

Systematics of the Acorn-Infesting Weevils *Conotrachelus naso*, *C. carinifer*, and *C. posticatus* (Coleoptera: Curculionidae)¹

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ABSTRACT

The descriptions of all forms from eggs to adults of *Conotrachelus naso* LeConte, *C. carinifer* Casey, *C. posticatus* Boheman, as well as keys for mature larvae, pupae, and adults, are presented.

The purpose of this paper is to provide workable keys to the larvae, pupae, and adults, and to present descriptions of all stages of the species of *Conotrachelus* breeding in acorns in the United States and Canada. There has been no previous attempt to key larvae or pupae of *Conotrachelus*. In this paper all descriptions of the eggs, larvae, and pupae are new; the descriptions of the adults are from Schoof (1942), except for bracketed additions. Most of the specimens described in this paper were preserved during a study of the biology of the same species (Gibson 1964). Terminology of the larvae is that of Anderson (1947) except for the spiracles, for which the terminology of Peterson (1957) is used.

KEY TO CONOTRACHELUS LARVAE FROM ACORNS

1. Small round sclerotized spots usually present on midventral line between abdominal segments 1-8; postmentum strongly sclerotized as in Fig. 5; pronotal shield extending past subdorsal setae 1 and 2, at least in middle; endocranial suture approximately two-thirds as long as frons..... *naso*
No midventral sclerotized spots between abdominal segments; postmentum lightly sclerotized or not sclerotized; pronotal shield not extending past subdorsal setae 1 and 2; endocranial suture one-half as long as frons or less..... 2
2. Postmentum lightly sclerotized appearing yellowish; endocranial suture almost one-half as long as frons *carinifer*
Postmentum usually not sclerotized appearing white; endocranial suture one-third as long as frons..... *posticatus*

KEY TO PUPAE

1. Profemoral teeth absent; center pair of setae on anterior margin of prothorax subparallel to convergent *naso*
Profemoral teeth present; center pair of setae on anterior margin of prothorax usually divergent... 2
2. Interocular pit deep and well formed; median longitudinal groove present on base of rostrum; length 6.5-8.00 mm..... *carinifer*
Interocular pit absent or poorly formed; shallow median longitudinal groove present at base of rostrum; length 4.5-6.5 mm..... *posticatus*

KEY TO ADULTS

1. Femoral teeth absent or obsolete..... *naso*
Femoral teeth present..... 2

2. Prothoracic punctures distinctly larger than elytral punctures *carinifer*
Prothoracic punctures not larger than elytral punctures *posticatus*

Conotrachelus naso LeConte

Eggs: Elongate oval; width 0.375 mm; length 0.75 mm; white; shell granulate.

Larvae, 1st instar: Width 0.50 mm; length 1.0 mm; head capsule 0.33 mm, lightly sclerotized, pale yellow; eyes clear; 3 dorsal plicae per abdominal segment; setae clear or white.

2nd instar: Width 0.75 mm; length 2.0 mm; head capsule 0.58 mm, lightly sclerotized, yellow; eyes clear; 3 dorsal plicae per abdominal segment; pronotal shield lightly sclerotized, outline not definite; setae clear or white.

3rd instar: Width 1.0 mm; length 4.0 mm; head capsule 1.0 mm, lightly sclerotized, yellow; eyes clear; 3 dorsal plicae per abdominal segment; pronotal shield sclerotized, outline definite; setae white; spiracles obvious; epimeral sclerite faint, but discernible.

4th instar: Width 2.00 mm; length 7.0 mm; head capsule 1.25 mm, lightly sclerotized, yellow; eyes clear; 3 (sometimes 4) dorsal plicae per abdominal segment; crescent-shaped sclerite on prothoracic sternum discernible; setae brown.

5th instar: Mature larva (Fig. 1A) somewhat crescent shaped, width approximately 2.75 mm, length 12 mm; head capsule 1.33 mm, brown; body color white to deep yellow, depending somewhat upon the pigment of the food acorn; legless; setae brown; pronotal shield extends down past base of subdorsal setae 1 and 2 at least in middle; epimeral sclerite (Fig. 2A) usually with 1 or 2 projections caudad past base of epimeral setae 1 and 2; premental sclerite with center projection as long as side projections; a crescent shaped sclerite on prothoracic sternum; small round sclerites between segments I-VIII, sometimes obsolete; 10 abdominal segments, 10th segment very small, bearing X-shaped anus; abdominal segments I-VII with 2 ventral and 4 dorsal plicae; abdominal epipleurum and pleurum I-VIII with 2 setae, epipleural seta 1 tiny and located anteriodorsal from epipleural seta 2, pleural seta 1 tiny and located anterior to ps. 2; biforous spiracles on prothoracic and first 8 abdominal segments.

Larval head capsule (Figs. 3A, 4A): Head free, brown, as broad as long, broadest at middle, rounded

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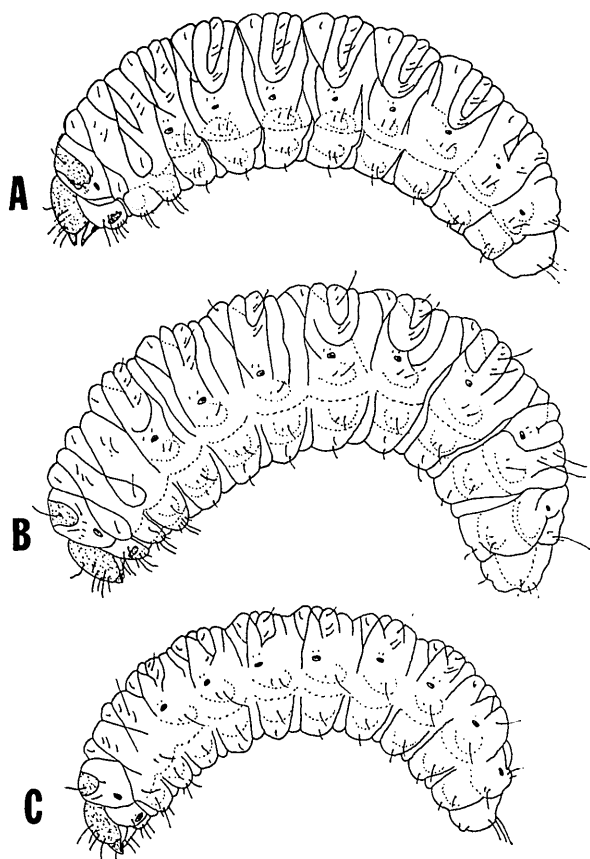


FIG. 1.—Mature *Conotrachelus* larvae. (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

posteriorly; anterior ocellus present; posterior ocellus absent, antenna consisting of 1 membranous article which bears a small cylindrical segment; hypopharyngeal bracon absent; frontal suture distinguishable throughout its length, incomplete anteriorly; epicranial suture more than one-half as long as head; endocranial suture approximately two-thirds as long as frons; frons with 2 pairs of setae, setae 1, 2, and 3 absent, seta 4 short, and seta 5 long, at least 3 times as long as 4; dorsal epicranial setae 1, 2, and 3 subequal, moderately long; seta 4 represented only by a spot; seta 5 long, and as long as frontal seta 5; lateral epicranial seta 1 long; lateral epicranial seta 2 as long as frontal seta 5; ventral epicranial seta 2 short, one-third length of ventral epicranial seta 1; posterior epicranial setae absent, represented only by 4 spots; clypeal setae 1 pair only, very short; anterior margin of labrum slightly convex; labral setae 1 and 3 short, longer than 2; median and paired lateral sensilla absent from labrum; labral rods moderately elongate, stout, subparallel; epipharynx (Fig. 5A) with 3 pairs of spines anterolateral, 1 pair anteromedian, and 2 pairs median spines; mandible with 2 apical teeth; mandibular seta 1 short, slightly shorter than and directly behind 2; labial palpus with 2 articles; premental sclerite complete, with anterior and posterior median extensions; postmentum (Fig.

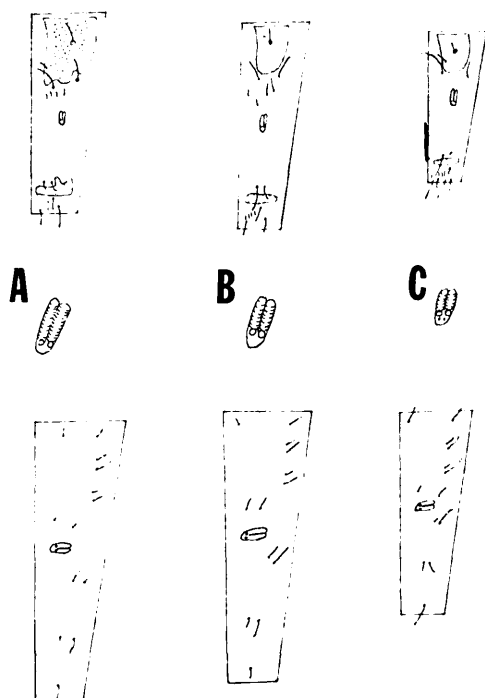


FIG. 2.—Prothoracic segment, spiracles, and fifth abdominal segment. (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

5A) with 3 pairs of setae, posterior pair located in membranous area, center and anterior pairs located on sclerotized portion; postmentum with strongly sclerotized M-shaped area; maxillary palpus with 2 articles without accessory process or setae.

CHAETOTAXY OF PUPAE

Ventral View

(Fig. 6A)

Pupae: Length 7 mm; width 4 mm (approximately).

Rostrum: 4 pairs of divergent setae; 1 pair at juncture of beak with head; 1 pair one-fourth toward tip in female, one-third toward tip in male; 1 pair one-half toward tip in female, slightly past one-half mark in male; 1 pair two-thirds toward tip laterad. Male beak reaches third tarsal segment of front legs, female beak reaches past tarsi of front legs usually to distal tip of tarsi of middle legs.

Head: 2 pairs of divergent setae, 1 pair above eyes, 1 pair at rear edge of eyes.

Prothorax: 4 setae on each lateral edge, 1 one-third back on lateral edge, 3 in tight line at one-half, five-eighths, and three-fourths marks; 4 setae on anterior margin of prothorax, center pair subparallel to convergent, outer pair divergent.

Legs: 1 seta on each femur immediately above elbow, 1 seta near elbow epicenter.

Elytra: 4–6 setae visible on carina of fifth interval, 1–3 setae visible on carina of third interval.

Abdomen: 1 pair of setae on each of last 2 seg-

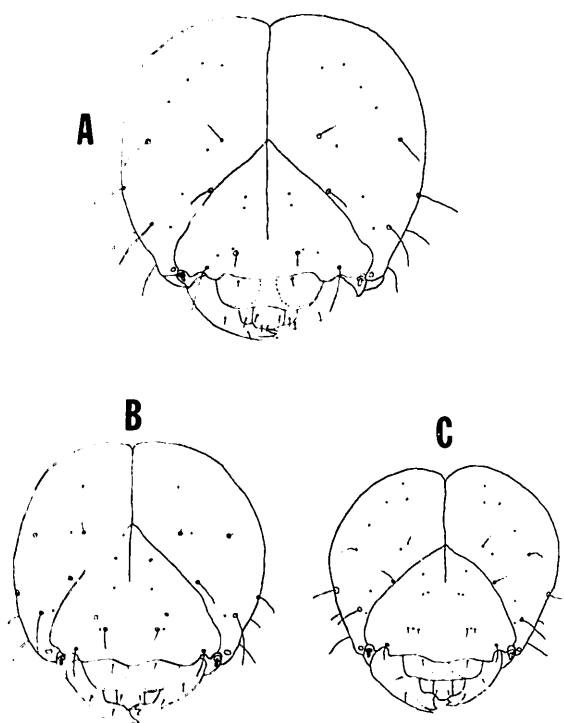


FIG. 3.—Larval head capsule (front view). (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

ments near lateral margin, 2 pairs of very long and curved setae (especially in male), located on a pair of large fleshy caudal hooks, 1 pair arises at base of these caudal hooks, the second pair arises halfway to the tip on the ventral side.

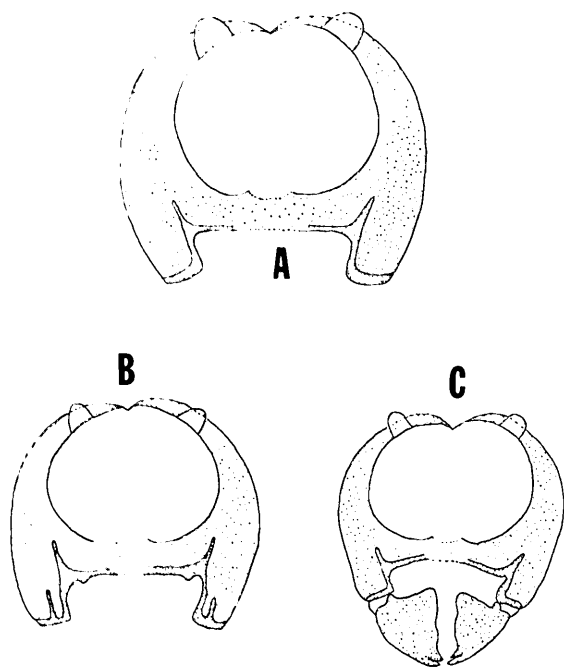


FIG. 4.—Larval head capsule (rear view). (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

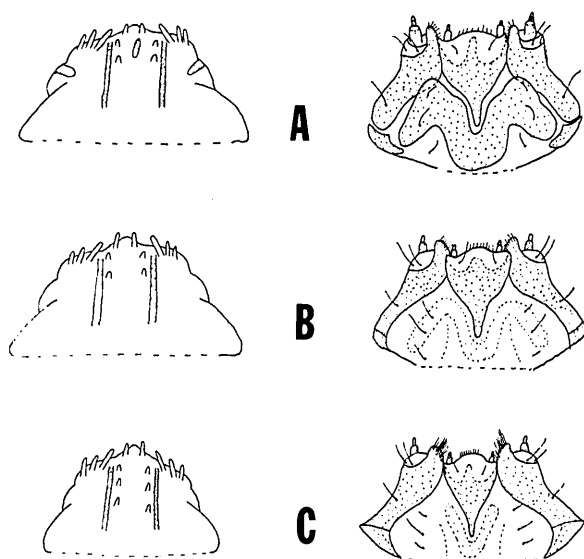


FIG. 5.—Epipharynx; maxillae and labium. (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

Variations: Setae sometimes missing at elbow and on elytra in male.

Dorsal View (Fig. 7)

Note: Dorsal view does not include setae visible from ventral view, except the lateralmost pair of the abdominal setae, and 2 setae on each elytron that usually are visible above the antennae.

Prothorax: Immediately behind 4 setae situated along back of head, 2 pairs divergent in line, situated one-third and two-thirds of way back, one-fourth from center line to lateral margin; 1 pair on rear edge midway between second pair above and last seta on lateral edge.

Meso- and Metathorax: Each with 2 pairs of lateral setae, with anterior pair closer together. Those on mesothorax very near base of elytra.

Abdomen: Segments I–VI each with a transverse series of 6 setae, these comprising a subdorsal, a dorsolateral, and a lateral pair; the 3 setae on a side equidistant. Segment VII with 4 pairs of setae, center pair convergent, second pair straight to slightly convergent, third and fourth pairs convergent. Next to last segment with 1 pair which point caudad.

Elytra: 7 setae on carina of third interval, 9 setae on carina of fifth interval, 3 setae on carina of seventh interval, 1 or 2 setae on carina of ninth interval.

ADULT (Fig. 8A)

Length: 4.8–6.6 mm.

Special characters: Femoral teeth feeble or obsolete, that of metafemur most evident; prothorax densely but not deeply punctate; female beak slender, in repose reaching base of abdomen, the distance from antennal insertion to tip of beak 7–9 times width of

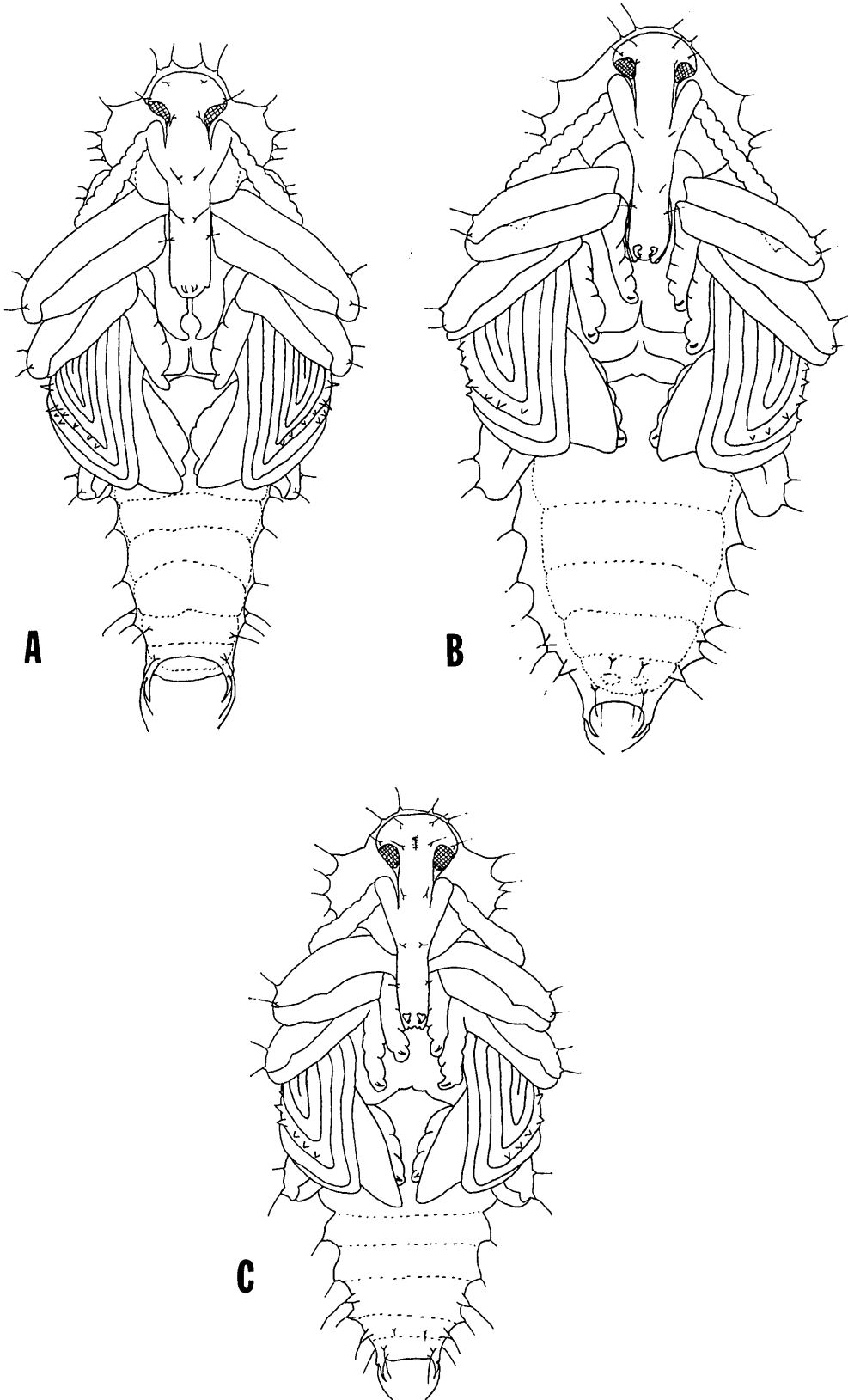


FIG. 6.—Pupae (ventral view). (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticatus*.

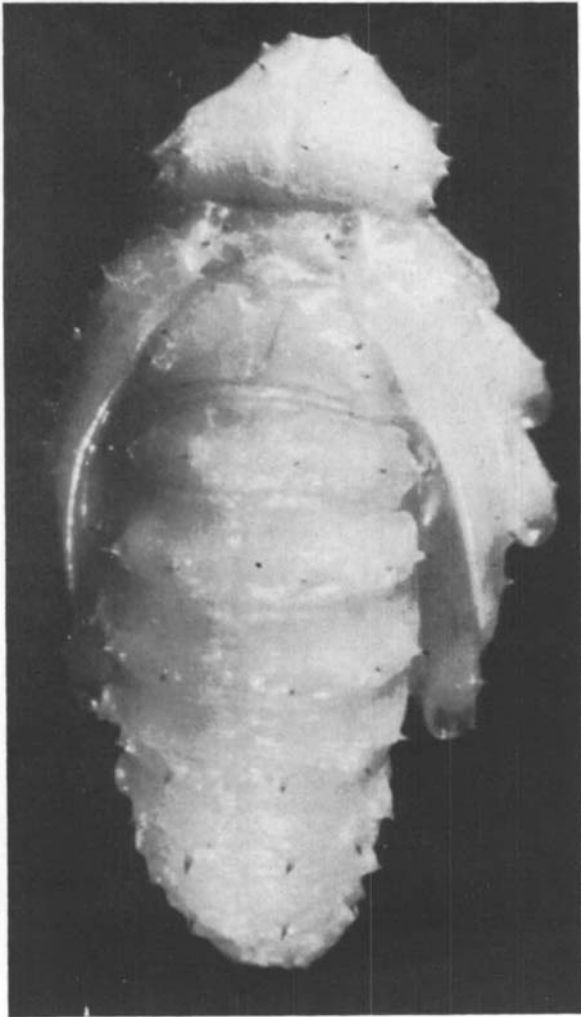


FIG. 7.—Pupa (dorsal view) of *C. carinifer*.

beak at antennal insertion, antennal insertion approximately one-half before apex; male beak stouter, in repose only reaching metasternum; antennal insertion one-fourth from apex.

Color: [Varies from shining black to light reddish brown. The prothorax is always darker than elytra, except in black specimens. Pattern varies from slight to intricate; certain patterns are present, although faint even in slight-patterned individuals. There are 8 white spots arranged in 2 rows of 4, the first across the prothorax and the second across the junction of prothorax and elytra; also a white band occurs on the elytra near apical third. Males have sides of elytra lighter, causing center of elytra to appear to have a dark piceus spot from intervals 1-3.]

Head: Densely punctate; [with a sparse to moderately dense covering of mostly tan and a few white scales. Beak with a sparse to moderately dense vestiture of light-brown and white setae arising in the sulci; moderately stout and curved; longer than prothorax, slightly longer and less stout in female than in male; trisulcate laterally between base and anten-

nal insertion; upper and median sulci evanescent basally, distinct and prominent apically; dorsal surface with a feeble rounded carina at most]; surface distad of antennal insertion with fine, elongate punctures, [moderately dense to dense in composition].

[Antennae tan; inserted approximately one-fourth before apex in male, one-half before apex in female; segments 8, 9, 10, and 11 densely clothed with pale golden brown scales; female segment 2 of funicle longer than 1; 3 and 4 subequal, shorter than 1; 5, 6, and 7 subequal, two-thirds of 3 or 4; segment 8 cone-shaped and nearly one-half length of club; male antennae like female, except segment 8 is slightly more than one-third length of club, segment 9 is one-third length of club; 10 and 11 comprise remainder.]

Prothorax: Sides smoothly rounded from base to apex, constricted just before apex, occasionally curvature slight so that sides appear subparallel; very densely punctate, punctures large but shallow, prominently confluent apically; a distinct longitudinal median carina from base to apex; tubercles absent; vestiture extremely sparse of pale tan and white [sometimes pale pink], recumbent to subrecumbent, elongate, setae; a few broader white setae forming four small spots transversely behind the middle, the discal spots usually the most evident.

Elytra: Approximately one-third longer than wide; sides distinctly subparallel for more than half the length, then gradually converging to apex; basal border emarginate before humeri; humeri not prominent, obliquely rounded; intervals 3, 5, 7, and 9 acutely and completely costate; possibly a very feeble indication of an interruption anteriorly on costae of intervals 3 and 5; males usually with intervals 1 and 2 also acutely and completely costate, that of interval 1 usually extending from base to apical declivity, that of 2 attaining the apical declivity, but usually evanescent anteriorly, sometimes barely evident; females with interval 1 sometimes feebly costate [serial punctures shallow and set apart the distance of the puncture size]; vestiture sparse to moderately dense, of pale tan or brown, tan and white recumbent elongate frequently tapering setae, white setae scattered in small aggregates along costae and at base of intervals 3 and 6, denser and usually forming a narrow transverse postmedian band; pale brown and tan setae chiefly in noncostate intervals, the tannish setae sometimes replacing the white ones at base of intervals 3 and 6; this pattern varying, depending on density of setae; each interval set with short, suberect, pale tan to brown, sometimes white, blunt-tipped setae which are sometimes difficult to detect.

Ventral surface: Metasternum protuberant anteriorly, deeply emarginate and with anterolateral projections [abdominal sternae with dense punctures shallower than and approximately one-half size of prothoracic punctures; fifth sterna depressed medianly almost to anterior edge in female and only in posterior half in male]; sometimes tuberculate; each puncture with a pale tan, amber, or white elongate seta; setae both recumbent and suberect, sometimes almost entirely suberect, giving venter a "bristly" appearance.

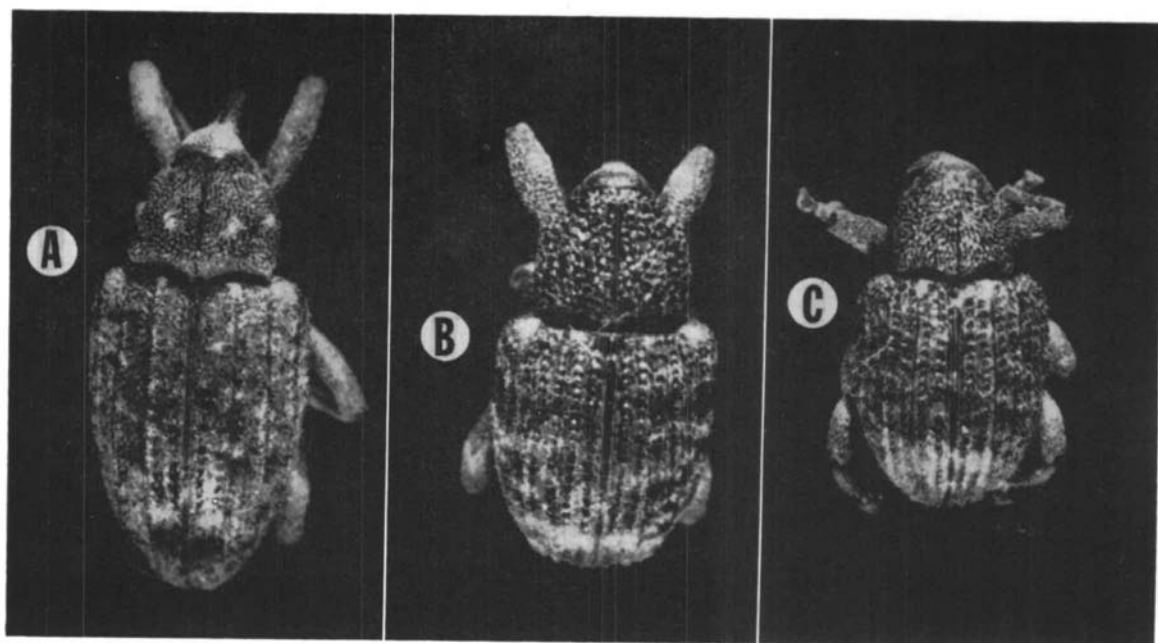


FIG. 8.—Adults (dorsal view). (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

[*Setae*: Setae in abdominal punctures and elytral punctures originate in anterior part of punctures, those on prothorax, particularly on dorsal side, originate in the center of puncture; all setae usually originate in punctures, except on elytra and front of head, exceptions are the 8 white spots listed above under "Color."]

Legs: Metaunci in male dentate, those of female not dentate; legs with a sparse covering of white and tannish setae, vestiture denser on apical area of meta-femora, the latter sometimes annulated.

Male genitalia (Fig. 9A): Aedeagus twice as long as wide and twice as long as aedeagal struts; sides subparallel to apical fifth, then converging to form a distinct apical process; inner curvature variable in form basally; dorsal membrane sinuately V-shaped; transfer apparatus consisting of a complex of bars of which the elongate lateral pieces are the most distinct; lateral and ventral pieces protruding into pre-phallosomic area, especially the lateral ones; laterally, aedeagus has an extreme basal extension of the basal ventral angle. Length 0.974–1.18 mm, width at base 0.474–0.536 mm, aedeagal struts 0.375–0.461 mm.

Type-locality: Texas.

Type: Female, Museum of Comparative Zoology Type no. 5222, J. L. LeConte Collection (MCZ).

Conotrachelus carinifer Casey

Eggs: Elongate oval; width 0.46 mm; length 0.75 mm; white; shell appears finely reticulate.

Larvae, 1st instar: Width 0.35 mm; length 1.0 mm; head capsule 0.33 mm; lightly sclerotized, pale yellow; 3 obsolete dorsal plicae per abdominal segment.

2nd instar: Width 0.67 mm; length 2.0–2.5 mm; head capsule 0.50 mm; yellow; 3 obsolete dorsal

plicae per abdominal segment; eyes clear or nearly clear; pronotal shield lightly sclerotized, indefinite in outline.

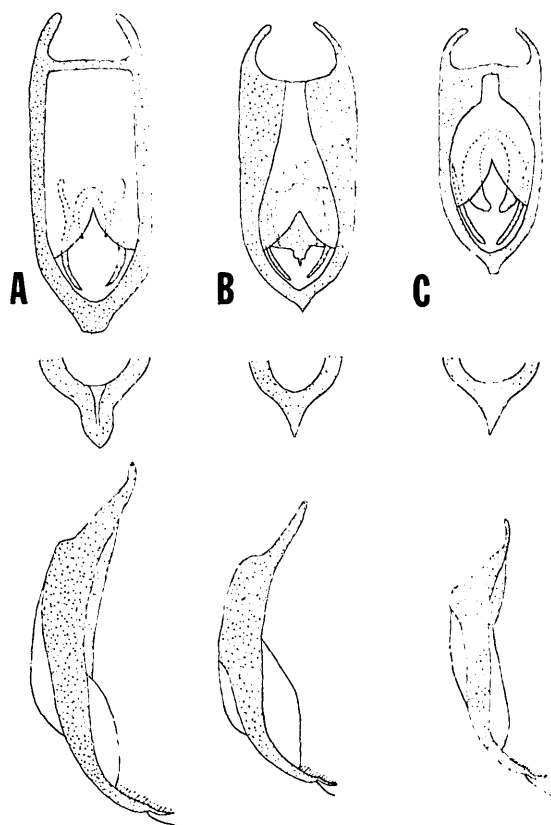


FIG. 9.—Aedeagus. (A) *C. naso*, (B) *C. carinifer*, (C) *C. posticus*.

3rd instar: Width 1.0–1.4 mm; length 3–5 mm; head capsule 0.79 mm; yellow; 3 dorsal plicae per abdominal segment; pronotal shield sclerotized, outline definite; setae white, eyes clear.

4th instar: Width 1.75 mm; length 5–6 mm; head capsule 1.05 mm, yellow or yellow-brown; 3 or 4 dorsal plicae per abdominal segment, pronotal shield sclerotized; setae brown; spiracles obvious; epimeral sclerite light but usually discernible; eyes clear.

5th instar: Mature larva (Fig. 1B) somewhat crescent shaped, width 2.50–3.75 mm; length 7–11 mm; color white to deep yellow; head capsule 1.25 mm wide, yellow-brown; pronotal shield extends almost to base of subdorsal setae in center, but not on sides; epimeral sclerite (Fig. 2B) usually with no projections dorsally; premental sclerite with center projection as long as side projections; usually no small sclerites on ventral line between sterna, if present, only between prothoracic and mesothoracic sterna; 10 abdominal segments, 10th segment very small bearing X-shaped anus; abdominal segments I–VII with 2 ventral and 4 dorsal plicae; abdominal epipleurum and pleurum I–VIII with 2 setae, epipleural seta 1 tiny and located anteriodorsal from eps. 2, pleural seta 1 tiny and located anterior to ps. 2, sometimes ps. 1 of VI located anteroventral to ps. 2; biforous spiracles located on prothorax and first 8 abdominal segments.

Larval head capsule (Figs. 3B, 4B): Head free, brown, as broad as long, broadest at middle, rounded posteriorly, anterior ocellus present; posterior ocellus absent; antenna consisting of 1 membranous article bearing a small cylindrical segment; hypopharyngeal bracon absent; frontal suture distinguishable throughout its length, incomplete anteriorly; epicranial suture less than one-half as long as head; endocranial suture nearly one-half as long as frons; frons with 2 pairs of setae; setae 1, 2, and 3 absent, seta 4 short, and seta 5 long, at least twice as long as 4; dorsal epicranial setae 1, 2, and 3 subequal, moderately long, seta 4 absent, seta 5 long, twice as long as frontal seta 5; lateral epicranial seta 1 and lateral epicranial seta 2 as long as frontal seta 5; ventral epicranial seta 2 short, one-third length of ventral epicranial seta 1; posterior epicranial setae absent, represented only by 1 spot, clypeal setae 1 pair only, very short; anterior margin of labrum slightly convex; labral seta 1 short, setae 2 and 3 absent, median and paired lateral sensilla absent from labrum; labral rods moderately elongate, stout, subparallel; epipharynx (Fig. 5B) with 3 pairs of spines anterolateral, 1 pair anteromedian, and 2 pairs median spines; mandible with 2 apical teeth; mandibular seta 1 short, slightly shorter than and directly behind 2; labial palpus with 2 articles; premental sclerite complete, with anterior and posterior median extensions; postmentum (Fig. 5B) with 3 pairs of setae, center pair at least twice as long as anterior and posterior, posterior pair located in membranous area, center and anterior pairs located on sclerotized portion; postmentum with lightly sclerotized M-shaped area; maxillary palpus with 2 articles without accessory process or setae.

CHAETOTAXY OF PUPAE

Ventral View

(Fig. 6B)

Pupae: Length 6.5–8 mm; width 4.5–5 mm.

Rostrum: 4 pairs of divergent setae, 1 pair at base of beak (head and beak juncture) sometimes absent, 1 pair nearly one-half toward tip, 1 pair near two-thirds mark, 1 pair laterad at three-fourths mark. Male beak extends to base of foretarsi, female beak extends to base of third foretarsal segment.

Head: 2 pairs divergent setae, 1 pair above eyes, 1 seta at rear edge of each eye.

Prothorax: 4 setae on anterior margin of prothorax, both pairs divergent; 4 setae on each lateral edge, first pair near center, second and third pairs close together near three-fourths mark, fourth pair located near rear edge of prothorax, usually hidden from ventral view. Sometimes second or third pair missing on one or both sides.

Legs: 1 seta on each femur immediately above elbow, 1 seta near elbow epicenter.

Elytra: 7 setae on carina of fifth interval, 1 or 2 setae on carina of third interval.

Abdomen: 1 pair of setae on each of last 3 segments near lateral margin; 1 pair near center of next to last segment; the terminal segment has 2 pairs of very long, curved setae, especially in male, located on a pair of large fleshy caudal hooks; 1 pair arises near the base of these caudal hooks; the second pair arises halfway to tip on ventral side.

Dorsal View

(Fig. 7)

Prothorax: Immediately behind 4 setae located near back of head are 2 pairs of divergent setae in line, located one-third and two-thirds of way back, one-fourth from center line to lateral margin; second pair in line sometimes missing or only one aberrantly positioned.

Mesothorax: 2 pairs of setae near base of elytra, with anterior pair closer together.

Metathorax: 2 pairs of setae near base of wings, with anterior pair slightly closer together.

Abdomen: Segments I–VI each with a transverse series of 6 setae, these comprising a subdorsal, a dorsolateral, and a lateral pair; the 3 setae on a side equidistant, the gap between the subdorsal pair wider. Segment VII with 4 pairs of setae, center pair convergent, second pair straight, third and fourth pairs convergent; next-to-last segment with 1 pair which point caudad; lateralmost pair of setae also visible from ventral view.

Elytra: 4–6 setae on carina of third interval, 10 or 11 setae on carina of fifth interval, 5 setae on carina of seventh interval, 1–3 setae on carina of ninth interval.

ADULT

(Fig. 8B)

Length: 4.75–5.70 mm.

Special characters: Prothorax with dense deep

punctures, which have distinct sides; beak in male [and female] trisulcate laterally; female sometimes unisulcate, the other sulci obsolete; humerus with oblique, usually prominent, patch of yellow or tannish setae; metafemoral tooth distinct.

Color: Elytra dark reddish-brown with a few small black areas; prothorax piceous to black, darker than elytra.

Head: Densely punctate and with a sparse to moderately dense vestiture of yellow, tan, or pale dusty pink elongate setae; beak in male curved, longer than prothorax, curvature abrupt distad of antennal insertion, trisulcate laterally between base and antennal insertion, lower sulci distinct, median and upper sometimes evanescent basally, especially the median; dorsal aspect broadly carinate from base to position of antennal insertion, area distad of carina densely punctate; beak in female curved and with a lateral sulcus above the antennal groove, the usual median and upper sulci frequently obsolete, the upper represented by a row of fine punctures, dorsal surface not carinate but with few sparse punctures which are scattered over the surface distad of antennal insertion but arranged laterally toward the base so that a median nonpunctate area remains; with a very sparse vestiture of pale fine setae lacking in female except near margin of eye; [antenna dark brown to piceous with very fine brown setae on club; antenna of the male inserted one-fourth from the apex, that of the female one-third from the apex; with segment 1 of funicle enlarged basally, more so than any other prior to the club; segment 2 one-third longer than 1; segment 3 two-thirds as long as 1; 4 and 5 subequal in length two-thirds as long as 3; 6 and 7 globular subequal in length to 4 and 5; segment 8 bell-shaped, less than one-third length of club; segment 9 one-third length of club; 10 and 11 make final one-third; both sexes similar].

Prothorax: Sides usually rounded, sometimes subparallel to near apex, then constricted; with dense, coarse, reticulate punctures frequently confluent, with a prominent longitudinal median, frequently tortuose, carina from base to apex, sometimes short of base; each puncture with a suberect or erect seta, color of setae varying from pale brown and tan to pale gray and white.

Elytra: One-fourth to one-third longer than wide, sides subparallel for approximately one-half the length, then gradually converging to apex, humeri rounded, but not prominent; basal border feebly emarginate mesad of humeri, intervals 3, 5, 7 [8], and 9 feebly to moderately costate; costae complete; those of intervals 7 and 9 frequently evanescent posteriorly; [also, the male has the second interval moderately costate] serial punctures deep and closely set. Vestiture sparse to moderately dense of brown, tannish, yellow, and white, elongate, tapering, recumbent setae; white and lighter-colored setae forming the usually faint narrow postmedian band, and frequently scattered over the surface in small aggregates; light tan and yellowish to whitish setae condensed at the base of interval 3 to form a small patch and at base

of intervals 6 and 7 to form a usually conspicuous oblique patch across humerus, elytra frequently glabrous in spots so that general appearance of vestiture is mottled, intervals sparsely set with rows of chiefly pale tan and also white blunt-tipped suberect setae; [numerous dark pink to pale pink setae are present at the posterior confluence of carinae intervals 3 and 9].

Ventral surface: Mesosternum emarginate anteriorly. Abdominal sternae densely and coarsely punctate, fifth sternum without tubercles, usually depressed medianly and laterally, each puncture with a pale tan or white subrecumbent to suberect seta, sometimes giving the venter a "bristly" appearance.

Legs: Pro- and metafemoral tooth distinct, that of mesofemur frequently feeble or obsolete; sparse to moderately dense vestiture of tan to white elongate and tapering setae; [metaunca of male dentate, of female not dentate].

Male genitalia (Fig. 9B): Aedeagus twice as long as wide and twice as long as aedeagal struts; sides converging on apical third to form an acute process; dorsal membrane V-shaped apically, variable in its basal extent, sometimes almost obliterated by lateral plates; transfer apparatus a complex of bars, with the elongate lateral pair most evident and protruding into the prephallotremic area; laterally, apical process usually not hooked. Sometimes similar in shape to that of *posticatus* Boheman. Length 1.00–1.05 mm; width at base 0.475–0.500 mm; aedeagal struts 0.435–0.475 mm.

Type-locality: Austin, Texas.

Type: Male, United States National Museum Type no. 37425, T. L. Casey Collection (USNM).

Conotrachelus posticatus Boheman

Eggs: Elongate oval; width 0.36 mm; length 0.71 mm; white; shell surface very finely reticulate.

Larvae, 1st instar: Width 0.33 mm; length 1.50 mm; head capsule 0.33 mm, lightly sclerotized, pale yellow; no other sclerotized areas; no plicate segments, ventral part of thoracic segments 2 and 3 and abdominal segments I–VII protrude resembling prolegs similar to mature *Hypera* sp. larvae.

2nd instar: Width 0.65 mm; length 2.60 mm; head capsule 0.50 mm, lightly sclerotized; eyes dark brown, pronotal shield faintly sclerotized, outline not definite; 1 or 3 obsolete dorsal plicae per segment.

3rd instar: Width 0.84 mm; length 3.50 mm, head capsule 0.67 mm, lightly sclerotized; eyes brown; 3 dorsal plicae per abdominal segment; pronotal shield sclerotized, outline definite; setae white.

4th instar: Width 1.0 mm; length 4.5 mm; head capsule 0.75 mm, lightly sclerotized; eyes brown or variable; 3 dorsal plicae per abdominal segment; pronotal shield sclerotized, setae white or brown, spiracles usually obvious.

5th instar: Mature larva (Fig. 1C) somewhat crescent shaped; width approximately 2.0 mm; length 6–8 mm long; head capsule 0.92 mm, yellow-brown; pronotal shield rounded on lateral sides, but does not extend to subdorsal setae; epimeral sclerite (Fig.

2C) with no projections dorsally; premental sclerite with center projection as long as lateral or side projections; a lightly sclerotized plate on ventral surface of prothoracic segment; 10 abdominal segments, 10th segment very small bearing X-shaped anus; abdominal segments I-VII with 2 ventral and 4, rarely 3, dorsal plicae; abdominal epipleurum and pleurum I-VIII usually with 2 setae, epipleural seta 1 extremely small to obsolete located anteriodorsal to eps. 2; pleural seta 1 extremely small to obsolete, located anterior to ps. 2; biforous spiracles located on prothorax and first 8 abdominal segments; skin with asperities.

Larval head capsule (Figs. 3C, 4C): Head free, brown, as broad as long, broadest at middle, rounded posteriorly; anterior ocellus present; posterior ocellus absent; antenna consisting of 1 membranous article which bears a small cylindrical segment; hypopharyngeal bracon absent, frontal suture distinguishable throughout its length, incomplete anteriorly; epicranial suture less than one-half as long as head; endocranial suture approximately one-third as long as frons; frons with 3 pairs of setae, setae 1 and 2 absent, seta 3 close to 4 and very tiny, seta 4 short, and seta 5 long, at least twice as long as 4; dorsal epicranial setae 1, 2, and 3 subequal, moderately long, as long as frontal seta 5; seta 4 represented by a spot; seta 5 long, twice as long as frontal seta 5; lateral epicranial seta 1 long, lateral epicranial seta 2 longer than frontal seta 5; ventral epicranial seta 2 short, one-third length of ventral epicranial seta 1; posterior epicranial setae absent, represented only by 4 spots, clypeal setae 1 pair only, very short; anterior margin of labrum convex; labral seta 1 short, setae 2 and 3 absent, median and paired lateral sensilla absent from labrum; labral rods moderately elongate, stout, subparallel. Epipharynx (Fig. 5C) with 3 pairs of spines anterolateral, 1 pair antero-medial, and 3 pairs of median spines; mandible with 2 apical teeth; mandibular seta 1 short, slightly shorter than and directly behind 2; labial palpus with 2 articles; premental sclerite complete, with anterior and posterior median extensions; postmentum (Fig. 5C) with 3 pairs of setae, center pair at least twice as long as anterior and posterior pairs; postmentum not sclerotized or lightly sclerotized in V-shaped area; maxillary palpus with 2 articles, without accessory process or setae.

CHAETOTAXY OF PUPAE

Ventral View

(Fig. 6C)

Pupae: Length 4.5–6.5 mm; width 2.5–3.5 mm.

Rostrum: 4 pairs of divergent setae, 1 pair at junction of head and beak, 1 pair one-fourth toward tip, 1 pair one-half toward tip, 1 pair two-thirds toward tip laterad. Usually a tiny pair of setae on tip, sometimes extra seta between eyes and on lateral part of enlarged tip.

Head: 2 pairs divergent setae, 1 pair above eyes, 1 seta at rear edge of each eye.

Prothorax: 4 setae on each lateral edge, first 3 pairs usually evenly spaced, sometimes 1 or 2 setae missing on 1 or both sides; 4 setae on anterior margin of prothorax, both pairs divergent.

Legs: 1 seta on each femur immediately above elbow, 1 seta near elbow epicenter.

Elytra: 4 setae on carina of fifth interval, 1 or 2 setae on carina of third interval.

Abdomen: 1 pair setae on each of last 2 segments near lateral margin. 1 pair near center of next to last segment; the terminal segment has 2 pairs of long curved setae, especially in male, situated on a pair of large, fleshy caudal hooks; 1 pair arises near the base of these caudal hooks, the second pair arises halfway to tip on the ventral side.

Dorsal View

(Fig. 7)

Prothorax: Immediately behind 4 setae located near junction of prothorax and head, 2 pairs divergent in line, sometimes out of line, situated one-third and two-thirds of way back, one-fourth from center line to lateral margin; 1 pair on rear edge midway between second pair above and last setae on lateral edge.

Meso- and Metathorax: Each with 2 pairs of lateral setae, with anterior pair closer together. Those on mesothorax very near base of elytra.

Abdomen: Segments I–VI each with a transverse series of 6 setae, these comprising a subdorsal, a dorsolateral, and a lateral pair; the 3 setae on a side equidistant, the gap between the subdorsal pair wider. Segment VII with 4 pairs setae, center pair convergent, second pair straight, third and fourth pairs convergent. Next-to-last segment with 1 pair which point caudad.

Elytra: Usually 4, sometimes 7 setae on carina of third interval; usually 7, sometimes 12 setae on carina of fifth interval; 4 setae on carina of seventh interval; 1 or 2 setae on carina of ninth interval.

Note: The lateralmost pair of the abdominal setae is visible also from the ventral view, as are 2 setae on each elytron, which usually are visible above the antennae.

ADULT

(Fig. 8C)

Length: 4.25–5.00 mm.

Special characters: Prothorax with dense, but not deep punctures, [punctures usually without] distinct sides, beak in both sexes trisulcate laterally, [mesofemoral tooth distinct], prounci of male usually long and extremely acute.

Color: Elytra dark reddish-brown with black splotches, black sometimes predominate; prothorax usually darker than elytra.

Head: Densely punctate [sometimes punctures so shallow they appear to form little wavy lines], sparse to moderately dense covering of pale tan or pinkish, sometimes orange, tapering setae. Beak feebly curved and longer than prothorax, curvature usually more abrupt apically; beak equal in length in both sexes;

strongly trisulcate laterally between base and antennal insertion; median sulcus sometimes evanescent basally, lower sulcus possibly subdivided; dorsal surface with a distinct to broadly rounded carina from base to distad of middle, sometimes feeble in female, dorsal surface distad of antennal insertion in male with dense elongate punctures which form small sulci, in female punctures quite dense along the lateral areas, but sparse in median area; sulci sparsely set with elongate pale tan and white setae. [Antennae of male inserted approximately one-sixth from apex and that of female one-fourth from apex; segments 1 and 2 of funicle subequal in length, segment 2 slightly longer than 1, segments 3, 4, 5, 6, and 7 subequal in length and globular, particularly 6 and 7, segment 8 bell shaped comprising slightly over one-third of club, segment 9 comprising one-third of club, segment 10 makes up most of remainder of the club; antennae of both sexes similar.]

Prothorax: Sides usually distinctly rounded with a constriction just before apex, sometimes subparallel behind apical constriction; dense punctures frequently confluent, disc usually with fine, median, longitudinal carina from base to apex, sometimes evanescent sub-basally; sparsely covered with pale tan, reddish-yellow, brownish, pale white, or white elongate, [some tapering] recumbent to subrecumbent setae; color of setae varying greatly; frequently a few, sometimes many, setae erect.

Elytra: Approximately one-fourth longer than wide; sides subparallel for more than half of length, then converging to apex; basal border only feebly emarginate before the humeri, which are obliquely rounded and not prominent; intervals 3, 5, 7, and 9 feebly and acutely costate; costa sometimes quite distinct; costa at interval 3 frequently flattened out on apical declivity; males usually with intervals 1 and 2 as distinctly or more costate than intervals 3, 5, 7, and 9; costa extending from base to apical declivity, that of interval 2 sometimes evanescent subbasally or feebly interrupted in places, these costae rarely absent; females with interval 1 frequently costate and sometimes with interval 2 feebly and irregularly costate; costa of interval 2 never as distinct in female as in male, serial punctures large, closely set and quadrate; elytra with a sparse covering of reddish-yellow, pale tan, and white elongate and tapering recumbent setae; white setae condensed in a few scattered patches, but

chiefly in a narrow posteriorly curved postmedian band, the distinctness of which is variable, sometimes also forming a conspicuous spot at the base of the third interval, sometimes absent; the other colored setae scattered over the surface; sometimes the lighter ones are aggregated in patches here and there; elytra sometimes bare in spots, the vesture then giving them a mottled appearance; each interval with a usually conspicuous row of pale tan, amber, or white, blunt-tipped, suberect setae.

Ventral surface: Mesosternum usually with a distinct emargination anteriorly; abdominal sterna densely and coarsely punctate, fifth sternum sometimes finer and more densely punctate than preceding sterna, without tubercles, and with or without a median depression; sparse vesture of tan, amber, and reddish-yellow, recumbent and suberect setae, the latter sometimes giving the venter a "bristly" appearance.

Legs: Mesofemoral tooth occasionally obsolete; sparse to moderately dense vesture of reddish-yellow, light tan, grayish, and white elongate and tapering setae.

Male genitalia (Fig. 9C): Aedeagus twice as long as wide and twice as long as aedeagal struts; sides gradually converging on apical third to form at apex a distinct acute process; basal portion of inner curvature not as distinct as it is apically; dorsal membrane V-shaped apically; transfer apparatus consisting of a complex of bars similar to that of *naso* LeConte, the elongate lateral pair most evident and protruding into the prephallotremic area; lateral apical process hooked. Length 0.875–0.937 mm; width at base 0.413–0.449 mm; aedeagal struts 0.375–0.399 mm.

Type locality: Florida.

Type: Boheman Collection, Stockholm Museum, Stockholm, Sweden.

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