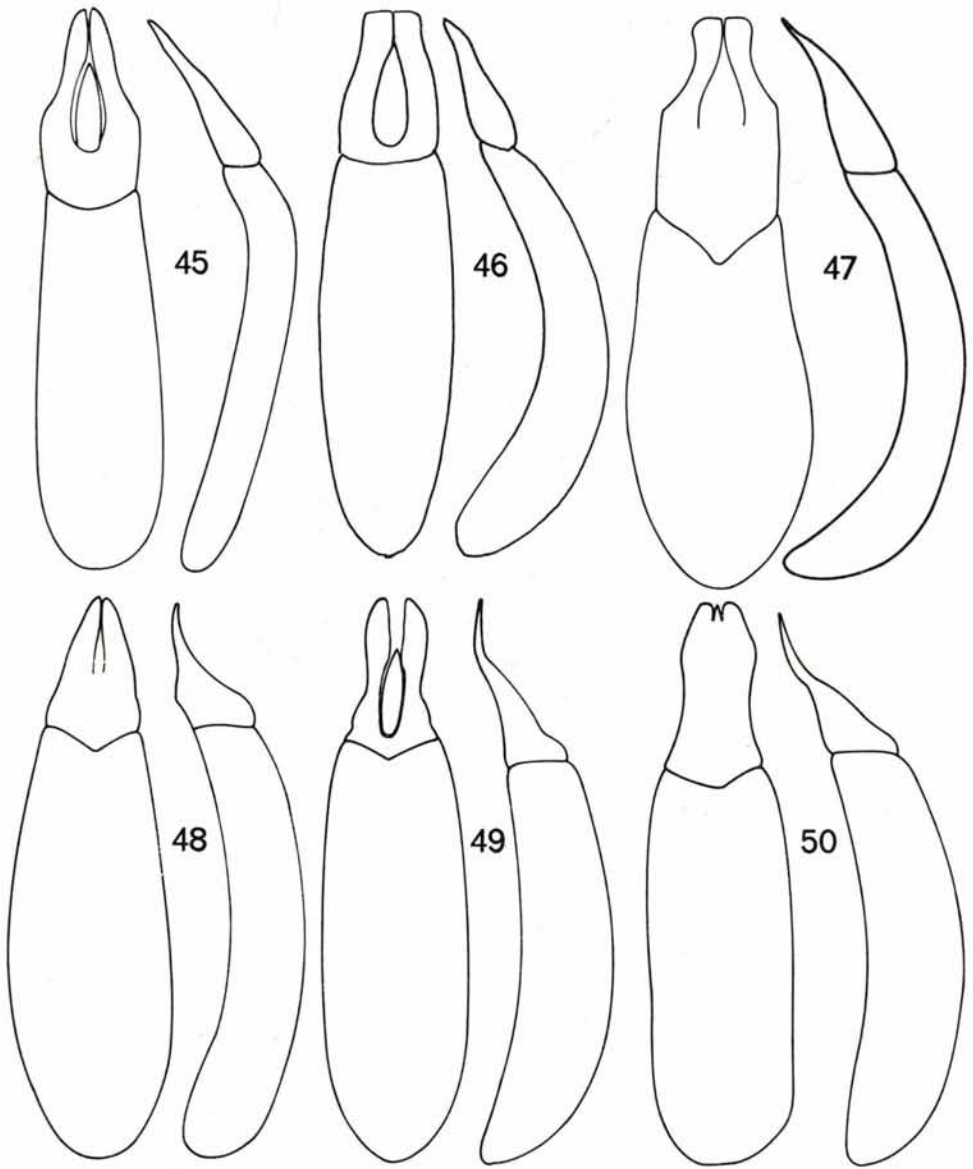
Characteristic because of no distinction between basale and apicale in dorsal view. Long, lanceolate, with a rounded base, then gradually narrowed towards apex. Parameres well separated with almost parallel sides, though a little curved. Apex truncate. Aedeagus not visible. In lateral view very convex dorsally; a suture between basale and apical well visible. Ratio $A:B$ (though difficult to calculate because of the convexity of basale) near $0,31$. Basale with maximum thickness near the base, then gradually narrowed towards apex; the apical part with a rather uniform thickness, apicale very slender, gradually narrowed from base to tip, which is distinctly pointed and straight.

Blapstinus fortis LeConte, 1878 (Fig. 45)

LECONTE (1878): Proc. am. phil. Soc., 17: 420.

Examined specimen: Guatemala, coll. MÜLLER.

Very large, compared with body size (2,43 mm), strong as in *B. buqueti*, basale not very little ovoidal, with straight sides. Apicale enlarged in its basal half, then abruptly sinuate and narrowed up to apex, which is rather pointed. Division between parameres very clear, aedeagus quite visible, lanceolate, pointed at tip. In lateral view slightly bent before apex, thickness uniform all through basale, apicale slender, gradually narrowed at tip, this only a little pointed.



Figs 45-50. Aedeagus in dorsal and lateral view: *Blapstinus fortis* LeConte (45), *Austrocaribius venezuelensis venezuelensis* Marcuzzi (46), *A. venezuelensis aragnae* ssp. n. (47), *Trichoton occidentale* Berg (48), *T. posthumum* Gebien (49) and *T. curvipes* Champion (50)

Austrocaribius venezuelensis venezuelensis Marcuzzi, 1954 (Fig. 46)

MARCUZZI (1954): Studies of the fauna of Curacao and other Caribbean Islands, No. 22: 18, figs 2a-c, pl. 4, figs 6-7.

Examined specimen: Sucre, Cariaco, 9.48, leg. G. MARCUZZI.

Wide, gradually narrowed from base to apex; basale rather long (A:B = 0,45), ovoidal, with sides only slightly curved, sinuate at apex. Apicale wide at the base, then narrowed and sinuate before the apex, which is truncate as in no species of genus *Blapstinus* (to which *Austrocaribius* seems to be closely allied and with which is sympatric). Parameres well divided with exception of base; aedeagus well visible between, wide, lanceolate at the tip, this is pointed. In lateral view strongly convex dorsally, thickness of basale lesser from base to apex, apicale gradually narrowed up to the tip, which is not pointed.

Austrocaribius venezuelensis araguae ssp. n. (Fig. 47)

Distribution: San Sebastian, Llanos of Estado Aragua, SW of Carcas, Loma del Medio.
Examined specimen: locus classicus.

Different from *A.v. venezuelensis* because of apicale in the hind part with parallel sides, followed by an angularity to which a sinuosity follows up to the truncate apex. Aedeagus not completely visible in dorsal view. Base of apicale very much prolonged towards basale in which it is inserted. Basale more ovoidal than in the nominal form. A:B (measured each separately) = 0,64. In lateral view less bent than in *v. venezuelensis*, with a rather uniform thickness. Apicale at the apex quite pointed.

Opatrini

Trichoton occidentale Berg, 1883 (Fig. 48)

BERG (1883): Stettin ent. Ztg, 44: 396.

Examined specimen: Chile, coll. HAAG-RUTENBERG.

Rather small (1,58 mm), ovoidal, with basale and apicale regularly narrowed towards apex. Basale long (A:B = 0,30), apicale subtriangular, at the apex slightly rounded, parameres separate near the tip, aedeagus very little visible. In lateral view very slightly bent, thickness of basale uniform through all its length, apicale thick at the base, then abruptly pointed at the tip.

Trichoton posthumum Gebien, 1928 (Fig. 49)

GEBIEN (1928): Stettin. ent. Ztg, 89: 114.

Examined specimen: Valencia, North, Venezuela, leg. SCORZA.

Rather large (2,42 mm) basale very long, sides slightly and perfectly rounded both towards base and apex, apicale with two parameres widely separated almost up to the base; aedeagus well visible between, lanceolate, pointed. Parameres liguliform, with parallel sides, a little pointed at the apex. A:B = 0,38. In lateral view scarcely bent dorsally, thickness of basale rather uniform; apicale thick near the base, then gradually narrowed, bent upward at the tip, which is pointed.

Trichoton curvipes Champion, 1885 (Fig. 50)

CHAMPION (1885): Biol. cent.-am., 4 (1): 136, pl. 6, fig. 25 ♂.

Examined specimen: Venezuela.

Rather large (2,86 mm), basale with almost parallel sides, apicale at the base narrowed, then a little widened, to finish in two rounded tips. The parameres seem to be separated only at the tip, where the pointed apex of the aedeagus is visible. A:B = 0,45 ca. In lateral view scarcely bent at the hind 2/3; thickness only very little decreasing towards apex. Apicale very similar to that of *T. posthumum*, but less bent upwards and a little less pointed.

Trichoton cayennense Gebien, 1910 (Fig. 51)

GEBIEN (1910): Col. Cat. Pars 22: 320, nom. n. for *T. rotundatum* Mulsant & Rey, 1859, nec Curtis, 1845.

Examined specimen: Montevideo, Punta gorda, leg. G. TREMOLERAS (*cayennense* det. Z. KASZAB).

Trichoton rotundatum Curtis, 1845 (Figs 52-53)

CURTIS (1845): Trans R. Soc. ent. London, 19: 469.

Examined specimens: 1) Jujuy, North. Argentina, leg. WEYRAUCH, *T. rotundatum* C. det. KULZER 1961 (Fig. 52); 2) Rio de Janeiro (Fig. 53).

Long-ovoidal from base to apex, the latter only a little narrowed at the base; parameres separated in the anterior 1/3 only; aedeagus not visible. In lateral view slightly convex. Thickness gradually decreasing towards the apex; apicale first enlarged, then narrowed, with an apex very thin and pointed. A:B = 0,40 c.

Ovoidal, somewhat rounded at the base, then gradually narrowed. Basale long (A:B = 0,40); apicale constituted by two quite separate parameres, with the sides curved before the apex, which is rather narrow; extremity of parameres a little rounded. Aedeagus apparently very broad, with a round apex as in other observed species. In lateral view very little convex, thickness only slightly lesser towards the apex. Apicale strongly narrowed from base to apex, bent upwards and rather pointed at tip.

Trichoton plicatum Dejean (nomen nudum) (Fig. 54)

Examined specimen: Bahia (Brasil), coll. R. OBERTHÜR, ex-coll. DEYROLLE.

Basale very long (A:B = 0,33), ovoidal, apicale sinuate in the hind half, then widened and regularly curved towards the apex, which is rounded. Parameres separated in the anterior half, a little distant one from another. In lateral view slightly bent, narrowed towards the base, practically of the same thickness from the half up to the apex. Apicale gradually narrowed in the basal half, then rather thin, bent a little upwards, apex rounded. The systematic status is still doubtful (the author is going to describe this species very soon).

Trichoton sordidum LeConte, 1851 (Fig. 55)

LECONTE (1851): Ann. Lyc. nat. hist. N.Y., 5: 146.

Examined specimen: Riverside, California, leg. E. R. LEACH.

Easily recognizable because of shape of apicale. Basale short (A:B = 0,48) with almost parallel sides, rounded at the base; slightly sinuate at apex. Apicale narrowed in the basal half, then dilated and abruptly restricted towards the apex, forming a characteristic angularity before it. Apex somewhat pointed. Parameres well divided, aedeagus well visible between, exactly in the middle of the apicale. In lateral view very little convex, narrow at the base, then thickness rather uniform, truncate at the apex, apicale enlarged at the base, then narrowed, with the apex bent upwards and pointed as in no other species.

Trichoton garbei Gebien, 1928 (Fig. 56)

GEBIEN (1928): Stettin. ent. Ztg., 89: 114.

Examined specimen: San Javier, probably in North. Argentina between Corrientes and Misiones, leg. C. S. CARBONEL.

Easily recognizable because of apicale. Basale very wide, ovoidal, rather long (A:B = 0,40), at the middle wider twice the apicale at the middle. Apicale subtriangular, gradually narrowed towards the apex, only with a slight curve in the middle. Parameres separated up to the basal 1/3, aedeagus well visible between, wide, abruptly narrowed in a characteristic point. In lateral view bent in the basal 1/3, thickness practically the same all through its length. Apicale narrowed, though not uniformly from base to apex, the latter a little bent upwards and pointed.

Trichoton marcuzzii Kulzer, 1961 (Figs 57-58)

KULZER (1961): Ent. Arb. Mus. Georg Frey, 12 (1): 212.

Examined specimens: 1) Margarita Id., El Valle, leg. MARCUZZI (Fig. 57); 2) Guadeloupe, Fortes Chateaux, leg. BONFILS (Fig. 58).

Phallus very variable. - Spec. 1) Basale long, ovoidal, narrowed equally at the base and at the apex, A:B = 0,40. Apicale slightly narrowed up to the tip; this is only feebly pointed. Parameres separate at the apex but aedeagus not visible. In lateral view somewhat convex, slightly bent, thickness rather uniform all throughout the length of basale. Apicale not so thick, gradually narrowed,

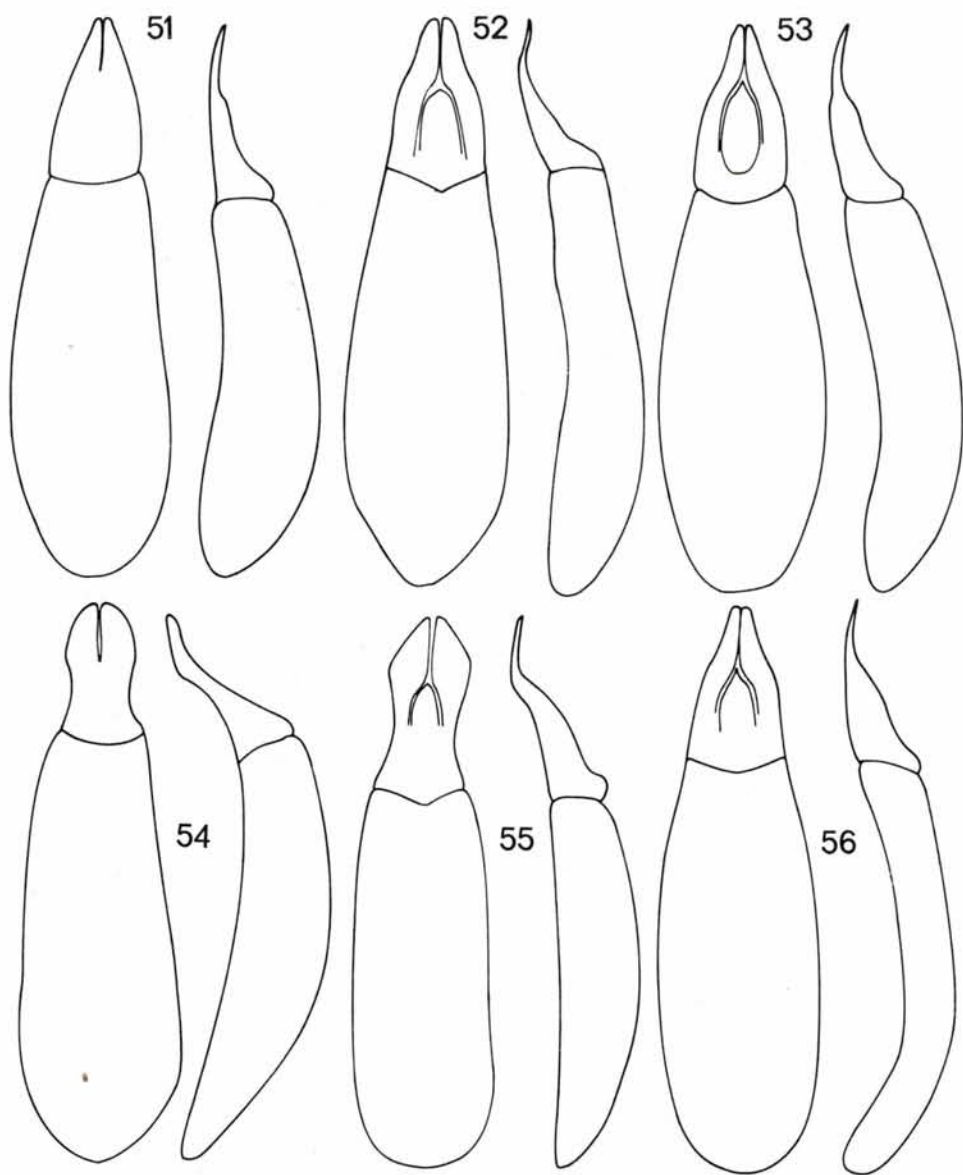


Fig. 51. *Trichoton cayennense* Gebien: aedeagus in dorsal and lateral view. - Figs 52-53. *Trichoton rotundatum* Curtis: aedeagus in dorsal and lateral view, Jujuy, North Argentina (52), Rio de Janeiro (53). - Figs 54-56. *Trichoton plicatum* Dejean (54), *T. sordidum* (55) and *T. garbei* (56), aedeagus in dorsal and lateral view

bent upward at the tip, this only feebly pointed. - Spec. 2) Shorter (A:B = 0,39) basale ovoidal, wider, apicale subtriangular, with a distinct angularity at the middle of the length, parameres slender and almost pointed, aedeagus not visible. In lateral view similar to N. 1, but apicale very regularly narrowed, pointed at the tip. In view of the great diffusion of the species, insularity of some populations and variability of the phallus it is not advisable today to name the form of Guadeloupe as a new subspecies. Much more material should be needed for it.

Trichoton lapidicola Champion, 1885 (Figs 59-61)

CHAMPION (1885): Biol. cent.-am., 4 (1): 136.

Examined specimens: 1) Venezuela, 1856, leg. MORITZ (Fig. 59); 2) Mexico, Volcan Colima, Esperanza, m 1000, coll. J. LOVE (Fig. 60); 3) Colombia, coll. HAAG-RUTENBERG (Fig. 61).

Rather well recognizable thanks to the shape of apicale, both in dorsal and lateral view. Basale subovoidal with the sides almost parallel; apicale recalling *T. sordidum*, wide at the base, then narrowed and then again widened towards the apex, which is restricted and truncate at the tip. Parameres well separate, aedeagus visible (specimen from Venezuela) or not (specimen from Mexico). In lateral view slightly convex, with a rather constant thickness. A:B = rather variable (0,32-0,50). Apicale gradually narrowed though in a not uniform way, at the apex abruptly bent upwards. The apex is long and pointed.

Ammodonus tropicus (Kirsch, 1866) (Fig. 62)

KIRSCH (1866): Berl. ent. Z., 10: 190 (Asida).

Examined specimen: Mexico, Vera Cruz.

Characteristic, as the other species (*A. ciliatus*), because of the great extension of aedeagus as long as the parameres. Basale slightly ovoidal with almost parallel sides, sinuate at the apex; apicale long (A:B = 0,63), a little triangular, with the sides gradually converging towards apex. This is slightly rounded, parameres separate with a long and wide aedeagus between. The latter is lanceolate, not pointed at the apex. In lateral view basale distinctly bent, though of a uniform thickness; basale gradually and regularly narrowed up to the tip, this is feebly pointed.

Ammodonus ciliatus (Champion, 1896) (Fig. 63)

CHAMPION (1896): Trans. R. ent. Soc. London, 41: 9 (Scaptus)

Examined specimen: N-E Venezuela, Manzanillo, leg. J. ROZE.

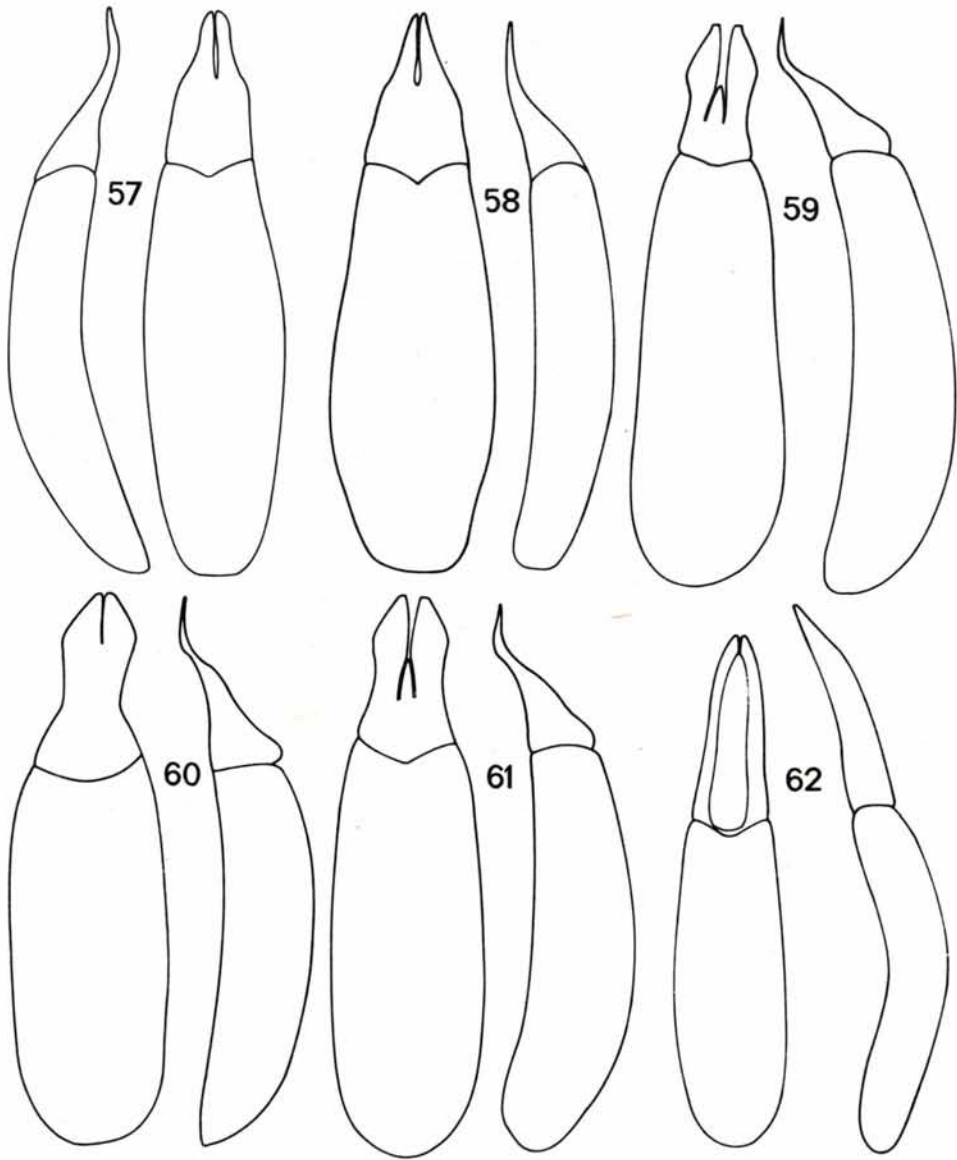
Very similar to *A. tropicus*, from which it can be distinguished through the aedeagus, a little narrower with almost parallel sides, but particularly because of lateral view, in which the basale is convex but less bent and whose thickness varies from base to hind 1/3, then narrowed towards the apex. Apicale more slender than in *A. tropicus*, sinuate dorsally after the base, then narrowed only near the apex, which is somewhat rounded. A:B = 0,60.

Trichotoides hintoni (Kaszab, 1949) (Fig. 64)

KASZAB (1949): Ann. Mag. nat. Hist., (12) 2: 775, figs 5-6 (Ammodonus)

Examined specimen: Cumaná, Sucre, leg. MARCUZZI.

Distinctly different from all the other examined Neotropical Opatrini because of the organization of the apicale (dorsal view). Basale very broad, ovoidal, with the sides almost straight, deeply sinuate at the apex, where the apicale is inserted as in no other examined genus. Apicale first narrowed from base, then dilated in the middle and then deeply narrowed at the apex, which is a little rounded. The parameres seem to be completely separated and between the aedeagus is well visible, long, narrow, lanceolate before the apex, which is pointed. In lateral view basale very little bent, with uniform thickness, apicale gradually narrowed up to a prolonged, narrowed up to a prolonged, narrow, tip, whose apex is rounded. A:B = 0,45.



Figs 57-58. *Trichoton marcuzzii* Kulzer: aedeagus in dorsal and lateral view, Margarita Id., el Valle (57), Guadeloupe, Fortes Chateaux (58). - Figs 59-61. *Trichoton lapidicola* Champion: aedeagus in dorsal and lateral view, Venezuela (59), Mexico, Volcan Colima, Esperanza (60), Colombia (61). - Fig. 62. *Ammodonus tropicus* (Kirsch): aedeagus in dorsal and lateral view

Phaleriini

Phaleria fulva Fleutiaux & Sallé, 1889 (Fig. 65)

FLEUTIAUX & SALLÉ (1889): *Annls Soc. ent. Fr.*, (6) 9: 423.

Examined specimen: Margarita, P^{to} Fermin.

Very characteristic because its almost rectangular shape, scarcely narrowed from base to apex, before which the sides of the parameric capsule are abruptly convergent. Basale not easily separated from apicale either in dorsal or in lateral view. Apex distinctly rounded. In lateral view bent twice, first dorsally, then, towards apex, ventrally. Thickness gradually decreasing. Apex only slightly pointed. Large compared with body size (0,93 mm).

Phaleria testacea Say, 1824 (Fig. 66)

SAY (1824): Long's Exped., Philadelphia, 8, Append. 2: 280.

Examined specimen: French Guiana (coll. BRÉME).

Basale and apicale well separated, basale relatively short (A:B = 0,59, measuring apicale and basale apart); ovoidal, sinuate at apex, apicale long lanceolate, with a rounded apex (formed by the fused parameres). In lateral view very flattened, basale and apicale showing one unique axis. The thickness is very even, only in the apical part smaller, with a well rounded apex.

Phaleria chevrolati Fleutiaux & Sallé, 1889 (Fig. 67)

FLEUTIAUX & SALLÉ (1889): *Annls Soc. ent. Fr.*, (6) 9: 442.

Examined specimen: Maiquetia, near Caracas, leg. G. MARCUZZI.

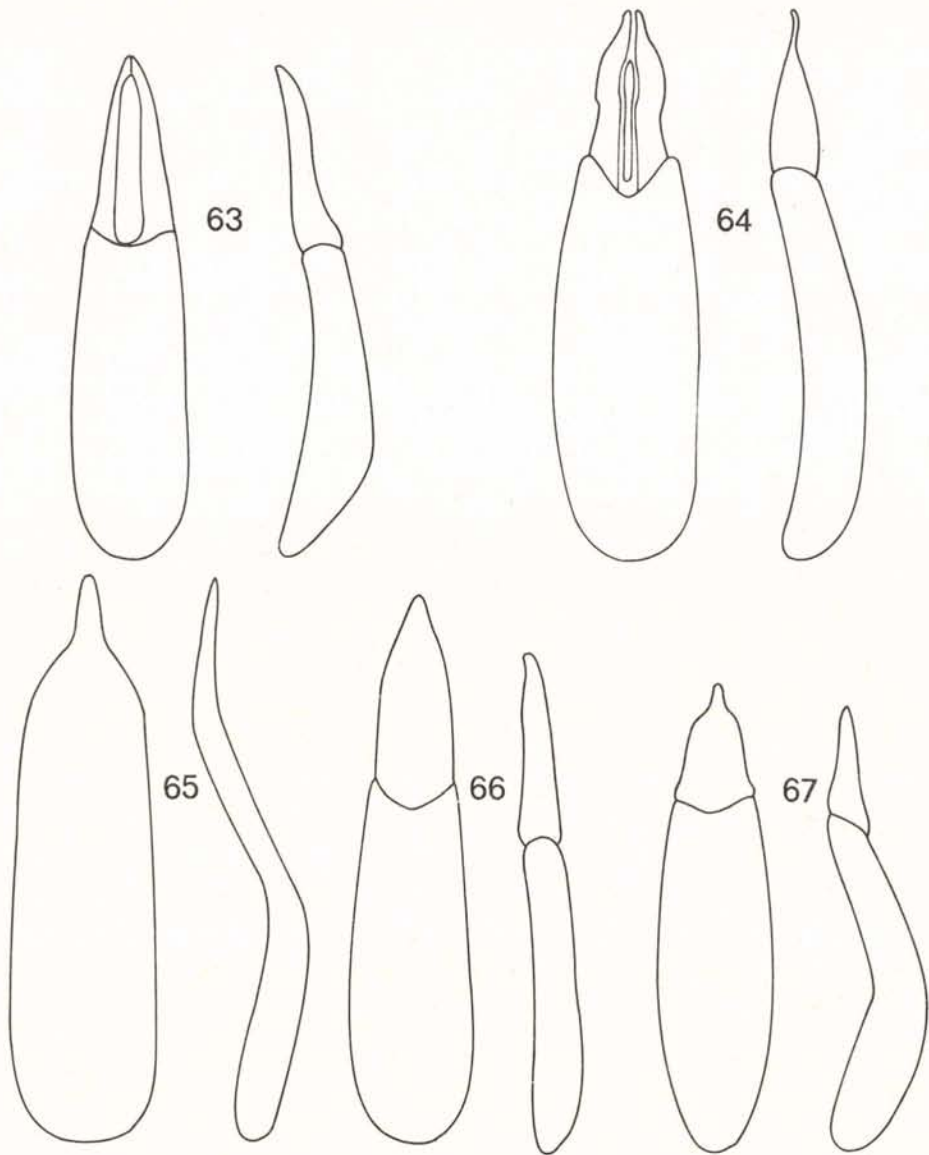
Basale distinctly separated by apicale, elliptical, equally restricted towards base and apex, long (A:B = 0,27, apicale and basale being measured each apart). Apicale sinuate after the base, then slightly narrowed to restrict abruptly before the apex; this is rounded. In lateral view strongly bent dorsally, the thickness of basale gradually smaller towards apex. Apicale like a long triangle, with a pointed apex.

COMMENTS

Though extremely limited as number of species, all three subfamilies of Tenebrionidae are represented, with a total of 5 tribus and 16 genera; of some genus several species are studied. The research is still in course, since in the present work only the tribus from Epitragini to Phaleriini are taken into consideration, i.e.; particularly the least vagile, geophilous, lapidicolous or psammophilous, often wingless species.

All species are easily distinguishable through the size, aspect and external morphology of male genitalia or phallus. In some instances the differences between the phallus of two species are more evident than those we observe in outer, skeletal characteristics of the adult. This allows us a more accurate determination of the species, whose female specimens are sometimes not classifiable at all. An example is given in genus *Trichoton* by the group *cayennense-rotundatum*; the same holds for *Diastolinus*, where there are some species (for instance those of Cayman group or the couple *sallei-puncticollis*) in which the determination of females is extremely difficult, if not impossible. In these groups however also the determination of males is much easier thanks to the examen of the genitalia. Useless to say that a further study, to begin with that of the ventral surface, not to speak of inner structures (laciniae, clavae, struts etc.) could—at least theoretically—make still easier the determination.

Though the present results are based on a small number of species we may speak of some phylogenetic affinities at least in two groups, the Epitragini of the Dutch Leewards Islands off the coast of Venezuela and the genus *Diastolinus*, limited to Caribbean islands and to northernmost part of South America, namely Goajira and Paraganá Peninsulas. Among Epitragini *Tapinocomus* is extremely similar to Epitragus + Epitragopsis and should be considered as derived in relatively recent epoch from this group of continental Epitragini through the isolation of Paraguan Peninsula and the nearby islands Aruba, Curaçao and Bonaire. Stictoderia exhibitis more evolved characters and points to a much older separation from the rest of Epitragini. Its geographical distribution is consistent with this idea (from Curaçao and Bonaire up to Los Hermanos). In this connection



Figs 63-67. Aedeagus in dorsal and lateral view: *Ammodomus ciliatus* (Champion) (63), *Trichotoides hintoni* (Kaszab) (64), *Phaleria fulva* Fleutiaux & Sallé (65), *Ph. testacea* Say (66) and *Ph. chevrolati* Fleutiaux & Sallé (67)

we may mention GEBIEN's rightfulness in considering Tapinocomus well separated from Stictoderia (p. 103). The morphology of the phallus of Stictoderia is a confirmation of GEBIEN's word (p. 101) "Ich stelle diese neue Gattung nur mit Vorbehalt zu den Epitraginen . . . Stictoderia ist vorläufig an das Ende der Epitraginen zu stellen". Perhaps a more thorough study of male genitalia and possibly also of female genitalia could demonstrate that it belongs a new tribus.

As far as Diastolinus is concerned, in my previous studies (see Bibliography) I had observed the great systematic distance existing between the Antillean species (Bahamas, Cayman and the Antilles proper) and the Southern Caribbean species, living on the coast or on the islands immediately off shore (Leeward Islands). The first are constantly larger, have very often reduced or even absent elytral striae and in the Antillean species the last articles of the antennae are yellowish or reddish yellow; the second group of species have constantly well visible elytral striae (reduced only in D. curtus), are smaller and exhibit constantly completely dark antennae. On the ground of the examen of the phallus, it should be possible to consider the two geographical groups as two subgenus if not two different genus. The species of the Caribbean Islands have formed when Greater and Lesser Antilles were still united, but after the southern Lesser Antilles (with the near Continent) have been completely separated from the northern Lesser Antilles; after that epoch in the southern Lesser Antilles there has been the possibility of immigration and/or neoformation of Schoenicus, Uloma spp., Ammodonus ciliatus, Alegoria dilatata, Epitragus roscidus.

The South Caribbean group of Diastolinus is formed by D. chevrolati (Barranquilla, Colombia), D. fairmeirei, D. curtus, D. margaritensis, D. impressicollis (Trinidad). If we examine now the phallus of Diastolinus s. lato (or sensu GEBIEN) we observe a quite peculiar habitus in D. barbudensis, different from both Antillean and South Caribbean stocks. In my previous paper of 1962 (p. 29-30), when I described this species, I affirmed "D. barbudensis should be easily distinguishable by the absence of elytral striae, unpunctate interstriae, extremely small scutellum and, lastly, by the golden recumbent pubescence on the upper surface. It might possibly belong to a new genus, different from Diastolinus". I think the study of the phallus could not bring better results.

We have shown the undoubtful importance of external male genitalia for systematic tasks, and for an approximate phylogenetic setup inside a genus and sometimes a tribus (e.g. Diastolinus, Austrocaribius, Hummelinckia, Trichotoides, Caribbean Epitragini etc.), there the morphology of phallus, together with the external morphology of exoskeleton, is sufficient to recognize a certain systematic affinity vs. diversity in a subjective, qualitative way, but the knowledge of male genitalia could be better utilize in the study of the so called OTUs (or operational taxonomic units). Indeed the quantitative systematics, and more specially the phenetic and cladistic classification, is more and more extending. In recent times also several proposals have been made for a reassessment of the enormous coleopterous family of Tenebrionids. Useless to say that any proposal was different from all others¹. It is not my aim, of course, to speak of phylogenesis basing on the external morphology of the phallus of 56 species, but what I would emphasize is the relatively scarce attention phallus has so far received by workers². So I do not fully agree with DOYEN & TSCHINKEL when they say that, compared to the ovipositor, aedeagal structure is rather simple and uniform except for details and its value in higher classification is limited. It is true that the same modifications can appear in several distinct tribus, but still there are some details which seem to be characteristic only of some group. DOYEN & TSCHINKEL say that clavae are restricted to Opatrini and Pedinini; some other tribus however can show laciniae instead of clavae; some groups such as Nicandra, Diestecopus, etc. offer a bilobed aedeagus, a character that perhaps - through a more thorough study - could be utilized in cladograms and computerization. We may mention also the case of Crypticus (KOCH, p. 124) where the aedeagus may be absent and in its place we find two laciniae. Nicandra (Drosocrhini or Helopinini) where there are parameral processes (p.183); Diestecopus where there is an additional sclerite on inner surface of aedeagus

¹ DOYEN (1973, p. 79) speaking of phylogenesis of Tenebrionids and of numerical methods (here included OTUs) says that "at any rate it is apparent that the stability promised by numerical taxonomy has not yet been attained, a conclusion shared by other workers (MICHENER 1970, EADES 1970, HULL 1970)".

² DOYEN (1973, p. 77) says that "external genitalia, especially of the males, offer important characters of higher classification of Tenebrioninae, as indicated by KOCH (1960)". It is a pity that he does not know KOCH's work of 1958 on the Tenebrionidae of Angola.

(p.186), or *Crypticus quisquilius*, where besides laciniae, there are also two intermediate, ventral plates (p. 123). The examples of course could be multiplied.

Lastly, a very short comment about OTUs and cladograms. In the recent work by DOYEN & TSCHINKEL we find in their cladograms some isolated Tenebrionid genus such as *Rhypasma* and *Nothrotres*. Without entering absolutely in merit of the goodness of treeness of such cladograms, what I feel is that maybe, besides *Rhypasma* other Stenosini could have been considered, and together with *Bothrotres* other Epi-tragini. In GEBIEN's Catalogue there are 78 Stenosini and 83 Epi-tragini, and since the number is much increased. Only in the genus *Rhypasma*, thanks to my researches, the number of species (4 in GEBIEN's Catalogue) is now 15, the genus going from Costa-rica, Bolivia, Brasil and Uruguay, up to Haiti and Trinidad. We have also seen in the present work how great differences are present among Epi-tragini, provided *Stictoderia* belongs to this tribus, and how different Antillean species of *Diastolinus* are from Southern Caribbean species. I think that in phenetic and cladistic classifications both these characters, morphology of phallus and geographic distribution (which if properly used can be a good criterion to judge antiquity of taxon, indifferent whether a species or a tribus) could be employed. Indeed, DOYEN & TSCHINKEL (p. 158) rightly point to the relationships between evolutionary history and geographic distribution of Lagrini, Adellini, Goaniaderini and Pycnocerini. I think that in the study of OTUs a major space should be given to chorology, which also can be-if one has sufficient familiarity with geography and paleogeography-computerized. Of course there can be the danger of lack of sufficient knowledge about the exact distribution of a taxon. We must not forget that chorology is very often associated to mesological conditions of the territory in which a taxon is living, and that several physiological and morphological characters can be influenced - and actually are often influenced - by these conditions (presence or absence of wings, alimentary habits, length and shape of legs, morphological devices apt to defend the animal from desiccation, etc., all characters good for cladistic classifications).

REFERENCES

- ARDOIN, P. (1977): Contribution a l'étude des especes Américaines du genre *Doliema* Pascoe [Col. Tenebrionidae]. - *Annls Soc.ent.Fr. (S.n.)*, 13(1): 1-20, figs 1-20.
- BERG, F.W.K. (1883): Zur Pampa-Fauna. - *Stett.ent.Ztg.*, 44: 392-396.
- BLAISDELL, F.E. (1909): A monographic revision of the Coleoptera belonging to the Tenebrionidae tribe Eleodini inhabiting the United States, Lower California, and adjacent Islands. - *Smithson.Inst.U.S.nat.Mus.*, 63: I-XI + 524 pp, pl. 1-13.
- CASEY, Th.L. (1891): Coleopterological Notices II. - *Ann.N.Y.Acad.Sci.*, 5: 307-504, pl. 4.
- CHAMPION, G.C. (1884-1893): *Insecta. Coleoptera. Heteromera (part.)*. - in: *Biologia cent.-am.* 4 (1): I-XXXII + 1-572, pl. 1-23.
- CHAMPION, G.C. (1896): On the Heteromeres Coleoptera of St.Vincent, Grenada and the Grenadines. - *Trans. R.ent.Soc. London*, 1896: 1-54, pl. 1.
- CURTIS, J. (1845): Descriptions of the Insects collected Capt. P.P. King in the Survey of the Straits of Magellan. - *Trans.Linn.Soc.London*, 19: 441-475, figs., pl. 1.
- DOYEN, J.T. (1973): Systematics of the genus *Coleocnemis* (Coleoptera: Tenebrionidae). A quantitative Study of Variation. - *University of California Publ.Ent.*, 73: 110 pp, figs 1-53, pl.1-3.
- DOYEN, J.T. & TSCHINKEL, W.R. (1982): Phenetic and cladistic relationship among tenebrionid beetles (Coleoptera). - *Syst.Ent.*, 7: 127-183, figs 1-62.
- ERICHSON, W.F. (1848): *Die Insecten*. - in Schomburgk: *Reise in British-Guinea*, Leipzig, Weber, 3: 533-617.
- ESPAÑOL, Fr. (1960): Un nuevo tipo de Tenebrionido sakulicola de las costas del Peru. - *Inst. biol.apl.*, 31: 113-117, figs 1-3.
- FABRICIUS, J.Ch. (1792): *Systematica emendata et aucta, secundum classes, ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus*. - *Hafniae*, 1: XX + 330 pp; 2: 538 pp.
- FAIRMAIRE, L. (1889): Quelques Hétéromeres de Minas-Geraes (Brésil). - *C.R.Soc.ent. Belg.*: XXXII-LIII.
- FAIRMAIRE, L. (1892): Voyage de M.E. Simon au Venezuela (Décembre 1887-Avril 1888) 18^e Mémoire. Coléopteres Hétéromeres. - *Annls Soc. ent. Fr.*, 59: 77-98.
- FLEUTIAUX, E. & SALLÉ, A. (1889): *Liste des Coléopteres de la Guadeloupe et descriptions d' especes nouvelles*. - *Annls Soc.Ent. Fr.*, (6) 9: 351-424, 425-484, fig. 1, pl. 8.

- FREUDE, H. (1967): Revision der Epitragini (Col., Tenebrionidae) I. Teil. - Ent.Arb.Mus.Georg Frey, 18: 137-307, figs 1-24.
- FREUDE, H. (1968): Revision der Epitragini (Coleoptera, Tenebrionidae). - Ent.Arb.Mus.Georg Frey, 19: 1-112 !32-143!, figs 25-30.
- GEBIEN, H. (1910-1911): Tenebrionidae. - in JUNK, W. SCHENKLING, S.S.: Coleopterorum Catalogus, 18: 742 pp.
- GEBIEN, H. (1928): Über einige Gruppen amerikanischer Tenebrioniden (Col.Heter.). - Stett.ent. Ztg, 89: 97-164, 167-234, figs 1-27.
- HERBST, J.F.W. (1796): Natursystem aller bekannten in- und ausländischen Insecten. - Berlin, 8: 304 pp, pl. 1-49.
- HORN, G.H. (1871): Revision of the Tenebrionidae of America, North of Mexico. - Trans.Am. phil. Soc. (S.N.), 14: 253-404, pl. 14-15.
- KASZAB, Z. (1949): Vier neue exotische Tenebrioniden (Coleoptera). - Ann.Mag.nat.Hist., (12) 2: 775-782, figs 1-6.
- KIRSCH, Th. (1866): Beiträge zur Kaferfauna von Bogota. - Berl.ent.Z., 10: 173-216.
- KOCH, C. (1958): Tenebrionidae of Angola. - Subsidos para o Estudo da Biol. na Lunda, Lisboa, No. 39: 1-231, figs. 1-196, pl. 1-43, maps 1-3.
- KULZER, H. (1961): Neue Tenebrioniden aus Südamerika (Col.). - Ent.Arb.Mus. Georg Frey, 12: 205-235, figs 1-2.
- KULZER, H. (1962): Neue Tenebrioniden aus Südamerika (Col.). - Ent.Arb.Mus.Georg Frey, 13 (1): 79-100, fig. 1.
- LACORDAIRE, J.Th. (1859): Histoire naturelle des Insectes. Genera des Coléoptères ou exposé méthodique et critique de tous les genres proposés jusqu'ici dans cet ordre d'insectes. - Paris, 5: 750 pp.
- LA RIVERS, I. (1943): A list of the Eleodes of Nevada with the description of a new subspecies (Coleoptera: Tenebrionidae). - J.Ent.Zool.Claremont, 35: 53-61, pl. 1.
- LATREILLE, P.A. (1833): Insecta. - In von Humboldt, F.H. & Bonpland, A.: Voyage aux régions équinoxiales du nouveau continent I: Recueil d'observation de Zool. faites dans l'Océan Atlantique, dans l'intérieur du nouveau continent et dans la Mer du Sud, Paris, 1: 127-304, pl. 15-25; 2: 9-138, pl. 31-43.
- LE CONTE, J.L. (1851): Description of new species of Coleoptera from California. - Ann.Lyc. nat.hist. N.Y., 5: 125-184, pl. 1.
- LE CONTE, J.L. (1878): The Coleoptera of Florida. - Proc.Am.Phil.Soc., 17: 420.
- MARCUZZI, G. (1949): Contribución al conocimiento de los Tenebrionidae de Venezuela. - Mems Soc.Cienc.nat. 'La Salle', 9: 333-352, figs 1-17.
- MARCUZZI, G. (1950): Descrizione di cinque nuove specie di Tenebrionidae del Venezuela. - Mem. Soc.ent.ital., 29: 105-109.
- MARCUZZI, G. (1951): Contributi alla conoscenza dei Tenebrionidi Venezuelani (Coleoptera). Specie inedita del genere Blapstinus, ed osservazioni su varie specie note. - Atti Mus.civ.Stor.nat. Trieste, 18: 61-80, figs 1-9, pl. 2.
- MARCUZZI, G. (1954): Tenebrionid beetles of Curacao, Aruba, Bonaire, and the Venezuelan Islands. - Studies on the fauna of Curacao and other Caribbean Islands, No. 22: 1-54, figs 1-13.
- MARCUZZI, G. (1959): Tenebrionid beetles of Curacao, Aruba, Bonaire, and Venezuela. - Studies on the fauna of Curacao and other Caribbean Islands, No. 40: 79-91, fig. 87, pl.6.
- MARCUZZI, G. (1961): Descrizione di nuove specie di Tenebrionidi neotropicali apparenti all'attributo Epitragini. - Publ. Istituto di Zoologia, Università di Trieste, No. 2: 1-41.
- MARCUZZI, G. (1961): Revisione delle specie Venezuelane della tribu Epitragini (Col.Tenebr.) con appunti su altre specie neotropicali. - Annali Mus.civ.Stor.nat.Giacomo Doria, 72: 313-352, figs 1-57, pl. 1-5.
- MARCUZZI, G. (1962): Tenebrionid beetles of the West Indies. - Studies on the fauna of Curacao and other Caribbean Islands. - No. 57: 21-48, figs 48-52, pl. 1-6.
- MARCUZZI, G. (1977): Further studies on Caribbean Tenebrionid beetles. - Studies on the fauna of Curacao and other Caribbean Islands, No. 170: 1-71, figs 1-26, pl. 1-3.
- MARCUZZI, G. & D'AGUILAR, J. (1971): Catalogue raisonné des Antilles Françaises. - Annls zool.- ecol.anim., 3 (1): 79-96, figs 1-20.
- MEDVEDEV, G.S. (1968): Zuki-cernotelki (Tenebrionidae) podsemejstvo Opatrinae Tribu Platynotini, Dendarini, Pedinini, Dissonomini, Pachypterini, Opatrini (cast) i Heterotarsini. - Fauna CCCP, zestkokrylye, 19 (2): 825 pp, figs 1-488.

- MULSANT, E. & REY, Cl. (1859) Essai d'une division des derniers Mélasomes. - Opusc.ent., 9: 65-137.
- PEÑA, L. (1974): Los Tenebrionidos del genero *Thinobatis* Esch. (Coleoptera: Tenebrionidae). - Bol.Soc.biol. Concepcion, 48: 243-252, figs 1-2.
- SAHLBERG, C.R. (1823): Periculi Entomographici, species Insectorum nondum descriptas propositur. - Aboae, Resp.A.W.Dammert, 1923: 16 pp. - Reimpr.Thon:Archiv, 2 (1) 1829: 12-31.
- SAY, Th. (1824): Keatings narrative of an expedition to the source of St.Peters River, Lake Winnepeck, Lake of the Woods under the command of Major Long 1823. - Philadelphia, 8, Appendix 2: 268-378.
- SEIDLITZ, G. (1893-1898): Tenebrionidae. - in ERICHSON, W.F.: Naturgeschichte der Insecten Deutschlands, Berlin, V (1): 201-877-
- SNODGRASS, R.E. (1935): Principles of insect morphology. - London McGraw-Hill.Publ. Co Ltd.: I-IX + 667 pp, figs 1-319.
- SPILMAN, T.J. (1963): The American genus *Mycotrogus*: a synopsis, a new species from Cuba, and a note on a larva (Coleoptera: Tenebrionidae). - Proc.ent.Soc.Washington, 65: 21-30, figs 1-21.
- SPILMAN, T.J. (1967): A new North American Ulominae genus and species, *Doliodesmus Charlesi* (Coleoptera: Tenebrionidae). - Pan. Pacific Ent., 43: 149-154, figs 1-7.
- SPILMAN, T.J. (1967): The heteromeres intertidal beetles (Coleoptera: Salpingidae: Aegialitinae). - Pacif.Insects, 9: 1-21, figs 1-44.
- TRIPLEHORN, Ch.A. (1965): Revision of Diaperini of America North of Mexico with notes on extralimital species (Coleoptera: Tenebrionidae). - Proc.U.S. nat.Mus., No.3515, 117: 349-458, figs 1-3, pl. 1-7.
- TRIPLEHORN, Ch.A. (1967): Notes on the species of *Megasida* Casey from the United States (Coleoptera: Tenebrionidae). - Ohio J.Sci., 67 (1): 38-41, figs A-F.
- TRIPLEHORN, Ch.A. (1970): A Synopsis of the genus *Apsida* with description of a new species (Coleoptera: Tenebrionidae). - Am.ent.Soc.Amer., 63 (2): 567-572, figs 1-12.
- TRIPLEHORN, Ch.A. & WATROUS, L.E. (1980): Studies in Phaleria (Coleoptera: Tenebrionidae): Lectotype designation for *P. guatemalensis* Champion and a new species from the west coast of Mexico. - Col.Bull., 34 (1): 55-61, figs 1-15.
- WATT, J.C. (1967): The families Perimylopidae and Dacoderidae (Coleoptera, Heteromera). - Proc.R.ent.Soc.London, (13) 36 (7-8): 109-118, figs 1-24.
- WATT, J.C. (1970): Coleoptera: Perimylopidae of South Georgia. - Pacific Insects Monograph, 23: 243-253, figs 1-17.
- WIGGLESWORTH, V.B. (1953): The principles of insect physiology. - 5th edn, with addenda, London, Methieu & Co.: I-VIII + 546 pp, figs 355.

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