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A Revision of *Craniotus* LeConte (Coleoptera: Tenebrionidae: Pimeliinae: Asidini), with Descriptions of New Insular Species from Mexico and Notes on Distribution and Biology

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Abstract

The genus *Craniotus* LeConte is revised. The genus includes *Craniotus pubescens* LeConte and the following **new species**: *Craniotus mardecortesi* Aalbu, Smith, and Sanchez Piñero (Isla San Esteban, Baja California, Mexico) and *Craniotus triplehorni* Aalbu, Smith, and Sanchez Piñero (Gulf Islands and Baja California, Mexico). *Craniotus blaisdelli* Tanner is placed as a synonym of *C. pubescens*. This form corresponds to northern populations of *C. pubescens*. A key to the species is provided. The distribution and biology of the genus are briefly discussed.

Key Words: taxonomy, darkling beetles, Southwestern United States, Baja California, island biogeography, endemism, Chuck Triplehorn

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The genus *Craniotus* LeConte was recently redescribed (Smith 2013). It was originally placed in the tribe Craniotini LeConte and Horn due to its distinctive appearance, but was recognized as an unusual member of the tribe Asidini Fleming and moved to that tribe by Aalbu *et al*. (2002). *Craniotus* is distinguished from other genera of Asidini by a unique combination of the following characters: epistoma acutely produced laterally, mesotrochantin minute, concealed; antennomere 11 conical, tapering to apex, tomentose sensillae on antennomere 10 coalesced into a complete apical band. Two species were listed for the genus: *Craniotus blaisdelli* Tanner and *Craniotus pubescens* LeConte.

During a trip sponsored in part by the San Diego Museum of Natural History and the National Geographic Society in 1986, one of us (RLA) collected a specimen of an unusual new species of *Craniotus* from Isla San Esteban, Gulf of California, Mexico. An additional previously collected specimen of this species was found in the California Academy of Sciences Collection. Later, a multiyear study of the biogeography of the flora and fauna of the Sea of Cortés in the late 1990s and early 2000 was undertaken by numerous institutions. These studies resulted in the book "A New Biogeography of the Sea of Cortés" (Case *et al*. 2002). These studies, which included the Tenebrionidae as one of two arthropod groups analyzed, resulted in the identification of another new *Craniotus* species on multiple, but closely associated, islands (see Sanchez Piñero and Aalbu 2002). These new species have remained undescribed until now.

Material and Methods

For this revision, material was borrowed from the following individuals and institutions. These persons (in parentheses) are gratefully acknowledged for the loan of their materials:

CASC	California Academy of Sciences, San Francisco, CA, USA (Dave Kavanaugh)
OSUC	C. A. Triplehorn Insect Collection, Ohio State University, Columbus, OH, USA (Charles A. Triplehorn)
RLAC	Rolf L. Aalbu Collection, El Dorado Hills, CA, USA
ADSC	Aaron Smith Collection, Flagstaff, AZ, USA
WBWC	William B. Warner Collection, Chandler, AZ, USA

USNM	US National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (Warren Steiner)
LACM	Los Angeles County Museum of Natural History, CA, USA (Brian Brown)
CDFA	California State Collection of Arthropods, Sacramento, CA, USA (Charles Bellamy†)
CIDA	Orma J. Smith Museum of Natural History, College of Idaho, Caldwell, ID, USA (William Clark)
FMNH	Field Museum of Natural History, Chicago, IL, USA (James Boone)
BYUC	Monte L. Bean Life Science Museum, Brigham Young University, Provo, UT, USA (Shawn Clark)
UCDC	Bohart Museum of Entomology, University of California, Davis, CA, USA (Steve Heydon)
UCRC	Entomology Research Museum, University of California, Department of Entomology, Riverside, CA, USA (Doug Yanega)
SDNM	San Diego Natural History Museum, San Diego, CA, USA (David Faulkner)

Measurements were taken using digital calipers or an optical micrometer attached to a Leica MZ16 APO stereomicroscope. Segment ratios are in relation to each other. Images of specimens or characters were taken using a BK Plus or Passport Imaging system (R. Larimer, www.visionarydigital.com). Montaged images were assembled using Zerene Stacker (zerenesystems.com/stacker/) and backgrounds were cleaned up in Adobe Photoshop CS6. Visits to the islands in the Gulf of California were partially supported by the San Diego Museum of Natural History, The National Geographic Society, The Earthwatch Institute, and the University of California, Davis, Department of Ecology.

Craniotus mardecortesi Aalbu, Smith, and Sanchez Piñero, new species
(Figs. 1–2)

Description. Holotype female. Length 11.5 mm, width 5.3 mm. Color black, luster opaque to slightly shiny (Fig. 1). Body elongate, bi-ovate, inflated, apterous. **Head:** Moderately deflexed, widest anterior to eyes, vertex convex; surface strongly punctate; punctures contiguous, moderate in size, deeply perforate in form, each puncture bearing 1 moderately long, black seta approximately equal in length to length of clypeus; some setae on vertex shorter, anteriorly decumbent; clypeus broadly bilobed; labrum produced, quadrate, convex; frons with genae strongly produced laterally above antennal insertions, lateral apex acute, depressed medially between lateral projections; eyes dorsoventrally transverse, dorsal slightly larger, laterally produced, surface convex, anteriomedial border concave; mentum large, reniform, 1.8X broader than long, surface punctate, punctures as on top of head; ligula large, medially acutely excavate; maxillary palpus approximately equal in length to first 3 antennomeres; ratio of segment lengths 8:20:15:24; antennae long and slender, apical antennomeres reaching elytra, 11th antennomere broadly attached to 10th; ratio of antennomere lengths 24:13:32:20:19:17:17:16:16:13:9. **Pronotum:** Narrower than elytra, laterally rounded, strongly inflated (Fig. 2); anterior margin broadly concave, apical angles produced, basal margin broadly convex; lateral margins strongly serrate with lateral connate projections longer anteriorly, each bearing 1 moderately long, erect seta; surface strongly punctate, punctures contiguous moderate in size, deeply perforate in form, each puncture bearing 1 short, black, posteriorly appressed seta approximately equal to puncture diameter in length, interspaced with few, longer, erect setae. **Scutellum:** Visible, triangular. **Elytra:** Convex, inflated, surface strongly punctate-striate, punctures set in uneven striae on disc, laterally becoming more confused; punctures contiguous, large in size, impressed near lateral margins, deeply perforate centrally, intervals bearing rows of short, black, posteriorly recumbent setae approximately equal to puncture diameter in length, subspatulate in shape, few longer, black, erect setae present on posterior lateral margins; epipleura remaining narrow from apex to base. **Venter:** Prosternal process convex between procoxae, mesosternum not excavate; mesotrochantin hidden; metacoxae separated by about 1.5X distance of mesocoxae; intercoxal process of

Figs. 1–2. *Craniotus mardecortesi*, Holotype female, habitus. **1)** Dorsal view; **2)** Lateral view.

abdomem truncate; apex of meso- and metasternum impressed; Sterna decreasing in length posteriorly, slightly convex; surface of thoracic pleura punctate, punctures as on pronotum; thoracic and abdominal sternal surfaces with smaller, moderately dense, perforate punctures each bearing a short to moderately long, fine seta; sternal ratios (anterior to posterior midline) 21:17:12:7:11. **Legs:** Moderate in length, slender, not inflated; leg ratios (femur:tibia) pro- 20:20, meso- 21:20, meta- 25:28; tibiae and tarsi densely setose, femora sparsely setose; tarsi with ventral surface bearing numerous short, stiff, black setae. Tarsomere length ratios as follows (base to apex): protarsus 22:10:8:8:24; mesotarsus 22:12:11:10:23; metatarsus 30:14:13:28.

Allotype Male. Similar to female, slightly smaller, length 10.4 mm, width 5.3 mm.

Type Specimens. HOLOTYPE: female; MEXICO. Baja Calif. Norte, Isla San Esteban, main canyon wash, east side, VII-28/29-86 R. L. Aalbu col. [deposited in CASC]: ALLOTYPE: male MEXICO:B.Cal. Isla San Esteban IV-8-1953 Col. J.P. Figg-Hoblyn (CASC).

Diagnosis. *Craniotus mardecortesi* can be easily separated from other *Craniotus* species by the strongly globose pronotum with lateral margins bearing numerous lateral connate projections and the very large elytral punctures set in uneven striae. This species is most similar to *C. triplehorni* new species.

Etymology. This species is named for the Sea of Cortéz, in which Isla San Esteban is more or less centrally positioned.

Craniotus triplehorni Aalbu, Smith, and Sanchez Piñero, new species
(Figs. 3–4)

Description. Holotype female. Length 11.0 mm, width 5.1 mm. Integument reddish black, luster slightly shiny (Figs. 3–4, 13). Body elongate, bi-ovate, inflated, apterous. **Head:** Moderately deflexed, widest anterior to eyes, vertex convex; surface densely, deeply punctate; distance between punctures about equal to puncture diameter, moderate in size, deeply perforate in form, each puncture bearing a seta. Setae moderately long, black, approximately equal in length to length of clypeus anteriorly, shorter, yellowish, recumbent posteriorly; clypeus broadly bilobed; labrum produced, quadrate, convex; frons with genae strongly produced laterally above antennal insertions, lateral apex acute, depressed medially between lateral projections at clypeal suture; eyes globose, dorsoventrally transverse, dorsal surface slightly larger, surface strongly convex, anteriomedial border straight to very slightly concave; mentum large, both anteriorly and posteriorly concave, twice as broad as long, surface punctate, punctures deep, sparse, each bearing 1 long, black seta;

Figs. 3–4. *Craniotus triplehorni*, Holotype female, habitus. **3)** Dorsal view; **4)** Lateral view.

ligula strongly bilobed, anterior recurved upward; maxillary palpus approximately equal in length to first 3 antennomeres; ratio of segment lengths 15:25:35:45; antennae long and slender, apical antennomeres reaching elytra, 11th antennomere broadly attached to 10th; ratio of antennomere lengths 45:30:55:35:35:35:20:20:20:20:15. **Pronotum:** Narrower than elytra, subquadrate, slightly arcuate laterally, moderately inflated (Fig. 4); anterior and posterior margins nearly straight, apical angles acutely produced, lateral margins with large, branched, apically serrate projection; laterally with few (4) connate projections, longer anteriorly, each bearing 1 moderately long, erect seta; surface deeply punctate, punctures moderate in size, separated by puncture diameter, each bearing 1 short yellow, posteriorly appressed seta, irregularly interspaced with few, longer setae. **Scutellum:** Visible, triangular. **Elytra:** Convex, inflated, surface strongly punctate-striate, punctures set in uneven striae on disc, laterally becoming more confused; punctures contiguous, large in size, form impressed near lateral margins, deeply perforate centrally, intervals bearing rows of short, black, posteriorly recumbent setae approximately equal to puncture diameter in length, subspatulate in shape, few longer, black, erect setae present on posterior lateral margins; epipleura remaining narrow from apex to base. **Venter:** Prosternal process convex between procoxae, mesosternum not excavate; mesotrochantin hidden; metacoxae separated by about 1.5X distance of mesocoxae; intercoxal process of abdomen truncate; apex of meso- and metasternum impressed; Sterna decreasing in length posteriorly, slightly convex; surface of thoracic pleura punctate, punctures as on pronotum; thoracic and abdominal sternal surfaces

with smaller, perforate punctures each bearing a short fine seta; sternal ratios (anterior to posterior midline) 27:22:16:8:16. **Legs:** Moderate in length, slender, not inflated; leg ratios (femur:tibia) pro - 35:45, meso- 40:47, meta-50:68; tibiae and tarsi densely setose, femora sparsely setose; tarsi with ventral surface bearing numerous, short, stiff, black setae. Tarsomere length ratios as follows (base to apex): protarsus 20:13:11:11:30; mesotarsus 20:11:11:10:31; metatarsus 45:20:12:32. **Genitalia:** Paraprocts nearly 4 times as long as coxites; coxites strongly sclerotized acutely to apex, flattened, subconcave dorsally; gonostyle visible as single short setae, positioned ventrolaterally in subapical concave cavity.

Allotype Male. Similar to female, slightly smaller, length 13.6 mm, width 6.3 mm.

Type Specimens. HOLOTYPE: female, MEXICO, Baja Calif. Isla Ventana, XII-29-98, F. Sanchez-Pinero col. [deposited in CASC]: ALLOTYPE: male, MEXICO, Baja Calif. Isla Coronadito XII-28-98 F.Sanchez-Pinero col. [deposited in the Rolf L. Aalbu Collection, El Dorado Hills, California (RLAC)]. PARATYPES: MEXICO, Baja Calif. Isla Cerraja XII-28-98 F.Sanchez-Pinero col. (5), RLAC; MEXICO, Baja Calif. Isla Flecha XII-28-98 F.Sanchez-Pinero col. (4), RLAC; MEXICO, Baja Calif. Isla Coronadito XII-28-98 F.Sanchez-Pinero col. (12), RLAC; MEXICO, Baja Calif. Isla Jorobado III-10/ V-11-99 EGPT Rolf L. Aalbu col (15), RLAC; MEXICO, Baja Cal. N Llave Is., Bahia de Los Angeles 5-iii-1996, F.S.Pinero (3), OSUC; MEXICO, Baja Calif. Isla Llave, III-10/ V-10-99 EGPT Rolf. L. Aalbu col. (16), (RLAC); MEXICO, Baja Calif. Isla Pescadero, III-9-99 Rolf L. Aalbu col. (10) (RLAC); MEXICO, Baja Calif. Isla Smith (Coronado), XII-28-98 F.Sanchez-Pinero col. (5), RLAC; MEXICO, Baja Calif. Isla Ventana, XII-29-98, F. Sanchez-Pinero col. (2), RLAC; MEXICO, Baja Calif. Mainland near Isla Pescadero III-12-99 Rolf L. Aalbu col. (5), RLAC.

Distribution. This species is restricted to a number of geographically close islands in the Bahia de Los Angeles, Gulf of California (Figs. 13–14). It is also found on the mainland on an isolated elevated promontory, directly south of these islands. This unnamed area, with capes Punta Rosa and Punta Que Malo, was likely insular until recent times (Fig. 14). *Craniotus pubescens*, found on the rest of the mainland around Bahia de Los Angeles, is not found on either the islands or the adjacent promontory.

Diagnosis. *Craniotus triplehorni* can be easily separated from other *Craniotus* species by the less globose pronotum with lateral margins bearing only a few (4) lateral connate projections and the fine, unevenly scattered elytral punctures.

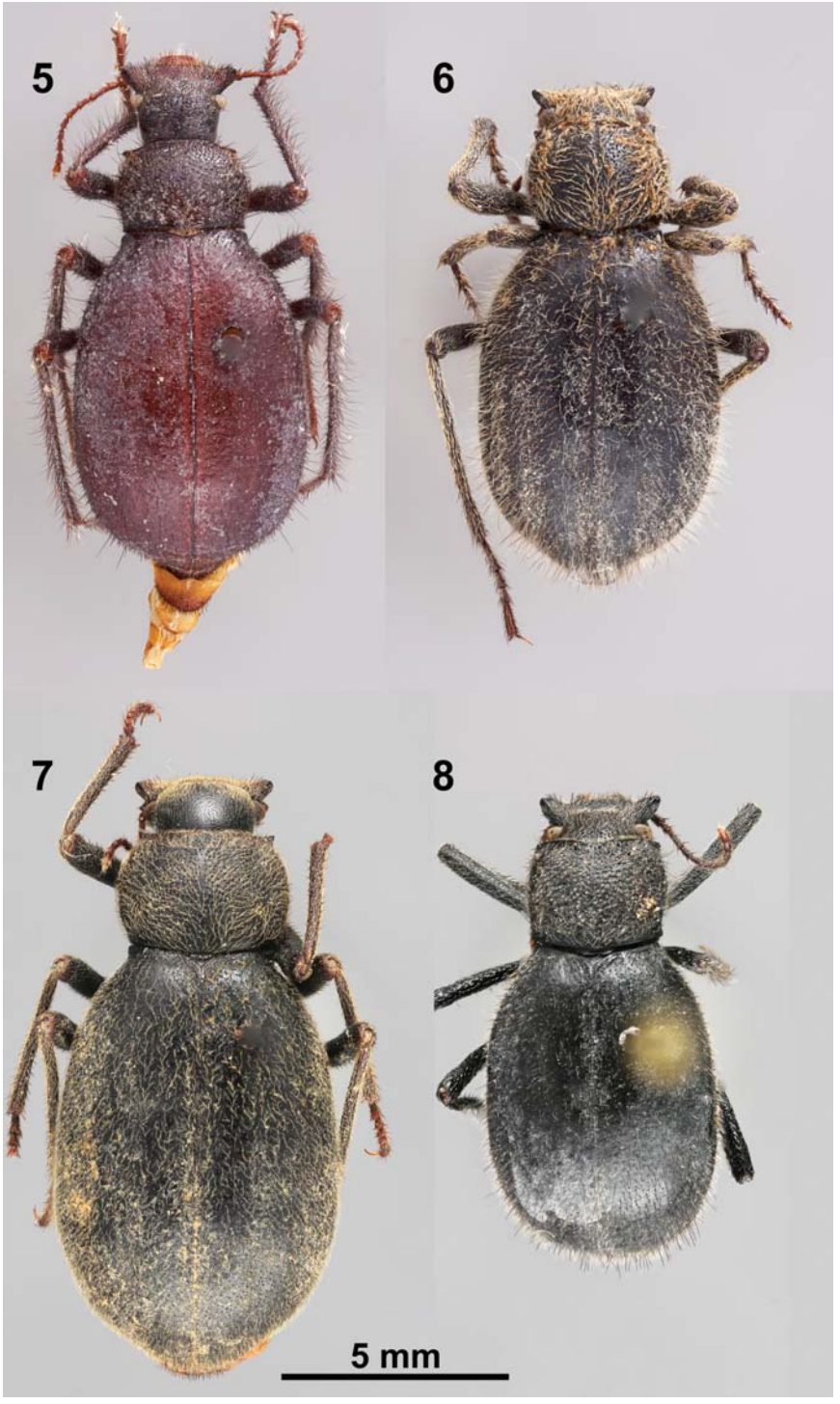
Etymology. This species is named for Charles (Chuck) Triplehorn, a prominent worker in Tenebrionidae and a great mentor to many students of systematic entomology.

Craniotus pubescens LeConte, 1851
(Figs. 5–13)

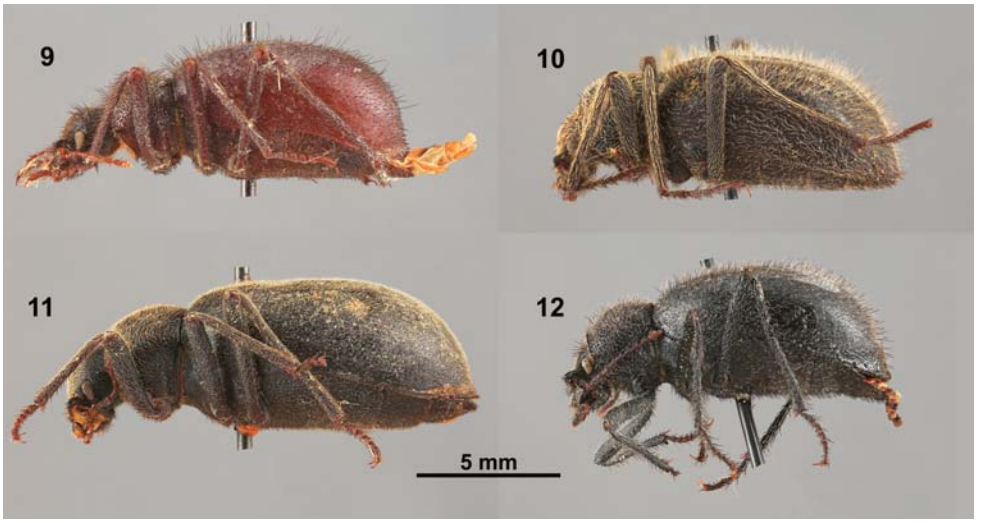
Craniotus pubescens LeConte 1851: 142.
Craniotus blaisdelli Tanner 1963: 169. **New synonymy.**

Diagnosis. *Craniotus pubescens* can be easily separated from other *Craniotus* species by the less globose pronotum with lateral margins not bearing lateral projections.

Material Examined. (443 from the following 191 collecting events). CALIFORNIA (260 specimens/ 122 collecting events): IMPERIAL CO: Anza Borrego narrows (1); El Centro (1); La Puerta (2); Calexico, 20 mi. W (1); Myer Valley (2); Ocotillo (3); Palo Verde, 10 mi. W., Coon Hollow (1); Salton City (7); Signal Mt., (6); Westmoreland (1); INYO CO. Eureka Valley (4); Keeler, 1 mi. W (1); Saline range (4); Scotty's Castle, 15.5 mi. NW (10; Upper Shoshone Cave (1); KERN CO; Mojave (1); ORANGE CO; Huntington Beach (1); RIVERSIDE CO. 1000 Palms, 4 mi. E (2); Andreas Cyn. (2); Anza-Borrego St. P. Oyster Cyn., (1); Blythe (3); Borrego (2); Caliente, Cyn W of (3); Cathedral City (1); Conejo Well (JTNM) (1); Deep Canyon, N gate, (3); Joshua Tree National Monument (JTNM), Squaw Tank, .7 mi S (10); Painted Cyn., (4); Palm Desert 3); Palm Springs (35); Pinto Basin (1); Pinto Wsh. Well (JTNM) (5); Pinyon Wells (JTNM) (4); Pleasant Valley 2 (JTNM) (6); Pleasant Valley 3 (JTNM) (3); Quail Guzzler (JTNM) (1); Queen Valley (JTNM) (1); Riverside (4); Salton Sea (1), State Park (1); Santa Rosa Mts., Agua Alta cyn., (4); Whitewater Cyn. (1), 2 mi. N Hwy 60 (1), 1/2 mi. N 60 (4); Yaqui Flats (1); SAN BERNARDINO CO; 29 Palms (1); Amboy Crater (1); Bonanza King Mine (1); Deadman Pt. (4); Lucerne Valley, 14 mi. E (2); Morongo Valley (6); Needles (4); Ord Mts, (1); Pisgah Crater (1); Zzyzx, 1 mi. S (1); SAN DIEGO CO; Anzá-Borrego State Park, (1); Coyote (2); Borrego (1); Borrego Valley (1); La Puerta (4); Mason Valley (66); San Diego (5); Yaqui Flat (1). ARIZONA (52 specimens/ 10 collecting events): YUMÁ CO; Dateland, on dunes (20); Gila Mts., (29); Yuma, Hwy. 95, 10 mi. N (1); PINAL CO; Casa Grande, 30 mi. W (1); MOJAVE CO; Gold Road (1). NEVADA (75 specimens/ 32 collecting events): CLARK CO. Valley of Fire (1); NYE CO; Amargosa Valley (1); Mercury (4); Rock Valley (69). MEXICO, BAJA CALIFORNIA (133 specimens /13 collecting events); Bahia San Luis Gonzaga, 15 mi. SW (2); Isla Partida (2); Sierra San Pedro Martir, Canyon del Cabana (3); El Cajon (1); San Felipe (2), 31 mi. N (5); Gas Kills Tank (1); Bahia de Los Angeles



Figs. 5–8. Dorsal habitus of *Craniotus pubescens* from four populations. **5)** Male, Nevada, Nye Co., Nevada test site; **6)** Male, Arizona, Yuma Co., I-8 rest stop on east side of Mohawk Mts.; **7)** Female, California, Joshua Tree National Monument, Pleasant Valley; **8)** Male, Arizona, Maricopa Co., north side of Saddle Mtn., west of Tonopah.



Figs. 9–12. Lateral habitus of *Craniotus pubescens* from four populations. **9)** Male, Nevada, Nye Co., Nevada test site; **10)** Male, Arizona, Yuma Co., I-8 rest stop on east side of Mohawk Mts.; **11)** Female, California, Joshua Tree National Monument, Pleasant Valley; **12)** Male, Arizona, Maricopa Co., north side of Saddle Mtn., west of Tonopah.

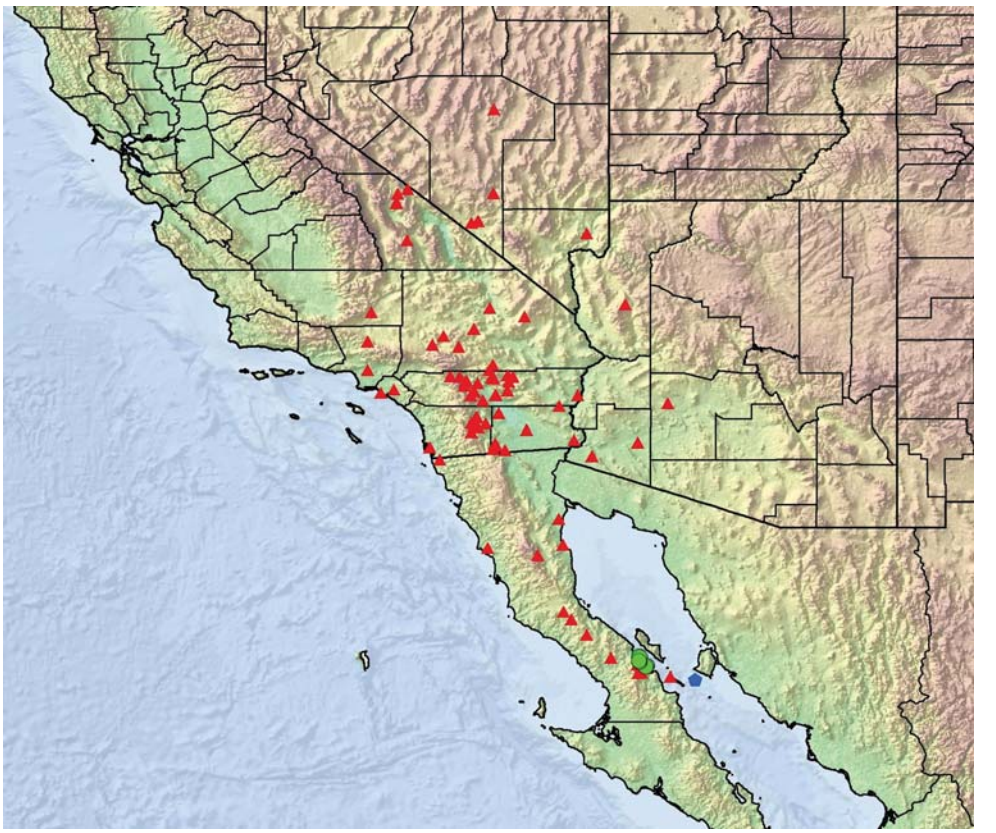


Fig. 13. *Craniotus* species, distribution map. Blue pentagrams = *C. mardecortesi*. Green circles = *C. triplehorni*. Red triangles = *C. pubescens*.

Fig. 14. *Craniotus* species, distribution around Bahia de los Angeles. Red square = *C. pubescens*. Green circles = *C. mardecortesi*.

(10), Cardonal, 6 mi. S. (2); Isla Sal Si Puedes (3); Rancho Santa Inez, 6 mi. NW (11), 9 km NW (7); San Telmo (1) Mainland near Isla Pescadero (5).

Variation. Tanner (1963) distinguished *C. blaisdelli* from *C. pubescens* by the following characters: 1) large size; 2) elytral surface consisting of "sparse, short black setae, devoid of striae and with a more or less dull luster yet with a shining surface" rather than having "three rather distinct lines of areas of either side of the suture which are covered with brownish decumbent thickly placed setae" separated by small places devoid of setae; and 3) prothorax "more round and convex with numerous deep punctures". The

type and paratypes of *C. blaisdelli*, as well other specimens from the same locality, were examined. As we could not find any consistent morphological differences, including in the genitalia, we believe that these characters, including the size of the specimens and the relative inflation of the prothorax which are variable within populations, are the results of a north-south clinal variation. These more or less form two populations: the southern population, corresponding more or less to the type of *C. pubescens* and the northern population corresponding to "*blaisdelli*", which seems to occur only in a few localities, mainly Eureka Valley, Inyo Co., California and Rock Valley, Nye Co., Nevada (see Tanner 1963). Northern population specimens have a papillose-punctate pronotum which tends to be more sparsely furnished with recumbent, yellow setae. The pronotum tends to be less inflated as well, resulting in lateral margins which are less rounded, although this character is variable. The elytra in these specimens have very few recumbent, yellow setae, resulting in a more or less glabrous elytral surface. Because of this, less debris tends to accumulate in the more depressed strial areas.

Distribution. *Craniotus pubescens* ranges from Inyo County (California) and Nye County (Nevada) to the state of Baja California, Mexico (Fig. 13). Interestingly, *C. pubescens* also occurs on Isla Partida as well as Isla Sal Si Puedes, islands in the central western part of the Gulf of California and between the areas where the two new species occur. As these islands are separated from the larger Isla Angel de la Guarda by only a few hundred meters of ocean depth and Isla Angel de la Guarda was separated from the mainland of Baja California only fairly recently, populations from the north may have moved south along this bridge during glacial maxima, when ocean levels were higher. Elevational range is fairly low: from 0 to 750 m. It has been collected by a number of techniques: ground trap, pitfall trap, blacklight, under board, under cow dung, under rock, and under agave (*Agave deserti* Engelm., Asparagaceae).

Key to the Known Adults of the Genus *Craniotus*

1. Lateral margins of pronotum bearing lateral connate projections longer anteriorly, each bearing moderately long, erect seta (Figs. 1–4)..... 2

1′. Lateral margins of pronotum without lateral connate projections (Figs. 5–12) ....***Craniotus pubescens*** **LeConte**

2. Lateral margins of pronotum strongly serrate with more than 6 lateral connate projections. Elytral punctures very large, set in uneven striae (Figs. 1–2) ....***Craniotus mardecortesi*** **Aalbu, Smith, and Sanchez Piñero, new species**

2′. Lateral margins of pronotum with 6 or fewer connate projections. Elytral surface with punctures fine, scattered unevenly (Figs. 3–4)..... .....***Craniotus triplehorni*** **Aalbu, Smith, and Sanchez Piñero, new species**

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