THE GENUS PHLEPSIUS—A STUDY OF THE NORTH AMERICAN SPECIES WITH SPECIAL REFERENCE TO THE CHARACTERS OF THE MALE GENITALIA

BY

DWIGHT M. DELONG

Reprinted from LLOYDIA, Vol. 1, pp. 232-252, December, 1938

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The Genus Phlepsius

A Study of the North American Species with Special Reference to the Characters of the Male Genitalia

DWIGHT M. DELONG

(Ohio State University, Columbus, Ohio)

The most recent Synopsis of the Genus Phlepsius was published by Osborn and Lathrop[1] in 1923. At that time they treated some 80 North American species, constructed a key to these, and furnished descriptions and illustrations of the head and external genital characters.

The genus Phlepsius was erected in 1866 by Fieber on the basis of European specimens, and *intricatus* was designated the haplotype. The first treatment of the North American species was published by Van Duzee[2] in 1892. At that time he recognized 17 North American forms. No other generic treatment appeared until the work by Osborn and Lathrop. Ball treated the Mexican and Central American species[3] in 1918. Following the synoptic paper by Osborn and Lathrop, Ball published two short papers ([4],[5]) in which he discussed the synonomy of the North American forms. However, not until the present time were the male genitalia studied in detail or used as distinguishing characters of closely related species or those considered to be synonymous. The present study is based on the male genital characters although the female segments are illustrated as an aid in identification if the males are not included in the series. Type material was used as far as possible for the present study.

The Osborn, Osborn and Ball, Osborn and Lathrop, DeLong, and Sanders and DeLong types were available for this study. Through the courtesy of Dr. H. H. Knight the VanDuzee types in the Iowa State College collection were studied. Dr. R. H. Beamer very kindly lent a cotype or compared material with type specimens of four western species. Mr. Oman kindly compared specimens in the author's collection with types in the National Museum and lent paratype material from that collection. Dr. W. E. China compared specimens with the Walker types in the British Museum. Dr. A. N. Tissot furnished material from Florida. Dr. C. E. Mickel lent material from the Minnesota Collection and the specimens in the Illinois Natural History Survey Collection were made available through the kindness of Dr. T. H. Frison and Dr. H. H. Ross.

Ball established several subgenera, some of which undoubtedly deserve generic rank. The following key should be of assistance in separating the subgenera.

[1]Osborn, H. & Lathrop, F. H. Anns. Ent. Soc. Amer. **16**:310-362. 1923.
[2]VanDuzee, E. P. Trans. Amer. Ent. Soc. **19**:63-82, 1892.
[3]Ball, E. D. Anns. Ent. Soc. Amer. **11**:381-389. 1918.
[4]Ball, E. D. Can. Ent. **59**:262-265, 1927.
[5]Ball, E. D. Pan. Pacif. Ent. **8**:85-89, 1931.

KEY TO GENERA AND SUBGENERA OF PHLEPSIUS GROUP

1. Head distinctly narrower than pronotum, lateral margin of pronotum strongly carinate, length nearly equaling the short diameter of the eye 8
1¹. Head as wide as or wider than pronotum 2
2(1¹). Head conical about as wide as pronotum, lateral margin of pronotum almost obsolete, not more than one fourth the short diameter of the eye, usually with distinct markings ..... *Dixianus*
2¹. Head as wide as or wider than pronotum, lateral margin of pronotum carinate, longer, at least one-third as long as the short diameter of the eye 3
3(2¹). Color patterns of elytra showing transverse banding with paler and darker shades of brown, dark red, or tawny ..... *Pendarus*
3¹. Color pattern of elytra without transverse banding 4
4(3¹). Front margin of head well produced, foliaceous 5
4¹. Front margin of head not strongly produced or foliaceous 6
5(4). Irrorations and ramose pigment lines some shade of brown ..... *Paraphlepsius*
5¹. Irrorations and pigment of wing veins blood red ..... *Josanus*
6(4¹). Vertex parallel margined, broadly rounded with a depressed transverse line back of margin. Male plates long, slender, deeply notched on outer margin forming a long conspicuous caudally directed marginal tooth ..... *Orientus*
6¹. Vertex without a depressed line back of margin. Male plates not deeply notched on lateral margins 7
7(6¹). Vertex long and flat, front flat in profile, acutely angled with vertex, margin blunt ..... *Zioninus*
7¹. Vertex short, front sloping, convex, thin, margin rounding or acute, not strongly produced ..... *Phlepsius*
8(1). Head much narrower than pronotum, vertex produced between the eyes, front long and narrow, species large, elongate ..... *Iowanus*
8¹. Head slightly narrower than pronotum, vertex more broadly rounded, front broader above, species shorter and broader ..... *Texananus*

The present treatment includes only those subgenera (Phlepsius, Pendara, Paraphlepsius, Josanus, and Zioninus), belonging to the typical Phlepsius group.

KEY TO SPECIES OF PHLEPSIUS

1. Vertex pronotum and scutellum yellowish or tawny, elytra heavily marked with brown or black pigment 2
1¹. Vertex pronotum and scutellum not distinctly marked in color in contrast to elytra ... 7
2(1). Apex of male oedagus recurved forming a ventral recurved hook ..... *hemicolor*
2¹. Apex of oedagus not recurved ventrally 3
3(2¹). Male pygofers with dorso-caudal spines directed ventrally 4
3¹. Male pygofers with ventro-caudal spines or without spines 5
4(3). Male oedagus long, slender, curved concavely upward, bifurcate at apex ..... *rossi*
4¹. Male oedagus short, as broad as long, apex truncate, enlarged ..... *particolor*
5(3¹). Male oedagus short with short dorsal and ventral processes 6
5¹. Male oedagus long, slender, curved convexly upward without dorsal or ventral processes ..... *eburneolus*
6(5). Male pygofer oblique caudally, terminating in ventral upturned spine like apex. Oedagus with very short ventral and dorsal processes ..... *fulvidorsum*
6¹. Male pygofer more truncate caudally with a long heavy dorsally directed spine on ventral caudal margin. Oedagus with a pair of rather long spines on ventral side ..... *collitus*
7(1¹). Vertex rounded in front or slightly angulate 8
7¹. Head distinctly angulate, vertex longer on middle than next the eye 37
8(7). Vertex short, margins parallel, or vertex rounded to front or both 9
8¹. Vertex slightly longer at middle than next the eye, vertex angled with front 25
9(8). Male plates obliquely sloping on inner margins from base so that plates appear divergent 10

9¹. Male plates not obliquely sloping from base on inner margin 13
10(9). Plates with sharp pointed attenuate apices ..... *obvius*
10¹. Plates with blunt apices or apices not attenuate 11
11(10¹). Male plates very short, pygofers truncate ..... *divergens*
11¹. Male plates longer or pygofers not truncate or both 12
12(11¹). Plates longer than basal width, pygofers exceeding plates, longest at dorsal caudal angle, spine on inner margins of pygofers ..... *maculosus*
12¹. Plates almost twice as long as basal width, exceeding pygofers which are longest on ventral caudal margin. Inner spine of pygofer large ..... *pallidus*
13(9¹). Vertex broadly rounded to front 14
13¹. Vertex bluntly angled with front, margin usually thick (fuscipennis group) 20
14(13). Size small, not exceeding 6 mm 15
14¹. Larger in size 7 mm. or more 17
15(14). Pale brown in color, oedagus short, apex tapered, pointed and directed caudally and apically, not recurved ..... *denudatus*
15¹. Darker brown marked with tawny or dull red, oedagus longer, apex tapered and ventrally recurved 16
16(15¹). Pygofer bluntly pointed, oedagus bifurcate at apex but without lateral spines just before apex ..... *supinus*
16¹. Pygofer rounded caudally, oedagus with lateral spines arising anterior to bifurcate apex ..... *tigrinus*
17(14¹). Male plates roundedly notched on inner margins just before apices 18
17¹. Male plates not notched on inner margins before apices, inner margins straight 19
18(17). Male plates more deeply notched, slender at apex, dorsal spine of pygofer without dorsal pointed tooth ..... *latifrons*
18¹. Male plates shorter and broader, more convexly rounded, less strongly notched, dorsal spine of pygofer with a conspicuous pointed dorsal tooth ..... *operculatus*
19(17¹). Male plates longer than basal width, dorsal portion of oedagus with a broad dorsally directed anterior process and a dorsally and anteriorly curved posterior process ..... *vanduzei*
19¹. Male plates shorter than basal width, dorsal portion of oedagus without an anterior process, slender posterior process curved dorsally ..... *nigrifrons*
20(13¹). Dorsal spine of pygofer abruptly or distinctly curved ventrally 21
20¹. Dorsal spine of pygofers straight or sinuate, not distinctly curved ventrally 24
21(20). Spine, abruptly bent, not arising in same curvature as dorsal pygofer margin 22
21¹. Spine not abruptly bent approximately the same curvature as the dorsal margin of the pygofer 23
22(21). Spine short, arising close apex of pygofer, curved over apex and not exceeding ventral pygofer margin ..... *abruptus*
22¹. Spine long, arising about middle of dorsal surface, crossing before apex of pygofer and extending decidedly beyond ventral margin ..... *siclus*
23(21¹). Spine rather short, arising near apex, extending around apex of pygofer and beyond the ventral margin ..... *continuus*
23¹. Spine much longer, tapering and sharply pointed, gently curved, extending around apex of pygofer and slightly beyond ventral margin ..... *fuscipennis*
24(20¹). Species larger, 7 mm. dorsal spine waved, apex directed caudally dorsal to pygofer apex ..... *turpiculus*
24¹. Species smaller, 6 mm., dorsal spine not sinuate, apex pointed, directed ventrally and caudally over apex and beyond ventral margin ..... *var. seminolus*
25(8¹.) Size small, less than 6 mm. in length 26
25¹. Larger, 6 mm. or more in length 31
26(25). Male pygofers with a distinct, usually long dorsally directed spine on caudal or ventrocaudal margin 27
26¹. Male pygofers without long dorsally directed spines on caudal margin 30
27(26). Pygofer spine attached at dorsal angle of caudal margin, oedagus with a heavy ventral portion and a slender convexly curved dorsal portion ..... *attractus*
27¹. Pygofer spine arising on ventral caudal margin, oedagus composed of one piece 28

28(27¹). Oedagus long, rather narrow, about the same width throughout with a short erect dorsal process about one third the distance from the base.....*certus*
28¹. Oedagus shorter and broader, wider at middle than at either end.....29
29(28¹). Pygofer obliquely sloping to pointed apex, basal spine shorter, oedagus with two dorsal toothlike processes and a blunt apex.....*altus*
29¹. Pygofer truncate caudally, basal spine long, oedagus with one dorsal blunt tooth, apex curved ventrally, tapered and pointed.....*pusillus*
30(26¹). Male oedagus composed of a long slender process curved dorsally and caudally..*optatus*
30¹. Male oedagus with a broad, elongate ventral process which has a ventrally curved pointed apex; dorsal process which arises at base elongate and almost parallel to ventral portion.....*tubus*
31(25¹). Male plates distinctly notched on outer margins about one third the distance from apex where they are abruptly narrowed then produced to form broadly rounded apices.....*mimus*
31¹. Male plates not notched nor abruptly narrowed on outer margins.....32
32(31¹). Dorsal margin of pygofer obliquely sloping to bluntly pointed apex at ventral margin' A long dorsal spine resting on pygofer margin.....*incisus*
32¹. Dorsal margin of pygofer not obliquely sloping to ventral margin, usually broadly rounded.....33
33(32¹). Male oedagus abruptly and completely recurved ventrally and widened at apex.....*lascivius*
33¹. Male oedagus not recurved ventrally.....34
34(33¹). Male oedagus composed of a heavy ventral and slender dorsal process.....35
34¹. Male oedagus composed of a ventral process or a paired ventral process, without dorsal processes.....36
35(34). Oedagus short, ventral portion only slightly narrowed before apex.....*umbrosus*
35¹. Oedagus longer, ventral portion greatly narrowed just before dorsally produced apex.....*bipartitus*
36(34¹). Oedagus composed of a pair of long slender tapering processes greatly exceeding pygofers.....*cinereus*
36¹. Oedagus composed of a single portion, enlarged at base tapered to an acutely pointed apex, a pair of short lateral processes arising near base.....*carolinus*
37(7¹). Pygofer with a long bifurcate spine process arising from the median caudal margin.....*texanus*
37¹. Pygofer without bifurcate spine process.....38
38(37¹). Pygofers with spines arising from the ventro-caudal angle.....39
38¹. Pygofer spines absent or not arising on ventro-caudal margin.....43
39(38). Oedagus in lateral view rather narrow and elongate scarcely broadened at middle....40
39¹. Oedagus in lateral view greatly broadened at middle, at least half as broad as long...42
40(39). Oedagus without teeth or spines, apex pointed and directed ventrally, pygofer spine directed dorsally and posteriorly.....*maculellus*
40¹. Oedagus with dorsal or subapical teeth, apex not directed ventrally, pygofer spine directed dorsally and posteriorly.....41
41(40¹). Oedagus with dorsal teeth between which the margin is concavely rounded, apex pointed, curved dorsally.....*irroratus*
41¹. Oedagus with barb like basally directed oblique spines just before bluntly pointed apex.....*apertinus*
42(39¹). Pygofer with dorsal caudal margin sloping to ventral apical spines, oedagus in ventral view widely bifurcate at apex.....*tennessa*
42¹. Pygofer truncate caudally, oedagus in ventral view with bifurcate tips which are proximal.....*apertus*
43(38¹). Plates very long, twice as long as pygofers, apices of pygofers constricted then produced into broadened flaplike structure.....*rileyi*
43¹. Pygofers as long as plates or scarcely exceeded by plates in length.....44
44(43¹). Pygofer tapered to bluntly pointed apex with a dorsal spine directed ventrally over apex.....*brunneus*
44¹. Pygofers without ventrally directed apical spine.....45

45(44¹). Oedagus composed of a short basal dorsally enlarged portion from which a pair of long slender divergent tapering processes extend beyond margin of pygofers ... *truncatus*
45¹. Ventral and dorsal processes of oedagus elongate ... 46
46(45¹). Ventral portion of oedagus in lateral view broad, dorsal portion slender slightly longer than ventral portion ... *torridus*
46¹. Oedagus in lateral view with ventral and dorsal processes approximately equal in width ... 47
47(46¹). Pygofer short greatly exceeded by oedagus processes; dorsal process considerably longer than ventral process ... *lobatus*
47¹. Pygofer longer, oedagus processes of approximately equal length and scarcely exceeding caudal margin of pygofer ... *electus*

Subgenus PHLEPSIUS

P. collitus Ball can be distinguished from most of the species of the genus by the color pattern alone, and in addition the pygofers with their truncate apices and long dorsally directed ventral spines and the rather short oedagus with the ventro-caudal spines separate it easily from the other yellow headed species.

P. hemicolor S. & DeL., one of the yellow headed species, has an oedagus which is quite similar in type to that of *P. tigrinus* Ball. The apices of the oedagi in each case are ventrally recurved, forming hooks at the apex in each species. Externally they show little resemblance. *P. tigrinus* is a species occurring on pine. *P. hemicolor* is a northern species.

Four species of the *fulvidorsum* group resemble each other in general color pattern but can easily be distinguished by the male genital characters which are entirely different. In *P. fulvidorsum* Fh. the oedagus is short with a short ventral and short dorsal blunt process. The oedagus of *P. eburneolus* Osb. & Lath. is long, thick at the base, with the apical two thirds slender and curved convexly upward. In the case of *P. rossi* DeL. the long slender oedagus is curved concavely upward and is bifurcate at apex. The oedagus of *P. particolor* S. & DeL. is short and broad, concavely notched on dorsal surface then broadened and truncate at the apex. The dorsal caudal surface is concavely rounded in *fulvidorsum* and *eburneolus*. In both *rossi* and *particolor* there is a dorso-caudal spine directed caudally and ventrally.

Ball previously placed *P. floridanus* Ball and *P. graniticus* O. & L. as synonyms of *P. attractus* Ball. A large number of specimens of *attractus*, *floridanus*, and the type of *graniticus* was dissected and the genitalia are identical.

Phlepsius torridus Lath. is closely related to *P. attractus* in general form of genitalia; while the oedagi are different, the long dorsal caudal spine of the pygofer in *attractus* will readily distinguish it from *torridus* which possesses a short spine in the same position.

Phlepsius denudatus Ball is a pale, blunt headed species with a dinstinctive male oedagus character. The pygofer is rounded without spines. The variety *carpolus* Ball has not been available for examination.

Phlepsius operculatus Ball and *P. latifrons* V. D. are closely related and similar in general type of both male and female genitalia. Although they can be separated by the external characters, the males were dissected and figured. The oedagi of the two species are quite similar in structure but the pygofer spine is different. In *latifrons* a dorsal spine process is lacking while *operculatus* has a distinctive dorsal spine.

Both *P. pallidus* V. D. and *P. maculosus* Osb. were described from female specimens whereas the males were never adequately described. Ball discussed these species at some length and placed *maculosus* as a synonym of *pallidus*. The female types of both species were examined and are apparently different. Likewise the males appear to be different in external appearance. The plates of *pallidus* are longer and more slender than in the case of *maculosus*. The pygofer in *pallidus* is produced caudally on the ventral margin and in *maculosus* it is longer on the dorsal caudal margin. The dorsal spine of the pygofer is long and curved in the case of *pallidus*; in *maculosus* it is short and directed inwardly. There is no doubt that these species are distinct yet closely related like *P. latifrons* and *P. operculatus*. *Pallidus* is southern in distribution and known from Florida and Texas whereas *maculosus* has a northern distribution, occurring in New York, Ohio, Illinois, and Nebraska.

Although *P. divergens* Oman was not examined, the original figure and description suggest a close relationship to *pallidus*. The male plates are even shorter than in *maculosus*, which Oman compared with his type in the National Museum.

The *fuscipennis* group is very difficult as Ball indicated in a previous discussion when he reduced *P. turpiculus* Ball to a variety of *P. fuscipennis* V.D. During the present study a large amount of material placed under the names *fuscipennis* or *turpiculus* was examined. These data seem to indicate that the group comprises several closely related species which can be separated on the basis of the caudal spine of the pygofer. *Fuscipennis* is a small dark brown species which occurs along the Atlantic coast whereas *turpiculus* is a large pale species which is western in distribution, found chiefly in the plains area and on the sand plains of Illinois, Indiana, and Ohio. The pale form from Texas described as *P. continuus* DeL. is entirely different from *turpiculus* as is also a smaller pale form from Tennessee, described as *P. abruptus* DeL. The Florida pale form differs from all of these species and is described here as *P. siclus* DeL., and the dark everglade form represents at least a variety of *fuscipennis*. The following descriptions reveal the characters which differentiate these species.

Phlepsius fuscipennis var. **seminolus** n. var.

Resembling *fuscipennis* in form and general appearance but with pygofer spine almost straight and longer than pygofer. Length 6 mm.

Vertex about one-third longer on middle than next the eyes, margin thick.

Color: Pale yellow, heavily marked with brown. Scutellum a little paler than vertex, pronotum or elytra.

Genitalia: Female last ventral segment with lateral angles strongly produced, posterior margin concavely rounded either side of a broad, central, gradually produced tooth. Male plates longer than pygofers which are tapered and bluntly pointed. Pygofer spines almost straight, exceeding pygofers in length.

Holotype male, allotype female, and male and female paratypes Belle Glade, Florida (Clifton).

Phlepsius abruptus n. sp.

Resembling *fuscipennis* in form and general appearance but with male pygofer blunt at apex and with pygofer spine short and abruptly bent. Length 6.5 mm.

Vertex short, almost parallel margined, roundedly produced, margin thick, obtusely angled with front.

Color: Cream rather evenly marked with irrorate pale brown spots on vertex, pronotum and scutellum, and with pale ramose pigment lines on elytra.

Genitalia: Male plates longer than pygofers. In lateral view oedagus almost as broad as long. Pygofers blunt at apex, pygofer spines short, directed caudally, then abruptly bent ventrally, not exceeding base of pygofer in length.

Holotype male and paratype male Bells, Tennessee, June 16, 1915 (DeLong).

Phlepsius siclus n. sp.

Resembling *fuscipennis* in form and appearance but paler in color and with pygofer spine curved ventrally and extending about one-third its length beyond ventral margin of pygofer. Length 5.5—6 mm.

Vertex short, broadly rounded, scarcely longer on middle than next the eyes, almost parallel margined.

Color: Pale yellow marked with brown. Vertex, pronotum and scutellum yellowish, rather evenly irrorate with brown. Elytra white rather sparsely marked with brown pigment.

Genitalia: Female last ventral segment with lateral angles strongly produced and rounded, posterior margin strongly concavely emarginate either side of a median slightly produced broad median tooth which is black margined. Male plates long, gradually tapered to blunt apices. Oedagus as in *fuscipennis*. Male pygofers tapered to blunt apices. Dorsal pygofer spine long, curved ventrally, crossing pygofer before apex and extending considerably beyond ventral margin of pygofer.

Holotype male, allotype female, and male and female paratypes St. Petersburg, Florida collected March 16 by Professor Herbert Osborn and in his collection. Male and female paratypes same locality in author's collection.

Phlepsius continuus n. sp.

Resembling *fuscipennis* in form and appearance, with vertex more rounded, more thickly angled with front, and with pygofer spines of male shorter. Length 7 mm.

Vertex broadly rounded, almost parallel margined, margin thickly angled with front. Vertex sloping, not flat on disc.

Color: Vertex, pronotum and scutellum cream irrorate with pale brown. Elytra white, evenly covered with fine brown vermiculate lines.

Genitalia: Female last ventral segment with strongly produced, rounded lateral angles between which the posterior margin is broadly, shallowly excavated with a broad median shallow notch. The margin is embrowned either side of notch, causing it to appear produced. Male valve broadly triangular, plates long, broad at base, gradually tapering to narrow, pointed apices. Male oedagus in lateral view almost as broad as long, apex broad, abruptly narrowed near base. Dorsal pygofer spine comparatively short, scarcely exceeding apex of pygofer in length, directed ventrally over pygofer apex.

Holotype male, allotype female, and male and female paratypes collected at Brownsville, Texas May 1-25 by Prof. J. N. Knull.

The correct identity of *P. cinereus* V.D. has apparently never been recognized since its description, and at least two other species have been confused with it. Many specimens of the paler species of the *fuscipennis* group have been labelled "cinereus". Moreover, Osborn and Lathrop placed *optatus* Crumb as a synonym of *cinereus*. Dissection of the type male showed that the oedagus is composed of a pair of extremely long, slender pointed processes while the oedagus of *P. optatus* is a single slender dorsally curved and arched process. Likewise, the plates and pygofers are entirely different. The form of the genitalia suggests that *cinereus* is most closely related to *P. truncatus* V.D.

Two very large round headed species from the southwest, *P. vanduzei* Ball and *P. nigrifrons* Ball, seem to be related to each other but differ from all other species of *Phlepsius*. The oedagi in both species consist of a ventral and more slender dorsal portion and are unique in type. The female segments are also different from the other species of the genus by having the two sides of the segment separated at the middle.

The type of *P. mimus* Baker was not examined but Ball placed *P. cottoni* Sanders & DeLong as a synonym. The illustrations were made from specimens described as *cottoni*. The oedagus is short, simple in form, and without processes.

The type of *P. micronotatus* Osb. & Lath. was examined and the male characters are exactly like those of *P. lascivius*. Ball has already placed *micronotatus* in synonomy. The heavy portion of the oedagus is recurved ventrally upon itself and is enlarged and truncate at the apex. A pair of short slender anterio-dorsal processes extend into the cavity formed by the recurved loop.

The correct identities of *P. fuscipennis* V.D. and *P. pusillus* Bak. were apparently mistaken by Osborn and Lathrop and as a consequence they redescribed *P. pusillus* and *P. collinus*. This is the common short stout form in pastures and meadows in the eastern and southeastern states, whereas *allus* is the middle western prairie species, occurring on short grasses. The oedagi of the two species are somewhat similar in general form and the pygofer in each case has a distinct caudal-ventral spine extending caudally and dorsally. This similarity does not necessarily indicate a close relationship.

It was impossible to obtain male specimens of *P. obvius* Oman for dissection, but undoubtedly it is distinctive in character. Oman has kindly lent a paratype female and the illustration of this female segment is included.

Although the margin of the head is rather sharp in *P. incisus* V.D. as compared with the thick margined vertices of the *fuscipennis* group, the genital characters are very much alike. The oedagus is similar and the type of pygofer with the accompanying caudal apical spine is exactly the same as in the *fuscipennis* group.

P. tubus Ball is unique in its genital characters. The oedagus is an elaborate structure with a ventral process, bifurcate at the apex and bearing short processes. The dorsal process which parallels the ventral portion is simpler.

The oedagus of *P. electus* DeLong resembles that of *lobatus* Osborn. Both have a long slender dorsal and a shorter slender basal process. They differ in the terminal part of these processes and in the oedagus.

P. irroratus Say, the most common species of the genus, is distinctive in external characters. The oedagus is simple in form with short spine-like teeth on the dorsal margin. *P. certus* DeLong resembles *irroratus* externally but the oedagus, which is also simple, differs by possessing a short dorsal process near the base and a truncate apex. The shape of the pygofer is different in the two species but each has a ventro-caudal spine.

Although *P. truncatus* V.D. resembles *irroratus* very closely in size, form, and color, the genitalia indicate that it is most closely related to *cinereus* V.D. thus it differs greatly from *irroratus*.

The oedagus of *P. maculellus* Osborn is short, simple in form, and resembles the oedagus of *mimus* Baker. The caudo-ventral spines are long and heavy and are directed dorsally and somewhat anteriorly.

P. tennessa DeL. and *P. brunneus* DeL. are similar in general appearance but are distinct in their male genitalia. The oedagus in *tennessa* is short and broad with laterally divergent processes at the apex. In *brunneus* the oedagus is long, curved dorsally, then caudally with the apex curved upward. In the case of *tennessa* the ventro-caudal spines of the pygofers are turned upwards and in the case of *brunneus* the spine is dorsal and curved ventrally.

P. rileyi Baker is distinct in type of oedagus, pygofers, and plates from the other species of the genus. The plates are long, the pygofers are short with terminal pointed flaps. The oedagus is erect, S-shaped enlarged on apical two thirds, and truncate at apex.

On the basis of internal male structures *P. texanus* Baker seems to be most closely related to *P. tubus* Ball but it differs entirely in the oedagus. It is unique in possessing a long bifurcate spine which arises from the oedagus on either side and extends caudally.

P. supinus DeLong, a recently described species, was for several years considered as *P. uhleri* V.D., but by comparison with the type of *uhleri* the genital characters were found to differ.

P. umbrosus Sand. & DeL. was erroneously placed in the genus *Texananus*. It is a rather large robust species and in general type of oedagus—the large ventral, and slender dorsal processes—it resembles more closely *torridus* and *attractus*.

The females of *P. carolinus* Lathrop and *P. bipartitus* DeL. are very similar in type of segment but the males are entirely different in genital characters. In *carolinus* the oedagus is composed of a single process, the dorsal portion of which is produced caudally, narrowed, and sharply pointed. In the case of *bipartitus* the oedagus is heavier and the apex is enlarged. At the base a pair of long slender processes arise dorsally, and extend caudally to the apex of the ventral portion. *P. planus* Sand. & DeL. is apparently more closely related to *carolinus* than any other species and it has the same general type of oedagus. It is distinct in color pattern, female genitalia, and other characters.

The following specimens are designated as allotypes of species as indicated in these descriptions and illustrations and are in the author's collection.

P. pallidus, male allotype. Gainesville, Fla. Sept. 29, 1932.

P. punctiscriptus, male allotype. Riley Co., Kans. Oct.

P. maculosus, male allotype. Carns, Neb. July 25, 1902.

KEY TO SPECIES OF PENDARA

1. Pygofer with conspicuous caudo ventral spines 2
1[1]. Pygofer without caudo ventral spines 3
2(1). Oedagus not greatly enlarged at middle, with short basally directed spines just before apex ..... *apertinus*
2[1]. Oedagus abruptly and greatly widened at middle ..... *apertus*

3(1¹). Pygofer notched either side of a median spine on caudal margin....4
3¹. Pygofer not notched either side of a median tooth....6
4(3). Upper notch deep, forming a pointed tooth dorsal to notch....5
4¹. Dorsal notch rounded, shallow, margin of pygofer dorsal to notch rounded.... *punctiscriptus*
5(4). Dorsal notch broad at base, U-shaped, ventral notch broad and shallow.... *slossoni*
5¹. Dorsal notch narrower at base, ventral notch narrow.... *tullahomi*
6(3¹). Pygofer with a caudal or dorso-caudal heavily pigmented margin....7
6¹. Pygofer margin not heavily pigmented....8
7(6). Pigmented caudal portion with a bluntly produced tooth at middle of caudal margin.... *lippulus*
7¹. Pigmented caudal margin rounded, without median produced portion.... *strobi*
8(6)¹. Oedagus long, slender, tapered to attenuate apex.... *optatus*
8¹. Oedagus long, slender, apex bearing a pair of rather long basally directed spines.... *palustris*

Subgenus PENDARA Ball

Four species have been described in the *punctiscriptus* group. Ball placed *P. fastuosus* Ball (known only from the female) and *P. tullahomi* DeLong as synonyms of *P. slossoni* Ball. During this study the type of *P. punctiscriptus*, the type of *P. tullahomi*, and a paratype of *P. slossoni* were examined. If these three are to be considered as one species they should all be placed as synonyms of *punctiscriptus* which is of the same morphological type. Actually the three species *punctiscriptus*, *slossoni*. and *tullahomi* show about the same degree of morphological differences This study seems to indicate that they are closely related, but specific, forms and when studied in series they possess different color marking, which can be correlated with the differences in the pygofer structures on the caudal margin as well as the different structural forms of the head.

Ball previously placed *P. franconianus* Ball as a synonym of *P. strobi* Fitch. A study of a "compared with type" specimen of *P. uhleri* Van Duzee kindly lent by Oman from the National Museum revealed its identity with *strobi* and therefore it should be regarded as another synonym of that species.

The male genital characters of *P. lippulus* Ball are of the same general type as *P. strobi* Fitch. The oedagus is very similar but the dorsal caudal portion of the pygofer has a produced part. In addition the head and coloration distinguish it from *strobi*. No male specimens of *P. fulviceps* Osb. & Lath. were available for study. Ball reduced it to a synonym of *lippulus*.

P. palustris S. & DeL. is not closely related to the other banded species. The oedagus is entirely different and seems to be more like that of *P. rossi* DeL. in general form. The head is short and very broad.

A large number of specimens of *P. apertus* V. D. and *P. apertinus* O. & L. were dissected and studied, leaving no doubt that these two species are distinct. In the case of *apertus* the terminal portion of the oedagus is broad and square on the anterior dorsal margin. The oedagus of *apertinus*

is more slender with spine-like portions near the apex directed basally. On the basis of this study *apertinus* is restored to its specific rank.

KEY TO SPECIES OF PARAPHLEPSIUS

1. Ventral portion of male oedagus long, slender, armed with four or more long barb like spines directed anteriorly on apical third ..... *nudus*
1'. Oedagus without barb like spines 2
2(1). Oedagus long, strongly curved in the form of an inverted sickle (convexly upward) ... 3
2'. Oedagus short and approximately straight or curved concavely upward 5
3(2). Dorsal margin of pygofer deeply notched, forming a dorsally directed apical spine like portion on dorso caudal margin ..... *occidentalis*
3'. Dorsal margin of pygofer not notched, spine directed caudally 4
4(3'). Caudal margin of pygofer notched, forming short dorso-caudal spine ..... *ramosus*
4'. Dorsal spine long, arising about one third the distance from apex, dorso caudal margin of pygofer tapered to bluntly pointed apex ..... *solidaginis*
5(2'). Oedagus strongly curved concavely upward, pygofer very short, with a caudal spine directed dorsally ..... *humidus*
5'. Oedagus short, almost straight, with a short dorsal process near middle, pygofer long, narrow, a dorsal spine on upper margin of pygofer directed ventrally over apex of pygofer and with a dorsal spine near apex directed upwardly ..... *bifidus*

Subgenus PARAPHLEPSIUS

The identity of *P. solidaginis* Walker was misinterpreted for some time. This name was applied to the common marsh or swamp species with a yellowish thorax which Van Duzee described as *P. humidus*. *Solidaginis* was originally described from a female specimen by Walker. W. E. China, curator of Hemiptera in the British Museum, states in correspondence that it is the species commonly called *P. nebulosus* V.D. and kindly sketched the female segment which proved beyond doubt the species to which the name should be applied. More recently he compared specimens of *humidus* V.D., *nebulosus* V.D., and *ramosus* Bak. and thus substantiated the true identity of *solidaginis*. Therefore *nebulosus* V.D. becomes a synonym of *solidaginis*, and *humidus* is again the specific name of the common marsh species.

P. occidentalis Baker is the western form of the flat headed group. The oedagus is similar in general type to those of *P. solidaginis* and *P. ramosus*, having the form of an inverted sickle shaped structure, but the terminal portion of the pygofer is entirely different. In *occidentalis* the pygofer is notched dorsally forming a caudal dorsally directed portion. In *ramosus* the pygofer is notched caudally thus forming a dorso caudal spine directed caudally. In *solidaginis* the pygofer is tapering to a bluntly pointed apex, but the large spine arises dorsally at about two thirds the length of the pygofer and extends beyond its apex.

The oedagus of *P. nudus* Ball is unique in consisting of a long, slender ventral portion with long anteriorly directed spines arising on the apical third.

The oedagus of *P. bifidus* S. & DeL. is short, simple, and similar to that of *mimus* Bak. but the dorso caudal spine which extends ventrally has a dorsal erect spine at about one-half its length.

The type specimens of *P. tenuifrons* Sand. & De.L. were examined and the genitalia are like the typical *ramosus* form. It is therefore reduced to synonymy although the head structures vary somewhat.

Subgenus **Josanus** n. subgen.

Resembling *paraphlepsius* in general characters of the head. Vertex strongly bluntly produced, margin thin and foliaceous. Vertex depressed behind margin, apex upturned. Entire insect heavily irrorate with blood red spots. Veins conspicuously marked with red. Both male and female genital characters are different in general type from the other subgenera.

Type of subgenus *Phlepsius josea* Ball.

P. josea Ball seems to be different from the other species of the group. The oedagus is unique in being composed chiefly of long, anterior and caudal processes, dorsally directed from a short basal oedagus body.

Subgenus ZIONINUS

Extremus Ball seems to be intermediate between *Phlepsius* and *Texananus*. Ball placed it in *Zioninus* because of the longer vertex. In general the type of genital structure is that found in the *areolatus* group.

EXPLANATION OF PLATES

Plates I—VI. Ventral and lateral views of the apical segments of the males of species of Phlepsius as named, showing the genital structures in position.

Plates VII—VIII. Last ventral segments of females of species of Phlepsius as named.

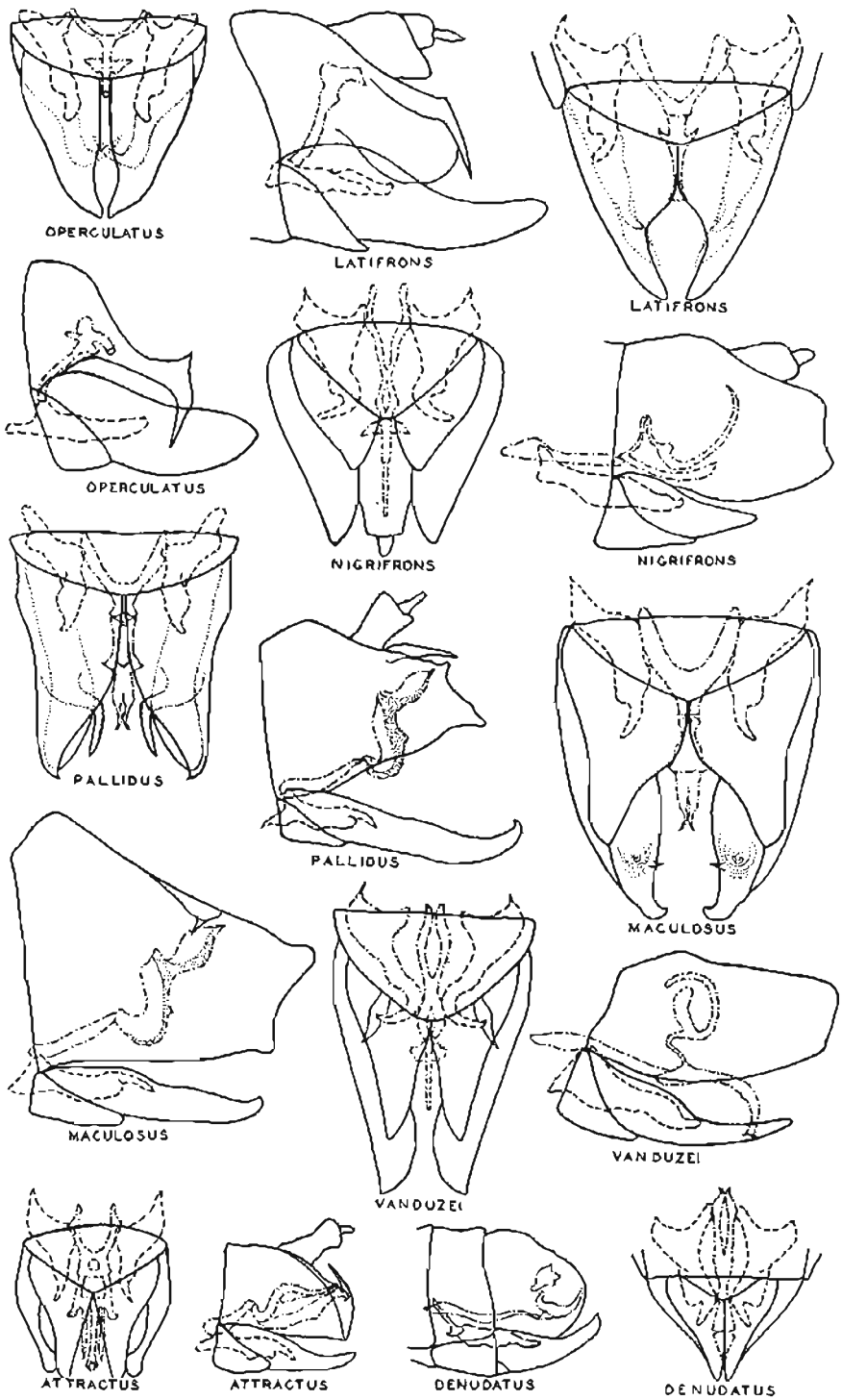
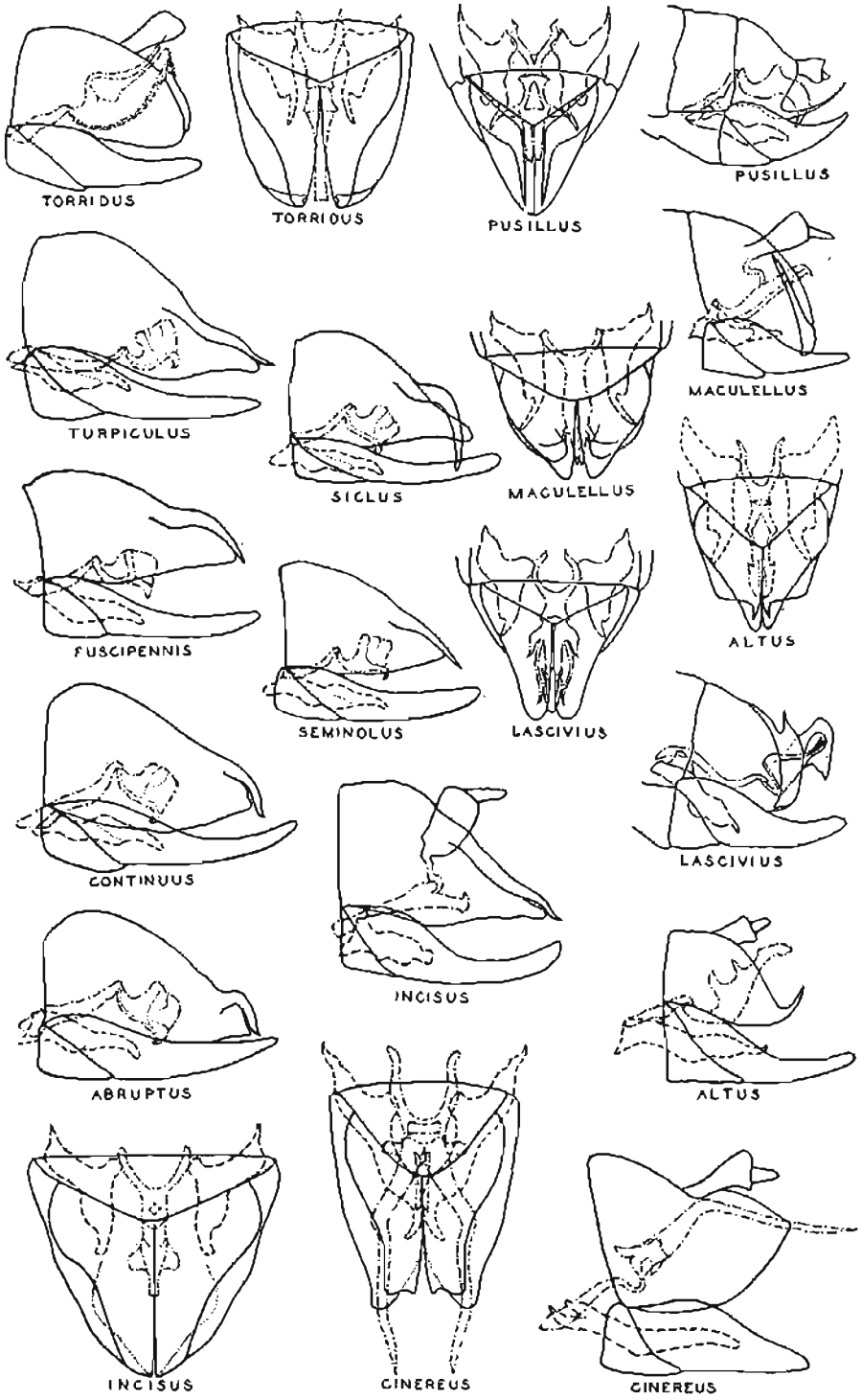

OPERCULATUS
LATIFRONS
LATIFRONS
OPERCULATUS
NIGRIFRONS
NIGRIFRONS
PALLIDUS
PALLIDUS
MACULOSUS
MACULOSUS
VANDUZEI
VANDUZEI
ATTRACTUS
ATTRACTUS
DENUDATUS
DENUDATUS

PLATE I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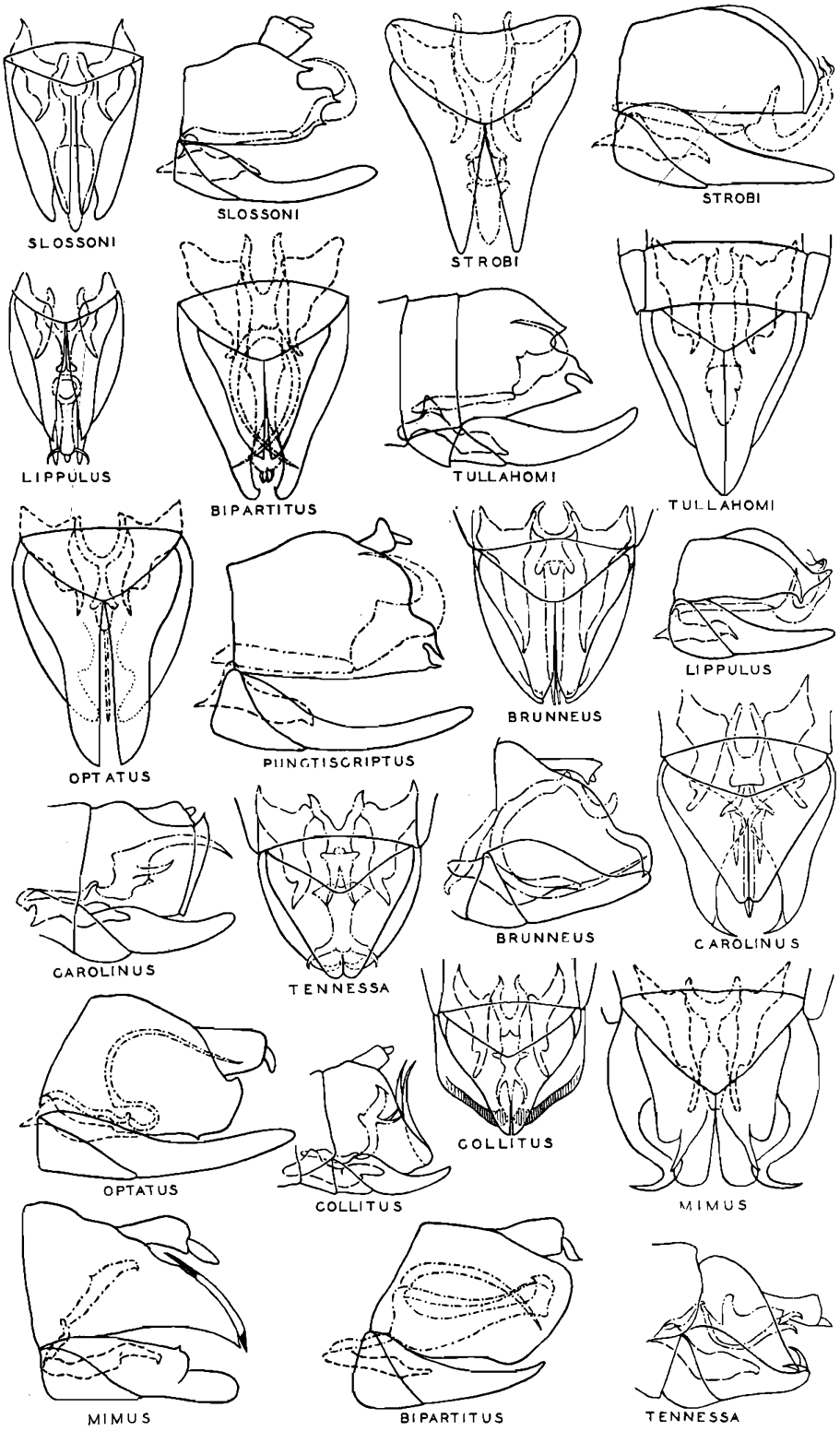
TORRIOUS
PUSILLUS
PUSILLUS
TURPICULUS
SICLUS
MACULELLUS
MACULELLUS
FUSCIPENNIS
SEMINOLUS
LASCIVIUS
ALTUS
CONTINUUS
LASCIVIUS
INCISUS
ABRUPTUS
ALTUS
INCISUS
CINEREUS
CINEREUS

PLATE II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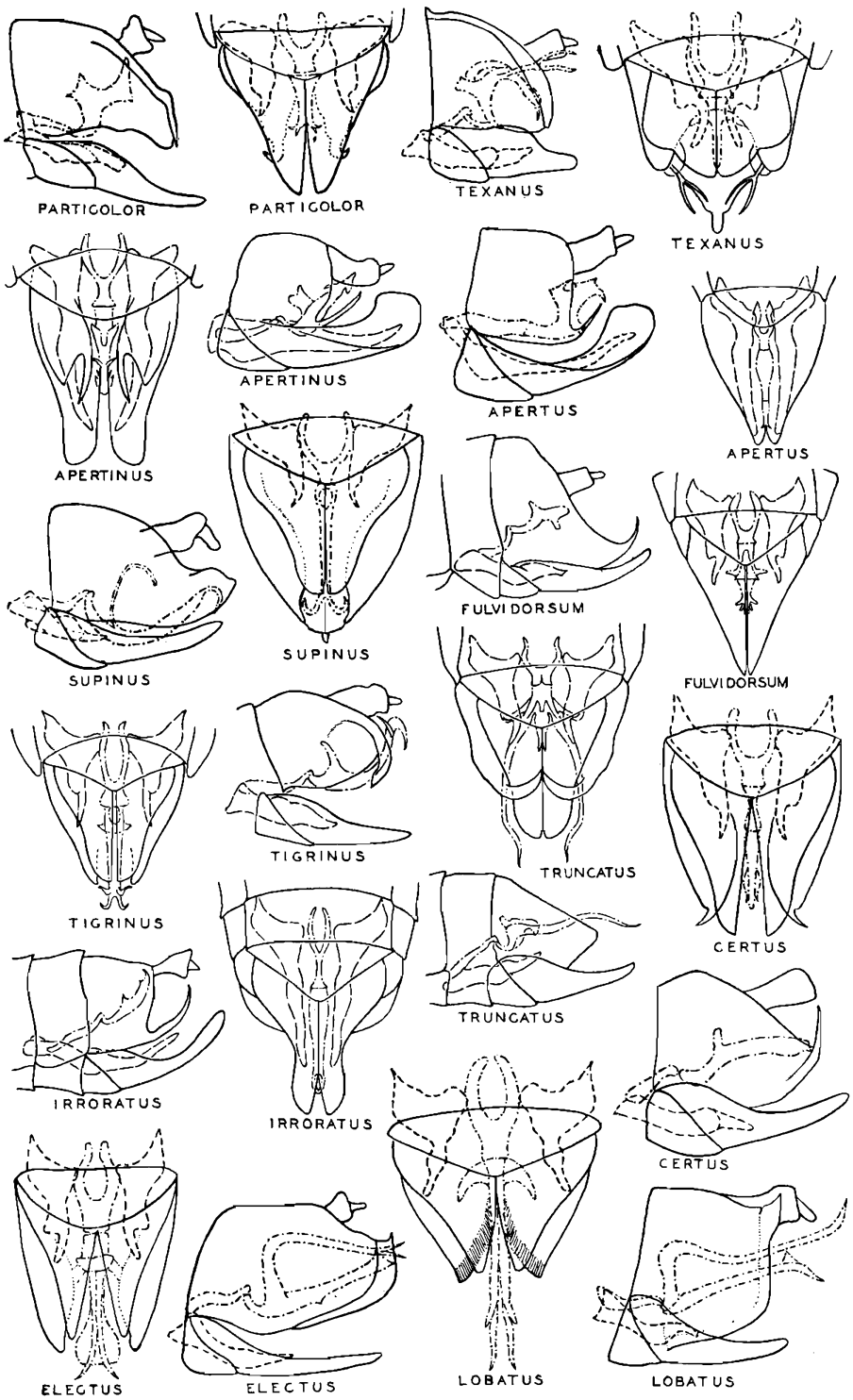
STROBI
STROBI
LIPPULUS
BIPARTITUS
TULLAHOMI
TULLAHOMI
OPTATUS
PUNCTISCRIPTUS
BRUNNEUS
LIPPULUS
CAROLINUS
TENNESSA
BRUNNEUS
CAROLINUS
OPTATUS
COLLITUS
COLLITUS
MIMUS
MIMUS
BIPARTITUS
TENNESSA

PLATE III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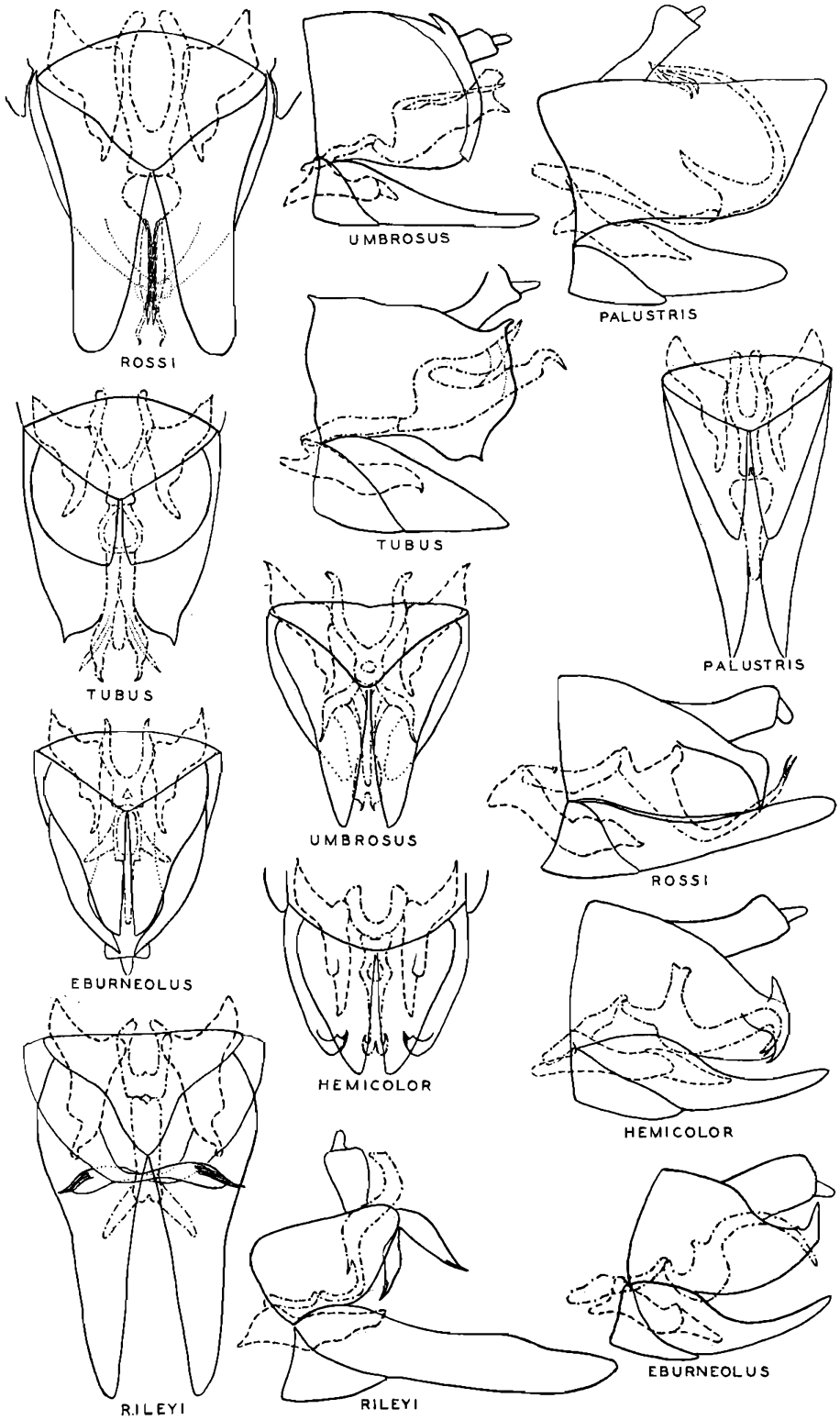
TEXANUS
APERTINUS
APERTINUS
APERTUS
APERTUS
SUPINUS
SUPINUS
FULVIDORSUM
FULVIDORSUM
TIGRINUS
TIGRINUS
TRUNCATUS
CERTUS
IRRORATUS
IRRORATUS
TRUNCATUS
CERTUS
ELECTUS
ELECTUS
LOBATUS
LOBATUS

PLATE IV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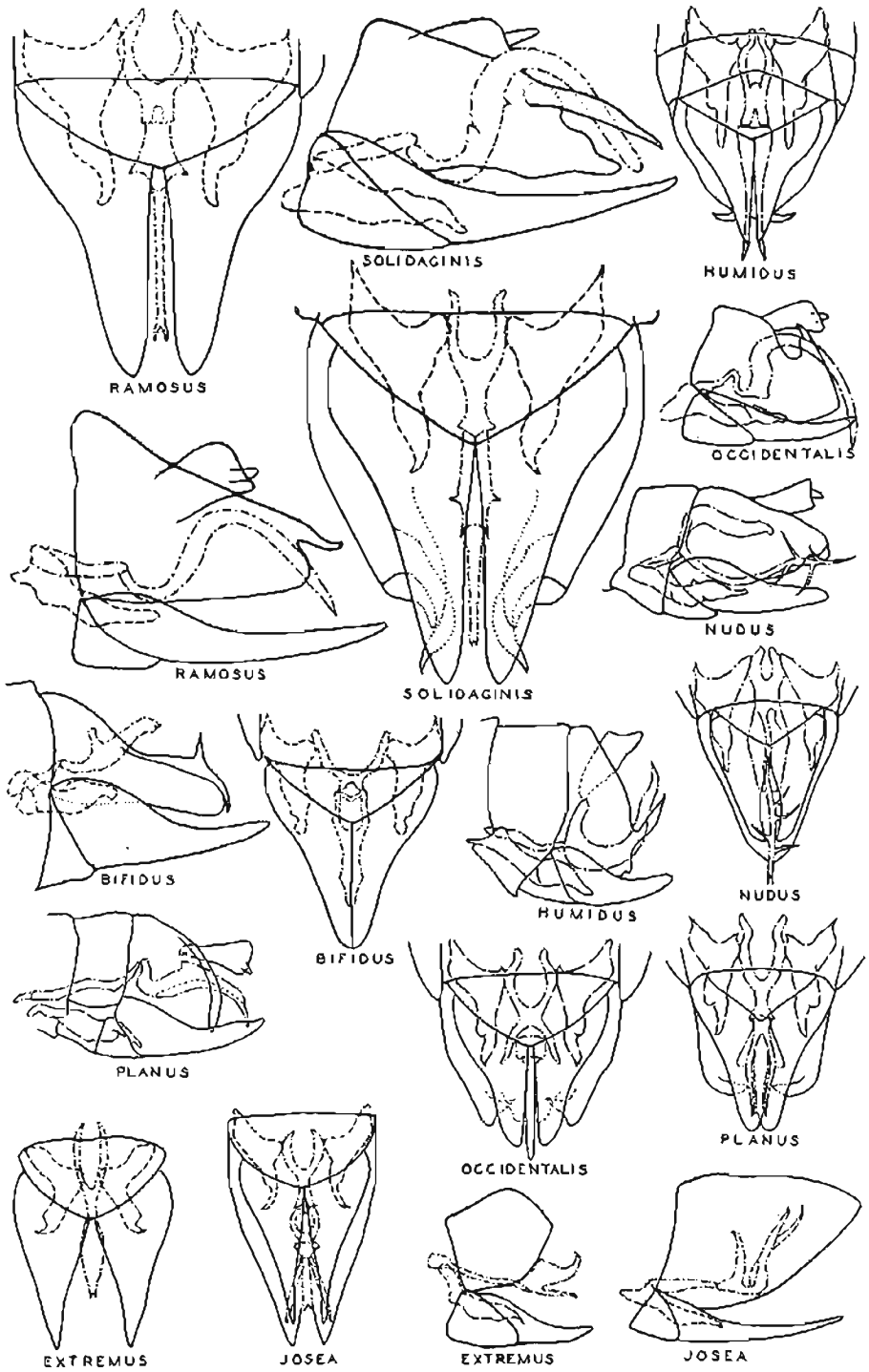
UMBROSUS
PALUSTRIS
TUBUS
TUBUS
PALUSTRIS
UMBROSUS
ROSSI
EBURNEOLUS
HEMICOLOR
HEMICOLOR
RILEYI
RILEYI
EBURNEOLUS

PLATE V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SOLIDAGINIS
HUMIDUS
OCCIDENTALIS
NUDUS
RAMOSUS
SOLIDAGINIS
BIFIDUS
BIFIDUS
HUMIDUS
NUDUS
PLANUS
OCCIDENTALIS
PLANUS
EXTREMUS
JOSEA
EXTREMUS
JOSEA

PLATE VI

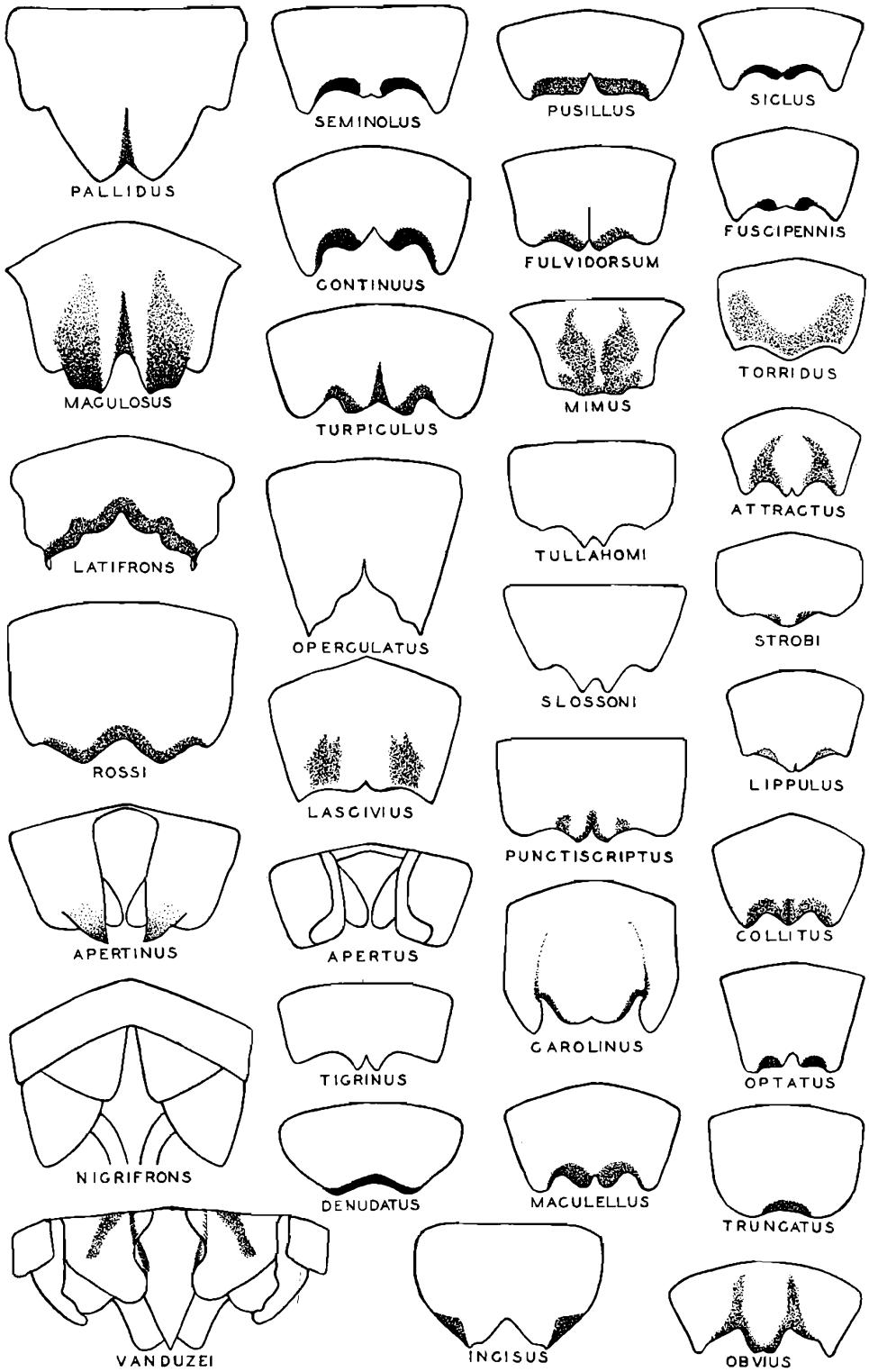
PALLIDUS
SEMINOLUS
PUSILLUS
SICLUS
CONTINUUS
FULVIDORSUM
FUSCIPENNIS
MACULOSUS
TURPICULUS
MIMUS
TORRIDUS
LATIFRONS
TULLAHOMI
ATTRACTUS
OPERCULATUS
STROBI
ROSSI
SLOSSONI
LASCIVIUS
LIPPULUS
PUNCTISCRIPTUS
APERTINUS
APERTUS
COLLITUS
CAROLINUS
TIGRINUS
OPTATUS
NIGRIFRONS
DENUDATUS
MACULELLUS
TRUNCATUS
VANDUZEI
INGISUS
OBVIUS

PLATE VII