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REVISION OF THE SCARABAEID BEETLES OF THE PHYLLOPHAGAN SUBGENUS LISTROCHELUS OF THE UNITED STATES, WITH DISCUSSION OF RELATED SUBGENERA

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Listrochelus was described as a genus by Blanchard in 1850, with *L. laportaei* (from Mexico) as the type species. In 1878 Horn published a revision of the United States species, and other than scattered descriptions there has since been no further revision of the group. The present paper treats 39 species and subspecies, of which 20 are herein described as new; also listed are four Mexican species that have not heretofore been recorded from north of the Rio Grande. The material studied consisted of 1,571 specimens (1,003 males and 568 females) lent by all the major private and public collections of the country. All the figures were drawn by the author.

The species considered as belonging to this group present a rather varied appearance, and nearly all types of structural modifications between species found in the typical portion of the genus (*Phyllophaga* sensu stricto) occur; as yet, however, no species of *Listrochelus* is known to me in which one of the hind tibial spurs in the male is immovable or in which the middle male tarsal claws are "deformed."

Nearly every serious student of the group has expressed at one time or another the opinion that *Listrochelus* was not tenable as a genus and either that its boundaries be modified or else that it be suppressed entirely. With more than twice the number of species known to previous workers before me, I am unable to find characters that will sustain *Listrochelus* as a valid genus. True, there are a certain num-

ber of species that by the strongly pectinate tarsal claws and prominent transverse carina of the vertex appear to form well-marked groups, but when an attempt is made to separate these groups generically or even subgenerically on good characters the hopelessness of the task is at once apparent. In certain species, whose males have the tarsal claws strongly pectinate or serrate, the claws of the female are toothed and have hardly visible serrations, and such females are separable from *Phyllophaga* only by possessing a frontal carina. On the other hand, such species as *Listrochelus cavata* Bates, *L. meadei* Saylor, *L. cochisa* Saylor, and *L. micros* Bates do not have any trace of the transverse frontal carina, nor do they have even the posterior area of the front marked by a transverse boundary of rugose punctures (as in *L. timida* Horn and *L. senex* Horn); but they do have (at least in the male and much less noticeably so in the female) strongly pectinate or serrate tarsal claws, so that their inclusion in the *Listrochelus* group of species is necessary. The only alternatives (other than suppressing *Listrochelus* entirely) are to erect half a dozen or more purely artificial genera or else to reduce the name *Listrochelus* to a subgenus of *Phyllophaga* (into which it grades gradually and completely through such species as *L. cavata* and allies, *L. senex*, *L. timida*, and others to a lesser extent), and I feel that the latter course is justified and necessary. Admittedly, by preserving *Listrochelus* as a valid name at all we are maintaining a somewhat poorly defined unit of *Phyllophaga* (since the two must be separated by a combination of characters any one of which may fail), but since by so doing proper identification of the included species is facilitated, certain purposes of taxonomic research are better served.

In a recent revision of the United States *Phytalus* (1939) the author found it necessary to reduce that group to subgeneric standing under *Phyllophaga*. In this connection the two genera *Chirodines* Bates and *Chlaenobia* Blanchard may be mentioned: the former is separated from *Phytalus* only through having the tarsal claws of the anterior and middle legs of the male (female unknown) simple. This is obviously a poor character upon which to separate genera, as we have many instances in other genera and subgenera where the teeth on the claws vary widely within the group (e. g., *Anoplosiagum*, *Listrochelus*). Until the female is found and is proved also to possess simple anterior tarsal claws as does the male, I prefer to regard *Chirodines* as at most a subgenus of *Phyllophaga*.

The genus *Chlaenobia*, ably revised by Chapin in 1935, is separated from *Phytalus* only through having the "male tarsal segments thickened and densely pilose below"; *Phytalus chlaenobiana* Saylor is practically inseparable externally from the male *Chlaenobia tumulosa* Bates both by general facies and characters, if the pilose and broad-

ened tarsal segments of the latter are omitted from consideration. *Chlaenobia vexata* Horn and *C. unituberculata* Bates have the male tarsal segments only slightly more pilose than in normal male *Phytalus*, while the segments themselves are not at all expanded. The front tarsal segments are expanded in male *C. latipes* Bates, *C. tumulosa*, etc., and not at all so (even though pilose below) in *C. aequata* Bates, *C. colimana* Arrow, *C. vexata* Horn, etc. The situation here is exactly comparable to that in *Liogenys* Guerin, wherein the tarsal segments may vary in the male from normal size to twice or even three times the normal width—this being therefore a sexual and specific variation and not to be considered of generic importance. Thus the differences between *Chlaenobia tumulosa* on the one hand and *Phytalus chlaenobiana* on the other are fully bridged over in the species *C. vexata* and *unituberculata*, and the only alternative to suppressing *Chlaenobia* entirely is to keep it as a subgenus of *Phyllophaga*; moreover, the generic differences as set up between *Phytalus* and *Chlaenobia* hold only in the male sex.

In this connection I wish to quote a short paragraph from an article by G. J. Arrow (of the British Museum of Natural History), who has had wide and varied experience in scarab taxonomy for a good many years. Mr. Arrow says (1938) in speaking of a scarab genus: "Those who see advantage in the multiplication of generic names may perhaps discover some diagnostic feature by which the retention of one or both these names may be rendered possible. Such attempts seem to me, however, to be only resisting an inevitable process. As more and more species of any group become known, previously apparent gaps in the series necessarily become filled, and the disappearance of many genera is as natural as their erection at an earlier date, when the known species were fewer." With this statement I heartily concur.

By treating *Chlaenobia* as a subgenus of *Phyllophaga*, most closely allied to the subgenus *Phytalus*, and restricting to it those species having closely cleft tarsal claws in both sexes, and the tarsal segments in the male more densely pilose than normal (with also widened tarsal segments in some of the species), I believe the status and true relationships of these subgenera will be better evidenced than by using any other arrangement.

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A word concerning the procedure followed in the present paper: In the account under each species are listed the total number of individuals and the localities for all specimens examined; where a species is distributed over a wide range, specific localities are not given but only the approximate boundaries of such range, as evidenced from the material at hand. The names of collectors are given in parentheses, and the collections from whence the specimens came and/or are at present housed are indicated by enclosure within brackets. In the bibliography a note is given defining the nature and scope of each article listed.

In some places in the key use has been made of the genitalia characters to separate species; this is necessitated by the fact that these species exhibit such slight external differences that series of each must be carefully compared to determine them correctly, while if the genitalia are used the specimens may be quickly and positively placed.

KEY TO THE AMERICAN SUBGENERA OF PHYLLOPHAGA

1. Tarsal claws of anterior and middle legs simple, neither cleft nor toothed (female unknown) (Mexico)..... **Chirodines** Bates
Claws of all legs pectinate, cleft, or variously toothed..... 2
2. Claws of tarsi narrowly cleft, angle formed by cleft being acute at least in males; females frequently with cleft much more obtuse, rarely grading into almost a median tooth..... 3
Claws toothed, pectinate or serrate, never cleft..... 4
3. Tarsal segments densely to moderately pilose beneath, less obviously so in females (segments broadened in males of some species); color usually light testaceous (Central America and United States)..... **Chlaenobia** Blanchard
Tarsal segments at most very sparsely pilose beneath, segments never broadened in either sex; color variable (North and South America)..... **Phytalus** Erichson

4. Claw with a strong to moderate tooth, position of latter variable, claw never with serrations or pectinations; tarsi never densely pilose; vertex of head plane, never transversely carinate (North and South America).....**Phyllophaga** Harris
- Claw finely or coarsely serrate to pectinate, with or without a larger intercalated triangular tooth; vertex usually with a well-marked transverse carina, the latter reduced in some species and entirely absent in some; tarsi in some few species densely pilose or ciliate in male (Southwestern United States and Mexico).....**Listrochelus** Blanchard

KEY TO THE MALES OF LISTROCHELUS

1. Head densely, coarsely, and entirely punctate behind transverse carina of vertex; tarsal claws pectinate or serrate along a single margin (figs. 2, *f*, *i*) without a larger intercalated tooth (serrations of margin frequently hardly noticeable); not densely hairy above..... 2
- Head rarely punctate behind transverse carina and then only at sides, with at least a large portion of vertex impunctate, more commonly the entire surface posterior to carina impunctate; claw variably serrate or pectinate along a single or double margin; if with characters as in preceding couplet, then with dense short hair dorsally (*pilosipes*)..... 3
- 2 (1). Claw with serrations obvious to nearly absent (fig. 2, *j*); antenna unicolorous rufotestaceous, club usually shorter than, or subequal to, funicle (genitalia, fig. 3, *a-c*)... **timida** (Horn)
- Claw definitely pectinate; antennal club testaceous, lighter in color and slightly longer than funicle (genitalia, fig. 3, *d-f*)..... **snowi**, new species
- 3 (1). Claw definitely pectinate (fig. 2, *f*)..... 4
- Claw serrate (figs. 2, *h*, *i*), serrations rather strong to faint..... 23
- 4 (3). Claw pectinate along two margins (fig. 2, *g*)..... 13
- Claw pectinate along one margin (fig. 2, *f*)..... 5
- 5 (4). Genitalia symmetrical (fig. 12, *a*); transverse carina of vertex obsolete, clypeus plane; dorsal surface glabrous or nearly so; sixth abdominal segment plane (*cavata* and related species)..... 6
- Genitalia asymmetrical (figs. 5, *c*, *h*); transverse carina strong, or if weak then clypeus strongly tumid at base; densely hairy above, or if glabrous then sixth abdominal segment either with a deep fovea or large and flattened and with scabrose, setigerous punctures..... 9
- 6 (5). Genitalia in *en face* view with apices bluntly rounded or bluntly pointed, apices never reflexed (fig. 12, *d*, *g*)..... 7
- Genitalia in *en face* view with apices narrow and pointed and strongly to moderately reflexed toward sides (fig. 12, *l*)..... 8
- 7 (6). Genitalia with tips pointed but bluntly so, not at all reflexed toward sides (fig. 12, *d-f*) (Mexico and New Mexico)..... **cavata** (Bates)
- Genitalia tips bluntly rounded, neither pointed nor reflexed (fig. 12, *g-i*) (Colorado and Mexico)..... **micros** (Bates)

- 8 (6). Genitalia tips very narrow and strongly reflexed (fig. 12, *j-l*) (Mexico) ----- **meadei**, new species
 Genitalia pointed and very acute at tip, the tips only slightly reflexed toward sides (fig. 12, *a-c*) (Arizona and Mexico)----- **cochisa**, new species
- 9 (5). Dorsal surface covered with moderately dense and short hair; antennal club much shorter than funicle; sixth abdominal segment slightly convex (genitalia, fig. 11, *l-n*)----- **pilosipes**, new name
 Thorax and head usually subglabrous; antennal club equal to funicle; sixth abdominal segment very long, either foveate or flattened----- 10
- 10 (9). Base of clypeus hardly or not at all tumid, front flattened; thorax polished, densely punctate, not rugose; sixth abdominal segment strongly flattened, never even slightly concave, with fine scabrose punctures, the hairs short and not dense; genitalia in lateral view with only one apical tooth (fig. 5, *i-n*)----- **mirafloza**, new species
 Clypeal base always tumid, front always coarsely and usually rugosely punctate; thorax variable, rugosely punctate or not; sixth abdominal segment always broad and either slightly or markedly concave or foveate (never merely flattened as in *mirafloza*), scabrous punctures and short erect hairs denser than in *mirafloza*; genitalia in lateral view always with two rather obvious teeth (fig. 5, *b, g*)----- 11
- 11 (10). All of thoracic disk closely, coarsely, and rugosely punctate; middle base of clypeus strongly tumid; posterior margin of transverse carina on vertex very coarsely and closely punctate; genitalia in *en face*-dorsal view with lateral margins of the two teeth nearly parallel (fig. 5, *f*); upper tooth in lateral view of moderate length (fig. 5, *e*).
densicollis (LeConte)
 Thoracic disk less densely punctate, if rugose at all then along the apical margin only, center of disk usually with an impunctate area; transverse carina less densely punctate; genitalia in *en face*-dorsal view slightly to strongly expanded toward the outside (figs. 5, *c, h*); upper tooth in lateral view either very short (fig. 5, *b*) or of moderate length (fig. 5, *g*)----- 12
- 12 (11). Genitalia in *en face*-dorsal view slightly expanded toward sides and in lateral view with upper tooth markedly shorter than lower (fig. 5, *b, c*)----- **carminator** (Horn)
 Genitalia in *en face*-dorsal view strongly expanded toward sides and teeth much longer than in above species; in lateral view the two teeth are approximately same width and length (fig. 5, *g, h*)----- **michelbacheri**, new species
- 13 (4). Hind tarsus densely pilose beneath, pilosity of each segment occurring in a dense patch (fig. 4, *e*); sixth abdominal segment with raised cariniform ridges (fig. 2, *d, e*)----- 14
 Hind tarsus pilose but never densely so; sixth abdominal usually plane or nearly so----- 15

- 14 (13). Surface of sixth abdominal segment strongly ascending (fig. 2, *d*), apex deeply, narrowly cleft, producing a bidentate apex; hind trochanters hardly or not produced (fig. 4, *b*) (genitalia fig. 7, *e, f*)-----**scoparia** (LeConte)
 Sixth abdominal with a moderately high, strong, transverse carina, the latter slightly curved and running nearly total width of segment (fig. 2, *e*), edges of carina at each side of segment highly angulate; hind trochanters very strongly and narrowly produced (fig. 4, *a*) (genitalia fig. 9, *d-b*)-----**trochanter**, new name
- 15 (13). Only outer front tarsal claw with a large and definite tooth just before apex----- 16
 Both front tarsal claws with pectinations of approximately equal size and no teeth before apex----- 19
- 16 (15). Sixth ventral with small, moderately dense granules; outer claw of middle tarsus usually with small subapical tooth; hair on abdomen (in lateral view) moderately long and fairly dense; pygidium highly polished, very convex (genitalia fig. 8, *j-l*)-----**plena** (Fall)
 Sixth ventral without trace of granules; outer claw without any larger tooth; hair of abdomen very short or obsolete, rather sparse if present; pygidium usually with at least the basal half pruinose, slightly to moderately convex----- 17
- 17 (16). Genitalia in lateral view with entire apical margin evenly and slightly reflexed (fig. 8, *d-f*)-----**mucoorea** (LeConte)
 Genitalia in lateral view with apical margin only slightly reflexed and that at about middle----- 18
- 18 (17). Apical margin of genitalia in lateral view reflexed slightly below center into a short lobe, remainder of margin not reflexed (fig. 8, *g-i*)-----**pulcher** (Linell)
 Apical one-third of margin reflexed; general form in lateral view (fig. 8, *a*) quite different from that of either *pulcher* or *mucoorea* (fig. 8, *e, g*)-----**reinhardi**, new species
- 19 (15). Elytra testaceous, prothorax rufous; surface never pruinose; clypeus and head very densely punctured; antennal club obviously longer than the funicle; sixth abdominal with deep longitudinal sulcus----- 20
 Elytra rufobrunneous to rufopiceous, usually at least slightly pruinose, especially on elytra; clypeus and front moderately densely, not rugosely punctate; sixth abdominal without or with but a very faint indication of a longitudinal sulcus; antennal club equal to, or shorter than, funicle----- 21
- 20 (19). Antennal club equal to funicle or not more than one-fifth longer than the latter; clypeus plane at center base (genitalia fig. 10, *a-d*)-----**flavipennis** (Horn)
 Antennal club one-fourth to one-third longer than funicle; clypeus usually strongly tumid at center base, at least noticeably so (genitalia fig. 10, *e-h*)-----**granti**, new species
- 21 (19). Elytra coarsely punctured and rugose, never more than faintly pruinose; thorax rufocastaneous; sixth abdominal segment with longitudinal sulcus moderately impressed,

	without traces of lateral oblique carinae (genitalia fig. 6, <i>a-d</i>).....	<i>disparilis</i> (Horn)
	Elytra always pruinose, usually markedly and densely so, usually finely punctate and hardly rugose; sixth abdominal segment with a much deeper impressed sulcus each side of which is a faint, lateral, oblique impression.....	22
22 (21).	Genitalia in <i>en face</i> view with upper margin deeply emarginate each side between center top and point of greatest width (fig. 7, <i>a-d</i>); in lateral view apical margin is slightly reflexed at middle; lower apex of genital stem without bristles or with very small fine ones.....	<i>huachuca</i> , new species
	Genitalia in <i>en face</i> view gently curved each side of middle top to point of greatest width at each side (fig. 7, <i>g-i</i>); in lateral view apical margin is very strongly reflexed at middle; lower apex of genital stem with several to many long and rather coarse bristles.....	<i>chapini</i> , new species
23 (3).	Tarsal claw definitely serrate (not pectinate) along two margins.....	24
	Tarsal claw serrate along only one margin (or hardly noticeably so at all).....	25
24 (23).	Front claws each with a strong tooth just before apex; thorax and base of elytra with very long, fine, erect hairs (genitalia fig. 10, <i>k, l, n</i>).....	<i>macmurryi</i> , new species
	Front claws with subapical enlarged tooth absent, or rarely present and then on outer claw only; head and thorax subglabrous (genitalia fig. 10, <i>i-j</i>).....	<i>wickhami</i> , new species
25 (23).	Above densely pruinose, thorax apparently impunctate, or at least punctures hardly visible from above; glabrous except for elytra.....	26
	Pruinose or shining above, thorax usually punctate and shining (if pruinose then with long hair).....	28
26 (25).	Elytra with long and dense hairs; clypeus and front with erect hair on entire disk; first segment of hind tarsus strongly expanded (fig. 4, <i>d</i>) (genitalia fig. 9, <i>g-j</i>).....	<i>tarsalis</i> (Schaeffer)
	Elytra with minute, hardly visible hairs; clypeus glabrous; first segment of hind tarsus usually but little expanded, at most becoming gradually wider apically (note: a variable character; always check genitalia).....	27
27 (26).	First segment of hind tarsus strongly expanded just before the apex (fig. 4, <i>f</i>); thorax pruinose or not, puncturation always quite obvious; clypeus usually densely pilose (genitalia fig. 9, <i>a-c</i>).....	<i>falsa</i> LeConte (part)
	First segment of hind tarsus normal, not at all expanded toward apex; entire upper surface densely pruinose, the punctures of thorax hardly perceptible; clypeus nude or nearly so.....	<i>falsa nogales</i> , new subspecies
28 (25).	First segment of hind tarsus strongly expanded near apex, about twice as long as wide at apex; first segment of front tarsus with noticeable to large inner tooth.....	29
	First segment normal, apparently a little expanded but always about three to four times longer than width at apex; first segment of front tarsus without or with a very small inner spine.....	32

- 29 (28). Hind tibia with short sparse spines, these never more, and usually less, than one-third length of tibia; first segment of hind tarsus very suddenly widened at apex (fig. 4, *f*); hind tarsus sparsely hairy..... **falsa** (LeConte) (part)
 Hind tibia with long, usually rather dense and fine hair on inner side, this hair often one-half as long as or longer than tibia; first segment of hind tarsus gradually widened from near base, and usually densely hairy, especially near base..... 30
- 30 (29). First segment of front tarsus with very long spinelike projection, width of segment at apex one-half or more its length (fig. 3, *n*), hind tarsus with first segment always expanded and from two to two and one-half times as long as wide..... 31
 First segment of front tarsus with a small inner spine, width not more than one-third its length and usually less (fig. 3, *l*); hind tarsus with first segment usually but little expanded and not less than three times as long as wide at apex (genitalia fig. 9, *k-n*)..... **ambripes** (LeConte) (part)
- 31 (30). Aedeagus in lateral view with two teeth on lower margin (fig. 11, *a-d*)..... **koehleriana**, new species
 Aedeagus in lateral view with a single bluntly rounded lobe in place of the two approximate teeth (fig. 11, *e-g*).
neomexicana, new species
- 32 (28). Abdomen transversely tumid, often markedly so (fig. 2, *c*); hind tibia with moderately long and often rather dense and fine hairs (except in *parilis*)..... 33
 Abdomen flat or nearly so (fig. 2, *b*); hind tibia with moderately coarse and sparse hairs, usually without long or fine hairs (except *peninsularis*)..... 35
- 33 (32). Thorax strongly pruinose; entire dorsal surface with moderately long and erect hair (genitalia fig. 11, *h-k*).
opacicollis (Horn)
 Thorax shining, not pruinose; pilose above but thorax in great part glabrous, especially on disk..... 34
- 34 (33). Hind tarsus and tibia with thickened, almost spinelike hairs, without any long fine cilia; thorax and pygidium strongly shining (genitalia fig. 11, *o-r*)..... **parilis** (Bates)
 Hind tarsus and tibia with long, often dense, fine cilia; thorax and pygidium dull to moderately shining (genitalia fig. 9, *k-n*)..... **ambripes** (LeConte) (part)
- 35 (32). Elytra with very short and dense erect hairs; thorax very densely, coarsely, and entirely, punctate; clypeus trapezoidal, angles sharp and entire apical margin reflexed (genitalia fig. 3, *h-i*)..... **peninsularis**, new species
 Elytra with very sparse, short, procumbent hair, or glabrous; thorax moderately punctured; clypeus with angles noticeably rounded..... 36
- 36 (35). All claws with moderately strong submedian tooth..... 37
 All claws without any larger intercalated tooth (except front outer claw in *texensis*)..... 39
- 37 (36). Thorax rufotestaceous, moderately sparsely punctate, with large median impunctate area; lateral margins of

- thorax with long cilia; clypeal suture very faintly bi-arcuate; antennal club one-third longer than funicle..... 38
- Thorax rufous, densely punctate, with little or no trace of a median impunctate area; lateral margins of thorax with short cilia; clypeal suture strongly biarcuate, impressed; antennal club subequal to funicle (genitalia fig. 6, *i, j*)..... **cushmani**, new species
- 38 (37). Sides of genitalia in *en face* view thickened near apex, not open to base through middle (fig. 6, *g, h*)..... **duncani** (Barrett)
- Genitalia in *en face* view thickened all along the median line and open through the middle (fig. 6, *e, f*)..... **arizona**, new species
- 39 (36). All claws without a larger intercalated tooth; pygidium plane or very convex..... 40
- Outer front claw with a larger intercalated tooth, inner claw without such tooth; pygidium normally convex; sides of thorax subangularly dilated, margin very coarsely crenate (genitalia fig. 10, *m-o*)..... **texensis**, new species
- 40 (39). Pygidium very convex, densely and coarsely punctate and shining, with short procumbent hair; sixth abdominal segment plane (genitalia fig. 6, *k-n*)..... **scuticeps** (Bates)
- Pygidium plane, very sparsely and finely punctate, with minute hair, surface subopaque; sixth abdominal with a short and truncate lobe at middle (fig. 2, *b*)..... **senex** (Horn)

KEY TO THE FEMALES OF LISTROCHELUS

(The females of *L. cavata*, *neomexicana*, *cushmani*, *snowi*, and *duncani* are either unknown or, for reasons explained later, not included)

1. All tarsal claws serrate or pectinate along a single margin; without any intercalated larger teeth..... 2
- Claws variable, one or both of those of front tarsus with a much larger tooth among serrations or pectinations..... 4
- 2 (1). Glabrous above (Texas)..... **senex** (Horn)
- At least elytra densely hairy (Lower California)..... 3
- 3 (2). Claws pectinate; clypeus reflexed at center apex, angles broadly rounded..... **pilosipes**, new name
- Claws minutely serrate; entire clypeal apex strongly reflexed, angles very sharply indicated..... **peninsularis**, new species
- 4 (1). Thorax opaque, punctures not or hardly visible from a straight dorsal view; disk glabrous except at sides..... 5
- Thorax always distinctly punctured and usually highly polished; if opaque then with dense hairs..... 6
- 5 (4). Elytra with long dense hair; first segment of hind tarsus somewhat expanded at apex (fig. 3, *m*); first front tarsal segment with a strong inner spine, width of segment at apex one-half of its length..... **tarsalis** (Schaeffer)
- Elytra with minute hair, or glabrous; first segment of hind tarsus normal; first segment of front tarsus with a sharp but small inner spine, the width of segment at apex scarcely two-fifths its length..... **falsa nogales**, new subspecies
- 6 (4). Entire dorsal surface highly pruinose and densely hairy; pygidium convex, polished, not impressed..... **opacicolis** (Horn)

- Thoracic disk usually glabrous, if slightly hairy then pygidial apex with a longitudinal impression..... 7
- 7 (6). Dorsal surface shining, rarely elytra pruinose; serration of claws feeble to moderate; size 10-12 mm..... 8
- Dorsal surface and claws variable; size 13 mm. or more..... 10
- 8 (7). Form elongate, parallel; glabrous above or nearly so; pygidium plane, very coarsely and densely punctate, not impressed..... *timida* (Horn)
- Form robust-oval; elytra and head (at times thorax also) hirsute..... 9
- 9 (8). Pygidium plane, finely punctate, not at all impressed; elytra pruinose..... *arizona*, new species
- Pygidium polished, finely punctate, apical third with a deep longitudinal impression; elytra shining. . . *macmurryi*, new species
- 10 (7). Pygidium flat or nearly so in basal three-fourths and usually densely pruinose, with at least the apical fifth always raised slightly to strongly, and usually polished; dorsal surface usually, or quite frequently, pruinose (note: the Lower California *mirafloza* of the following couplet has the basal half of the pygidium pruinose and slightly convex, the apical half highly polished and evenly convex, the center disk thus slightly foveate)..... 11
- Basal half at least of pygidium always convex, usually noticeably so, if at all flattened then surface smooth, highly polished, and without an apical raised portion..... 16
- 11 (10). Pygidial apex very strongly gibbose (especially in lateral view) and surface very coarsely rugose, with dense, short hairs; claws serrate along a double margin. . . *scoparia* (LeConte)
- Pygidial apex variable, not at all gibbose, usually smooth and polished, and densely pruinose..... 12
- 12 (11). Pygidium strongly flattened and polished in apical third to half, with a definite longitudinal impression in polished area; large intercalated tooth of tarsal claws always nearly apical in position; inner hind tarsal claws without a larger intercalated tooth..... 13
- Pygidium not flattened apically, the polished raised area at and before apex polished but transverse (fig. 8, *m-o*) and without any impressed line, large tooth of claws median in position; hind claws each with a strong median tooth..... 14
- 13 (12). Pygidium with basal hairs short and inconspicuous; apical fourth very highly polished and sparsely, finely punctate, the latter area glabrous or nearly so..... *pulcher* (Linell)
- Pygidium more densely pruinose and hairy in basal three-fourths, hairs a little longer; apical fourth less highly polished, more densely punctate, with short hairs. . . *mucorea* (LeConte)
- 14 (12). Lateral thorax margins behind median dilation straight or nearly so; form robust and surface usually shining; pygidium with raised smooth area in apical sixth only and this area not strongly V-shaped (fig. 8, *m*)..... *disparilis* (Horn)
- Thorax sinuate behind dilation; form elongate and sub-parallel, surface usually moderately to densely pruinose;

- raised smooth area of pygidium occupying apical third, or if in apical sixth only, then strongly V-shaped..... 15
- 15 (14). Apical sixth of pygidium raised, polished, and strongly V-shaped (fig. 8, *n*)..... *huachuca*, new species
- Apical third of pygidium raised, polished and only very slightly V-shaped, at times somewhat irregular in outline (fig. 8, *o*)..... *chapini*, new species
- 16 (10). Base of clypeus transversely raised, usually very coarsely punctate; larger intercalated tooth subapical in position (Lower California)..... 17
- Clypeus never gibbose, always plane, puncturation variable (United States)..... 20
- 17 (16). Pygidium in lateral view with basal half slightly convex and highly pruinose, apical half highly polished, evenly and strongly convex, and center disk with a small shallow fovea; front flat, not rugose, rather sparsely punctate; thorax densely, not rugosely, punctate; elytral hair very short and scarcely obvious; dorsal genital plate deeply concave before apex and center base prolonged into a blunt, semierect lobe (figs. 13, *e-f*)..... *miriflora*, new species
- Pygidium variable, but not as above; front coarsely punctate and usually coarsely rugose; thorax rugosely punctate or not; elytral hair longer and more obvious than in *miriflora*; dorsal genital plate smooth or at most transversely impressed before apex and usually incompletely so..... 18
- 18 (17). Pygidium convex at base, apical half strongly flattened to faintly concave and smooth; dorsal genital plate in lateral view suddenly declivous just before apex (fig. 13, *a-b*); thoracic disk densely punctate but never rugose, highly polished..... *micelbacheri*, new species
- Pygidium variable, not as above; dorsal genital plate in lateral view without subapical declivity or latter, if present, always very indefinitely indicated; thoracic disk rugose or not..... 19
- 19 (18). Thorax densely punctate, never rugose; dorsal genital plate in lateral view always smooth (figs. 13, *g-h*); pygidium variable, center of disk always gibbose and frequently gibbosity slightly to moderately flattened at middle, at times with a trace of a longitudinal sulcus.
- carminator* (Horn)
- Thorax always coarsely rugose; dorsal genital plate usually with a fine, incomplete, subapical impression, rarely entire plate smooth (figs. 13, *c-d*); pygidium highly variable, varying from faintly convex, with center disk flattened, to center disk faintly concave to moderately foveate, or even longitudinally sulcate at middle; disk never so convex at middle, however, as in *carminator*..... *densicollis* (LeConte)
- 20 (16). Pygidium highly polished, very finely punctate, glabrous; apex explanately prolonged into two rounded toothlike lobes, separated by a narrow U-shaped notch..... *micros* (Bates)
- Pygidium not exactly as above..... 21

- 21 (20). Pygidium polished, finely punctate, nearly glabrous (except under high power); apex gibbose and slightly overhanging itself in lateral view, apical margin with two small and very obtuse teeth, separated by a broad and shallow emargination (fig. 4, c)-----*meadei*, new species
Pygidium not exactly as above----- 22
- 22 (21). Apex of fifth abdominal segment with a broad and moderately deep emargination; pygidial disk and dorsal surface highly polished; larger tarsal tooth subapical in position-----*cochisa*, new species
Apex of fifth abdominal segment entire, not at all emarginate----- 23
- 23 (22). Larger teeth of front tarsal claws subapical in position; elytra densely pruinose----- 24
Teeth of front tarsal claws always median in position or nearly so; pruinosity variable----- 25
- 24 (23). Pygidium and thorax highly and entirely polished, not at all pruinose; inner hind tarsal claw usually with a larger intercalated tooth (this frequently worn) (Arizona)---*plena* (Fall)
Pygidium and thorax always pruinose, at least in part; inner hind tarsal claw always without a larger tooth (Texas)-----*reinhardi*, new species
- 25 (23). Pygidium noticeably flattened and densely hairy, basal half pruinose, disk densely, coarsely, and rugosely punctate, apex broadly rounded; elytra with moderately long to short, erect hairs (Arizona)-----*trochanter*, new name
Pygidium variable, never as above----- 26
- 26 (25). Base of clypeus noticeably tumid, pygidium flat to slightly convex, surface coarsely rugose, slightly polished and with dense short hairs, apex with coarse spines, all claws subpectinate along a double row (Arizona)----*granti*, new species
Base of clypeus flat, pygidium convex, surface polished, pilosity absent or present----- 27
- 27 (26). Thorax more than twice as wide as long, lateral margin behind median dilation straight or slightly sinuate; center base of pygidium with slight but noticeable fovea at point of juncture with propygidium; elytra always at least slightly pruinose----- 28
Thorax scarcely twice as wide as long, lateral margins straight or nearly so posteriorly; center base of pygidium not impressed; elytra and dorsal surface shining to slightly pruinose----- 31
- 28 (27). Pygidium broadly rounded to semirounded apically, disk strongly convex; thoracic disk never with hair except at sides; first hind tarsal segment frequently much wider at apex-----*falsa* (LeConte)
Pygidial sides noticeably convergent apically, apex truncate, usually markedly so; usually with at least some hair on disk, at times this rubbed off----- 29
- 29 (28). First front tarsal segment with a strong inner spine, width of segment at apex nearly one-half total length (fig. 3, n); elytral area near suture with moderately dense, long, erect hairs (New Mexico)-----*koehleriana*, new species

- Front tarsal spine weak, the width of segment at apex about a third of total length (fig. 3, *l*); long hairs on elytra variable, dense or not----- 30
- 30 (29). Pygidium and propygidium moderately finely and regularly punctate, with short erect hairs; sides of thorax behind median dilation nearly straight; thorax moderately densely and not finely punctate----- *fimbripes* (LeConte)
- Pygidium and propygidium more sparsely and finely punctate, hair if present hardly noticeable; thorax behind middle slightly sinuate, thoracic disk very finely and not densely punctate----- *parilis* (Bates)
- 31 (27). Pygidium convex and with moderately dense short hairs; claw serrate along a single margin; lateral thoracic margins very coarsely crenate, disk very convex (Texas and Mexico)----- *scuticeps* (Bates)
- Pygidium variable, with at most very short and sparse hair----- 32
- 32 (31). Pygidium moderately convex, very highly polished, and very finely punctate; abdominal hairs moderately dense at center and of moderate length; all claws serrate to subpectinate along a double margin; entire lateral thoracic margin coarsely crenate (Arizona and New Mexico)----- *flavipennis* (Horn)
- Pygidium flat to slightly convex, highly polished, and finely punctate; abdominal hairs very fine and hardly obvious; all claws serrate along a single margin----- 33
- 33 (32). Lateral thoracic margins behind median dilation entire; front extremely densely and coarsely punctate; clypeal angles narrowly rounded; prevailing color dark piceocastaneous----- *texasensis*, new species
- Lateral thoracic margins behind the dilation crenate; front densely to sparsely punctate; clypeal angles broadly rounded; prevailing color rufocastaneous to rufotestaceous----- *wickhami*, new species

Genus PHYLLOPHAGA Harris

Subgenus LISTROCHELUS Blanchard

PHYLLOPHAGA (LISTROCHELUS) MIRAFLORA, new species

FIGURES 5, *i-n*; 13, *e-f*

Male.—Elongate, head and thorax strongly shining, elytra strongly pruinose, with short, sparse, scarcely noticeable hair, otherwise glabrous above. Color rufocastaneous to rufopiceous, the thorax usually the darkest. Clypeus flat, base rarely a little elevated but never gibbose, disk closely and moderately coarsely punctured; apex subtruncate, faintly to slightly reflexed, sides nearly straight, the angles narrowly rounded. Front flat, sparsely to moderately densely punctate, not rugose. Antenna 10-segmented, club of lighter color than the funicle and subequal to the latter in length. Prothorax regularly punctate, the punctures separated by one to one and one-

half times their diameters on the disk, the punctures somewhat closer at sides and along the frontal margin; basal margin entire; front angles strongly rounded, hind angles obtuse, lateral margins entire or faintly crenulate. Elytra finely, not densely, punctate, with striae subobsolescent in basal half, sutural stria normal; in a few specimens there is a weakly indicated second stria. Pygidium strongly and evenly convex, basal half or third pruinose, the apical portion highly polished; disk sparsely and finely punctate, with very short erect hairs. Abdomen flattened at middle and finely sparsely punctate; sixth segment longer than the preceding, flattened nearly from side to side, the flat area with fine scabrose punctures and very short, sparse, and erect hairs. All claws strongly pectinate along a single margin, without any larger intercalated teeth. First segment of hind tarsus shorter than the second. Larger hind tibial spur usually one-fourth longer than the first tarsal segment.

Female.—Antennal club slightly shorter than the funicle; pygidium convex and pruinose in basal half, apical half strongly convex and highly polished, the center disk with a small, shallow foveate area; abdomen highly polished at middle, subconvex in lateral view, the apical segment moderately densely and finely punctate. All claws pectinate along a single margin and each with a subapical, larger, intercalated tooth. Otherwise similar to the male.

Length.—13–17 mm. *Width*.—5.5–6.5 mm.

Types.—The holotype male is from "5 miles S. of Miraflores, Lower California, collected VII-10-38 by Ross and Michelbacher"; the allotype female is from "Miraflores, collected VII-8-38" also by Ross and Michelbacher; both types are in the California Academy of Sciences.

Paratypes: LOWER CALIFORNIA: 2 from Miraflores; 21 from Triunfo, July 7, 1938 (Ross and Michelbacher), and from 6 miles north of Triunfo, July 15, 1938; 2 from 5 miles west of San Bartola, July 13, 1938 (Ross and Michelbacher). Designated paratypes are in the collections of the California Academy of Sciences, the United States National Museum (No. 53758), Messrs. Ross and Michelbacher, Mont Cazier, and in the Saylor collection.

Remarks.—This interesting species at first glance resembles those of the *densicollis* complex very closely, but the key characters will readily separate the various species concerned. The male genitalia of the present species are asymmetrical and tend toward the more tubular type but are still somewhat similar to those of *densicollis*; in the female *miraflorea* the dorsal genital plate has been modified considerably though still maintaining the basic type of the *densicollis* group.

There is considerable variation in the male genitalia, each type of small variation being limited, however, to one general region (see fig. 5, *i-n*); since these variations are only in degree and since there appears to be no other internal or external differences, I believe this aggregation of specimens is better treated as a single variable species.

PHYLLOPHAGA (LISTROCHELUS) DENSICOLLIS (LeConte)

FIGURES 5, *e, f*; 13, *c, d*

Listrochelus densicollis LECONTE, Smithsonian Misc. Coll., vol. 6, No. 167, p. 77, 1863.—HORN, Trans. Amer. Ent. Soc., vol. 7, p. 143, 1878.

Male.—Elongate, wider behind, elytra rather dull brown and moderately densely pruinose; thorax and head rufopiceous, moderately shining. Head glabrous, coarsely, rugosely, and densely punctate; transverse carina of vertex rather noticeable; clypeus very tumid at center of base, the tumosity densely and coarsely punctured; apex of clypeus subtruncate, very slightly emarginate, the angles narrowly rounded, margins but little reflexed; front very coarsely and closely punctate. Antenna 10-segmented, the club very slightly longer than the funicle. Prothorax densely, subrugosely, and (in front) coarsely punctured, lateral margins with long cilia, the margin in front of the median lateral dilation coarsely crenate, that behind the dilation entire; hind angles subangularly rounded, the front angles noticeably rounded; front and basal margins strong and entire. Elytra punctured as thorax, with short, inconspicuous, yellow hairs in the punctures; striae, except the sutural, hardly obvious. Pygidium very convex, strongly shining, with fine, moderate-sized, and dense punctures and with short, scattered, and suberect hair; apex subrounded. Abdomen flattened at middle, polished, sparsely pilose; fifth segment shorter than fourth, plane; sixth segment rather large, strongly convex, and with a very large and broad, moderately deep fovea in the middle, the surface with sparse, moderately long, and erect hair. All claws pectinate along a single margin, the pectinations large and of uniform size; first segment of hind tarsus much shorter than the second, hind tarsus scarcely longer than its tibia. Genitalia as in figure 5, *e, f*.

Female.—Antennal club three-fourths the length of the funicle; elytra markedly pruinose. Pygidium convex, moderately densely punctate, with short erect hairs; disk pruinose in basal half and polished in apical portion, the apical margin slightly explanate (the disk in the apical half is more densely punctate, and either tumid or faintly and longitudinally impressed at the center). Abdomen polished, slightly convex; sixth segment slightly convex, moderately densely and setigerously punctate. All claws subpectinate along a single margin, with a large triangular tooth beyond the middle (i. e.,

subapical). Genitalia as in figure 13, *c, d*. Otherwise similar to the male.

Length.—15–16.5 mm. *Width*.—7–8 mm.

Type.—Female, from Cape San Lucas, in the LeConte collection.

Specimens examined.—Males, 116; females, 74. LOWER CALIFORNIA: San Felipe, August (Beyer) [U.S.N.M.] and [Robinson]; Santa Rosa [U.S.N.M.]; 6 miles north of Triunfo, July 15, 1938 [Ross and Michelbacher]; Triunfo, July 15, 1938; San Bartola, July [Saylor]; 5 miles west of San Bartola, July 13, 1938 [Ross and Michelbacher]; 3 miles north of San Pedro, July 6, 1938 [Ross and Michelbacher].

Remarks.—The majority of the specimens are those collected by Ross and Michelbacher and are the first adequate series ever assembled for study; previously the species was known in the major collections of the country by less than two dozen specimens. The pygidium of the female varies somewhat within the species and may be evenly convex or convex and slightly and longitudinally impressed.

PHYLLOPHAGA (LISTROCHELUS) CARMINATOR (Horn)

FIGURES 5, *a-c*; 13, *g, h*

Listrochelus carminator HORN, Proc. California Acad. Sci., ser. 2, vol. 4, p. 398, 1894.

Male.—Very similar in most respects to *densicollis*, differing most conspicuously as follows: Thoracic disk less densely punctate and usually with an impunctate area; transverse clypeal carina less densely punctate. The genitalia in an *en face*-dorsal view are slightly to strongly expanded outwardly, while the upper tooth as viewed laterally is fairly short, as is shown in figure 5, *b, c*.

Female.—Essentially the same as in *densicollis*, but with the thorax densely punctate and never rugosely so; the dorsal genital plate in lateral view is always smooth. The pygidium is variable, with the center of the disk always gibbose, frequently the gibbosity slightly to moderately flattened at the middle and at times with traces of a longitudinal sulcus. Genitalia as in figure 13, *g, h*.

Length.—15–17 mm. *Width*.—7–8 mm.

Type.—Male, from "San Jose del Cabo," in the Horn collection.

Specimens examined.—Males, 24; females, 25. LOWER CALIFORNIA: Santa Rosa [U.S.N.M.]; San Felipe, July 10, 1938; Santiago on July 8, 1938, and 10 miles southwest of San Jose del Cabo on July 9, 1938 [all Ross and Michelbacher].

Remarks.—Closely allied to *L. densicollis* but separable by the key characters. The very short upper tooth of the male genitalia is a

good distinguishing character. The rugosity of the thorax varies somewhat in *carminator*, as well as in *densicollis* and *micelbacheri*, but most specimens will readily fall into the proper couplets in the keys.

PHYLLOPHAGA (LISTROCHELUS) MICHELbacheri, new species

FIGURES 5, *g*, *h*; 13, *a*, *b*

Male.—Very similar in all characters to *carminator*, except as follows: The genitalia in lateral view (fig. 5, *g*, *h*) have the upper and lower teeth of approximately the same size, while in *en face*-dorsal view the genitalia are expanded outwardly toward the sides, and the upper teeth are much longer than in *carminator*.

Female.—Exactly similar to *carminator*, except that the pygidium is convex at the base, with the apical half strongly flattened to faintly concave, and smooth. In lateral view the dorsal plate of the genitalia (fig. 13, *a*, *b*) is suddenly declivous just before the apex. The thoracic disk is densely punctate and highly polished, but never rugose.

Length.—14–17 mm. *Width*.—7–8 mm.

Types.—Holotype male and allotype female are from "20 mi. N. of Comondu, Lower California, collected VII-23-38 by Ross and Michelbacher" and are in the California Academy of Sciences. Paratypes are in the collections of the California Academy of Sciences, U. S. National Museum (No. 53759), Messrs. Ross and Michelbacher, Mont Cazier, and in the Saylo recollection. Named in honor of the collector, Dr. Abe Michelbacher, of the University of California, Department of Entomology.

Paratypes: Males, 61; females, 30. LOWER CALIFORNIA: 20 miles north of Comondu, July 23, 1938; 15 miles west of La Paz, July 5, 1938; Venancia, July 17, 1938; 15 miles west of San Ignacio, July 26, 1938; San Domingo, July 19, 1938; 15 miles north of El Refugio, July 4, 1938; 12 miles south of Santa Rosalia July 27, 1938; and 25 miles south of San Rosalia, July 25, 1938 (all Ross and Michelbacher); Palmarita, September 1923 (Wm. Mann) [U.S.N.M.].

Remarks.—The pygidium of the female is very characteristic and will set off this sex immediately from the others of the complex. The male is most readily distinguished by the use of the genital characters since the external characters are close to those of *carminator* and *densicollis* and are less obvious without careful study.

PHYLLOPHAGA (LISTROCHELUS) PILOSIPES, new name

FIGURE 11, *l-n*

Listrochelus puberulus LeConte, Smithsonian Misc. Coll., vol. 6, p. 78, 1863 (homonym of *puberulus* du Val, 1851).—Horn, Trans. Amer. Ent. Soc., vol. 7, p. 142, 1878.

Male.—Robust-oval, much wider behind, entire dorsal surface moderately shining and with dense, very short, and erect hairs. Head very densely, coarsely, and rugosely punctate, the transverse carina of the vertex sharply defined, the surface posterior to the carina with dense, moderately coarse, and transverse tumosities; clypeal suture nearly straight, clypeus nearly hexagonal, apex truncate and very strongly reflexed, sides straight and strongly convergent apically, the angles narrowly rounded. Antenna 10-segmented, club two-thirds the length of the funicle. Thorax punctured like head but more densely so; lateral margins with long, dense cilia, and the entire margin finely crenulate; hind angles obtuse, front angles subrounded; base and apex with a strong and entire marginal line. Elytra punctured as thorax. Pygidium convex, pruinose, densely and moderately coarsely punctate, with moderately long erect hair. Abdomen flattened, subpruinose, with moderately dense hair; fifth segment twice the length of the sixth and very densely setigerously punctate; sixth segment very slightly convex, rugosely and setigerously punctate. All claws pectinate along a single margin. First segment of hind tarsus equal in length to the second.

Female.—Length of the antenna and all other characters are practically the same as in the male except that the abdomen is somewhat more convex.

Length.—12.5–15.5 mm. *Width*.—6.5–7. mm.

Type.—From "Cape San Lucas, Lower California," in the LeConte collection.

Specimens examined.—Males, 13; females, 12. LOWER CALIFORNIA: Santa Rosa [U.S.N.M. and Robinson]; Triunfo, July 13, 1938 (Ross and Michelbacher); Miraflores and San Bartola, July 10–13, 1938 (Ross and Michelbacher).

Remarks.—Known only from Lower California and uncommon in collections. Not close to any other species of the genus in either external characters or male genitalia except the new species *L. peninsularis*, described herein.

The specimens from Triunfo are more sparsely pubescent on the abdomen than are those from either Miraflores or San Bartola, but the genital and other characters appear to be essentially similar in all the specimens.

PHYLLOPHAGA (LISTROCHELUS) PENINSULARIS, new species

FIGURE 3, *h, i*

Male.—Small, wider behind, above with sparse and short erect hair, that of the thorax minute; color rufocastaneous and shining, the thorax more rufous. Head with entire surface of front coarsely and variolately punctate; transverse carina of the vertex very sharply

defined, the surface behind the carina sparsely punctate and much more sparsely so at the occiput; clypeal sulcus nearly straight, not impressed; clypeus nearly trapezoidal in shape, sides straight and convergent apically, apex sharply and markedly reflexed, truncate, the angles very narrowly rounded; clypeal disk flat, slightly less densely punctured than the front. Antenna 10-segmented, rufotestaceous, the club testaceous and very slightly longer than the funicle. Thorax subangulately dilated at about the middle of the lateral margins, the margin ciliate and slightly crenulate; front and hind angles well defined but obtuse; disk coarsely and densely punctate, the punctures closer near sides and front margins, with a small mediobasal impunctate area. Elytra very coarsely, not densely, but regularly punctured, striae except the sutural not obvious. Pygidium convex, semi-pruinose, entire surface coarsely and moderately densely punctate, with moderately long erect hair; apex ciliate and subtruncately rounded. Abdomen polished and somewhat flattened at middle, sparsely punctured with erect hair; fifth segment moderately densely and piliferously punctate; sixth shorter than fifth, moderately densely and somewhat coarsely punctate. All claws very finely, hardly noticeably serrate along a single margin, with no larger intercalated teeth.

Female.—Very similar to male in all respects except that the antennal club is slightly shorter than the funicle and the abdomen in lateral view is slightly convex instead of flattened.

Length.—10–11 mm. *Width*.—5–5.5 mm.

Types.—Holotype male and allotype female from "Purissima, Lower California, collected October 23 by W. M. Mann," are in the United States National Museum (No. 53760). Paratypes: One female, same data, in the Saylor collection.

Remarks.—This new species shows the slightly asymmetrical male genitalia characteristics of the Lower Californian *L. pilosipes* Saylor, and the two together form a group that can be confused with no other species groups in the genus; the dense short hair and coarse puncturation of the entire dorsal surface as well as the asymmetrical male genitalia readily characterize the group.

PHYLLOPHAGA (LISTROCHELUS) TROCHANTER, new name

FIGURES 2, *e*; 4, *a*; 9, *d-f*

Listrochelus gracilis HORN, Trans. Amer. Ent. Soc., vol. 12, p. 123, 1885 (pre-occupied by Burm, 1855, and Nonfried, 1891).

Male.—Oblong-oval, sides somewhat subparallel. Head and thorax shining rufous, elytra and legs rufocastaneous, the former moderately pruinose. Head densely, not coarsely punctured, glabrous, the clypeal suture not impressed; transverse carina of vertex sharp and

conspicuous; clypeal apex subtruncate, rather strongly reflexed, angles rather broadly but not suddenly rounded. Antenna 10-segmented (rarely 9-segmented), the club about subequal to funicle. Thorax highly polished, finely, densely, and regularly punctured; sides with long cilia, and crenulate in front of the median dilation only; hind angles angularly rounded, front angles slightly rounded; front and basal marginal lines strongly indicated. Elytra punctured as thorax but less densely so, with moderately long and suberect hairs; costae, except sutural, obsolete. Pygidium very convex, polished, sparsely and finely punctate, with very short and erect hair. Abdomen flattened, and moderately densely, but finely, subgranulate at center; fifth segment equal in length to fourth; sixth three times the length of the fifth, raised rather conspicuously at each side into a prominence that forms the side of the very wide and sharp transverse carina, the latter slightly curved and extending practically from side to side of the segment, the remainder of the sixth segment flattened, polished, and very finely, sparsely punctate. All claws subpectinate along two margins, the front outer claws alone having a larger triangular tooth near the apex. Hind trochanter strongly prolonged behind the femur into a spinelike projection (fig. 4, *a*). First segment of hind tarsi longer than the second, all hind tarsal segments except the last with very dense hair below.

Female.—More robust, thorax more rufopiceous. Antenna three-fourths the length of the funicle. Pygidium flattened to slightly concave at center, pruinose and densely, finely punctate in basal two-thirds and highly polished and more coarsely punctate apically; surface with dense, erect, moderately long hairs; disk just before apex faintly tumid. Claws serrate along two (high power, 20 \times) margins, with a moderately large triangular tooth at the center of each, the inner claw of the hind tarsi, however, with the median larger tooth absent. Hind trochanter hardly produced. Otherwise similar to male.

Length.—13.5–17 mm. *Width*.—6–7 mm.

Type.—From "Arizona," in the Horn collection.

Specimens examined: Males, 26; females, 11. ARIZONA: Seen from a rather limited area in the southeastern part of the State, embracing Graham (Oracle), Pima (Tucson), Cochise, and Santa Cruz (Nogales) Counties; July and August.

Remarks.—Easily distinguished in the male sex by the strongly produced hind trochanters and the abdominal armature, which have no counterpart in the described species of the genus. This species, together with *L. scoparia* LeConte, *L. gentryi* Saylor, and *L. terminalis* Saylor, forms a group of the genus having in the males oddly formed fifth abdominal segments and densely pilose hind tarsal segments; in

the latter character the group approaches the subgenus *Chlaenobia*, though the tarsal claws in the two subgenera are of course quite dissimilar. The present species varies somewhat in the number of antennal segments but this is not at all uncommonly met with especially in the more typical members of the genus (*Phyllophaga sensu stricto*).

PHYLLOPHAGA (LISTROCHELUS) SCOPARIA (LeConte)

FIGURES 2, *d*; 3, *g*; 4, *b*, *e*; 7, *e*, *f*

Listrochelus scoparius LECONTE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 264, 1856.—HORN, Trans. Amer. Ent. Soc., vol. 7, p. 142, 1878.—BATES, Biologia Centrali-Americana, Coleoptera, vol. 2, pt. 2, p. 173, 1888.

Male.—Oblong-oval, rufocastaneous, thorax more rufous; elytra slightly to markedly pruinose, with scattered pile. Head with a strong transverse carina on the vertex, front densely, moderately finely punctate; clypeus longer than front, less densely punctured; apex slightly reflexed, subtruncate and faintly emarginate, angles narrowly rounded. Antenna 10-segmented, club slightly longer than, or subequal to, the funicle. Labrum deeply bilobed. Thorax finely, regularly, and moderately densely punctured, glabrous except for a few minute hairs near basal margin; angles rounded in front, obtuse behind; lateral margins ciliate, coarsely crenulate, less so in basal half; base and apex both strongly margined. Elytra punctured as thorax, with moderately sparse, short, erect hairs; striae except sutural not evident. Pygidium strongly convex, finely, moderately densely punctured, with short suberect hairs; surface somewhat pruinose; apex wide and truncate, apical margin thickened. Abdomen with segments 1-5 inclusive flattened at middle and sparsely, finely punctured and pubescent; fifth segment with a small, triangular-shaped, elevated, plateaulike area beginning in apical half and continuing to the apical margin; sixth segment much larger than fifth, with a very strong transverse carina at middle, the carina deeply incised and forming at its ends two strong toothlike lobes, surface in basal half of sixth sparsely punctured, nonpilose, that of apical half moderately densely punctate and with rather long, erect hair. Hind tarsus only as long as the tibia and rather densely pilose below. Hind tibia somewhat more densely pilose on the inner side than in most of the species of the subgenus. All claws pectinate on a double margin, without larger intermixed teeth.

Female.—Antennal club shorter than funicle. Pygidium flat in basal two-thirds, abruptly gibbose in apical third, the latter very coarsely and rugosely punctured, and polished; basal area highly pruinose, with dense and fine punctures, and moderately long, erect hair; pygidial disk in lateral view appearing rather concave. Abdomen

highly polished and evenly convex at middle, with fine and sparse setigerous punctures, the sixth and apical portion of the preceding segment slightly more coarsely punctate. All claws except the inner hind one with a sharp median tooth intercalated with the serrations, which occur in a double row; hind inner claw serrate but without the larger intermixed tooth. Hind tarsus only slightly pilose below. Otherwise similar to male.

Length.—13–17.5 mm. *Width.*—5.5–9 mm.

Type.—In the LeConte collection.

Type locality.—“Sonora, near the Boundary line.”

Specimens examined.—Males 97; females, 63. ARIZONA: The range is rather general over the southern half of the State south of Prescott. June 6 (Sabino Canyon) to middle August (Buckeye). Taken on *Olneya tesota* (desert ironwood) by Ernest Holt at Higley.

Remarks.—This very distinct and common species can be distinguished in either sex probably more easily than any other of the group; the unusual abdominal armature and hairy hind tarsi of the male, as well as the pygidial characters of the female, are unique in the United States fauna. The male in abdominal armature is closely related only to the Mexican species *L. terminalis* Saylor and *L. gentryi* Saylor.

PHYLLOPHAGA (LISTROCHELUS) DISPARILIS (Horn)

FIGURES 1; 6, a-d; 8, m

Listrochelus disparilis HORN, Trans. Amer. Ent. Soc., vol. 7, p. 141, 1878.

Male.—Elongate, subparallel, rufocastaneous, shining above, with or without faint pruinose markings on elytra. Head with transverse carina strong; front flat, densely, coarsely, and not confluent punctate, glabrous; clypeal suture fine, subarcuate, not impressed; clypeus punctured as front but much more densely so at center of disk; apex of clypeus subtruncate, angles moderately rounded, the margins slightly reflexed; clypeus as long as the front. Labrum very deeply, widely, semicircularly emarginate. Antenna 10-segmented, club small and slightly longer than funicle. Thorax broad, moderately densely, finely, irregularly punctured, more closely so at sides, disk glabrous; base and apex with strong marginal lines, lateral margins ciliate and coarsely crenate; hind angles nearly rectangular, front angles slightly obtuse but distinctly angulate. Elytra punctured as thorax but less densely so, first and second striae weakly indicated, sutural striae strong; surface of elytra with sparse, short, suberect hairs; lateral margin with long cilia. Pygidium strongly convex, highly polished, very finely, moderately densely punctate, with very short suberect hairs; apex truncate and broad. Abdomen very shallowly, widely, and longitudinally channeled at center, surface moderately

densely punctate at center, with short suberect bristles; fifth segment one-third longer than fourth; sixth segment a little shorter than fifth, with a deep longitudinal median sulcus, surface finely punctate, with short erect hairs, sides with numerous small, transverse, and scabrous filelike elevations. Hind femur with a single transverse submarginal line of 8 or 9 strong spines set in punctures. All tarsal claws strongly pectinate along a double margin, without larger intercalated teeth. First segment of hind tarsus longer than the second.

Female.—Antennal club shorter than funicle. Pygidium slightly convex and pruinose basally and somewhat concave and polished apically; apical margin a raised smooth area in the shape of a very wide-mouthed V and punctured near apex; entire disk with fine dense punctures, each with a short erect hair; disk just basad of the apical raised area somewhat rugose. Abdomen convex, highly polished and sparsely, finely punctate at middle; fifth segment depressed in apical fourth; sixth nearly as long as the preceding, flattened, with moderately coarse and dense setigerous punctures. All claws with a strong median tooth, the surface each side of the tooth serrate to subpectinate along a double margin. Otherwise similar to male.

Length.—16–20 mm. *Width*.—7–9 mm.

Type.—In the Horn collection in Philadelphia.

Type locality.—"Colorado, New Mexico, and Arizona."

Specimens examined.—Males, 21; females, 23. ARIZONA: Central and eastern portions of the State, especially in the Flagstaff and Prescott areas, July and August. COLORADO: Custer County (Cockerell) [U.S.N.M.]. NEW MEXICO: Frequent around Las Vegas and the central areas of the State and seen also from Cloudcroft, August; Jemez Mountains on July 24 at 9,000 feet [Calif. Academy]. MEXICO: "Mexico" [Casey and Saylor].

Remarks.—A wide-ranging species that cannot be easily confused with any other United States species except possibly in the female of *L. huachuca* and *L. chapini*; these latter two are easily separated by their much less robust form, much denser pruinosity, and the pygidial characters as given in the keys. The Mexican specimens are noticeably hairier on the elytra in both sexes but are not otherwise different from the United States specimens.

PHYLLOPHAGA (LISTROCHELUS) HUACHUCA, new species

FIGURES 7, *a-d*; 8, *n*; 13, *i*

Male.—Strongly elongate, rufocastaneous, highly polished except for the densely pruinose elytra; head and thorax glabrous. Head with very dense and coarse variolate punctures; clypeal apex hardly reflexed, subtruncate, the angles broadly rounded; transverse carina of the vertex moderately strongly indicated, surface behind the latter

impunctate. Antennal club equal to funicle. Thorax with fine, dense, and regularly placed punctures; lateral margin coarsely crenate, with long cilia; disk with a small, longitudinal impunctate area at middle. Elytra with fine and dense punctures and apparently much smaller punctures intermixed, the hairs small to minute on disk, a little longer near and at the sides; striae, except sutural, obsolete. Pygidium strongly convex, with fine and sparse punctures, the hairs short and erect; apical part highly polished and less densely punctate, basal half pruinose or subpruinose. Abdomen flattened and slightly concave at middle, with dense, short erect hairs; sixth segment coarsely and rugosely punctate, with long erect hairs, with a rather deep median longitudinal sulcus, the area each side of middle with an oblique raised ridge on each side. All claws strongly pectinate along a double margin, without larger intermixed teeth.

Female.—Antennal club shorter than funicle. Base of clypeus somewhat tumid. Pygidium convex, densely pruinose in basal three-fourths, with fine, sparse punctures, and short, erect hair; apex with a strong, raised, and smooth V-shaped area. Abdomen slightly convex, polished, with fine, sparse, setigerous punctures; sixth segment as long as preceding but more densely and coarsely punctate and the hairs longer and more coarse. All claws serrate or subpectinate along a double margin, and each claw with a large, triangular median tooth. Otherwise as in male.

Length.—17–20 mm. *Width*.—7.5–8 mm.

Types.—Holotype and allotype are from the Huachuca Mountains, Carr Canyon, Arizona, collected by M. A. Cazier on June 14, 1936 (Saylor collection) and are deposited in the United States National Museum (No. 53761).

Paratypes.—Males, 14; females, 12. ARIZONA: Huachuca Mountains, July [U.S.N.M.], July 14 (Cazier) [Saylor]; June (Duncan) [Saylor] and July 8 (Beamer) [Snow Museum]; Santa Rita Mountains, July 24 (L. Anderson) [Snow Museum]; Chiricahua Mountains, June (Wickham) [U.S.N.M. and Saylor]; Ramsey Canyon, Huachuca Mountains (Cochise County) July [Saylor]. MEXICO: Ciudad Juarez, Chihuahua [Saylor].

Remarks.—While closely allied to *L. disparilis* Horn, *L. huachuca* is readily separated by the more elongate form and pruinosity of the dorsal surface (elytra), as well as by other structural and genitalic characters as shown in the keys. The form of the female pygidium in the three allied species (*L. disparilis*, *L. huachuca*, and *L. chapini*) is but slightly variable within each species and is of much assistance in separating specimens of this sex from one another.

PHYLLOPHAGA (LISTROCHELUS) CHAPINI, new species

FIGURES 7, *g-j*; 8, *o*

Male.—Very similar in all respects to *L. huachuca* Saylor, differing mainly in the genital characters. The area at the base of the clypeus is usually slightly to noticeably tumid in both sexes, while it is usually more flattened in *L. huachuca*.

Female.—Apical portion of the pygidium consisting of a large, smooth, and raised area in the shape of a very wide V, and is almost semicircular (fig. 8, *o*), whereas in *L. huachuca* the raised smooth area is a narrow, V-shaped area.

Length.—16.5–19 mm. *Width*.—7–8 mm.

Types.—Holotype and allotype are from "Fort Grant, Arizona, collected July 22 by Hubbard and Schwarz" and are in the United States National Museum (No. 53762).

Paratypes: Males, 26; females, 11. ARIZONA: Fort Grant [U.S.N.M. and Saylor]; Chiricahua Mountains, July [U.S.N.M.], July 13 (Van Dyke), June 10 [Saylor], and July 10 [Saylor]; Pinery Canyon, Chiricahua Mountains, 6,000 feet, July 1 [American Museum]; mouth of Rucka Canyon, Chiricahua Mountains, July 7 (Van Dyke). NEW MEXICO: "New Mexico" [U.S.N.M.]; Silver City, July 22 (Jackson) [Snow Museum].

Remarks.—While closely allied to *L. huachuca*, this species appears to be consistently different in both sexes and well deserving of a name. I take pleasure in naming this species for my good friend Dr. E. A. Chapin, of the National Museum, as a slight token of my appreciation of many kindnesses, both past and present.

PHYLLOPHAGA (LISTROCHELUS) FLAVIPENNIS (Horn)

FIGURES 2, *f-g*; 10, *a-d*

Listrochelus flavipennis HORN, Trans. Amer. Ent. Soc., vol. 12, p. 123, 1885.

Male.—Elongate-oval, strongly shining, elytra sparsely haired above. Head with front closely and coarsely rugose, transverse ridge of vertex moderately strong; clypeal suture hardly impressed, strongly bisinuate; clypeus punctured like front, apex truncate, apical margin slightly reflexed, angles strongly rounded. Antenna testaceous, 10-segmented, club about one-fourth to one-third longer than funicle. Thorax finely, moderately densely punctate, center of disk often with a suggestion of a smooth median line; base and apex strongly margined, sides finely crenulate and ciliate; front angles rounded, hind angles obtuse but subangulate. Elytra finely, rugosely punctate, with sparsely placed, short, erect hairs; first striae, besides sutural, strongly oblique, obsolescent in basal half, much wider and more pronounced apically. Pygidium strongly convex, highly polished, finely sparsely

punctate, with very short, suberect hairs. Abdomen widely, shallowly concave at middle, first five segments sparsely punctate, with short erect hairs; sixth segment a little shorter than the preceding, less densely but more coarsely punctured, with a faint longitudinal median sulcus. Claws of all the tarsi strongly pectinate along a double margin, without larger intercalated teeth. First segment of hind tarsus equal to second.

Female.—Antennal club a little shorter than the funicle. Pygidium convex but flattened, the entire disk very highly polished and smooth, with fine and sparse punctures, each of the latter bearing a short, suberect hair; apex rounded, with a row of coarse yellow bristles. All tarsal claws serrate along a double line (rarely apparently only along a single line) and each with a moderately large triangular tooth at about the middle. Abdomen highly polished, slightly convex, with fine punctures and short, sparse hairs, those of the subequal segments 5 and 6 somewhat longer. Otherwise similar to the male.

Length.—14–16.5 mm. *Width*.—6.5–7 mm.

Type.—In the Horn collection.

Type locality.—"Arizona."

Specimens examined: Males, 51; females, 9. ARIZONA: Pima, Pima, Gila, Graham, and Cochise Counties, in the southeastern parts of the State; July and August. NEW MEXICO: 'New Mexico' [U.S.N.M.]; Silver City, July 22 [Snow Museum].

Remarks.—This species and *L. granti* are quite conspicuous in the genus by their rufous thorax and shining, testaceous clytra. Apparently there is but little variation within the species. The females are rare in collections.

PHYLLOPHAGA (LISTROCHELUS) GRANTI, new species

FIGURES 4, *g*; 5, *d*; 10, *e-h*; 13, *j*

Male.—Elongate, subparallel, strongly shining; rufotestaceous, the head and thorax rufous. Head with front coarsely and variolately punctate, the punctures not contiguous and with several smaller punctures intermixed; transverse carina strongly indicated, surface behind it impunctate; base of clypeus faintly sinuate, hardly reflexed, the angles broadly rounded. Antenna 10-segmented, unicolorous, club one-fourth longer than the funicle. Thorax finely, not densely punctate on disk, the punctures closer at sides and apex, a slight median impunctate area visible; lateral margins with long cilia, coarsely crenate, angles well indicated but obtuse; base with strong marginal line. Elytra finely, subrugosely punctate, with fine, short, erect hairs; the striae on disk oblique and moderately prominent. Pygidium strongly convex, highly polished, moderately coarsely and not densely punctate, with short, suberect hairs; apex truncate and

ciliate. Abdomen flattened and faintly concave at center, highly polished except for a few patches of pruinosity at sides of segments 3-5; at center of segments 1-4 with fine, sparse granules and small hairs; segment 5 nearly plane at middle, with a few coarse punctures and hairs along the apical margin and at the sides; sixth segment shorter than the fifth, smooth at the center and coarsely, setigerously punctate at the sides; both fifth and sixth with a moderate longitudinal sulcus at the middle. All claws strongly pectinate along a double margin and without any larger teeth intercalated. Hind tarsus with first segment shorter than the second. Front tarsus without a small spine at inner apex of each segment.

Female.—Antenna shorter than funicle. Pygidium flattened and rugose in basal three-fifths, with fine, dense punctures and short suberect hair; apical two-fifths of disk slightly and gradually raised from the disk, polished and very sparsely punctate, apex densely ciliate; pygidial disk from a lateral view appearing quite flat, to slightly concave. Abdomen slightly convex, somewhat polished, coarsely punctate; fifth segment with a suggestion of two blunt transverse parallel ridges near base; sixth with very coarse, dense punctures, the hairs moderately long and erect. All claws with a submedian tooth and serrate along a double margin (at times apparently along a single margin only), except that the inner hind claw *usually* does not have the larger intercalated tooth. Otherwise as in the male.

Length.—14-17 mm. *Width*.—6-7.5 mm.

Types.—Holotype and allotype are from Patagonia, Ariz., collected on July 6 by M. A. Cazier (Saylor collection) and are in the United States National Museum (No. 53763).

Paratypes: Males, 13; females, 3. ARIZONA: Fort Grant [U.S. N.M. and Saylor]; Patagonia, July 6 (Cazier) (Ross and Cazier) [Saylor and Cazier]; Catalina Mountains, 5,500 feet [Saylor]; Nogales, Santa Cruz County (Nunenmacher) [Saylor]; Santa Rita Mountains [Saylor]; Tucson, July [Saylor]. MEXICO: Bakachaka, Rio Mayo, Sonora, August 25 (Gentry) [Saylor].

Remarks.—The female pygidium varies slightly as to the convexity of the disk, in one example being flat and semirugose and in the other semiconcave and rugose. Externally similar in general facies to *L. flavipennis* but quickly separated by the tumid clypeus of both sexes as well as the quite different male genitalia.

PHYLLOPHAGA (LISTROCHELUS) MUCOREA (LeConte)

FIGURES 8, *d-f*

Listrochelus mucoreus LECONTE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 263, 1856.—HORN, Trans. Amer. Ent. Soc., vol. 7, p. 144, 1878.—

BATES, Biologia Centrali-Americana, Coleoptera, vol. 2, pt. 2, p. 173, 1888.

Listrochelus texanus LECONTE, op. cit., p. 263, 1856.—HORN, op. cit., p. 144, 1878.

Listrochelus obtusus LECONTE, op. cit., p. 264, 1856.—HORN, op. cit., p. 144, 1878.

Male.—Robust-oval, shining rufocastaneous, usually with pruinose patches on sides of thorax, basal part of pygidium and on the elytra to a greater or lesser extent (rarely elytra entirely pruinose and thorax nearly so); sparsely hairy on elytra, especially in basal part, rarely glabrous. Head with a very strong transverse carina, front very densely coarsely punctate; clypeus less densely and less coarsely punctured than front, middle of disk very sparsely so; apex subtruncately rounded, very strongly reflexed, angles strongly rounded. Antenna 10-segmented, club slightly longer than funicle. Thorax moderately densely, somewhat coarsely punctate, the punctures more sparse at center of disk and very dense near front margin; disk apparently glabrous; lateral margins crenulate, with long cilia; front angles subrounded, hind angles subangulate but very obtuse; front and hind margins strongly margined, the latter with long erect cilia. Elytra finely, somewhat rugosely punctate, with very fine sparse hairs, the latter often rather dense near base and scutellum; striae including sutural hardly obvious. Pygidium strongly convex, finely and densely punctured, with short suberect hair, the punctures much sparser in apical third. Abdomen highly polished at middle and flattened, very finely sparsely punctate, the sutures between the segments nearly punctate, with moderately long suberect hair. Hind tibia with longest spur spatulate at apex; first two tarsal segments subequal in length. All claws pectinate along a double margin; outer front claw with a large subapical tooth.

Female.—Antennal club equal to funicle. Pygidium densely pruinose and semiconvex in basal half, polished and flat in apical portion; the latter with a strong longitudinal impression at the middle; disk with fine, not dense, setigerous punctures, the hair short and suberect; apex subtruncate. Abdomen highly polished and convex at the middle, with fine and dense punctures, the hairs very short; fifth sternite gibbose slightly beyond the middle; sixth shorter than preceding and with dense, coarse, setigerous punctures. All claws, except hind inner one, serrate to subpectinate along a single margin (rarely with traces of a second margin), with a much larger tooth beyond the middle of each claw; the hind inner claw apparently serrate along a double margin and without a larger intercalated tooth. Hind spurs strongly spatulate. Otherwise similar to the male.

Length.—12.5–19 mm. *Width*.—5.5–9.5 mm.

Type.—In the LeConte collection.

Type locality.—"Fort Yuma, Colorado River, California" and "Eagle Pass, Texas" for *L. mucoreus*; "Texas" for *L. texanus*; and "Kansas, near Platt River" for *L. obtusus*.

Specimens examined.—Males, 91; females, 39. TEXAS: General along the southwestern boundary of the State and apparently com-

mon in Zavala and Dimmit Counties in middle March; March 5 (Dimmit County) to June 22 (Del Rio). CALIFORNIA: Riverside, Imperial, and San Diego Counties only, February to April; apparently locally common at Indio early in April. NEW MEXICO: Mesilla Park [U.S.N.M.]. ARIZONA: Tucson and Yuma, in May [U.S.N.M.]. KANSAS: Syracuse (Schwarz) [Robinson]. MEXICO: "Mexico" [Casey]. Cited in literature (record questionable): "Cape San Lucas, Lower California" (Horn, 1878).

Remarks.—This species, with *L. pulcher* and *L. reinhardi*, forms a very definite complex and the females cannot well be separated, though the males are distinct in internal genitalic characters. Apparently a common species in much of the Southwest, coming frequently to light. The one Mexican example in the Casey collection agrees exactly with the United States females; this example is probably from the old Levette collection.

PHYLLOPHAGA (LISTROCHELUS) PULCHER (Linell)

FIGURES 8, 9-i

Listrochelus pulcher LINELL, Proc. U. S. Nat. Mus., vol. 18, p. 730, 1896.

Male.—Elongate-oval, rufous to rufopiceous or rufocastaneous, with varying amounts of pruinosity on the thorax, elytra, pygidium, and abdomen, the elytra often entirely pruinose; at least the discal part of thorax and head always shining rufous; glabrous above except for elytra. Head with very strong transverse carina; front very densely and coarsely punctured, except for a narrow smooth area along the clypeal suture; clypeal suture biarcuate, fine, scarcely impressed; clypeus very long, less densely punctured than front and center of disk, often quite smooth, apex subtruncate and strongly reflexed, angles narrowly rounded. Antenna 10-segmented, club testaceous, subequal to, or very slightly longer than, funicle. Thorax finely, densely, irregularly punctured, most closely so at front margin and near sides; lateral margin ciliate, entire behind and slightly sinuate in front of the median dilation; hind angles distinct but obtuse, front angles less distinctly angulate; base and apex with strong marginal lines, basal margin ciliate. Elytra finely, densely, and regularly punctate, with fine suberect hairs, surface subrugosely wrinkled; striae including sutural rather feebly indicated. Pygidium strongly convex, finely densely punctate, with short, suberect hairs; basal three-fifths usually strongly pruinose and apical part usually strongly shining; apex ciliate, truncate. Abdomen very slightly, hardly noticeably concave in basal three segments, the fourth slightly convex, and fifth somewhat flattened; surface sparsely, finely, setigerously punctured; fifth segment rather smooth in basal half, punctured in apical half, and either

pruinose or highly polished; sixth shorter than fifth, slightly transversely flattened, finely densely punctate, with moderately long hairs. All tarsal claws finely pectinate along a double margin, the outer front claw only with a large subapical triangular tooth; the hind claws often pectinate-serrate rather than entirely pectinate (especially the inner and shorter row of pectinations). First segment of hind tarsi subequal to or slightly shorter than the second.

Female.—Antennal club subequal to funicle. Pygidium slightly convex and highly pruinose in basal half, strongly flattened and polished apically; disk with moderately fine and somewhat dense setigerous punctures, the hairs erect and short; apical half of disk usually less densely punctate and with a slight to moderate median longitudinal impression. Hind inner claw without a larger tooth, all other claws with a strong, triangular, intercalated tooth slightly beyond the middle, the surface from large tooth to base serrate to subpectinate, along a double margin. Otherwise as in the male.

Length.—15–18.5 mm. *Width*.—7.5–8.5 mm.

Type.—Male in United States National Museum; female in the Ulke collection.

Type locality.—"Skidmore, Texas."

Material examined.—Males, 9; females, 4. TEXAS: Corpus Christi, Oakville in April, Pleasanton in February, Bexar County and Stephenville on April 5.

Remarks.—Close to *L. mucorea* and allies but quite distinct, at least in the male sex. I have been unable to find characters either genitalic or otherwise that will hold in a series in separating the females but am confident that females of both species are present in the material at hand. Varies somewhat in the density of the elytral pruinosity, especially in the females.

PHYLLOPHAGA (LISTROCHELUS) REINHARDI, new species

FIGURES 8, a-c

Male.—Elongate-oval, rufocastaneous to piceocastaneous, sides of thorax and larger part of elytra usually pruinose, elytra with sparse minute hair, otherwise glabrous. Head and clypeus densely and coarsely punctate, transverse occipital ridge strong and entire; apex clypeus sharply reflexed, thickened, subtruncate, angles rounded. Antenna 10-segmented, segment 3 longer than 2, 4 and 5 subequal and each shorter than 3, 6 and 7 transverse; club one-fifth (or less) longer than funicle. Thorax densely, moderately coarsely punctate, with a smooth median longitudinal stripe; lateral margins finely to coarsely crenulate and ciliate; basal marginal line entire and ciliate; hind angles obtuse but obvious, front angles obtusely rounded.

Elytra finely, sparsely, and regularly punctate, with minute hair and some much longer hair near base of scutellum. Pygidium convex, pruinose at base, polished apically; densely, not coarsely punctate in basal half, much less densely so in apical half, apex truncate. Abdomen flattened at middle, pruinose at sides and somewhat at middle; segments finely, sparsely punctate at middle, fifth segment plane, sparsely punctate, with several short and erect hairs apically; sixth segment transversely impressed, with moderately dense marginal rows of short hairs at base and apex. All claws pectinate along a double margin, the outer row of pectinations of outer front tarsal claw with a large, acute subapical tooth. Hind tibia with one spur three-fourths as long as the other and the longest rather broadly spatulate.

Female.—Thorax a little more coarsely punctate. Antennal club subequal to funicle; club testaceous, funicle castaneous. Pygidium moderately convex, densely pruinose in basal half, highly shining in apical portion, the latter usually convex (in some few specimens there is a trace of a finely impressed longitudinal sulcus, but not nearly so distinct as in the females of *L. mucorea* and *L. pulcher*, in which the apical half of the disk is also flat); disk with moderately dense and coarse punctures, with short suberect hairs. Abdomen evenly convex, highly polished, and with fine, moderately dense punctures at the center. Hind tibial spurs spatulate. Inner hind claw without a larger intercalated tooth; all other claws serrate to subpectinate, with a strong intercalated tooth. Otherwise similar to male.

Length.—14–16 mm. *Width*.—6.5–8 mm.

Types.—Holotype and allotype are from Hidalgo County, Tex., collected by H. J. Reinhard on April 5, 1930, and are in the United States National Museum (No. 53764).

Paratypes: Males, 16; females, 8. TEXAS: Several, same data as types; Weslaco, March 16 (Clark) [Reinhard]; Alice, June 12; Mercedes, February (Urbahms) [Reinhard].

Remarks.—Externally rather similar in both sexes to *L. mucorea* but quite different in the male genital organs; the females are quickly differentiated by pygidial characters. Named for H. J. Reinhard, of the Agricultural and Mechanical College, Texas, who has contributed much valuable material, both for the present and for other studies of the author's.

PHYLLOPHAGA (LISTROCHELUS) PLENA (Fall)

FIGURES 8, *j-l*

Listrochelus plenus FALL, Journ. New York Ent. Soc., vol. 40, p. 199, 1932.

Male.—Elongate, rufocastaneous, head and thorax polished, elytra subshining, with some pruinosity, head and thorax apparently gla-

brous. Head with front coarsely and variolately punctate, though somewhat sparsely so at the center, transverse carina of vertex strongly marked; clypeus polished, sparsely punctured at sides and impunctate elsewhere; apex of clypeus strongly reflexed and subtruncate, angle broadly rounded. Antenna testaceous, club slightly longer than the funicle. Thoracic disk somewhat coarsely, moderately densely punctured, with a narrow impunctate median line; both base and apex strongly margined; sides of thorax subangularly dilated behind the middle, margin coarsely crenate in front of, and finely so or entire behind, the emargination; angles obtuse, not prominent. Elytra coarsely, rugosely wrinkled, striae except sutural only faintly indicated; disk moderately densely and finely punctate, with numerous small suberect hairs; sutural striae much narrower at base and apex. Pygidium strongly convex and highly polished, with very fine, sparse punctures; disk apparently glabrous, apex rounded. Abdomen highly polished, segments with moderately dense and fine punctures; sixth segment slightly shorter than the fifth, flattened, entire surface covered with moderately dense, somewhat coarse granules and fine, erect hairs. All claws pectinate along a double margin, the outer claws of front and middle tarsi each with a larger tooth just before the apex, hind claws pectinate to subserrate, without larger intercalated teeth.

Female.—Antennal club shorter than funicle. Thorax slightly more rufous and more densely punctate. Elytra highly pruinose. Pygidium polished, much smaller than in the male, convex, with a suggestion of a gibbosity each side of the middle, these two gibbosities nearer the lateral margins than to each other; pygidial surface very finely and sparsely punctate, with a few minute hairs apically. Abdomen strongly convex and very highly polished, segments 1-4 with sutures nearly obsolete and the surface with a few minute hairs; fifth large, declivous apically, hardly punctured; sixth subplanate, with sparse erect hairs. All claws apparently subpectinate or serrate along a single margin and each of the front and middle claws with a large tooth just before the apex, the hind tarsi without such larger teeth.

Length.—13-15 mm. *Width*.—6-6.5 mm.

Type.—In Fall collection.

Type locality.—"Baboquivari Mts. and Ajo, Arizona."

Specimens examined.—Males, 5; females, 10. ARIZONA: All specimens seen are from a rather limited locality—Pima and Cochise Counties; the majority of specimens came from the Santa Rita or Baboquivari Mountains, June and July.

Remarks.—The males are readily placed by the key, and the females may be rather easily determined by the characteristic pygidium, which is small and highly polished and convex only on the disk, as well as by the characteristic shape of the abdomen in lateral view.

PHYLLOPHAGA (*LISTROCHELUS*) *OPACICOLLIS* (Horn)

FIGURES 3, k; 11, h-k

Listrochelus opacicollis HORN, Trans. Amer. Ent. Soc., vol. 7, p. 145, 1878.

Male.—Small, robust-oval, strongly and entirely pruinose except for head, hairy above. Head with a weak but noticeable transverse carina, surface behind carina without punctures; front very strongly, densely, rugosely punctured, with moderately long and erect pile; clypeus punctured as front, the punctures, however, much finer, apex slightly reflexed, subtruncate at middle, with moderately rounded angles. Antenna 10-segmented, testaceous, club a little longer than funicle. Thorax finely, moderately densely punctured, less densely so at center, with longer, erect, yellowish hairs; lateral margins strongly dilated at middle, very finely crenulate, with very long yellowish cilia; front angles rounded, hind margins subangular but very obtuse. Elytra finely, rugosely punctate, with long erect hair, striae except sutural obsolete. Pygidium strongly convex, highly polished, very finely, moderately densely punctate, with short suberect hairs, apex subtruncate. Abdomen strongly, transversely gibbose at middle, surface finely, densely, and setigerously punctate, the hairs fine and long; sixth segment punctured as fifth, but surface flatter and with a median longitudinal carina faintly indicated. Hind tibia moderately densely pilose within. All tarsal claws each with a small hardly obvious submedian tooth, the surface between the tooth and base of claw very minutely crenulate. First two segments of front tarsus each with small inner spinelike projections at apex; hind tarsi moderately hairy, first segment slender, and but little wider at apex than at base.

Female.—Antennal club slightly shorter than funicle. Pygidium convex, sides straight and strongly convergent apically, the apex truncate. Disk with coarse and moderately dense punctures and with short suberect hairs, the surface rugose. Abdomen evenly convex, highly polished, and sparsely punctured; fifth sternite slightly depressed apically, with a few scattered coarse punctures among the finer ones; sixth segment with coarse scattered punctures, surface rugose. All claws with a short tooth at center, surface between tooth and claw base minutely serrate. First segment of front tarsi with a blunt spine at inner apex. Otherwise similar to male.

Length.—11-14 mm. *Width*.—5-6.5 mm.

Type.—In the Horn collection.

Type locality.—"Utah, Arizona and New Mexico."

Specimens examined.—Males, 22; females, 17. ARIZONA: General in the eastern half of the State, from Williams south, and east to Cochise County, July. UTAH: Cedar City, Iron County, June 25

(Knaus) [U.S.N.M.]. NEW MEXICO: Jemez Springs, Galiena Creek, 8,500 feet, July 24 [Saylor].

Remarks.—Can be readily confused only with *L. fimbripes*, *L. koehleriana*, and more especially *L. tarsalis*, but is the only one of this group having densely pruinose thorax covered with long hair, and may thus be separated readily in both sexes.

PHYLLOPHAGA (LISTROCHELUS) TARSALIS (Schaeffer)

FIGURES 2, *a*; 3, *m*; 4, *d*; 9, *g-j*

Listrochelus tarsalis SCHAEFFER, Ent. News, vol. 19, p. 319, 1908.

Male.—Small, elongate, very deeply pruinose above; hairy above except for the glabrous and impunctate thoracic disk. Head very coarsely, rugosely, and contiguously punctate, with moderately long erect hair; the punctures of clypeus a little less dense at sides of apex; transverse carina strongly indicated, impunctate behind; apex of clypeus slightly rounded, slightly reflexed, angles broadly rounded. Antenna unicolorous, 10-segmented, club over a fourth longer than the funicle. Prothoracic disk apparently without punctures except for a very few just inside the center of both the apical and basal margins; all margins ciliate; the lateral margins with very long hair and coarsely crenate in apical half, and finely serrate or straight in basal half; hind angles very broadly rounded, just barely indicated. Elytra finely punctate, with long, erect, and moderately dense hairs; striae except for the weak sutural costae not indicated. Pygidium moderately convex, polished, finely and densely punctate, with short suberect hairs; disk declivous before apex, the latter truncate and ciliate. Abdomen highly polished except for lateral pruinose patches; center of disk somewhat depressed and flattened, segments 3 and 4 somewhat transversely elevated at centers; fifth segment with faint longitudinal sulcus; sixth flattened, impunctate immediately at the center. Hind tibia with very long and extremely dense hairs on the apical two-thirds of the inner surface. Hind tarsus with first segment over half as wide at apex as long, and with a strong wing-shaped projection in apical two-thirds (see figures). Front tarsus with a strong, sharp, triangular spine at inner apex of first tarsal segment, the spine of the second segment hardly noticeable. All claws weakly serrate along a single margin; without larger intermixed teeth. Hind tarsal segments moderately densely pilose, the hairs long and fine.

Female.—Antennae rufocastaneous, the club testaceous and as long as segments 3-7 of the funicle combined. Pygidium flattened, faintly tumid near apex; surface finely, densely punctate, with short erect pile; basal half of disk pruinose, apex shining and subtruncate. Abdomen more convex than in the male and the transverse elevations

less noticeable; fifth segment coarsely and moderately densely punctate; sixth segment slightly convex, shorter than and more coarsely and sparsely punctate than the preceding segment. First segment of hind tarsus slightly expanded each side at apex (as in diagram). All claws finely serrate along a single margin and each with a very fine submedian tooth. All other characters, as well as the spined front tarsi, as in male.

Length.—12.5–14 mm. *Width.*—5.5–6.5 mm.

Type.—In the United States National Museum.

Type locality.—"Santa Rita Mts., Arizona."

Specimens examined.—Males, 15; females, 16. ARIZONA: Pinal, Pima, Cochise, and Graham Counties, in the southeastern parts of the State, June 6 (Comstock) to August 8 (Huachuca Mountains). NEW MEXICO: Silver City.

Remarks.—Though resembling several small and densely pruinose species, *L. tarsalis* is the only one with a thorax that is apparently (view vertically) impunctate and glabrous, except at the sides. Also, the first hind tarsal segment is always very strongly expanded near the inner apex in the male and somewhat more so than usual in the female; the type of tarsal expansion in both sexes is not quite duplicated in any of the others species in the genus.

PHYLLOPHAGA (LISTROCHELUS) SCUTICEPS (Bates)

FIGURE 6, k-n

Listrochelus scuticeps BATES, *Biologia Centrali-Americana*, vol. 2, pt. 2, p. 171, 1888.

Male.—Oblong-oval, rufotestaceous, head and thorax shining rufous, elytra partly to almost entirely pruinose. Head subrugose with dense, gross, and variolate punctures, apparently glabrous; transverse carina of vertex moderately well indicated, surface behind carina impunctate; clypeus punctured as front, disk flattened and glabrous, apex reflexed and truncate, angles moderately broadly rounded. Antenna 10-segmented, unicolorous rufotestaceous, club subequal to funicle. Thorax with disk densely, finely, rather regularly punctured, somewhat denser near sides and apex; base and apex strongly margined; lateral margins coarsely crenate, ciliate, angles obtusely rounded, the hind angles not subangulate. Elytra finely, moderately densely punctured, with minute recumbent hairs, surface subrugose, costae besides sutural weakly indicated. Pygidium strongly convex, moderately densely, finely punctured, with short suberect hairs; apex truncate, and margin slightly thickened and a little reflexed, ciliate. Abdomen flattened at middle, slightly polished, strongly pruinose at sides; sparsely, finely punctate at center, with short erect hairs, the punctures and hairs larger and coarser near sides; sixth segment

shorter than fifth, slightly subrugosely, sparsely punctate, with moderately long erect hairs. All claws moderately coarsely serrate along a single margin, without intercalated larger teeth on front tarsi; first segment of hind tarsi slightly shorter than second.

Female.—Antennal club shorter than funicle. Clypeus with small impunctate area at center base (usually). Pygidium convex, moderately densely and not coarsely punctate, with short suberect hair, punctures sparser in apical third, basal half of disk subopaque, remainder polished. Abdomen convex, highly polished, segments 2-4 inclusive slightly, transversely gibbose. All tarsal claws serrate along a single margin, with a fine triangular tooth at the middle (hind claws worn in the single female at hand and appear to lack the central tooth, although Bates in his original description of the species says all claws have the central tooth). Otherwise as in the male.

Length.—11.5-13.5 mm. (to 17 mm. in var. *major* of Bates).
Width.—5.5-6.5 mm.

Type.—In the British Museum (Natural History).

Type locality.—"Villa Lerdo in Durango, also Tapachula in Chiapas, Mexico."

Specimens examined.—Males, 16; females, 17. TEXAS: Presidio, August [Saylor], June 28 [Reinhard], and July 18 [Saylor]. MEXICO: Torreon, Chiapas, June 17 (Al Meade) [Saylor]; Coahuila [Robinson]; San Antonio, Durango, 5,000 feet, June 10, 1937 (Meade) [Saylor]. Villa Juarez, 300 feet, May 20, 1937 [Saylor]; J. Manuel, El Salto, Durango, June 5, 1937 [Saylor].

Remarks.—Specimens from Texas and Mexico were compared with the types in the British Museum and found to agree well. Rare in the United States and not heretofore recorded from this country, but may be quickly placed by the male genitalia, which in form have no close relatives in our fauna, and by the strongly convex thorax of the female.

PHYLLOPHAGA (LISTROCHELUS) FIMBRIPES (LeConte)

FIGURES 3, *l*; 9, *k-n*

Listrochelus fimbripes LECONTE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 264, 1856.—HORN, Trans. Amer. Ent. Soc., vol. 7, p. 147, 1878.

Male.—Oblong-ovate, rufotestaceous to somewhat picotestaceous at times, elytra usually slightly to completely pruinose, otherwise shining above, pilose. Head with front very coarsely, densely, and rugosely punctured, frequently with a suggestion of a longitudinal carina, with sparse, short, erect hair; vertex with strong transverse carina, area posterior to carina impunctate; clypeus densely strongly punctured but usually not so densely so as front; apex clypeus very

faintly widely emarginate, or subtruncate, slightly reflexed, lateral angles moderately strongly rounded. Antenna 10-segmented, club darker in color than funicle and varying from slightly longer to nearly one-quarter longer than the funicle. Thorax with most of the disk very finely, rather sparsely punctured, the punctures much larger just behind the front margin and along the basal margin; center of disk with small impunctate longitudinal area; along central basal discal area and along all the margins, also frequently near the side discal areas, with long, fine, and erect testaceous hairs, these sometimes rather thinned out through wear; lateral margins finely and completely crenulate, front and hind angles strongly obtuse but subangulate; basal margin entire though weak at center base. Elytra very finely densely punctured, subrugosely wrinkled, with short erect hairs near basal and scutellar area; sutural striae strong, the two others moderately well indicated and strongly oblique. Pygidium somewhat convex, very finely, moderately densely punctate, with very small subprocumbent hairs (often nearly all abraded), discal area frequently very finely transversely wrinkled; apex truncate, ciliate, margin thickened. Abdomen polished at middle, pruinose at sides, with sparse punctures bearing short erect hairs: abdomen in lateral view exactly as in *L. falsa* (see fig. 2, *c*); fifth with single row of fine erect hairs near apex, apex somewhat narrowly incised at middle and the segment with a longitudinal sulcus along the entire center area; sixth as long as or longer than fifth, flat polished, slightly and sparsely punctured with a few short suberect hairs, and with a faint longitudinal median sulcus. Claws usually without any trace of a tooth, and the basal margin very fine, scarcely noticeably serrate, at times, however (not at all uncommonly), with a noticeable, short, triangular tooth above middle, and almost subbasal in position. Front tarsi with first segment rather strongly prolonged into a tooth at inner apex, the second much less noticeably so. Front tibiae strongly tridentate. First segment of hind tarsi subequal to second in length but somewhat wider at apex. Hind tibiae with many to few long thin hairs on inner side, often rather noticeably pilose.

Female.—Antennal club slightly longer than segments 3-7 combined. Pygidium a little less convex and sides more convergent apically than in the opposite sex. Abdomen evenly convex, highly polished, and finely and sparsely punctate at middle; fifth and sixth segments in apical halves and at sides coarsely punctate. First segment of the front tarsus with a small triangular tooth at the inner apex. All claws with a small triangular tooth at the middle, the surface between the tooth and the claw base minutely crenulate. Otherwise similar to the male.

Length.—11.5-14.5 mm. *Width*.—5-6.5 mm.

Type.—In the LeConte collection.

Type locality.—"Fort Riley, Kansas."

Specimens examined.—Males, 31; females, 6. ARIZONA: Flagstaff, July (Wickham) [U.S.N.M.]. NEW MEXICO: Tenaja (Wickham) [U.S.N.M.]; Torrence County (Douglas) [U.S.N.M.]; Grady, July 16 (Beaner) [Snow Museum]. NEBRASKA: Lincoln, July [U.S.N.M.]. COLORADO: "Colorado" and Colorado Springs [U.S.N.M.]; La Junta, July 21 (Rehn and Hebard) [American Museum]; Cragmore, June [U.S.N.M.]. TEXAS: New Braunfels [Robinson].

Remarks.—This species forms, along with *L. koehleriana* and *L. neomexicana*, a rather compact group of the genus, in the characters of the hairy hind tibiae and tarsi, rugosely sculptured head, and robust facies. The male genitalia are closely allied as regards similarity in form but are distinct and are apparently not variable within the species; the main specific differences are evidenced in the aedeagus rather than in the lateral lobes of the claspers.

PHYLLOPHAGA (LISTROCHELUS) FALSA (LeConte)

FIGURES 2, c; 4, f; 9, a-c

Listrochelus falsus LECONTE, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 264, 1856.—HORN, Trans. Amer. Ent. Soc., vol. 7, p. 147, 1878.

Listrochelus langeri CHAPIN, Proc. Biol. Soc. Washington, vol. 47, p. 93, 1934 (new synonymy).

Male.—Oblong-oval, wider behind, rufous above, sparsely pilose, thorax shining; elytra very highly pruinose. Head with front flattened, moderately coarsely punctate, vertex with a moderately prominent transverse carina; clypeus punctured as front, with sparse erect hairs, apex subtruncate and faintly emarginate, slightly reflexed, angles moderately broadly rounded. Antenna 10-segmented, unicolorous, club one-sixth longer than funicle. Thorax shining, finely, moderately densely, irregularly punctured, with short scattered hairs near base and sides; front angles broadly rounded, hind angles obtuse but moderately distinct, base and apex strongly margined; lateral margins ciliate and finely crenulate, less obviously so behind the moderate median dilation. Elytra finely punctured, rugosely wrinkled, with scattered small yellowish hairs arising from the highly pruinose surface; striae, except sutural, not obvious. Pygidium strongly convex, highly polished, very finely, moderately densely punctured, each puncture bearing a minute recumbent hair; apex broad and subtruncate. Abdomen convex, with segments 1 to 3 polished and moderately densely pilose; third segment abruptly raised at middle apex; fourth and fifth segments of approximately equal size and each very sparsely pilose, the two together having a common transverse sulcus, the latter being deepest at the point of

juncture of the two segments; sixth segment flattened, as long as or slightly longer than the fifth, sparsely finely punctured, and with a definite though shallow median longitudinal groove. Front tarsus with first segment slightly though perceptibly prolonged into a slight spine on inner side of apex; claws usually very finely, hardly evidently crenulate and without a tooth (a very fine suggestion of a tooth rarely noticeable). Middle claws as in front. Hind claws also minutely crenulate but usually with a very faint submedian tooth among the serrations, at least on the inner claw. First segment of hind tarsus shorter than the second, and very strongly prolonged inwardly at apex into a blunt tooth or lobe, the first segment being somewhat triangular in shape (see fig. 4, *f*).

Female.—Antennal club shorter than funicle. Pygidium evenly convex, entire disk polished and with regularly arranged, fine, dense punctures, the hairs short and suberect; apex thickened and ciliate. Abdomen evenly convex, highly polished at middle and with very fine and dense setigerous punctures, the hairs fine and minute; fifth and sixth sternites of approximately equal size, the sixth and apical portions of the preceding segment more coarsely punctate than the remainder of the abdomen. All claws with a short triangular tooth at the middle, surface between the tooth and claw base minutely serrate. First segment of the front tarsus with a blunt, short spine at inner apex. Otherwise similar to male.

Length.—12–15.5 mm. *Width*.—6–7 mm.

Type.—In the LeConte collection.

Type locality.—"Platt River, Kansas."

Specimens examined.—Males, 66; females, 39. CALIFORNIA: Barstow, July 18 [Saylor]. ARIZONA: General in the southeastern part of the State. Recorded several times as taken on ponderosa pine (*Pinus ponderosa*), July and August. COLORADO: General in the State; seen from Larkspur to Pagosa Springs and from the country in between; June to August; recorded on ponderosa pine. NEW MEXICO: General; seen from Rio Arriba County and southeast to Roswell; June to September.

Remarks.—In habitus and type of male genitalia the present species is most closely related to *L. fimbripes* and allies but is abundantly distinct in the hardly pilose hind tarsi and tibiae, the male genitalia, etc. Has been taken on several occasions in the adult state feeding on yellow pine. An interesting note concerning the life history is the following, excerpted from the field notes of A. J. Jaenicke, at the time stationed at the Fort Valley Experiment Station at Flagstaff, Ariz.: "Larvae of these beetles are doing extensive damage to the western yellow pine seedlings at Flagstaff, by cutting off the roots."

PHYLLOPHAGA (LISTROCHELUS) FALSA NOGALES, new subspecies

Male.—Entire elytra and thorax very densely pruinose above, the latter glabrous on disk, the punctures very fine and almost obscured by the pruinosity. Clypeus apparently glabrous on disk. First segment of hind tarsi slender and hardly at all expanded apically (no more than is normal in any species of the genus); first two segments subequal in length. All other characters, including the genitalia, the same as in the typical form.

Female.—Thorax very densely pruinose, punctures almost obscured by the pruinosity. Clypeal disk apparently glabrous. Otherwise the same as in the typical form.

Length.—13–15 mm. *Width*.—6.5–7.5 mm.

Types.—Holotype and allotype are from Mount Washington, 6,000 feet, Nogales, Ariz. (Saylor), and are deposited in the United States National Museum (No. 53765).

Paratypes: Males, 1; females, 1. ARIZONA: Huachuca Mountains [Saylor].

Remarks.—The densely pruinose and hardly perceptibly punctate thorax, the nonexpanded first hind tarsal segment of the male, and the nonpilose clypeus of the present subspecies seem to justify setting it off as distinct; indeed, the entire facies of the beetle are closer to those of *L. tarsalis* than to *L. falsa*, owing to the highly pruinose condition of the dorsal area. Were it not for the apparently identical genitalia of the males, I would not hesitate to describe this as a separate species.

PHYLLOPHAGA (LISTROCHELUS) KOEHLERIANA, new species

FIGURES 3, *n*; 11, *a-d*

Male.—Robust, elongate, hairy above; head and thorax rufous and shining, the elytra darker and strongly pruinose. Head very coarsely and rugosely punctate, with erect hair; transverse carina well marked, usually impunctate behind; clypeus strongly transverse, a little more finely and densely punctate than the front; clypeal apex strongly reflexed, subtruncate, angles moderately rounded. Antenna rufo-testaceous; club testaceous and slightly longer than the funicle. Thoracic disk with very fine and fine punctures intermixed, the puncturation rather dense at sides and front, the larger punctures more noticeable along the front margin; a slight central area of the disk impunctate; center-base, near sides and along the front margins with long or short hairs; lateral margins ciliate, finely crenulate, the angles prominent but obtuse. Elytra finely subrugosely punctate, with long and erect moderately dense hairs; striae, except sutural, obsolete. Pygidium convex, highly polished, very finely and densely punctate,

with fine procumbent hairs; apex widely truncate and ciliate. Abdomen polished, subpruinose at sides; surface finely and densely punctate with short and erect hair; segments 4 and 5 together forming between them a deep transverse sulcus, surface of each punctured nearly as in the preceding segments; sixth polished, faintly longitudinally sulcate at center, impunctate at middle, with a few coarse punctures at sides. Hind tibia with very dense and long hair on the apical three-fourths of the inner surface; first segment of the hind tarsi gradually widened toward the apex, the latter nearly half as wide as the length of the segment. First segment of front tarsus with a very long, sharp spine at inner apex, the width of the segment at the apex about three-fifths of its total length, second segment without inner, apical spine. All claws finely crenulate or serrate along a single margin, usually without larger intermixed teeth, at most with a very faint suggestion of a larger median tooth and that usually on the hind claws, if present at all. Hind tarsal segments each with a moderately dense patch of long hairs arranged in a row on each side of the under surface and pointing outward.

Female.—Antennal club slightly shorter than the funicle. Abdomen evenly convex, highly polished and very finely, sparsely punctate at center; apical half of the fifth segment flattened transversely; sixth segment one-fourth shorter than the preceding and with coarse sparse punctures. Hind tibia with hairs only moderately dense and not at all fine and ciliate; hind tarsi sparsely hairy. All claws with a strong tooth above the middle, the surface between tooth and claw base very minutely serrate or crenulate. First segment of front tarsus with a strong inner spine, this smaller than in the male.

Length.—12–15.5 mm. *Width*.—6–7 mm.

Types.—Holotype and allotype are from Koehler, N. Mex., and are in the National Museum (No. 53766).

Paratypes: Males, 38; females, 39. NEW MEXICO: Koehler [U.S. N.M. and Saylor]; prairie near Koehler (Wickham) [U.S.N.M. and Saylor]; Hot Springs, 7,000 feet [U.S.N.M. and Saylor]; Las Vegas (Linell) [U.S.N.M.]. TEXAS: "S. Texas" [Robinson].

Remarks.—In the large series at hand there is very little external variation and apparently none in the male genitalia, which closely resembles those of *L. fimbripes* but are constantly different in the shape of the aedeagus. The key characters should readily separate the two species.

The following notes, taken at the time of capture of part of the specimens (by V. L. Wildermuth, at Koehler, N. Mex., July 3, 1914), should be of much interest: "Tonight there occurred a remarkable flight of this beetle. The air was full of them, and the roar, for it was more a roar than a buzzing, from them was wonderful. They

were like several swarms of bees all in the air over one's head at once. Many came to the light of the tent, but the great majority of them seemed to be flying quite high. The flight lasted from about 8 until 9:30. The day previous had been rainy and heavy rains had fallen the past four days. July 13: This flight has continued to a greater or less extent each night since the first record—last night there were millions of the beetles in the air, and at times one could hardly remain out of doors because of them hitting the person in the face. Tent roofs and sides were fairly covered with them, and a large handful at a time could be picked up. I am told that many are found in the ground of the gardens hereabouts, and in fact I saw a great many turned up in a garden at the packing house. There are no trees closer than 3 miles from camp, and these are limited to scrub oak and several species of pine. The range around is covered with grama grass and weeds. Two classes of the latter predominate, namely *Gutierrezia* sp. (brown-weed) and *Artemesia frigida* (wormwood, or sage brush). Many native lupines abound. The soil is mostly a sandy clay loam. An unusual amount of moisture has fallen this season and it has been well distributed. To date it has rained 29 out of 59 days since we arrived in camp."

PHYLLOPHAGA (LISTROCHELUS) NEOMEXICANA, new species

FIGURES 2, *j*; 4, *h*; 11, *e-g*

Male.—Apparently not different externally from *L. koehleriana*. The male genitalia are distinct in the two species; the characters of the genitalia do not vary in the rather extensive series of *L. koehleriana* at hand.

Female.—Unknown.

Length.—13–15 mm. *Width*.—6–6.5 mm.

Types.—Two males, both from Roswell, N. Mex., collected by Brant on July 2. The holotype is in the United States National Museum (No. 53767), and the paratype is in the Saylor collection.

Remarks.—Though only the two specimens are at hand, the aedeagus is so different from that of *L. koehleriana* that I have no hesitation in describing *L. neomexicana*; reference to the genitalic figures will allow of ready separation of the two forms.

PHYLLOPHAGA (LISTROCHELUS) PARILIS (Bates)

FIGURE 11, *o-r*

Listrochelus parilis BATES, *Biologia Centrali-Americana*, Coleoptera, vol. 2, pt. 2, p. 172, 1888.

Male.—Oblong-ovate, highly polished, head and thorax rufous, otherwise rufocastaneous, elytra pruinose or opaque, above with

scattered hairs. Head with coarse and dense punctures, with a few fine ones intermixed; clypeus with rounded, usually moderately reflected apex, angles very broadly rounded. Antennal club one-sixth longer than the funicle. Thorax with fine, dense punctures, disk usually glabrous; lateral margins coarsely crenate and with long cilia. Elytra finely, regularly punctate, with scattered fine and erect hairs, the latter moderately long; striae, except sutural, obsolete. Pygidium convex, strongly and entirely polished, with fine scattered punctures, apparently glabrous; apex truncate and slightly sinuate. Abdomen with segment 3 transversely raised and segments 4 and 5 having in common between them a deep and wide transverse impression; fifth and sixth more coarsely punctate and each with a very weak longitudinal sulcus at the middle. All claws serrate apparently along a single margin (traces of a double margin under power of $20\times$) and each with a very small tooth slightly above the middle; this, however, is frequently worn down on one or all claws so that it is not visible at all. Inner face of hind tibia with moderately long bristles (not hairs); under soles of hind tarsus with but very sparse bristles (not hair). Inner apex of first front tarsal segment with a very blunt and short spine.

Female.—Antennal club equal to segments 3-7 combined. Pygidium as in male but much more flattened. Abdomen convex, apex of fifth segment somewhat depressed, smooth; sixth segment convex, the disk sparsely and setigerously punctured. All claws minutely dentate near the base and with a small but sharp median tooth.

Length.—12-14 mm. *Width*.—5.5-7 mm.

Type.—In the British Museum (Natural History).

Type locality.—"Refugio and Cuidad in Durango, Mexico."

Specimens examined.—Males, 11; females, 2. TEXAS: Davis Mountains [Saylor]; Davis Mountains, July 9, 1921, (C-D. Duncan) [Van Dyke]. MEXICO: Cusihiuriachic, Chihuahua, [Saylor]; Zacatecas, Zac. [Saylor].

Remarks.—The males at hand fit Bates's description exactly, and this, coupled with the fact that both the Mexican localities recorded by Bates for *L. parilis* are close to those from which come my Mexican examples (which are specifically identical with my Texas specimens), leaves little doubt that the species is correctly determined.

This species is most closely related to *L. fimbripes* and *L. koehleriana*, from both of which it can be readily separated by the spinose and not hairy hind tibiae and tarsi; also, the male genitalia are specifically different among the three species.

PHYLLOPHAGA (LISTROCHELUS) CAVATA (Bates)

FIGURE 12, *d-f*

Listrochelus cavatus BATES, *Biologia Centrali-Americana*, Coleoptera, vol. 2, pt. 2, p. 170, 1888.

Male.—Robust-oval, rufotestaceous to rufocastaneous above, strongly shining, glabrous above. Head lacking the transverse carina of vertex; front sparsely, moderately coarsely punctate; clypeal suture fine, not impressed; clypeus transverse and somewhat bowl-shaped owing to the moderately reflexed apical margin, surface finely and densely punctured; apex truncate, angles narrowly rounded. Antenna 10-segmented, testaceous, segment 3 the longest of the funicle, club a little shorter than the funicle. Thorax subrugosely, finely, and densely punctate; base and apex with strong marginal lines and both without cilia; sides roundly, arcuately dilated, the entire margin coarsely crenate and ciliate; hind angles very obtusely subangulate, nearly rounded, the front angles similar. Elytra finely, densely, and regularly punctate; sutural and first and second striae prominent. Pygidium unusually convex, highly polished, finely, sparsely, and irregularly punctured, apparently glabrous (minute hairs visible under high power); apex thickened and truncate; apical half of the propygidium very finely and very sparsely punctate. Abdomen highly polished, smooth (and hardly perceptibly punctate) at center; apical half of the fifth and the entire sixth segments with a fine longitudinal impression at center of each; sixth segment shorter than fifth, finely and sparsely punctate. Tarsal claws pectinate along a single margin, without larger intercalated teeth; first segment of hind tarsi noticeably shorter than the second. First segment of front tarsus with a very small inner spine at apex. Hind tibial spurs long, slender. Front tibia with upper tooth weakly indicated and closely adjacent to the large median tooth.

Female (from Bates's description).—Pygidium plane, polished, very sparsely punctate; apical margin explanate and bidentate. Apex of fifth abdominal segment transversely sulcate, sixth large, convex, grossly punctate, apex with deep fovea and margin widely and profoundly sinuate. All claws with a subapical tooth.

Length.—11–13 mm. *Width*.—6–7 mm.

Type.—In the British Museum (Natural History).

Type locality.—"San Antonio de Arriba and Mexico City, in Mexico." Also "Cuidad and Ventanas in Durango, and Real del Monte in Hidalgo for the variety *durangoensis*."

Specimens examined.—Males, 2; females, 0. MEXICO: 1 cotype from Cuidad in Durango, lent by the British Museum. NEW MEXICO: Las Vegas, August 11 [Saylor].

Remarks.—This typical form of the species is rare in the United States, and only the one specimen from this country is known to the author at the present time; various closely related species are found along our southern boundaries and in northern Mexico (*L. cochisa* Saylor and *L. meadei* Saylor).

PHYLLOPHAGA (LISTROCHELUS) MICROS (Bates)

FIGURE 12, *g-i*

Listrochelus micros BATES, *Biologia Centrali-Americana*, Coleoptera, vol. 2, pt. 2, p. 170, 1888.

Male.—Robust-oval, rufotestaceous to rufocastaneous, strongly shining, glabrous dorsally except at lateral margins of the thorax and elytra. Head with front sparsely, coarsely, and somewhat regularly punctate; clypeal apex moderately to strongly reflexed, surface densely punctate. Antennal club longer throughout than in *L. cavata* but subequal to the funicle. Thorax with a small median smooth space. First segment of hind tarsus nearly equal to second. Upper tooth of front tibiae strong, the three teeth equidistant. Elytra rather rugosely wrinkled, much more so than in *L. cavata*. Hind tarsi nearly as long as their respective tibiae. Unless otherwise indicated, the thoracic, elytral, pygidial, abdominal, and claw characters are as described for *L. cavata*.

Female.—Antennal club shorter than funicle. Pygidium convex, highly polished and smooth, very finely and sparsely punctate, apparently glabrous (minute hairs visible only under high power), apex with two obtuse lobes of moderate length, the two separated by a U-shaped notch (see drawing). Abdomen convex and highly polished, segments 1-5 connate; sixth segment long, apex with a moderately wide emargination, the surface just before the emargination with a small fovea; surface moderately densely and coarsely punctate, apex ciliate. Front tibiae strongly tridentate. All claws with a strong median tooth, surface between the tooth and the base dentate along a single margin. Hind tarsus shorter than their respective tibiae. Otherwise similar to the male.

Length.—8-14 mm. *Width.*—6-7.5 mm.

Type.—In the British Museum (Natural History).

Type locality.—Toluca, Mexico.

Specimens examined.—Males, 7; females, 3. COLORADO: Denver, July 1902 [Saylor]. MEXICO: Pachuca, Hidalgo [Saylor]; Guerrero Mills, Hidalgo [Saylor and Sanderson]; San Miguel, Hidalgo [Saylor and Sanderson]; Toluca (cotype) [Saylor].

Remarks.—The Colorado specimen is much lighter in color than the Mexican examples and a trifle more elongate; also the antennal club is much more robust in the former specimen and just a little

shorter than the funicle, but the majority of characters ally it with this species and the genitalia are apparently identical. There is some little variation in the Mexican specimens, and the extremes in size and color look quite different superficially, but all essential characters are apparently exactly similar, and in several instances the extremes have been collected together.

PHYLLOPHAGA (LISTROCHELUS) MEADEI, new species

FIGURES 4, c; 12, j-l

Male.—Antennal club testaceous and slightly longer than the rufous funicle. Clypeal apex weakly reflexed. Thorax with a small irregular median smooth area. Fifth abdominal segment at apex weakly incised, not longitudinally impressed; sixth with faint trace of the impressed longitudinal line. First two hind tarsal segments subequal in length. All three teeth of front tibia strongly developed and equidistant. Otherwise, all characters are the same as described for *L. cavata*.

Female.—Antennal club much shorter than the funicle. Pygidium plane on disk, widely and transversely gibbose just before the rather acuminate apex (especially evident in lateral view); disk very sparsely punctate; apical margin itself slightly incised and the sides expanded a bit so as to form two very blunt teeth, which are separated from each other by a moderately broad and rather shallow emargination. Apical segment of abdomen convex and coarsely punctate and having only the faintest trace of a very small fovea at the middle apex (absent entirely in a few specimens). All claws serrate along a single margin with a large triangular tooth nearly at the center.

Length.—12–14 mm. *Width*.—6–7 mm.

Types.—Holotype and allotype are from San Antonio in Durango, Mexico, and were collected by Al Meade on June 10, 1937 [Saylor], and are deposited in the National Museum (No. 53768).

Paratypes: Males, 11; females, 19. MEXICO: From the same locality as the types [Saylor]; Torreon, Chiapas, June 14, 1937 (Meade) [Saylor]; J. Manuel, El Salto, Durango, 9,300 feet, June 10, 1937 (Meade) [Saylor].

Remarks.—Described in the present revision since it is so closely allied with the rest of the *L. cavata* complex and may be expected to occur within our borders.

PHYLLOPHAGA (LISTROCHELUS) COCHISA, new species

FIGURE 12, a-c

Male.—Rufotestaceous to rufocastaneous above, strongly shining. Front moderately, not densely punctate. Antennal club subequal to funicle. Thorax finely, densely, somewhat irregularly punctate, with

suggestions of a smooth median discal area. Upper tooth of front tibia moderately strong. Hind tarsus longer than the tibia. Otherwise similar in all respects to *L. cavata*.

Female.—Antennal club robust, much shorter than the funicle. Pygidium highly polished, glabrous, finely and moderately densely punctate, surface minutely alutaceous; disk strongly gibbose before apex, the apex nearly truncate and somewhat thickened. Abdomen highly polished, segments 1-5 subconnate; sixth segment large, apical half with a moderately broad U-shaped emargination. Hind tarsus as long as their tibiae. All claws with a moderately large tooth slightly beyond the middle, the surface between the tooth and claw base denticulate. Otherwise as in the male.

Length.—11-13 mm. *Width*.—5.5-6.7 mm.

Types.—Holotype and allotype are from Cochise County, Ariz., July [Saylor] and are deposited in the United States National Museum (No. 53769).

Paratypes.—Males, 1; females, 3. ARIZONA: Cochise County [Saylor]; Pinery Canyon, Cochise County, Chiricahua Mountains, 6,000 feet, July 19, 1919 (Witmer Stone) [American Museum]. MEXICO: "Mexico" [Casey].

Remarks.—Apparently rather local in our territory. The Mexican examples in the Casey collection agree in all respects except that the female pygidium is more closely punctate on the apical gibbosity than in the typical form.

PHYLLOPHAGA (LISTROCHELUS) TEXENSIS, new species

FIGURE 10, *m, o*

Male.—Robust-oval, thorax rufous and polished, remainder of dorsal surface rufocastaneous; elytra and sides of thorax usually densely pruinose, apparently glabrous above. Antenna castaneous, club testaceous and subequal to the funicle. Head with dense variolate punctures, those at the middle of the clypeal disk a little finer than those of the front; clypeal suture strongly biarcuate; clypeal apex reflexed, subtruncate, the angles broadly rounded; vertex with a moderately strong transverse carina, the surface behind this impunctate. Thorax with fine, dense, regularly placed punctures, these closer near apex and somewhat sparser at the center of the disk; lateral margins coarsely crenate, with rather short cilia; hind angles obtuse. Elytra with coarse, sparse punctures, with minute hairs visible in a strong light; striae obsolete, except the sutural, which widens noticeably posteriorly. Pygidium evenly convex, with dense, fine punctures and short, minute hair; basal three-fifths pruinose, apical portion polished and less densely punctate. Abdomen flat and pruinose at center, with fine, sparse, setigerous punctures; sixth seg-

ment convex, impunctate in basal half and coarsely punctate in apical half, with a distinct though very blunt transverse carina at the center. Inner front claw always with a distinct tooth at center, all others (rarely the inner claws of both kind and middle tarsi have faint traces of a larger tooth) serrate apparently along a single margin, and without larger intercalated teeth.

Female.—Antennal club equal to funicle. Punctuation of head much coarser and denser than in the male. Pygidium flattened, with sparse, fine punctures and very short, suberect hair, the punctures in the apical polished half of the disk very sparse; basal discal area pruinose or subpruinose. Abdomen polished, evenly convex, with sparse and fine setigerous punctures; sixth segment and apical half of the preceding sternite more coarsely punctate than the remaining segments. All claws with a strong median tooth, surface basad of the tooth serrate (hind claws in one female worn and the larger teeth barely visible). Otherwise as in male.

Length.—11–14 mm. *Width*.—5.5–6.8 mm.

Types.—From Brownsville, Tex., June 5, 1932 [Saylor], deposited in the United States National Museum (No. 53770).

Paratypes: Males, 13; females, 4. TEXAS: Esperanza Ranch, Brownsville, July (Schwarz) [U.S.N.M.]; Del Rio, July 23, 955 feet (Wickham) [U.S.N.M.]; Sabinal, June 8 (Pratt) [U.S.N.M.]; Brownsville, July (Linsley) [Saylor and Snow Museum]; Sanderson, July 1937 (Al Meade) [Saylor]; Stillwater, July 4, light trap [Reinhard]; San Juan, May 10 (Stugard) [Sanderson]; Uvalde, June 15 and May (Linsley) [Saylor].

Remarks.—Externally probably closest superficially to *L. cushmani*, but quite different in the male genital and claw characters. The male genitalia of the present species are not closely similar in form to any others in the genus.

PHYLLOPHAGA (LISTROCHELUS) WICKHAMI, new species

FIGURES 2, *h, i*; 10 *i, j*

Male.—Robust-oval to elongate-oval, testaceous to rufotestaceous, thorax and head rufous, strongly shining; elytra subpruinose to shining. Head with front coarsely, moderately densely, variolately punctate, apparently glabrous; vertex with transverse carina strongly elevated, surface behind this impunctate; clypeus punctured as front but a little less densely so and usually with small impunctate area at center of disk, apex subtruncate, angles greatly rounded, giving the clypeus almost a semicircular appearance, apex moderately reflexed; clypeal suture strongly biarcuate. Antenna 10-segmented, rufotestaceous, club testaceous, one-fifth to one-fourth longer than funicle to almost one-third longer, segments 6 and 7 of funicle transverse and prolonged

on inner side into small spines. Thorax highly polished, with fine sparse punctures separated by a distance equal to two to four times their diameters, denser at sides and apex, usually disk entirely glabrous, rarely with few hairs near margins; lateral margins moderately strongly crenulate, with long cilia; base and apex of thorax strongly, entirely margined; angles subangulate and very obtuse. Elytra moderately densely, finely punctured, and rugosely wrinkled, with short sparse suberect hair; costae, except sutural, not indicated. Pygidium convex, shining, very sparsely and finely punctured, punctures sparsest near apex, with short suberect hairs, apex subtruncate. Abdomen flattened at center, with very shallow, rather wide, median longitudinal sulcus; surface finely sparsely punctate, with short and erect hairs; fifth plane; sixth usually slightly longer than fifth, flattened, punctured as fifth, apex ciliate. All claws finely serrate to subpectinate along a double margin, usually the serrations of similar size, rarely with the outer row of outer front claw with a much larger, submedian, acute tooth. First and second hind tarsal segments subequal in length and of nearly the same shape and width throughout.

Female.—Antennal club equal to funicle. Clypeal disk with or without an impunctate area at the base; apex less reflexed than in the male and more widely rounded. Pygidium convex but flattened on disk, highly and entirely polished, with sparse, very fine punctures, each bearing a minute subprocumbent hair; apex rounded, slightly declivous, ciliate. Front and middle claws serrate along a single margin and each with a small median tooth intercalated with the serrations; the inner of the hind claws without a larger intercalated tooth and the larger tooth of the outer claw very minute or absent (in the two examples at hand). Abdomen convex, highly polished, nearly glabrous and impunctate at center; fifth segment finely and sparsely punctate, with fine suberect hairs; sixth segment more coarsely punctate than the fifth. Otherwise as in the male.

Length.—12–14 mm. *Width*.—5.5–7 mm.

Types.—"Deming, New Mexico, August 1918 (Wickham)" (male) and "Castolon, Tex., June 11, 1928 (F. Bibby)" [Reinhard] (female), both in the United States National Museum (No. 53771).

Paratypes: Males, 12; females, 2. NEW MEXICO: Deming, July 11, 4,300 feet (Wickham) [U. S. N. M.]; Pyramid Peak, Dona Ana County, July 30 (Fosberg) [Los Angeles Museum and Saylor]; "N. M., August" [Van Dyke]. TEXAS: Brewster County, Chisos Mountains, July 10 (Mitchell and Cushman) [U. S. N. M.]; Castolon, June 11 (F. Bibby) [Reinhard]; Marathon, June 18 (Linsley) [Saylor]; Presidio County, July 16 (Beamer) [Snow Museum]. ARIZONA: Wilcox, July 24 (Hubbard and Schwarz) [U. S. N. M.]; "Arizona" (Al Meade) [Saylor].

Remarks.—Superficially resembles *L. cochisa* or a small *flavipennis* but not at all close to either species. Named for H. F. Wickham, who collected such fine series of many species in this group.

PHYLLOPHAGA (LISTROCHELUS) CUSHMANI, new species

FIGURE 6, *i, j*

Male.—Elongate-oval, strongly shining, elytra opaque or pruinose; apparently glabrous except for elytra. Head with dense and very coarse punctures, those of the clypeal apex sparser than those of front and somewhat finer; clypeal apex truncate and slightly reflexed, angles broadly rounded, transverse carina of vertex strongly indicated, impunctate behind. Antennal club short but subequal to funicle. Thorax with moderately coarse and dense punctures; lateral margins coarsely crenate, with short and coarse cilia; disk under high magnification showing extremely minute hairs. Elytra punctured as thorax, but more sparsely so, the hairs much more obvious; striae not obvious, the sutural striae also not prominent. Pygidium convex, with very fine and not dense punctures, with short, fine hairs, apex truncate. Abdomen flattened, highly polished, with very fine and sparse punctures; fifth sternite slightly impressed transversely at apex; sixth segment convex, with a slight transverse carina just before the middle, the surface posterior to this impunctate, that anterior to it coarsely punctured, with short and erect hair. All claws with a strong median tooth, surface between tooth and claw base minutely serrate. First segment of hind tarsus normal; first segment of front tarsus without a spine at the inner apex.

Female.—Unknown.

Length.—12.5–14 mm. *Width.*—5–6 mm.

Types.—Brewster County, Chisos Mountains, Tex., June 10, 1908, a male collected at light by Cushman and Mitchell; in the United States National Museum (No. 53772).

Paratypes: Males, 8; females, 0. TEXAS: Brewster County, Chisos Mountains, June 10 [U.S.N.M.]; Presidio, May 1 (Owen, Jr.) [Reinhard]; Big Bend Park, Brewster County, July 29, 1937 (Rollin Baker) [Cartwright]. NEW MEXICO: Pyramid Peak, Dona Ana County, August 9 (Fosberg) [Los Angeles Museum]. ARIZONA: "Arizona," August 9, 1937 (Al Meade) [Saylor]. MEXICO: Sierra Mojada, Coahuila [Saylor]; Villa Juarez, Tamps, 300 feet, May 26, 1937 (Meade) [Saylor]; J. Manuel, El Salto, Durango, June 3, 1937, 9,300 feet (Meade) [Saylor]; Torreon, Chiapas, May 28, 1937 [Saylor].

Remarks.—Superficially close to *L. texensis* but very distinct in the male genitalia as well as in the presence of the median larger tooth of the tarsal claw. Named for one of the collectors, R. A. Cushman, of the U. S. Bureau of Entomology and Plant Quarantine.

PHYLLOPHAGA (LISTROCHELUS) MACMURRYI, new species

FIGURES 3, j; 10, k, l, n

Male.—Robust-oval, testaceorufous, head and thorax rufous, shining and densely hairy above. Head and clypeus coarsely, variolately, not rugosely punctate, the punctures of front and vertex separated by one-half to once their diameters, with erect hair; the punctures of clypeus a little smaller and sparser than those of the front; carina of vertex moderately sharp and distinct; clypeus sharply reflexed, apex subtruncate, angles rounded. Antenna 9-segmented, third and fourth segments longer than broad and subequal, fifth and sixth transverse or subtransverse and shorter than the third and fourth; club small and somewhat lighter colored than funicle and subequal to, or slightly longer than, the funicle. Thorax with lateral margins roundly dilated, with long cilia, hardly noticeably crenulate; hind angles varying from with no trace of any angle to slightly through very obtusely angulate, the basal margin fine but entire; front angles obtuse and not prominent; disk finely punctured, the punctures separated by a distance equal to once to twice their diameters, with fine long erect hair over the major portion of the disk. Elytra moderately rugosely wrinkled, finely sparsely punctate, with very fine, long, erect hairs, these hairs shorter near apex; apex of each elytron as viewed from above apparently truncate or subtruncate; pygidium convex, highly polished, very finely, scarcely perceptibly punctate, with sparse, suberect, short hairs in basal area, apex rounded to subtruncate and often somewhat explanate. Abdomen polished at center, smooth, with dense short hair on sides, sutures obsolete; fifth segment wrinkled on sides, apical margin somewhat raised and slightly, semicircularly emarginate at apex; sixth segment longer than fifth, with a raised, transverse, cariniform process in the shape of a very wide V just apical from the basal margin; the summit of the carinae with a few short hairs, the remainder of the surface flattened and impunctate except for the ciliate apical margin. All claws finely pectinate along a double margin, the outer margin of each claw with a large tooth just slightly beyond middle, at times the hind claws subjectinate or serrate.

Female.—Thorax slightly less densely punctate. Antenna apparently 9-segmented, club ovate but nearly equal to funicle. Pygidium somewhat convexly flattened, disk with fine, moderately dense punctures, with a few very fine, short, and erect hairs; disk in apical two-fifths moderately deeply and broadly longitudinally impressed, the surface each side of the impression slightly gibbose; apex slightly emarginate, the sides of emargination broadly rounded. Abdomen convex, highly polished and with fine, moderately dense setiferous punctures, the hairs rather fine and short; segments 1-4 with sutures nearly effaced at the middle; fifth segment transversely impressed in

apical third and rather coarsely punctured thereon, with much finer punctures basally; sixth as long as preceding, somewhat convex, with dense and coarse punctures, and moderately long and erect hairs. Hind tarsus distinctly shorter than their tibiae. All claws serrate along a double margin (20 \times) and with a somewhat larger tooth at the middle. Otherwise as in the male.

Length.—10–13 mm. *Width.*—5–6 mm.

Types.—Holotype male from Wichita Mountains Wildlife Refuge, Oklahoma, April 1938 (Frank McMurry) [Saylor] and allotype female from Austin, Tex., July [Saylor]; both are in the United States National Museum (No. 53773).

Paratypes: Males, 16; females, 2. OKLAHOMA: Headquarters site, Wichita Mountains Wildlife Refuge, May 11, 1938 (Frank McMurry) [Saylor and U. S. Biological Survey]; Wichita Mountains, April 16, 1918 (R. Kuntz) [Univ. Oklahoma]; Wichita National Forest, May 3, 1936 [Saylor]. TEXAS: Austin, June and July [Saylor].

Remarks.—This hairy little species is abundantly distinct from all other United States species of the group, and the small robust body and shining surface, with the dense long hair of the entire dorsal surface readily distinguish it. Named for Frank McMurry, of the U. S. Biological Survey, who collected the Oklahoma specimens and transmitted them to the writer.

PHYLLOPHAGA (LISTROCHELUS) DUNCANI (Barrett)

FIGURE 6, *g, h*

Listrochelus duncani BARRETT, Can. Ent., vol. 65, p. 129, 1933.

Male.—Oblong-oval, shining above, sparsely pilose, rufotestaceous, head and thorax rufous. Head with front and clypeus coarsely, very rugosely punctate, punctures of front variolate and nearly contiguous, those of clypeus smaller and much denser at the center of disk, front and clypeus with sparse, short, erect hair; transverse occipital ridge moderately sharp and distinct, entire; clypeus moderately reflexed and very slightly emarginate at apex, angles broadly rounded. Antenna 10-segmented, 3–5 subequal, 6 and 7 transverse, club lighter in color and nearly one-third longer than funicle. Thorax very finely, rather regularly punctured, with a broad, median, impunctate strip, disk apparently glabrous except for several minute hairs at center of base; front and hind marginal lines entire, that of front margin greatly widened; lateral margins coarsely crenate, ciliate, hind and front angles obtuse but evident, not prominent. Elytra finely wrinkled, very finely sparsely punctate, with minute semierect hair; sutural striae wide and prominent, elytral disk with one strongly oblique stria running from inside the humeral umbos toward the sutural stria and fading out just before reaching the latter. Pygidium convex,

faintly pruinose at base, finely, moderately densely punctate, with minute hair, apex polished and subtruncate. Abdomen subpruinose at sides, slightly shining at middle, very slightly convex and finely sparsely punctate at center, with short suberect hair; fifth segment plane, very slightly, hardly noticeably, transversely impressed near apex; sixth with faint longitudinal sulcus, surface moderately densely, coarsely punctate, with sparse short hairs. All claws with a small triangular, median tooth, and minutely serrate on a single margin.

Female.—Unknown.

Length.—12 m. *Width*.—5.5 mm.

Type: In the collection of the Snow Museum at Kansas University.

Type locality.—"Chiricahua Mts., Ariz., VII-2-32, Duncan Collector."

Specimens examined.—The holotype, examined through the kindness of the describer, R. E. Barrett, of Saticoy, Calif.

Remarks.—The male genitalia are not closely similar in form to those of any other species. Known only from the type.

PHYLLOPHAGA (LISTROCHELUS) ARIZONA, new species

FIGURE 6, *e, f*

Male.—Identical in all respects with *L. duncani*, differing only in the conformation of the genitalia (see fig. 6, *e, f*).

Female.—More robust, elytra with longer and more obvious hair; antennal club small and shorter than the funicle. All claws with a strong median tooth and minutely serrate between the base and the tooth along a single margin. Transverse carina of vertex well developed. Pygidium slightly convex, smooth, polished, slightly pruinose basally; disk with fine and sparse punctures, apex rounded. Abdomen convex, polished, smooth, apex of fifth and of sixth segment with coarse and moderately dense punctures. Otherwise as in the male.

Length.—11-15 mm. *Width*.—5.5-6 mm.

Types.—Holotype male from Prescott, Ariz. [Saylor], and allotype female from Fort Wingate, N. Mex. [Casey], both deposited in the United States National Museum (No. 53774).

Paratypes: Males, 7; females, 3. ARIZONA: Prescott, May [Saylor]; Williams, July 1920 (Barber and Schwarz) [U.S.N.M.]; Bright Angel (Barber and Schwarz) [U.S.N.M.]; Phoenix [Saylor], Springerville, 1927 (Beamer) [Snow Museum]. TEXAS: Fedor, May [Saylor].

Remarks.—Some variation occurs: The transverse carina of the vertex is sometimes interrupted at the middle; the smooth central area of the thorax may not be a distinct band but may have an uneven edge; the pygidium may be less densely and more coarsely punctate; and the antennal club may vary from one-fourth to one-third longer than the funicle.

PHYLLOPHAGA (LISTROCHELUS) TIMIDA (Horn)

FIGURE 3, a-c

Listrochelus timidus HORN, Trans. Amer. Ent. Soc., vol. 7, p. 146, 1878.

Male.—Small, apparently glabrous above; color rufous to rufotestaceous, the elytra sometimes nearly testaceous. Front of head entirely covered with gross, contiguous, variolate punctures; transverse ridge of vertex not prominent, the surface immediately behind the ridge densely punctured, the punctures much smaller and more transverse than those of the front, and with dense, minute, subprocumbent hair; clypeus punctured nearly as coarsely as front but much less densely so, the punctures not contiguous; clypeal apex narrowly, not deeply emarginate, angles broadly rounded and moderately reflexed; eyes rather large. Antenna 10-segmented, club subovate and nearly equal to funicle in length. Thorax with coarse, moderately dense punctures, the latter much closer along the apical margin and most sparse at the center of the disk; lateral margins entire, nonciliate, the angles obtusely angulate, front angles often slightly explanate; base and apex with strong, complete marginal lines. Elytra coarsely, not densely punctate, the oblique striae moderately prominent; many of the punctures, especially near and at the apex, with minute, hardly evident hairs. Pygidium subopaque, slightly convex, sparsely and coarsely punctured, with short procumbent hairs, apex subrounded. Abdomen flattened at middle, sparsely and finely punctate, shining; fifth segment one-half as long as fourth and plane except for a row of coarse setigerous punctures along the apical margin. All claws finely serrate to nearly plane and smooth, without any larger intercalated teeth. Front tarsus without projections at the inner apex of each segment.

Female.—Antennal club equal to segments 3-7 combined, abdomen slightly convex, polished, fifth segment and apex of the sixth coarsely but sparsely punctate; all claws with a strong tooth slightly beyond the middle, the surface between the tooth and the claw base minutely serrate. Otherwise similar to the male.

Length.—8-11 mm. *Width*.—3.5-5 mm.

Type.—In the Horn collection in Philadelphia.

Type locality.—"Arizona."

Specimens examined.—Males, 116; females, 47. ARIZONA: Santa Catalina Mountains, Gila Bend, Tucson, Canyon Lake, Liberty, and base of Pinal Mountains, taken from April to late in September.

Remarks.—A common little species and one of the few in the genus in which the area of the vertex behind the transverse ridge of the front is densely, coarsely, and almost completely punctured; in most species this area is either entirely smooth or but sparsely punctate, and then only at the sides. The tarsal claws in fresh specimens are

distinctly though finely serrate, but they appear to be almost smooth in some worn specimens. The Mexican *L. mimicana* Saylor is with difficulty separated from this species externally, but the genitalia of the males are not only of radically different form but are nearly four times as large in the Mexican species as in ours. Also, *L. snowi* Saylor, described herein from Arizona, is rather close to *L. timida* but has different genitalia. The present species is commonly attracted to light.

PHYLLOPHAGA (LISTROCHELUS) SNOWI, new species

FIGURE 3, d-f

Male.—Small, shining, elongate; thorax rufous, otherwise testaceous to rufotestaceous; apparently glabrous above except for minute, scarcely perceptible elytral hairs. Head very coarsely, densely, and contiguously punctate; transverse ridge of vertex moderately strong, surface behind coarsely and entirely punctate; clypeal apex slightly emarginate, somewhat reflexed, angles very broadly rounded. Antennal club ovate, testaceous, and subequal to funicle. Thorax evenly convex, with coarse and dense punctures, and a row of impressed punctures just posterior to the apical margin; lateral margins entire, nonciliate, the angles broadly rounded and not explanate. Elytral striae, except sutural, obsolete. Pygidium convex, shining, with coarse and moderately dense punctures. Abdomen flattened, polished, the sixth segment impunctate at base, with coarse setigerous punctures along the apical margin. All claws with slight but distinct pectinations along a single margin, without intercalated teeth.

Female.—Unknown.

Length.—10 mm. *Width*.—5.5 mm.

Type.—The unique male type is from Congress, Ariz., collected by F. H. Snow in July, and is deposited in the collection of the Kansas Museum, from whence it was lent for study through Messrs. Sanderson and Benedict.

Remarks.—While superficially close to *L. timida*, the present species is easily distinguished through the characters of the male genitalia and the much more obvious claw pectination, the latter being at most minutely serrate in *L. timida*. It is interesting to speculate on the possibility that *L. snowi* has evolved from the *L. timida* type, since the apical portions of the male genitalia of the former appear to be merely an unfolding and flattening of the *L. timida* type; since the genitalia of each species are quite rigid, there is but little or no chance that the *L. snowi* genitalia are merely a deformed specimen of *L. timida*, and moreover, the two species are separated by external characters also.

PHYLLOPHAGA (LISTROCHELUS) SENEX (Horn)

FIGURE, 2, b

Listrochelus senex HORN, Trans. Amer. Ent. Soc., vol. 7, p. 148, 1878.

Male.—Oblong-oval, rufous and shining above, glabrous dorsally. Head without an obvious transverse carina on vertex, front very densely, coarsely, and variolately punctate; clypeal suture nearly straight; clypeus flat, more sparsely punctate than front; clypeal apex hardly at all reflexed, subtruncate, the center faintly emarginate, angles narrowly rounded. Antenna with club very robust (thickest in subgenus) and slightly longer than to one-third longer than, the funicle; segments 4-7 inclusive somewhat, to distinctly, transverse. Thorax very convex, with sparse coarse punctures in center disk, the punctures closer laterally; lateral margins coarsely crenate, front angles blunt, hind angles sharp but obtuse, base with a strong marginal line. Elytra sparsely and not very coarsely punctate, striae obsolete. Pygidium somewhat convex, smooth and shining, with very small punctures and very short and sparse hair, apex rounded. Abdomen polished, smooth, very sparsely and finely punctate; sixth segment nearly as long as the fifth and with a short backward-projecting lobe at center in lateral view (fig. 2, b), the apex of the lobe truncate, surface of the segment polished, smooth, sparsely and finely punctate. All claws long and slender, minutely serrate along a single margin, without any larger intercalated teeth.

Female.—Black or rufous in color; transverse ridge of occiput rather prominent; antennal club shorter than funicle; sixth abdominal segment plane, sparsely and coarsely punctate; pygidium slightly more coarsely punctate than in the male; all claws finely serrate along a single margin and each with a triangular tooth at center. Otherwise as in the male.

Length.—11-12.5 mm. *Width*.—5-6 mm.

Type.—In the Horn collection.

Type locality.—"Llano Estacado, Texas."

Specimens examined.—Males, 14; females, 3. TEXAS: Fort Clark [Saylor]. NEW MEXICO: Mesilla Park [U.S.N.M. and Saylor]; Albuquerque, May 22 (Schaeffer) [Robinson, U.S.N.M., Casey].

Remarks.—The color varies from rufous to or nearly quite black. Apparently rather rare in collections.

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Lists (p. 169) the one Mexican species known and describes 8 new species from that country; lists also (p. 173) the United States species *L. mucoreus* and *scoparius* as having been seen from Mexico.
1894. HORN, GEORGE H.: The Coleoptera of Baja California. Proc. California Acad. Sci., ser. 2, vol. 4, pp. 302-449, 2 pls.
Describes as new *L. carminator* (p. 393).
1896. LINELL, MARTIN L.: New species of North American Coleoptera of the family Scarabaeidae. Proc. U. S. Nat. Mus., vol. 18, pp. 721-731.
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1914. WICKHAM, HENRY FREDERICK: New Miocene Coleoptera from Florissant. Bull. Mus. Comp. Zool., vol. 58, pp. 421-494, 16 pls.
Describes (p. 459; pl. 6, fig. 10) the fossil species *L. puerilis* from the Miocene deposits at Florissant, Colo. (It is not at all certain that this species belongs in this genus, since the claws on the specimen cannot be seen in detail.)
1922. FALL, HENRY CLINTON: New Coleoptera, X. Can. Ent., vol. 54, pp. 170-173.
Describes as new *L. longiclarus* (p. 173). (This is a synonym of *Phyllophaga crinita* Burmeister.)

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Describes as new *L. plenus* (p. 199) and *L. juvenilis* (p. 200). (*L. juvenilis* is now included in the subgenus *Phyllophaga* sensu stricto.)
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Describes as new *L. duncani* (p. 129; pl. 8).
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Mentions (p. 286) generic and subgeneric usage of names.
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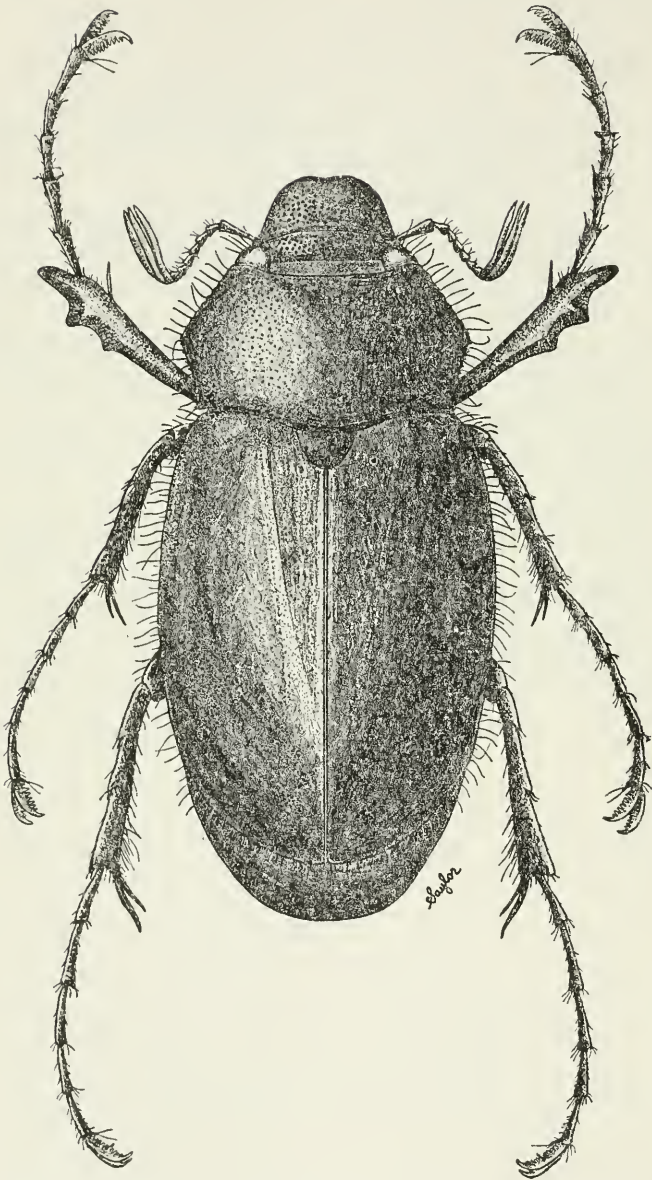


FIGURE 1.—Male specimen of *Phyllophaga (Listrochelus) disparilis* (Horn).

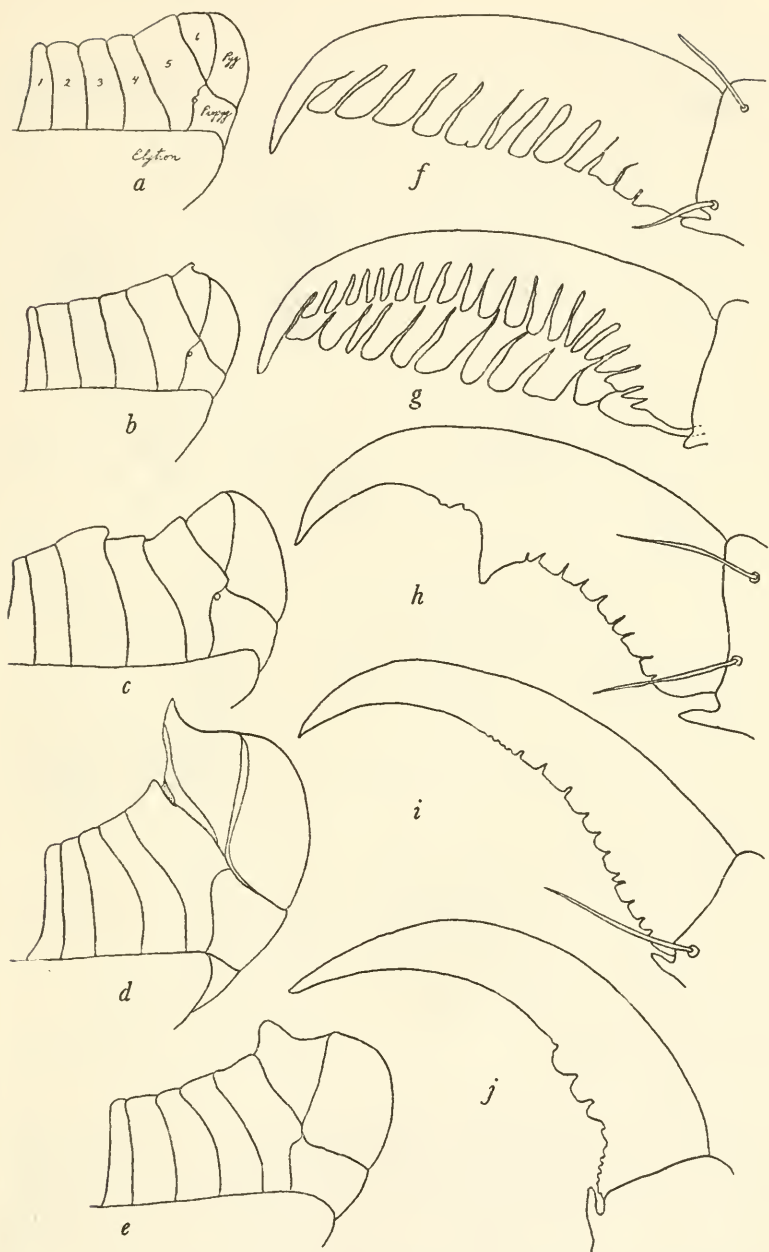


FIGURE 2.—Lateral views of male abdomen of (a) *Phyllophaga (Listrochelus) tarsalis*; (b) *P. (L.) senex*; (c) *P. (L.) falsa*; (d) *P. (L.) scoparia*; (e) *P. (L.) trochanter*. f-g, *P. (L.) flavipennis*: f, Outer side of front outer claw of male; g, inner side of front inner claw of male. h, i, *P. (L.) wickhami*: h, Outer side of front outer claw of male; i, outer side of hind outer claw of male. j, *P. (L.) neomexicana*: Outer side of hind outer claw of male.

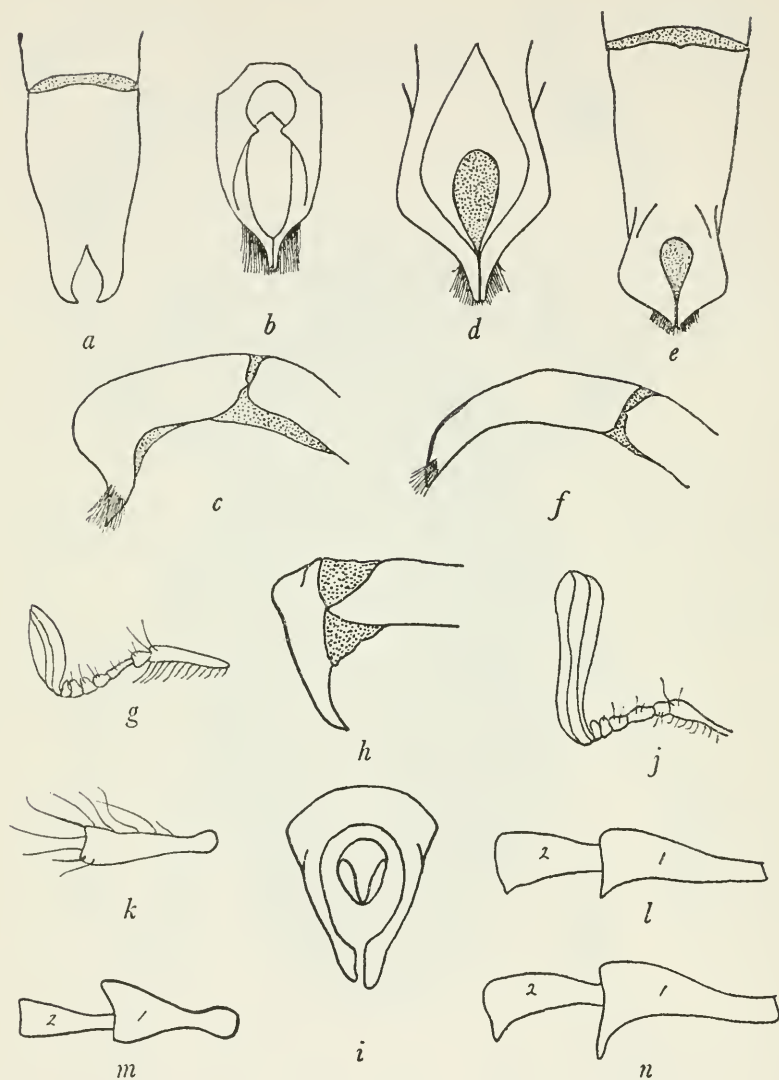


FIGURE 3.—*a-c*, *Phyllophaga (Listrochelus) timida*: *a*, Dorsal view of male genitalia; *b*, en-face view of male genitalia; *c*, lateral view of male genitalia. *d-f*, *P. (L.) snowi*: *d*, En-face view of male genitalia; *e*, en face-dorsal view of male genitalia; *f*, lateral view of male genitalia. *g*, *P. (L.) scoporia*: View of female antenna. *h, i*, *P. (L.) peninsularis*: *h*, Lateral view of male genitalia; *i*, en-face view of male genitalia. *j*, *P. (L.) macmurryi*: Male antenna. *k*, *P. (L.) opacicollis*: First hind tarsus of male. *l*, *P. (L.) fimbripes*: First two anterior tarsal segments of female. *m*, *P. (L.) tarsalis*: First two posterior tarsi of female. *n*, *P. (L.) koehleriana*: Front tarsal segments of female.

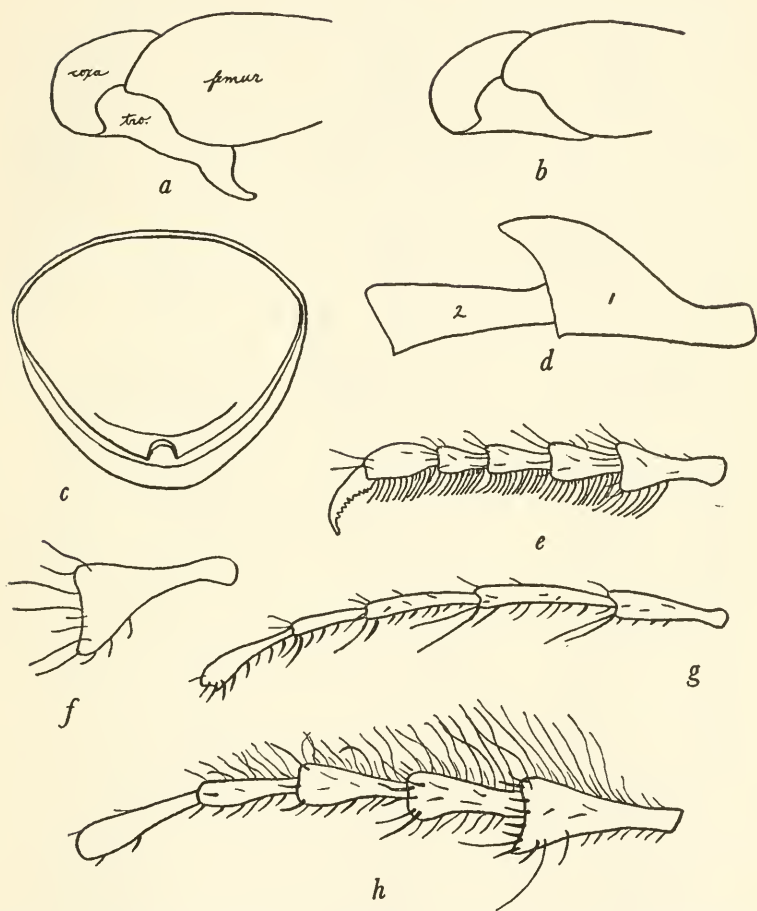


FIGURE 4.—*a*, *Phyllophaga (Listrochelus) trochanter*: Enlarged view of hind coxa and femur to show prolonged trochanter. *b*, Same of *P. (L.) scoparia*. *c*, *P. (L.) meadei*: Female pygidium. *d*, *P. (L.) tarsalis*: First two hind tarsal segments of male. *e*, *P. (L.) scoparia*: Hind tarsus of male. *f*, *P. (L.) falsa*: First hind tarsal segment of male. *g*, *P. (L.) grantii*: Hind tarsus of male. *h*, *P. (L.) neomexicana*: Dorsal view of hind tarsus of male.

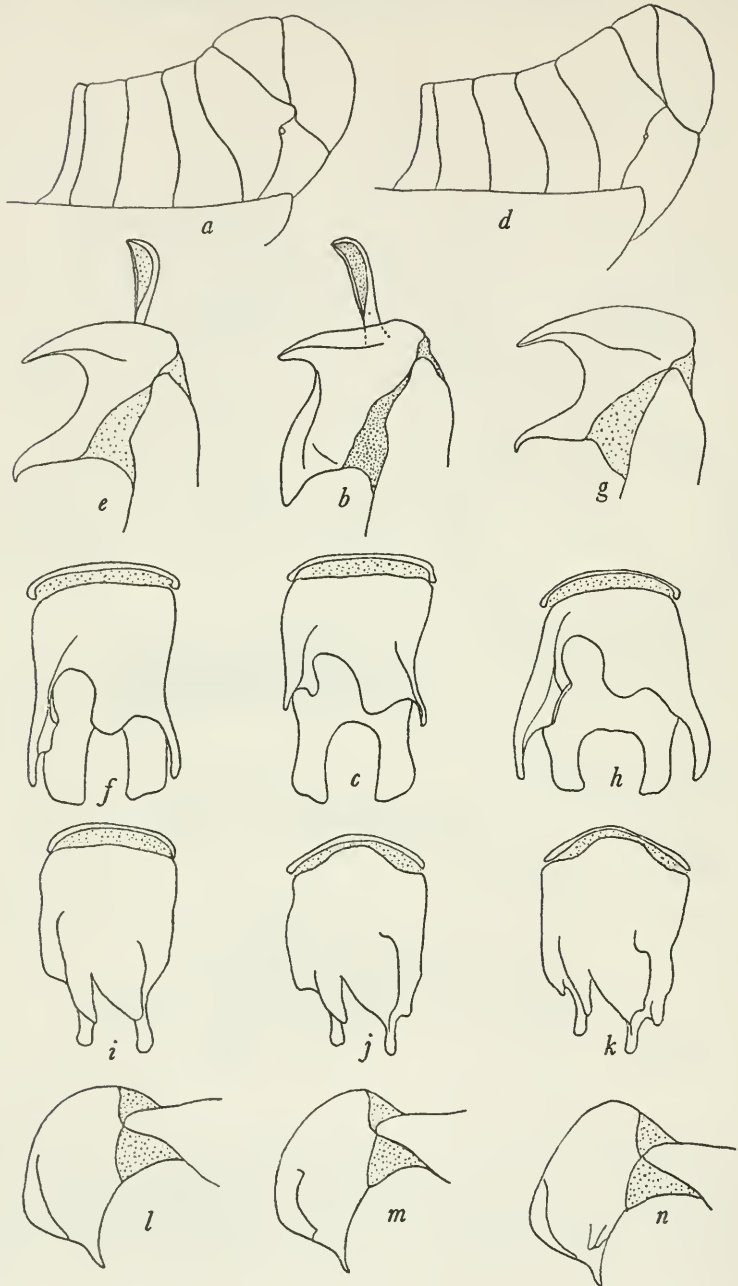


FIGURE 5.—*a-c*, *Phyllophaga (Listrochelus) carminator*: *a*, Lateral view of male abdomen; *b*, lateral view of male genitalia; *c*, en-face view of male genitalia. *d*, *P. (L.) granti*: Lateral view of male abdomen. *e, f*, *P. (L.) densicollis*: *e*, Lateral view of male genitalia; *f*, en-face view of male genitalia. *g, h*, *P. (L.) michelbacheri*: *g*, Lateral view of male genitalia; *h*, en-face view of male genitalia. *i-n*, *P. (L.) miraflorea*: *i*, En-face view of male genitalia of variety from Triunfo and San Bartola; *j*, same of typical form; *k*, same of variety from 5 miles south of Miraflores; *l*, lateral view of male genitalia of variety from Triunfo and San Bartola; *m*, same of typical form from Miraflores; *n*, same of variety from 5 miles south of Miraflores.

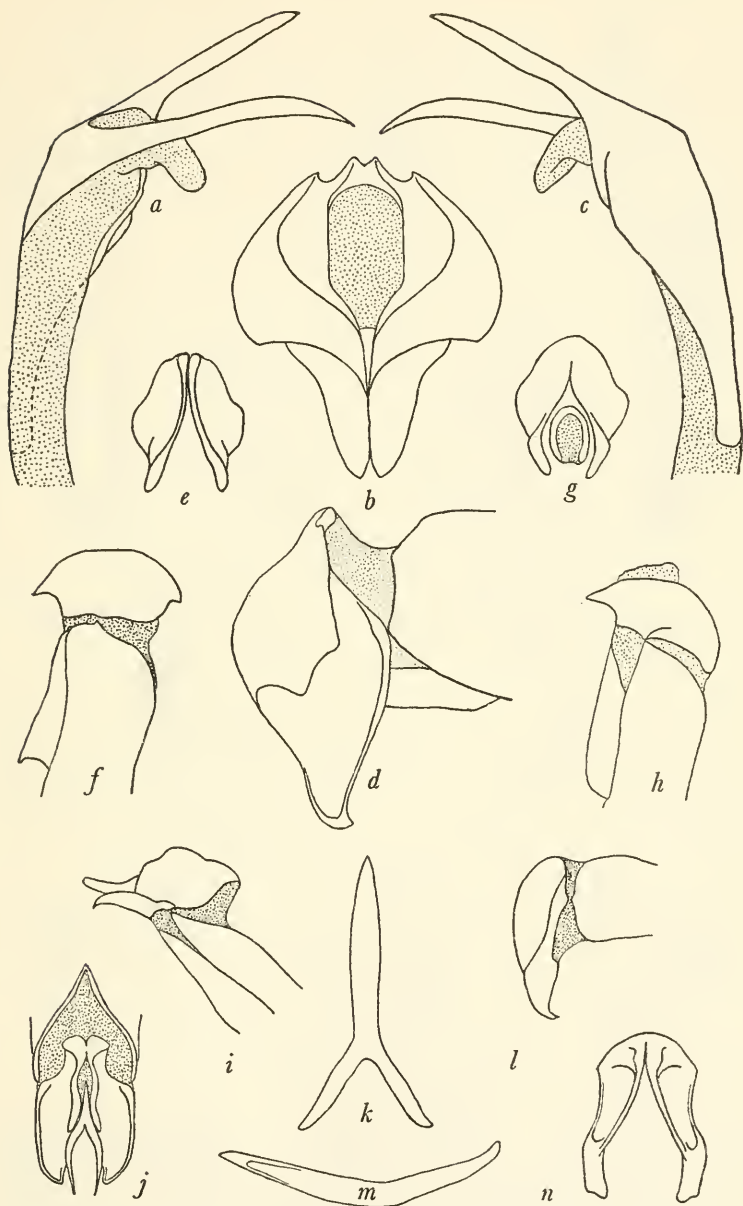


FIGURE 6.—*a-d*, *Phyllophaga (Listrochelus) disparilis*: *a, c*, Two views of aedeagus of male; *b*, en-face view of male genitalia; *d*, lateral view of male genitalia. *e, f*, *P. (L.) arizona*: *e*, En-face view of male genitalia; *f*, lateral view of male genitalia. *g, h*, *P. (L.) dun-cani*: *g*, En-face view of male genitalia; *h*, lateral view of male genitalia. *i, j*, *P. (L.) cushmani*: *i*, Lateral view of male genitalia; *j*, en-face view of male genitalia. *k-n*, *P. (L.) scuticeps*: *k*, Dorsal view of male aedeagus; *l*, lateral view of male genitalia; *m*, lateral view of male aedeagus; *n*, en-face view of male genitalia.

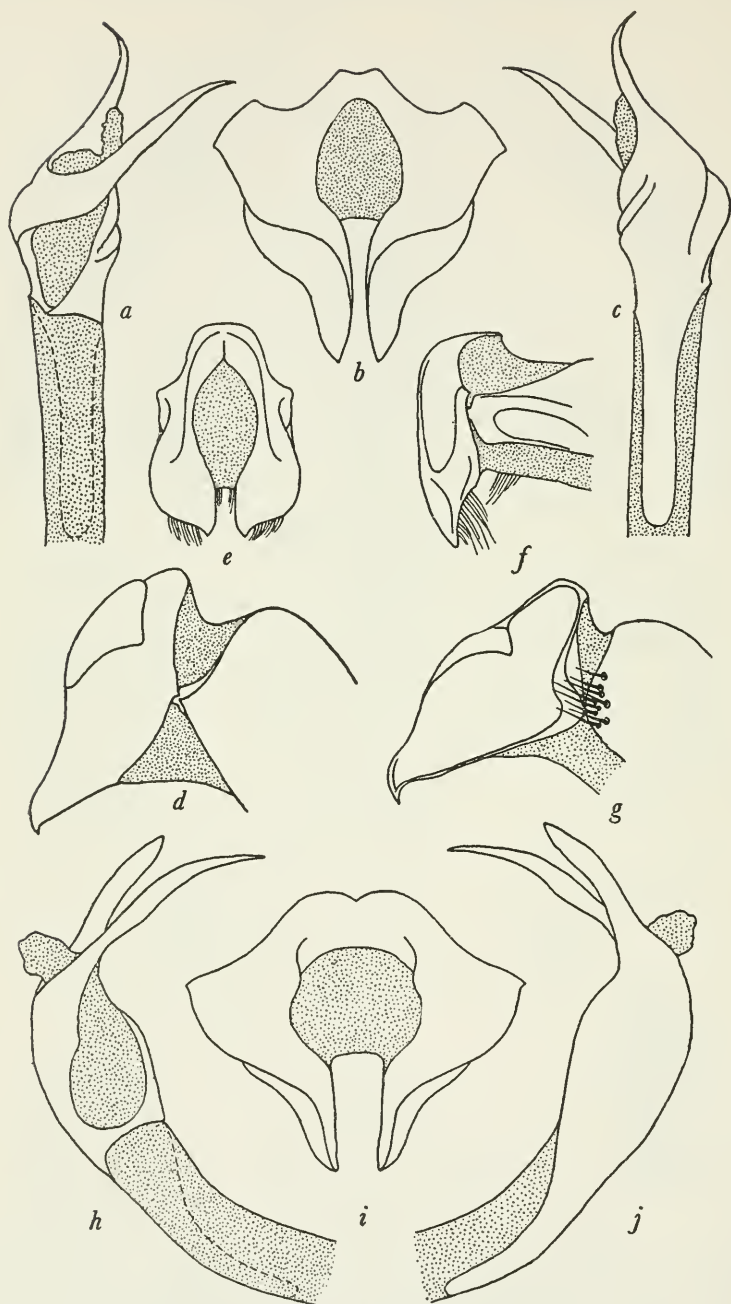


FIGURE 7.—*a-d*, *Phyllophaga (Listrochelus) huachuca*: *a*, *c*, Two views of male aedeagus; *b*, en-face view of male genitalia; *d*, lateral view of male genitalia. *e, f*, *P. (L.) scoparia*: *e*, En-face view of male genitalia; *f*, lateral view of male genitalia. *g-j*, *P. (L.) chapini*: *g*, Lateral view of male genitalia; *h, j*, two views of male aedeagus; *i*, en-face view of male genitalia.

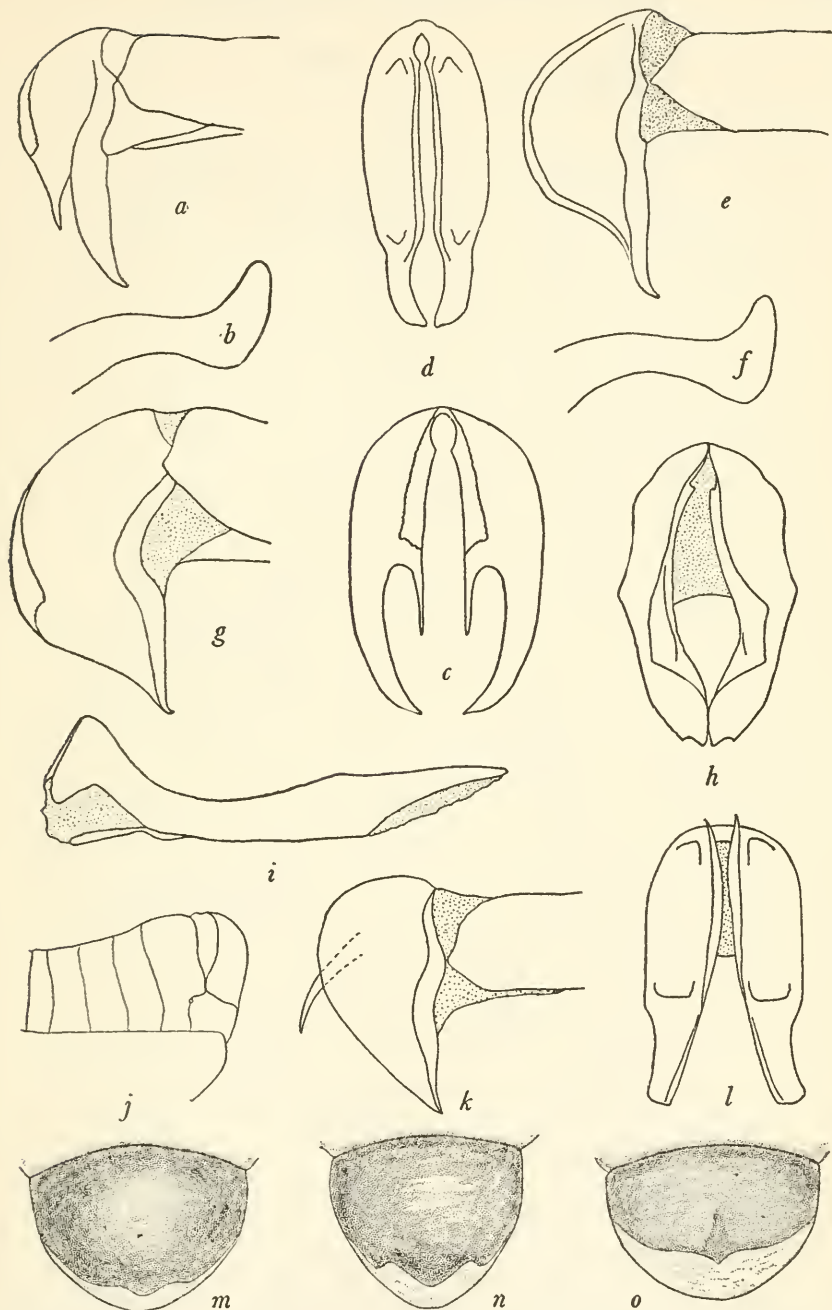


FIGURE 8.—*a-c*, *Phyllophaga (Listrochelus) reinhardi*: *a*, Lateral view of male genitalia; *b*, lateral view of male aedeagus; *c*, en-face view of male genitalia. *d-f*, *P. (L.) mucorea*: *d*, En-face view of male genitalia; *e*, lateral view of male genitalia; *f*, lateral view of male aedeagus. *g-i*, *P. (L.) pulcher*: *g*, Lateral view of male genitalia; *h*, en-face view of male genitalia; *i*, lateral view of male aedeagus. *j-l*, *P. (L.) plena*: *j*, lateral view of male abdomen; *k*, lateral view of male genitalia; *l*, en-face view of male genitalia. *m*, *P. (L.) disparilis*: Pygidium of female. *n*, *P. (L.) huachuca*: Pygidium of female. *o*, *P. (L.) chapini*: Pygidium of female.

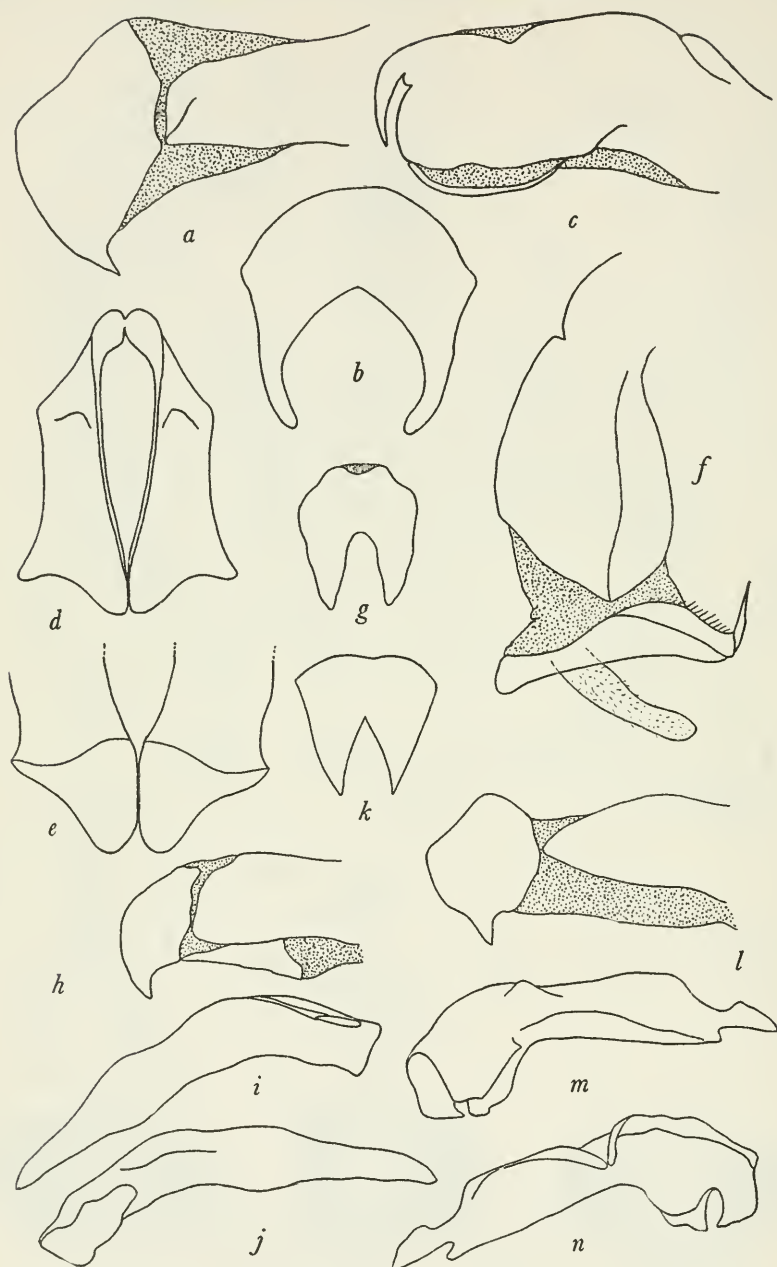


FIGURE 9.—*a-c*, *Phyllophaga (Listrochelus) falsa*: *a*, Lateral view of male genitalia; *b*, en-face view of male genitalia; *c*, lateral view of male genitalia. *d-f*, *P. (L.) trochanter*: *d*, En-face view of male genitalia; *e*, enlarged en-face ventral view of tips of male genitalia; *f*, lateral view of male genitalia. *g-j*, *P. (L.) tarsalis*: *g*, En-face view of male genitalia; *h*, lateral view of male genitalia; *i, j*, two views of male aedeagus. *k-n*, *P. (L.) fimbripes*: *k*, En-face view of male genitalia; *l*, lateral view of male genitalia; *m, n*, two views of male aedeagus.

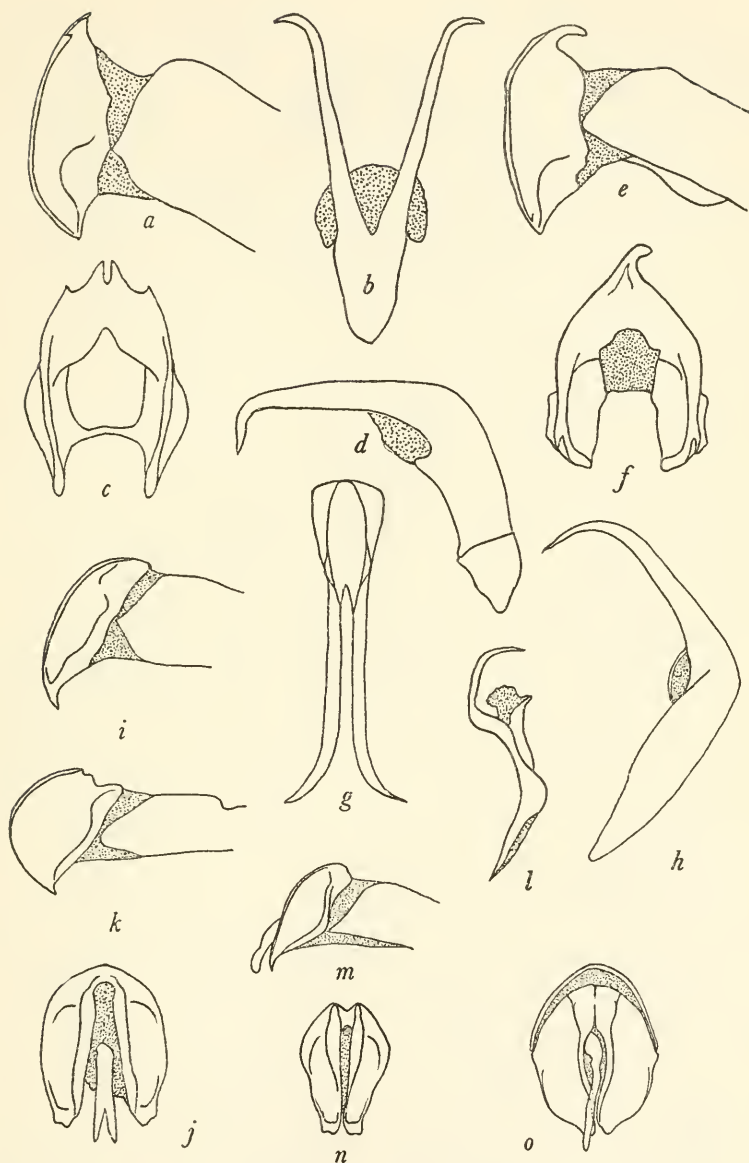


FIGURE 10.—*a-d*, *Phyllophaga (Listrochelus) flavipennis*: *a*, Lateral view of male genitalia; *b*, *d*, two views of male aedeagus; *c*, *en-face* view of male genitalia. *e-h*, *P. (L.) grantii*: *e*, Lateral view of male genitalia; *f*, *en-face* view of male genitalia; *g*, *h*, two views of male aedeagus. *i, j*, *P. (L.) wickhami*: *i*, Lateral view of male genitalia; *j*, *en-face* view of male genitalia. *k, l, n*, *P. (L.) macmurryi*: *k*, Lateral view of male genitalia; *l*, lateral view of male aedeagus; *n*, *en-face* view of male genitalia. *m, o*, *P. (L.) texensis*: *m*, Lateral view of male genitalia; *o*, *en-face* view of male genitalia.

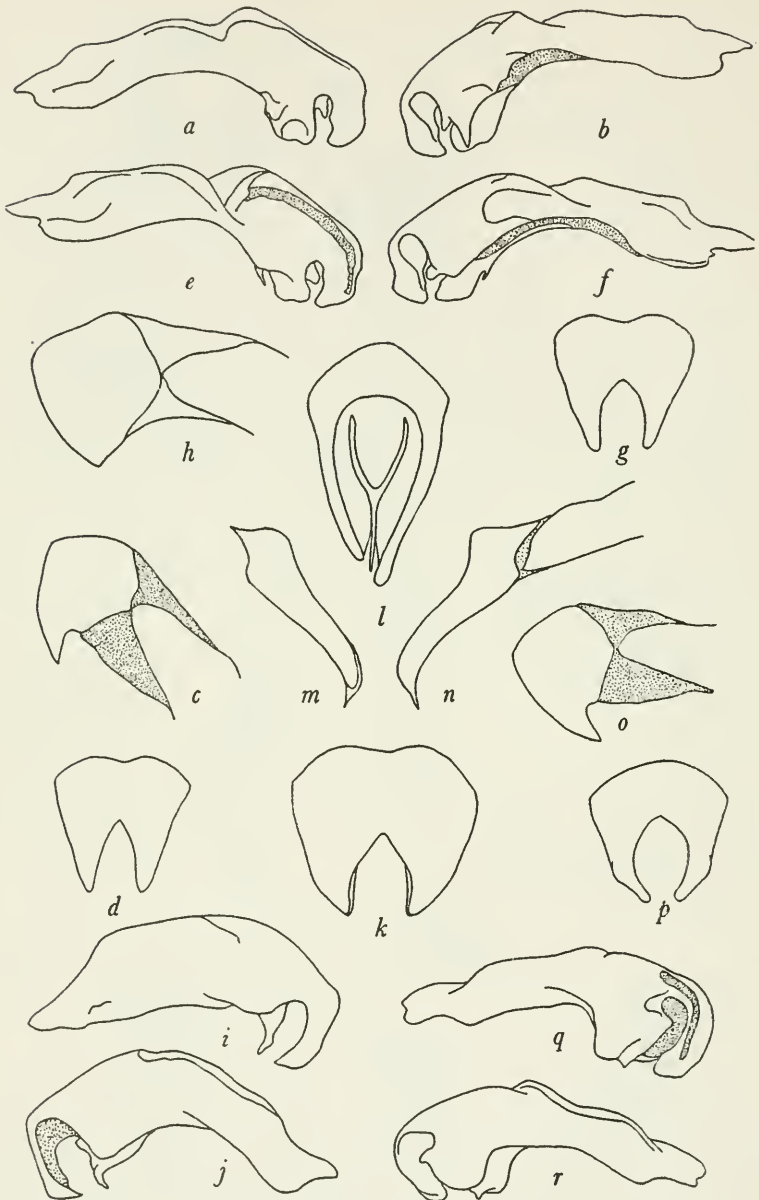


FIGURE 11.—*a-d*, *Phyllophaga (Listrochelus) koehleriana*: *a, b*, Two views of male aedeagus; *c*, lateral view of male genitalia; *d*, en-face view of male genitalia. *e-g*, *P. (L.) neo-mexicana*: *e, f*, Two views of male aedeagus; *g*, en-face view of male genitalia. *h-k*, *P. (L.) opacicollis*: *h*, Lateral view of male genitalia; *i, j*, two views of male aedeagus; *k*, en-face view of male genitalia. *l-n*, *P. (L.) pilosipes*: *l*, En-face view of male genitalia; *m, n*, opposite sides in lateral view of male genitalia. *o-r*, *P. (L.) parilis*: *o*, Lateral view of male genitalia; *p*, en-face view of male genitalia; *q, r*, two views of male aedeagus.

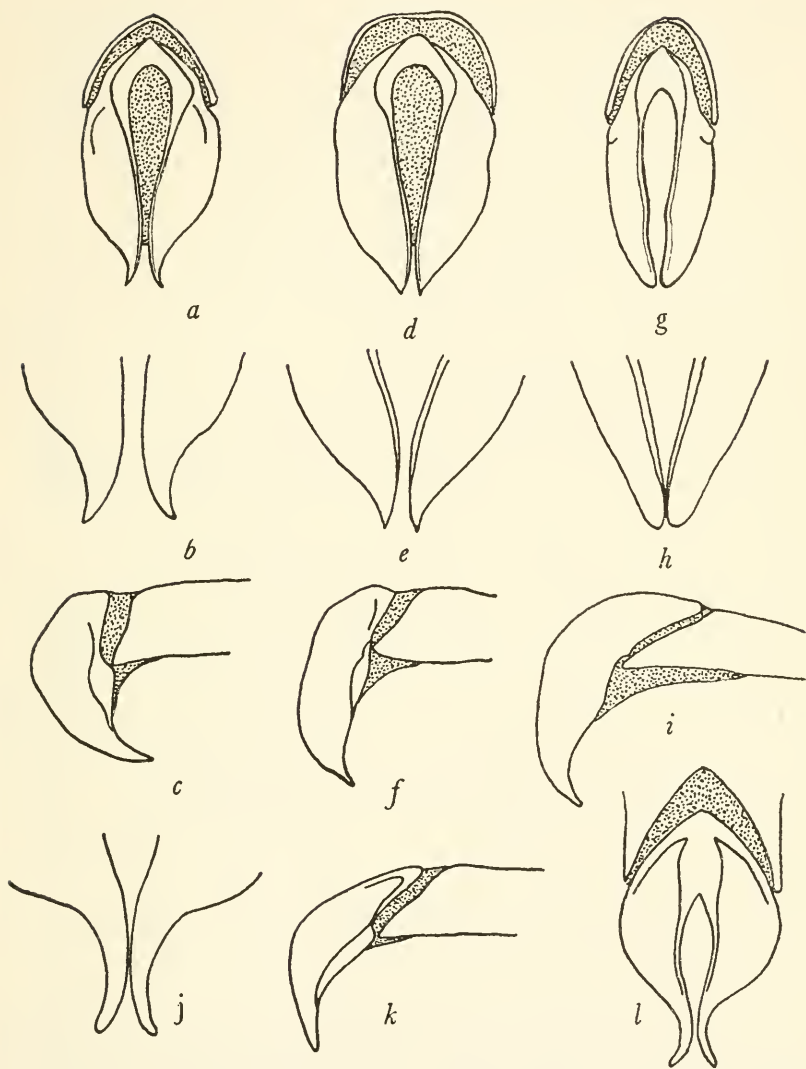


FIGURE 12.—*a-c*, *Phyllophaga (Listrochelus) cochisa*: *a*, En-face view of male genitalia; *b*, enlarged en face-ventral view of tips of male genitalia; *c*, lateral view of male genitalia. *d-f*, *P. (L.) cavata*: *d*, En-face view of male genitalia; *e*, enlarged en face-ventral view of male genitalia; *f*, lateral view of male genitalia. *g-i*, *P. (L.) micros*: *g*, En-face view of male genitalia; *h*, enlarged en face-ventral view of male genitalia; *i*, lateral view of male genitalia. *j-l*, *P. (L.) meadei*: *j*, Enlarged en face-ventral view of male genitalia; *k*, lateral view of male genitalia; *l*, en-face view of male genitalia.

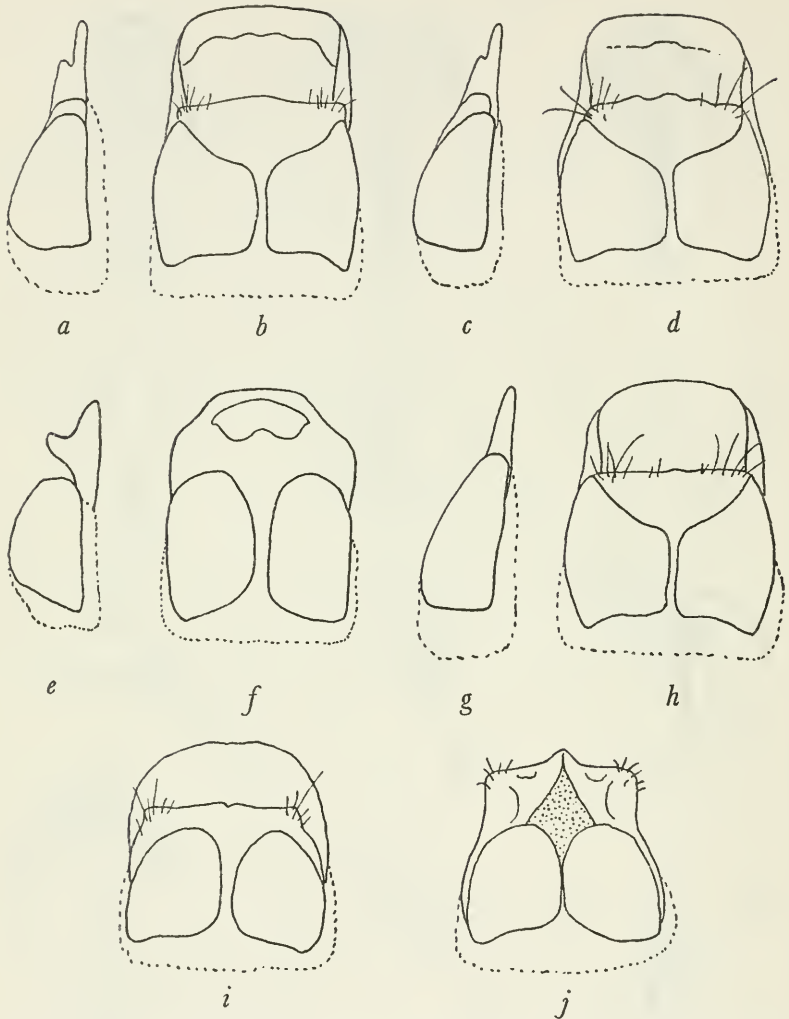


FIGURE 13.—*a, b*, *Phyllophaga (Listrochelus) michelbacheri*: *a*, Lateral view of male genitalia; *b*, *en-face* view of male genitalia. *c, d*, *P. (L.) densicollis*: *c*, lateral view of female genitalia; *d*, *en-face* view of female genitalia. *e, f*, *P. (L.) miraflores*: *e*, Lateral view of female genitalia; *f*, *en-face* view of female genitalia. *g, h*, *P. (L.) carminator*: *g*, Lateral view of female genitalia; *h*, *en-face* view of female genitalia. *i*, *P. (L.) huachuca*: *En-face* view of female genitalia. *j*, *P. (L.) granti*: *En-face* view of female genitalia.