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REVISION OF THE GENUS *ULUS* HORN, 1870 (COLEOPTERA: TENEBRIONIDAE: OPATRINI: BLAPSTININA)

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Abstract.— Previously comprised of 12 species, this revision is based on examination of over 4,200 museum specimens of *Ulus* Horn, 1870 collected throughout its range, encompassing North, Central, and South America. Lectotypes are designated for *Blapstinus crassus* LeConte, 1851, *Ulus comatus* Champion, 1893, *Ulus elongatulus* Casey, 1890, *Ulus fimbriatus* Casey, 1890, *Ulus hirsutus* Champion, 1885, *Ulus maritimus* Casey, 1890, and *Ulus venezuelensis* Marcuzzi, 1954 in order to clearly fix their taxonomic status. This study has revealed three new species: *Ulus steineri* Lumen & Smith, **sp. nov.** from Monahans Dunes, TX; *U. paniculus* Lumen & Smith, **sp. nov.** from Padre and Corpus Christi islands, TX; and *U. guapo* Lumen, Crowley, & Smith, **sp. nov.** from Guaymas, Sonora, MX, while at the same time uncovering variability within many taxa, resulting in seven synonymies: *Ulus hirsutus* Champion, 1885 (= *U. elongatulus* **syn. nov.**; = *U. maritimus* **syn. nov.**; = *U. comatus* Champion, 1893 **syn. nov.**; = *U. margaritensis* **syn. nov.**; = *U. venezuelensis* **syn. nov.**); and *Ulus obliquus* (LeConte, 1866) (= *U. fimbriatus* **syn. nov.**; = *U. latus* Blaisdell, 1892 **syn. nov.**). The fossil species *Ulus minutus* Whickham 1914 is placed as *incertae sedis* within Tenebrioninae Latreille, 1802, based on a lack of morphological data to confidently place the specimen within the tribe Opatrini Brullé, 1832, let alone the genus *Ulus*. A total of seven valid species are recognized in this study (*U. crassus*, *U. guapo*, *U. hirsutus*, *U. lineatulus*, *U. obliquus*, *U. paniculus*, *U. steineri*). Additionally, examination of female terminalia revealed all but two *Ulus* species (*U. lineatulus* and *U. obliquus*) possess sclerotized plates with spines in their bursa copulatrix.



Key words.— taxonomy, new species, Nearctic Realm, opatrinoide clade, Blapstinina, female terminalia

INTRODUCTION

Ulus Horn, 1870 and other genera representing Blapstinina Mulsant & Rey, 1853 (Coleoptera: Tenebrionidae) have displayed an affinity for anthropogenic dispersal and adaptability for establishment outside

their native range(s), as well as a propensity to damage fruits (e.g., strawberries, tomatoes, watermelon) and stored grain (such as wheat) (Elmore 1948, Steiner 2003, Aalbu *et al.*, 2009, Kamiński *et al.*, 2019a, b, museum specimen data). Despite their potential as pests, there is a stark lack of information concerning

the natural history of Opatrini Brullé, 1832, and aspects as straightforward as larval and pupal morphology (Kamiński *et al.*, 2019a, b). Considering these deficits, it is no surprise that the systematics and taxonomy of the group are also lacking, with many genera (in addition to *Ulus*) in need of revision (Aalbu *et al.*, 2002). Such revisions are necessary to understand the origins and differences between taxa, which may in turn serve to better address economic impacts these insects may present.

Ulus (Opatrini: Blapstinina) are small darkling beetles (5.0–8.0 mm) distributed from North America to South America (Casey 1890, Marcuzzi 1954). They occupy xeric landscapes, from beach dunes along the coast of the Gulf of Mexico, to inland dunes and dry scrub habitats of the southwest United States where they burrow in the substrate or cling beneath rocks. While some species have been recorded as pests (Kamiński *et al.*, 2019b), much of their life history remains a mystery. This genus has traditionally been distinguished from other blapstinoids by the combination of two characters (Aalbu & Triplehorn 1985, Casey 1890, Davis 1976), i.e. lateral fimbrial setae extending off the pronotum and elytron, and expanded foretibia often ending in a lateral projecting ‘tooth’.

Delineation of *Ulus* species is often difficult (see Casey 1890), and many species may show variation across their wide distributions (e.g., *U. hirsutus* Champion, 1885). This fact was best visualized by the state of the examined material, which was mainly identified only to the generic level or misidentified (Lumen pers. obser.). In order to fix this problem, a taxonomic revision based on loans totalling over 4,200 museum specimens, including type material of all 12 previously recognised *Ulus* species (Champion 1885, 1893 Casey 1890, Blaisdell 1892, Wickham 1914, Marcuzzi 1954, Bousquet *et al.* 2018) was conducted. The taxonomic validity of the genus and its component species was tested based on the examined materials. The results of this investigation are presented below.

Taxonomic history

Ulus was erected by Horn (1870) to include two *Blapstinus* Dejean, 1821 species, *B. crassus* LeConte, 1851 and *B. obliquus* LeConte, 1866; both described from California (USA) and Baja (MX). In 1885, Champion described *U. hirsutus* and *U. lineatulus* from Mexico and Central America. Casey (1890) then described three more species (*U. elongatulus*, *U. maritimus*, and *U. fimbriatus*) from Texas, and produced a key through which he differentiated them from each other and the previously described species. Blaisdell (1892) described *U. latus* from California, and Champion (1893) described another species from Mexico (*U. comatus*). Wickham (1914) described a species of *Ulus*

using an impression fossil from the Florissant shale formation in Colorado, USA (*U. minutus*). Lucas (1920) designated *U. crassus* as the type species of the genus. The last alphataxonomic contribution was made by Marcuzzi (1954) who described two species from Venezuela (*U. margaritensis* and *U. venezuelensis*).

Iwan & Kamiński (2016) introduced the most recent classification of opatrinoid beetles and placed *Ulus* within the North and South American endemic subtribe Blapstinina Mulsant & Rey, 1853. Lastly, based on comparative analysis of male terminalia within Blapstinina, Lumen *et al.* (2019) expanded the morphological definition of this genus by noting a specific structure of the aedeagus (presence of membranous region just below the parameres) (Fig. 4G).

MATERIAL AND METHODS

This taxonomic revision is based on morphological data acquired from over 4,200 adult specimens representing *Ulus*. Of these, subsets of each species were measured for size (total of 673 specimens) and georeferenced (total of 1,704 specimens) to generate distributional data. The type material, voucher specimens, and unidentified individuals were loaned from the following collections:

- AMNH – American Museum of Natural History, New York, NY; Lee Herman;
- BMNH – British Museum of Natural History, London, England; Maxwell Barclay;
- BYU – Monte L. Bean Life Science Museum, Provo, UT; Shawk Clark;
- CASC – California Academy of Sciences, San Francisco, CA; Christopher Grinter;
- CSCA – California State Collection of Arthropods, Sacramento, CA; Alexey Tishechkin;
- EMEC – Essig Museum of Entomology, Berkeley, CA; Peter Oboyski;
- FMNH – Field Museum of Natural History, Chicago, IL; Julia Snyder;
- MSNG – Museo Civico di Storia Naturale “Giacomo Doria,” Genova, Italy; Roberto Poggi;
- MCZ – Harvard Museum of Comparative Zoology, Cambridge, MA; Crystal Maier;
- OSUC – Ohio State University Insect Collection (C.A. Triplehorn Collection), Columbus, OH;
- SBMN – Santa Barbara Museum of Natural History, Santa Barbara, CA; Matthew Gimmel;
- TAMU – Texas A&M University, College Station, TX; Karen Wright;
- USNM – United States National Museum of Natural History, Washington D.C. – Floyd Shockley;
- UCR – University of California Riverside Entomology Research Museum, Riverside, CA; Doug Yanega;

UCDC – University of California Davis Richard M. Bohart Museum of Entomology, Davis, CA; Lynn Kimsey;

MAJC – M. Andrew Johnston (private coll.);

ADSC – Aaron D. Smith (private coll.);

GPC – Gareth Powell (private coll.);

KKIC – Kojun Kanda (private coll.);

KSC – Kyle Schnepf (private coll.);

RLAC – Rolf Aalbu (private coll.);

RLIC – Ryan Lumen (private coll.).

Images of specimens were taken using a Passport Imaging system (www.visionarydigital.com). Montaged images were assembled using Helicon Focus 5.3 (www.heliconsoft.com) and backgrounds were cleaned in Adobe Photoshop CS6. Measurements were taken digitally using the ruler tool in Photoshop on images with known measurements based on the camera body, lens, and magnification used.

Length was measured along the midline from the anterior margin of the epistoma to the apex of the elytra. Width was measured across the widest point of the elytra. Color was determined under fiber optic illumination and from images. Setae are acuminate and weakly flattened unless otherwise noted. Density of recurring features (primarily punctures, tubercles, and setae) and puncture size are as follows:

Density: confluent (at least partially merged), dense (separated by between 0–1 feature diameters but not partially merging), moderate (separated by 2–4 feature diameters), sparse (separated by more than four feature diameters), or absent (impunctate, smooth, or glabrous).

Puncture size: foveate—large (diameter greater than 0.02 mm) or punctate—small (diameter less than 0.02mm). Punctures each with a single decumbent seta unless otherwise noted.

Male and female terminalia were dissected using a standardized procedure (see Iwan & Kamiński 2016). Morphological nomenclature follows Doyen (1966).

Maps were produced with Quantum GIS (QGIS) v. 2.4 and free GIS layers available at <https://www.naturalearthdata.com/>.

RESULTS

Genus *Ulus* Horn, 1870

Ulus Horn, 1870: 358.

Type species. *Blapstinus crassus* LeConte 1851, by subsequent designation (Lucas 1920).

Etymology. Not stated in the original description. Potentially from the Latin *ullus*, meaning any; a non-specific subject. Gender masculine.

Phylogenetic position. Morphologically, the genus can be placed within the subtribe Blapstinina (Opatriini) based on the composition of the prothorax (with an elongate base), epipleuron (unabbreviated), and the eyes (divided into dorsal and ventral parts by expanding temples) (see Iwan 2004, Iwan & Kamiński 2016, Lumen *et al.* 2019).

Molecular analyses have also confirmed its affiliation with other genera within the subtribe (Kamiński *et al.* 2018, Kamiński *et al.* 2019a, b, Lumen *et al.* 2019). However, its exact position within Blapstinina was not ascertained due to ambiguous phylogenetic signal between the analyzed molecular loci. Nevertheless, all conducted phylogenetic analyses suggested a close relationship between *Ulus* and *Xerolinus* Ivie & Hart, 2016.

Revised diagnosis. The results of this investigation support the previous definition of *Ulus* (Aalbu & Triplehorn 1985, Casey 1890, Davis 1976, Lumen *et al.* 2019), which can be clearly differentiated from other blapstinoid genera by the dilation of the foretibia (Fig. 1C), often ending in a distal ‘tooth’ on the outside margin, and by the costate lateral margins of the pronotum and elytron with setal fimbriae (e.g. Fig. 1D). Furthermore, *Ulus* appears to be the only representative of Blapstinina with an enlarged membranous field on the basal portion of the aedeagal tegmen below the parameres (Fig. 4G) (Lumen *et al.* 2019).

Superficially *Ulus* can be confused with *Aconobius* Casey 1895, *Ammodonus* Mulsant & Rey 1859, *Blapstinus* Dejean 1821, and *Trichoton* Hope 1841 as they can be similar in size and shape, and also possess setae covering the body (Aalbu & Triplehorn 1985, Aalbu *et al.* 2002, Casey 1890, Davis 1970, Davis 1976, Davis 1980). *Aconobius*, in contrast with *Ulus*, are narrower in body-shape and lack modifications to the forelegs. *Ulus* can also be differentiated from *Ammodonus* and *Trichoton* by differences in setal morphology. *Ulus* possess only recumbent, acuminate setae on their body, while the setae of *Trichoton* are recumbent, acuminate setae interspersed with thick, erect setae (Kamiński *et al.* 2019b). *Ammodonus* possess flattened scale-like setae (Lumen *et al.* 2019). Furthermore, *Trichoton* possesses foretibiae which are bent (more sharply in males) toward the apex, and glabrous, spatulate, regions on the 5th abdominal ventrite (which *Ulus* does not possess) (Kamiński *et al.* 2019b).

The closest genus to *Ulus* morphologically is *Blapstinus*. A plesiomorphically defined genus (Davis 1970, 1976, 1980, Aalbu & Triplehorn 1985) with many diverse forms ranging from glabrous to densely hirsute, *Blapstinus* is often confused for *Ulus* and *vice-versa* (Lumen pers. obser.). The best way to delineate *Ulus* from *Blapstinus* externally is through the combination of dilated foretibiae (Fig. 1C), and the presence of lateral fimbriae on the outer perimeter of the

pronotum and elytra (e.g. Fig. 1D). *Blapstinus* may have weak dilation in the tibiae, and setae on the lateral margins of the pronotum and elytra; however, the tibial dilation is weaker and never ends in an apical tooth-like projection on the margin, nor are the setae along the periphery of the pronotum or elytra erect.

Although molecular evidence suggests a close relationship of *Ulus* and *Xerolinus* (Lumen *et al.* 2019), both can be easily distinguished morphologically (Ivie & Hart 2016). *Xerolinus*, in addition to lacking the strong setation present in *Ulus*, possess fused elytra (not present in *Ulus*) and reduced flight wings (state present in only *U. steineri*). Furthermore, male characteristics differ between the two genera: *Xerolinus* with more strongly expanded protarsi (compared to *Ulus*) and parameres broad and rounded at the tip, sinuate in lateral view (not tapering to a point and straight in lateral view as in *Ulus*). Though both genera inhabit similar habitats and overlap geographically, no evident morphological traits linking *Ulus* and *Xerolinus* were identified during the present study.

Redescription. Length 4.5–8.0 mm, width 2.0–4.5 mm. Colored shining aeneous to brown or black. **Head:** moderately to densely foveate or punctate, occasionally partially confluent. Mentum cordiform. Eye divided by extending canthus and temple, generally smaller in females. Antennae with 11 segments, terminal four segments forming weak club, sometimes shorter in females. **Prothorax:** scutellum triangular. Pronotum bisinuate at base, moderately to densely foveate or punctate, punctures occasionally partially confluent. Lateral margin costate, with setal fimbriae. Hypomeron foveate to punctate and finely to coarsely rugose. Prosternal process narrowly rounded and porrect, received by deep and similarly narrow metasternal groove. **Pterothorax:** elytron striae shallow and foveate or punctate. Intervals punctate; smooth to rugosely textured with tubercles. Lateral margin costate, with setal fimbriae. Flight wings variable (most macropterous; in one case brachypterous). Metasternal groove deep and narrow, apex reaching the middle coxae. **Abdomen:** punctate; aedeagus with curved to straight basal portion, parameres tapered and pointed with apices bent or straight, middle lobe exits dorsally. **Legs:** femurs slightly swollen toward apex. Foretibiae apically dilated, often with distinct lateral projection at apex. Meso and meta tibia straight to slightly curved and dilated toward apex. First three tarsomeres of male protarsi more robust than the fourth or feebly so. First three tarsomeres of male fore and mesotarsi with or without pencil pads. **Male terminalia:** tegmen bipartite; apical portion (parameres) tapered to point; basal portion with membranous subapical field. **Female terminalia** (Fig. 3A–C): Ovipositor with paraproct slightly shorter or equal in length to coxites; triangular, not shielding valvifer or any other

lobes of coxites. Valvifer, second and third lobes transverse. Apical lobe rounded; situated apically. Gonostylus reduced. Proctiger covering all coxites. Vagina and bursa copulatrix with pair of sclerites and/or equipped with spines in most species. Spermatheca with thick ducts; connected with bursa copulatrix by thick canal. Spiculum ventrale with short base (Fig. 3C).

Species included (7). *U. crassus* (LeConte, 1851), *U. guapo* sp. nov., *U. hirsutus* Champion, 1885, *U. lineatulus* Champion, 1885, *U. obliquus* (LeConte 1866), *U. paniculus* sp. nov., *U. steineri* sp. nov.

Species excluded (minutus). In 1914, Wickham described *Ulus minutus* – an impression fossil from florissant shale (Fig. 6). Reinvestigation of the holotype (AMNH) revealed that the characters to place it reliably into the genus *Ulus* (e.g., lateral fimbriae on pronotum and elytra; expanded foretibiae with projecting lateral ‘tooth’) are not apparent. The specimen appears to have several tenebrionid traits (e.g. presence of 5 abdominal ventrites; exposed membranes between sterna 3–5; potentially emarginate/notched epistoma), which make it a potential fit within the ‘opatrinioid clade’, i.e. Opatrini, Pedinini, Dendarini, and Platynotini (Kamiński *et al.* 2018, 2019a, b). However, as the characters specific to the aforementioned tribes are missing in the type specimen, it is recommended that *Ulus minutus* be placed *incertae sedis* within the subfamily Tenebrioninae.

Distribution (Fig. 5). Aruba, Cayman Islands, Colombia, Costa Rica, Dominican Republic; El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico [Baja California, Baja California Sur, Chihuahua, Coahuila, Jalisco, Nayarit, Durango, Guerrero, Nuevo Leon, Oaxaca, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, Veracruz]; Nicaragua, Panama, United States [AL, AR, AZ, CA, CO, FL, GA, HI, KS, LA, MS, NM, NV, OK, OR, SC, SD, TX, UT], Venezuela.

Key to the species of the genus *Ulus*

Notes. Specimens may require cleaning to see certain characteristics (sculpturing, punctures, etc.). Given distributions reflect the findings of this revision—there have been reports of *Ulus* subject to anthropogenic dispersal outside their native range (e.g. *Ulus hirsutus*). Some of the characters utilized in this key are subject to variation—in particular pronotal shape and puncture structure(s). Additionally, key characteristics such as setation can be rubbed away or otherwise destroyed. In most cases, males can be separated from female specimens via pencil pads (distinct tufts/groupings of setae) on fore and mesotarsal segments 1–3. This key should separate most species in most regions; however, in the area of Southern/Southeastern Texas, there are forms that may be intermediates between species, rendering some characteristics less useful. Male terminalia are best used to differentiate some of these.

1. Brachypterous (Fig. 2B). Elytral intervals rugose and tuberculate. Males without tarsal pads. Smaller species (4.5–5.5 mm long) *steineri* Lumen & Smith sp. nov.
Monahans Sand Dunes (Texas)
- . Macropterous (Fig. 3D). Elytral intervals smooth to rugose. Males with or without tarsal pads. Larger species (5.0–8.0 mm long) 2
2. Elytral striae with small, shallow, or finely marked punctures (sometimes difficult to differentiate from interval punctures) (Fig. 1G). Elytral intervals and epipleuron smooth. Hypomer on sculpturing reduced and fine. Head and pronotum not densely punctate (2 or more diameters apart); puncture diameter roughly equal to setal diameter (Fig. 1F). Males: Parameres (in lateral view) tapering to a downward facing point at the apex (Fig. 4D) *lineatulus* Champion
Central America
- . Elytral striae with punctures larger; easily discernible from interval punctures. Elytral intervals smooth to rugose, epipleuron tuberculate. Hypomer on sculpturing not reduced; coarse. Head and pronotal punctures variable; often densely punctate (1 or less diameters apart) and larger than setal diameter. Males: Parameres (in lateral view) either entirely straight, or turning slightly upwards apically 3
3. Pronotum narrowing at most only slightly in apical half; apices rounded. Margins arcuate apically and straight in basal half (Fig. 1B). Males: fore and mesotarsomeres 1–3 with weak pencil pads. Parameres triangular, and (in lateral view) tapering to an upward curved point at the apex (Fig. 4A) *crassus* (LeConte)
Southwestern US and Mexico
- . Pronotum narrowing apically; apices produced to weakly produced but not rounded (Fig. 1D). Margins evenly arcuate to straight (Fig. 1D). Males: fore and mesotarsomeres 1–3 with or without strong pencil pads (Fig. 2A). Parameres in lateral view tapering to a straight point 4
4. Pronotal punctures circular to oval, occasionally confluent (Fig. 1D–E). Males: fore and mesotarsomeres 1–3 with strong pencil pads (e.g., Fig. 2A). Parameres subtriangular, greater than 3× as long as wide (Fig. 4E) *obliquus* (LeConte)
Southwestern US and Mexico
- . Pronotal punctures circular, never confluent. Males: fore and mesotarsomeres 1–3 with or without strong pencil pads. Parameres triangular, less than 3× as long as wide 5
5. Foretibia dilated without lateral projecting tooth – or at most weakly projecting (Fig. 2A) *guapo* Lumen, Crowley, & Smith sp. nov.
Sonora and Sinaloa, Mexico
- . Foretibia dilated with lateral projecting tooth (e.g., Fig. 1C) 6
6. Males with pencil pads on protarsomeres and mesotarsomeres. Elytra and pronotum shining—almost nitidous in interstices between punctures (Fig. 1H) *hirsutus* Champion
Widespread, Southern US to Mexico, Central, and South America
- . Males without pencil pads on protarsomeres and mesotarsomeres. Elytra and pronotum less shining—dull to velvety in the interstices between punctures (Fig. 2C) *paniculus* Lumen & Smith sp. nov.
Corpus Christi and Padre Islands, Texas

REDESCRIPTIONS

Ulus crassus (LeConte, 1851) (Fig. 1A, B; 4A; 5)

Blapstinus crassus LeConte, 1851: 146.

Studied material. LeConte (1851) did not specify the number of studied specimens, however from the context it seems that he was dealing with at least two specimens. Therefore, a lectotype designation is needed to fix the taxonomic status of the species. Three specimens from the Museum of Comparative Zoology (MCZ) appearing to be the syntype series were compared, and a lectotype was chosen based on the presence of diagnosable characteristics (see below).

LECTOTYPE, designated here, male (MCZ): on red square (a) “Type / 4667”; (b) “Ulus / crassus / (Lec.)”; (c) “Jan-Jul.2005 / MCZ Image / Database”; (d) “MCZ-ENT / 00004667”; (e) “Tenebrionid Base / Aaron D. Smith / Catalog#18329”. **PARALECTOTYPES**: Single specimen (MCZ), gold disc/MCZ-Ent Barcode 00642137/PARALECTOTYPE *Ulus crassus* (LeConte 1851) Det. R.Lumen 2019. Single specimen, same data except MCZ-Ent Barcode 00642138. **ADDITIONAL MATERIAL**: see Appendix.

Diagnosis. *Ulus crassus* co-occurs with *U. obliquus*, *U. steineri*, *U. paniculus*, *U. hirsutus*, and *U. guapo*. *Ulus crassus* can be differentiated from all other species using the following combination of characters: pronotum with anterior apices weakly produced and rounded, lateral margin arcuate and nearly straight in basal half; elytra intervals intensely rugose; epipleuron with small tubercles. Moreover, males of this species possess weak pencil pads on the first three protarsomeres and mesotarsomeres, and the parameres of the aedeagus are slightly bent upwards towards the apex.

The morphology of the pronotum, pro/mesotarsus, and aedeagus each individually separates *U. crassus* from most species; however, some specimens may

possess some deformation, variation, or damage in the pronotum, making the combination of all characters paramount to diagnosing the species.

Redescription. Length 5.0–6.5 mm, width 2.0–3.5 mm ($n = 86$). Color aeneous to brown or black. **Head** Densely foveate, foveae occasionally confluent. **Prothorax:** Pronotum anterior apices weakly produced and rounded, lateral margin arcuate and nearly straight in basal half. Densely foveate. Lateral margin costate, with setal fimbriae. Hypomeron punctate and rugose. Hind margin carinate. **Pterothorax:** Epipleuron punctate and densely tuberculate. Elytron striae shallow and punctate. Intervals strongly rugose and punctate. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus curved, parameres triangular and tapered to a point, bent upwards at the apex. **Legs:** Anterior tibia apically dilated, with distinct lateral projection at apex. Meso tibia slightly dilated toward apex. Hind tibia straight to slightly curved toward apex. **Males:** First three protarsi more robust than the fourth and bearing weak pencil pads. First three mesotarsi with weak pencil pads.

Distribution (Fig. 5). Mexico [Baja California, Baja California Sur, Chihuahua, Coahuila, Durango, Jalisco, San Luis Potosi, Sinaloa, Sonora, Tamaulipas], United States [AZ, CA, HI (introduced), NM, NV, OR, SD, TX, UT].

***Ulus hirsutus* Champion, 1885**
(Figs 1H, I; 4C; 5)

Ulus hirsutus Champion, 1885: 133 = *Ulus elongatulus* Casey, 1890: 414 **syn. nov.**
= *Ulus maritimus* Casey, 1890: 414 **syn. nov.** = *Ulus comatus* Champion, 1893: 530 **syn. nov.**
= *Ulus margaritensis* Marcuzzi, 1954: 10 **syn. nov.** = *Ulus venezuelensis* Marcuzzi, 1954: 11 **syn. nov.**

Studied material. All the names synonymized here with *U. hirsutus*, except *U. margaritensis*, lacked clear type designations. Therefore, lectotype designations are needed to fix the taxonomic status of these species. Casey (1890) did not specify the number of studied specimens for *U. elongatulus* and *U. maritimus*, however from the context it is clear that he was dealing with at least two specimens. Seven specimens from the United States National Museum of Natural History (USNM) of each species appearing to be the syntype series were compared and lectotypes were chosen based on the presence of diagnosable characteristics (see below). Though Champion specified four specimens of *U. comatus* and multiple specimens of *U. hirsutus* in his descriptions (1885, 1893), only one specimen of each were obtained for this examination from BMNH and are here both chosen as the lectotypes. Marcuzzi (1954) provided measurements for a series of

U. venezuelensis in his descriptions. Of the material borrowed from his collection deposited in MSNG, one specimen with a red label appearing to have handwritten 'holotype' label, was chosen as lectotype (see below).

Ulus hirsutus, **LECTOTYPE**, designated here, female (BMNH): on circle with red border (a) "Type"; (b) "Sp. figured."; (c) "S. Geronimo, / Guatemala. / Champion."; (d) "Godman-Salvin / Coll., Biol. / Centr.-Amer."; (e) "Ulus / hirsutus CH". **ADDITIONAL MATERIAL:** see Appendix.

Ulus elongatulus, **LECTOTYPE**, designated here, male (USNM): *U. elongatulus* Cas./Casey bequest 1925/♂/Columbus 10-7 Texas/TYPE USNM 37146/Tenebrionid Base Aaron D. Smith Catalog # 18327/LECTOTYPE *Ulus elongatulus* Casey 1890/*Ulus hirsutus* Champion 1885 R.Lumen 2019. **PARALECTOTYPES:** (USNM): Four specimens, Tex/Casey bequest 1925/elongatulus—2,3,5,7 PARATYPE USNM 37146/ PARALECTOTYPE *Ulus elongatulus* Casey 1890 Det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019. Single specimen, Columb 10-7 Tex/Casey bequest 1925/elongatulus-7 PARATYPE USNM 37146/PARALECTOTYPE *Ulus elongatulus* Casey 1890 Det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019. Single specimen, Columbus 27.6 Texas/Casey bequest 1925/PARATYPE USNM 37146/PARALECTOTYPE *Ulus elongatulus* Casey 1890 det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019.

Ulus maritimus, **LECTOTYPE**, designated here, male (USNM), Tex/Casey bequest 1925/♂/*maritimus*—6 PARATYPE USNM 37145/Tenebrionid Base Aaron D. Smith Catalog # 18328/LECTOTYPE *Ulus maritimus* Casey 1890/*Ulus hirsutus* Champion 1885 R.Lumen 2019. **PARALECTOTYPES:** (USNM): Four specimens, Tex/Casey bequest 1925/*maritimus*—2,3,4,5 PARATYPE USNM 37145/PARALECTOTYPE *Ulus maritimus* Casey 1890 Det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019. Single specimen, dar Key 19 Fl/Casey bequest 1925/*Maritimus*—7 PARATYPE USNM 37145/ PARALECTOTYPE *Ulus maritimus* Casey 1890 Det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019. Single specimen, Tex/Casey bequest 1925/TYPE USNM 37145/*U. maritimus* Cas./PARALECTOTYPE *Ulus maritimus* Casey 1890 Det. R.Lumen 2019/*Ulus hirsutus* Champion 1885 R.Lumen 2019.

Ulus comatus, **LECTOTYPE**, designated here, male (BMNH): H-"?"/Vera Cruz, Mexico./♂/Type/*Ulus comatus* Ch./Godman-Salvin Coll., Biol. Centr.-Amer./LECTOTYPE *Ulus comatus* Champion 1893/*Ulus hirsutus* Champion 1885 R.Lumen 2019.

Ulus margaritensis, **HOLOTYPE**, male (MSNG): I. Margarita "?" Marcuzzi 3.48/Holotypus"?"/*Ulus margaritensis* "?" det. Marcuzzi 19"?2/*Ulus margaritensis* mihi/Museo Genova coll G. Marcuzzi (acquisto 2000)/

Syntypus *Ulus margaritensis* Marcuzzi 1954. **PARATYPES**: (BMNH): Two specimens, Paratype/Marga-rita P-“?” Marcuzzi 3.48/Brit. Mus. 1958 136/*Ulus margaritensis* M-“?”/*Ulus hirsutus* Champion 1885 R.Lumen 2019. (MSNG): Three specimens, I. Margarita “?” Marcuzzi 3.48/*Ulus margaritensis* mihi/Museo Genova coll G. Marcuzzi (acquisto 2000)/SYNTYPUS *Ulus margaritensis* Marcuzzi 1954.

Ulus venezuelensis, **LECTOTYPE**, designated here, male (MSNG): Caracas M-“?” Marcuzzi leg./red label/*Ulus venezuelensis* m-“?”/Museo Genova coll G. Marcuzzi (acquisto 2000)/SYNTYPUS *Ulus venezuelensis* Marcuzzi 1954/ Tenebrionid Base Aaron D. Smith Catalog # 23145/ **LECTOTYPE** *Ulus venezuelensis* Marcuzzi 1954/*Ulus hirsutus* Champion 1885 R.Lumen 2019. **PARALECTOTYPE**: male (MSNG) “Caracas “?” Marcuzzi leg./ Paratypus/*Ulus venezuelensis* “?”/*Ulus venezuelensis* mihi/Museo Genova coll G. Marcuzzi (acquisto 2000)/ SYNTYPUS *Ulus venezuelensis* Marcuzzi 1954/PARALECTOTYPE *Ulus venezuelensis* Marcuzzi 1954 Det. R.Lumen 2019.

Diagnosis. A widespread species which co-occurs with most other species of *Ulus* (Fig. 5). Useful characters to begin separating *U. hirsutus* are: elytral striae with foveae, intervals often smooth but sometimes rugose; pronotum narrowing anteriorly with produced apices, lateral margin weakly arcuate to straight; males: presence of pencil pads on protarsomeres 1–3 and mesotarsomeres 1–3; parameres triangular and tapered to a point and largely unmodified, separating it from species with ‘modified’ parameres such as *U. lineatulus* (downwardly curved tip), *U. crassus* (upwardly bent tip), and *U. obliquus* (long, narrow parameres >3× as long as wide).

Redescription. Length 4.5–6.0 mm, width 2.5–3.5 mm (n = 112). Color shining aeneous to brown or black. **Head:** Densely foveate, foveae occasionally confluent. **Prothorax:** Pronotum narrowing anteriorly, apices produced—sometimes weakly so, lateral margin evenly weakly arcuate to straight. Densely to moderately foveate. Lateral margin costate, with setal fimbriae. Hypomeron punctate and rugose. Hind margin carinate, sometimes weakly so. **Pterothorax:** Epipleuron punctate with small tubercles. Elytron striae shallow and foveate. Intervals smooth to rugose, and punctate. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus curved; parameres subtriangular and tapered to a point, may be slightly bent in some specimens. **Legs:** Anterior tibia apically dilated with lateral projection at apex (sometimes variably so). Meso and meta tibia straight to slightly bent, slightly dilated toward apex. **Males:** First three protarsi more robust than the fourth and with pencil pads. First three mesotarsi with pencil pads.

Distribution (Fig. 5). Aruba, Cayman Islands, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico [Chiapas, Coahuila, Colima, Guerrero, Jalisco, Nayarit, Nuevo Leon, Oaxaca, Puebla, San Luis Potosi, Sinaloa, Tamaulipas, Veracruz], Nicaragua, Panama, United States [AL, AR, AZ, FL, HI (introduced), LA, MS, OK, SC (intercepted from Honduras), TX], Venezuela.

Ulus lineatulus Champion, 1885
(Figs 1F, G; 4D; 5)

Ulus lineatulus Champion, 1885: 134.

Studied material. **SYNTYPE**, male (BMNH): on circle with red border (a) “Type”; (b) “Sp. figured.”; (c) “Champerico, / Guatemala. / Champion.”; (d) “Godman-Salvin / Coll., Biol. / Centr.-Amer.”; (e) “*Ulus / lineatulus* CH”; (f) on blue paper “Tenebrionid Base / Aaron D. Smith / Catalog#23148”. **ADDITIONAL MATERIAL:** see Appendix.

Diagnosis. The following characters can be used to delineate *U. lineatulus* from other species: head and pronotum moderately punctate, punctures enclosing setae tightly; hypomeron with fine (or reduced) sculpturing; elytral intervals and epipleuron smooth, punctures small (sometimes difficult to differentiate striae and interval punctures); aedeagal parameres bent downward apically.

Redescription. Length 5.5–6.0 mm, width 3.0–4.0 mm (n = 95). Color shining aeneous to brown or black. **Head:** Moderately punctate. Puncture diameter nearly equal to setal diameter. **Prothorax:** Pronotum narrowing anteriorly, apices produced—sometimes weakly so, lateral margin evenly weakly arcuate to straight. Moderately punctate. Puncture diameter nearly equal to setal diameter. Lateral margin costate, with setal fimbriae. Hypomeron finely punctate and rugose. Hind margin weakly carinate. **Pterothorax:** Epipleuron punctate and smooth. Elytron striae shallow and punctate. Intervals punctate and smooth. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus curved; parameres subtriangular and tapered to a point, bent downward at apex. **Legs:** Anterior tibia apically dilated with lateral projection at apex (sometimes variably so). Meso and meta tibia straight, slightly dilated toward apex. **Males:** First three protarsi dilated, distinctly more robust than the fourth and with pencil pads. First three mesotarsi with pencil pads. **Abdomen:** Base of aedeagus curved; parameres subtriangular and tapered to a point, curved downward at apex. Vagina and bursa copulatrix lacking sclerites/spines.

Distribution (Fig. 5). Costa Rica, El Salvador, Guatemala, Nicaragua, and Panama.

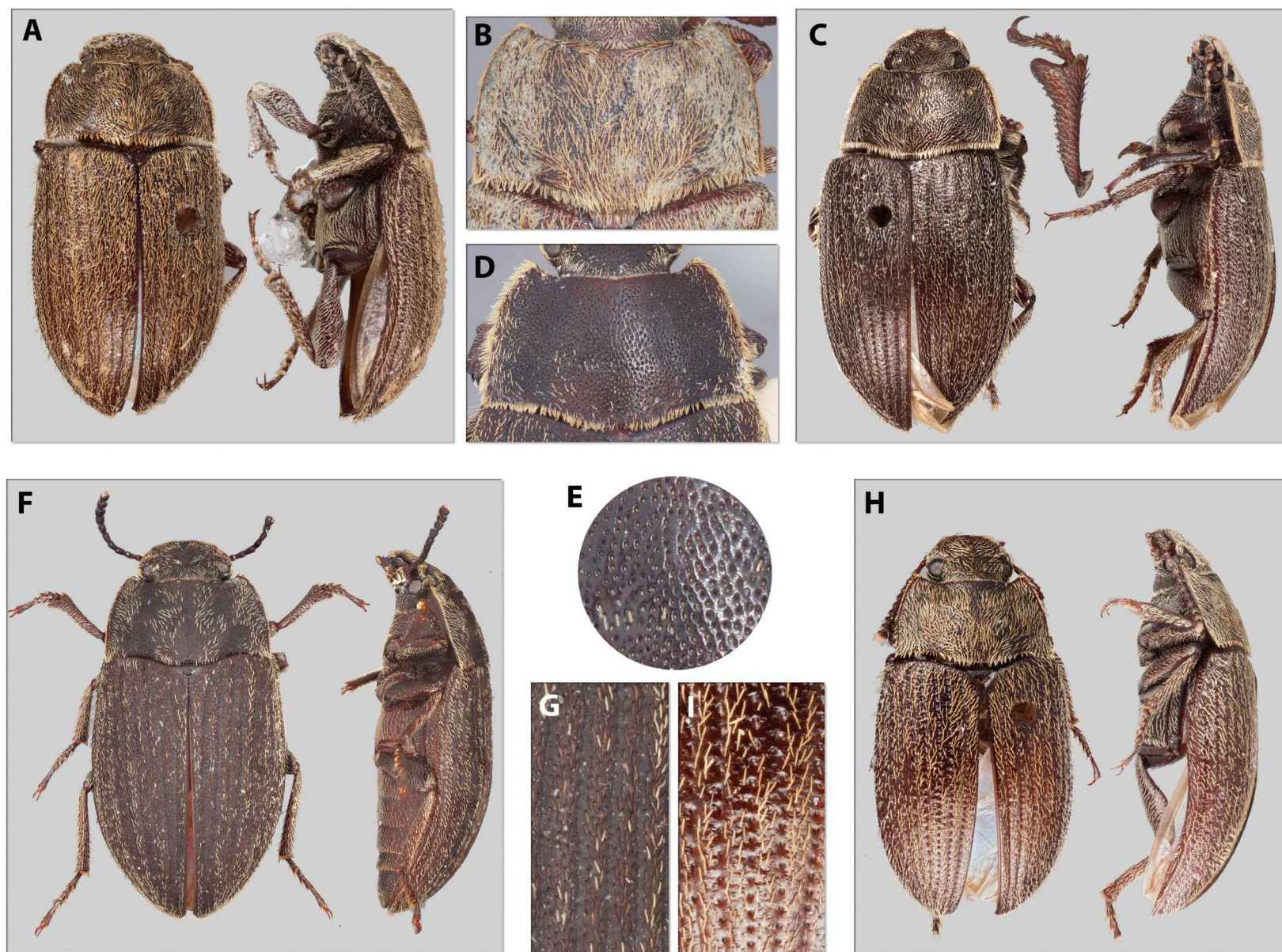


Figure 1. Morphology of selected *Ulus* species: (A = Dorsal & lateral habitus, B = Pronotum) *U. crassus*; (C = Dorsal & lateral habitus and foretibia, D = Pronotum, E = Close-up of pronotal disc punctures) *U. obliquus*; (F = Dorsal & lateral habitus, G = Close-up of elytral striae & interstices) *U. lineatulus*; (H = Dorsal & lateral habitus, I = Close-up of elytral striae & interstices) *U. hirsutus*.

***Ulus obliquus* (LeConte, 1866)**
(Figs 1C–E; 3D; 4E; 5)

Blapstinus obliquus LeConte, 1866: 117 = *Ulus latus* Blaisdell, 1892: 243 **syn. nov.**
= *Ulus fimbriatus* Casey, 1890: 413 **syn. nov.**

Studied material. Casey (1890) did not specify the number of studied specimens in his description of *U. fimbriatus*, however from the context it is clear that he was dealing with at least two specimens. Therefore, a lectotype designation is needed to fix the taxonomic status of the species. Seven specimens from USNM appearing to be the syntype series were compared and a lectotype was chosen based on the presence of diagnosable characteristics (see below).

Blapstinus obliquus, **HOLOTYPE**, female (MCZ): on red square (a) “Type / 4668”; (b) “B. obliquus / Lec.”; (c) “Jan-Jul.2005 / MCZ Image / Database”; (d) “MCZ-ENT / 00004668” (e) “Tenebrionid Base / Aaron D. Smith / Catalog#18326”. **ADDITIONAL MATERIAL:** see Appendix.

Ulus latus, **HOLOTYPE**, male (CASC): San Diego IV-19 Cal. 1891/♀/F.E.Blaisdell Collector/Blaisdell Collection/Type. *Ulus latus* blaisdell/California Academy of Science Type No.2925/*Ulus obliquus* (LeConte 1866) R.Lumen 2019.

Ulus fimbriatus, **LECTOTYPE**, designated here, male (USNM), Tex/Casey bequest 1925/*fimbriatus*—3 PARATYPE USNM 37144/Tenebrionid Base Aaron D. Smith Catalog # 18318/LECTOTYPE *Ulus fimbriatus* Casey 1890/*Ulus obliquus* (LeConte 1866) R.Lumen 2019. **PARALECTOTYPES: (USNM):** Five specimens, Tex/Casey bequest 1925/*fimbriatus*—2,4,5,6,7 PARATYPE USNM 37144/PARALECTOTYPE *Ulus fimbriatus* Casey 1890 Det. R.Lumen 2019/*Ulus obliquus* (LeConte 1866) R.Lumen 2019. Single specimen, Tex/♂/Casey bequest 1925/TYPE USNM 37144/*U. fimbriatus*/PARALECTOTYPE *Ulus fimbriatus* Casey 1890 Det. R.Lumen 2019/*Ulus obliquus* (LeConte 1866) R.Lumen 2019.

Diagnosis. The largest species, which has an overlapping distribution with *U. crassus*, *U. hirsutus*, *U. steineri*, *U. guapo*, and *U. paniculus*. It can be differentiated using the following features: large body size (5.5–8.0 mm long, 3.0–4.5 mm wide); pronotal shape evenly arcuate, narrowing anteriorly, apices weakly produced, punctures oval to round and occasionally confluent; elytral striae with small punctures, intervals smooth to rugose. Males with pencil pads on protarsomeres 1–3 and mesotarsomeres 1–3; parameres long and narrow, much longer than wide (>3×), tapering to an unbent point.

Confluent punctures of the pronotum and paramere morphology individually separate *U. obliquus* from most species; however, some specimens may possess some deformation, variation, or damage, making the

combination of all characters paramount to diagnosing the species.

Redescription. Length 5.5–8.0 mm, width 3.0–4.5 mm (n = 78). Color shining brown to black. **Head:** Densely foveate, foveae occasionally confluent. **Prothorax:** Pronotum narrowing anteriorly, apices weakly produced, lateral margin evenly weakly arcuate. Densely foveate, foveae occasionally confluent. Lateral margin costate, with setal fimbriae. Hypomeron punctate and rugose. Hind margin carinate. **Pterothorax:** Epipleuron punctate and densely tuberculate. Elytron striae shallow and punctate. Intervals smooth to rugose, and punctate. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus curved; parameres subtriangular and tapered to a point, narrow—more than three times longer than wide. Vagina and bursa copulatrix lacking sclerites/spines. **Legs:** Anterior tibia apically dilated, with distinct lateral projection at apex. Meso and meta tibia straight to slightly bent, dilating toward apex. **Males:** First three protarsi dilated, more robust than the fourth with pencil pads. First three mesotarsi with pencil pads.

Distribution (Fig. 5). Mexico [Baja California Sur, Chihuahua, Durango, Nayarit, Nuevo Leon, Puebla, Sinaloa, Sonora], United States [AZ, CA, NM, TX].

NEW SPECIES

Ulus guapo Lumen, Crowley, and Smith, sp. nov.
(Fig. 2A; 4B; 5)

Type material. **HOLOTYPE**, male (USNM): (a) “Guaymas / Sonora / Mexico”; (b) “Giuliani / 4.19.74” (c) on blue paper “Tenebrionid Base / Aaron D. Smith / Catalog#23153”. **PARATYPES: (CSCA):** female, Mexico: Sinaloa, 80km E. Mazatlan 2450m 27-IV-1974 Derham Giuliani/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEXICO: Sinaloa 10mi. N Los Mochis along Rio Fuerte VI-29-82 blacklight Fred G. Andrews/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEXICO: Sonora, sand dunes at Huatabampo, 22-IV-1974 Derham Giuliani/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. **(OSUC):** Two males, MEXICO: Sinaloa, Las Animas Beach, near Topolobampo 2.ix.1978, dunes at night, R.E. Woodruff & B.K. Dozier collectors/OSUC Barcode 717699 & 717696. Forty-three additional specimens bearing same labels, OSUC Barcode numbers 717666-717676, 717678-717695, 717697 and 717698, 717700-717709, and 717711. Single specimen with OCUC Barcode 717665 bearing additional label: *Ulus* Sp. Det. C.A. Triplehorn '13. **(USNM):** Thirteen specimens, Guaymas Sonora Mexico/Giuliani 4.19.74/ USNM Loan



Figure 2. Morphology of the newly described *Ulus* species: (A) *U. guapo*; (B) *U. steineri*; (C) *U. paniculus*. Abbreviations: **d** – dorsal, **v** – ventral, **l** – lateral views

2079495/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen with same data, Mexico misspelled 'Maxico.'. (EMEC): Four specimens, MEX: Son., "Los Algodones", 6 mi. W. San Carlos Bay II-22/23"-1980 J.Doyen, Coll./J.D. Lot #80C4/UC Berkeley EMEC barcodes 1185922-1185924, 1185927/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Collecting method labels "on dunes at night" and "ex pitfall traps.". Three specimens, MEXICO: Sinaloa, 6 km N. Mazatlan on the beach 24-IV-1974 Derham Giuliani/UC Berkeley EMEC barcodes 1185935,1185934, 1185937/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEX: Sinaloa, Culiacan, 19 mi. S. VI-22-63/UC Berkeley EMEC barcode 1184794/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEXICO: Sonora, sand dunes at Huatabam pito, 22-IV-1974 Derham Giuliani/UC Berkeley EMEC barcode 1185933/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEXICO: Sonora, 24 km S. of Guaymas (beach) 20-IV-1974 Derham Giuliani/UC Berkeley EMEC barcode 1185931/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Single specimen, MEXICO: Sonora, Sand dunes 8km N., 16km W. of Guyamas 10-IV-1974 D.Giuliani/*Ulus obliquus* Lec. Det J.Doyen 1972/UC Berkeley EMEC barcode 1185930/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. (CASC): Five specimens, MEX: Son., "Los Algodones", 6mi.W. San Carlos Bay III-22"/23-1980 J. Doyen, coll./ex pitfall traps/ J.D.Lot #80C4/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Three specimens, MEXICO: Sinaloa, 8km N. Mazatlan on the beach 24-IV-1974 Derham Giuliani/Tenebrionid Base Aaron D. Smith Catalog #18447-18449/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Two specimens, MEXICO: Sonora and Dunes at Huatabam pito, 22-IV-1974 Derham Giuliani/PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Three specimens, MEICO: Sonora, Sand dunes 8km N., 16km W. of Guaymas 19-IV-1974 D.Giuliani/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019. Three additional specimens, same data with differing date: "10-IV-1974.". Single specimen, MEX.Sonora Novojoa IX-26-1953 B.Malkin/Tenebrionid Aaron D. Smith Catalog #19891/ PARATYPE *Ulus guapo* Lumen, Crowley, & Smith 2019.

Diagnosis. Similar to *Ulus obliquus* (see previous diagnosis), from which it can be further discerned via the reduction of the lateral projection of the protibiae. Additionally, while they do not appear to co-occur, *U. guapo* is similar morphologically to *U. steineri* from which it can be differentiated by size, protarsal pencil pads in males, developed flight wings, and aedeagi with shorter parameres.

Description. Length 6.0–7.0 mm, width 3.0–4.0 mm (n = 22). Color shining aeneous to brown or black.

Head: Densely foveate. **Prothorax:** Pronotum narrowing anteriorly, apices produced, sometimes weakly so. Lateral margin arcuate. Densely foveate. Lateral margin costate, with setal fimbriae. Hypomerion punctate and rugose. Hind margin carinate. **Pterothorax:** Epipleuron punctate and densely tuberculate. Elytron striae shallow and foveate. Intervals punctate and rugose. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus straight to weakly curved, parameres subtriangular and tapered to a point. **Legs:** Anterior tibia apically dilated with, at most, a weak lateral projection at apex. Meso and meta tibia straight and slightly dilated apically. **Males:** First three protarsomeres dilated, distinctly more robust than the fourth. First three tarsomeres with pencil pads. Mesotarsi not dilated, and with pencil pads first three tarsomeres.

Etymology. Derived from Spanish *guapo*; meaning handsome, referring to its pelage.

Distribution (Fig. 5). Mexico [Sinaloa and Sonora].

Ulus paniculus Lumen & Smith, sp. nov.

(Fig. 2C; 4G; 5)

Studied material. **HOLOTYPE**, male (TAMU): (a) "TEXAS: Kenedy Co. / Kenedy Ranch, Jaboncillos / Pasture. sand dune area / 26°58'38"N, 97°40'59"W / IV-6-20-2001, W. Godwin / & E. G. Riley, pit-fall trap"; (b) "TAMU – ENTO / X1013344"; (c) on blue paper "Tenebrionid Base / Aaron D. Smith / Catalog#16423". **PARATYPES**: (USNM): Three specimens, CorpChri 8.5 Tex/EASchwarz Collector/Loan from USNM 2079495/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single specimen bearing same labels and additional, *Ulus maritimus* Cas. (KKIC): Single specimen, USA Texas: Kleberg Co., Padre Island, back dunes, 5m, 27.4299°N 97.2968°W, 18-19.vi.2014. KK14_082. K.Kanda/KKSP 000000507/Tenebrionid Base Aaron D. Smith Catalog # 17380/PARATYPE *Ulus paniculus* Lumen & Smith 2019. (EMEC): Three specimens, TEX: Kleberg Co. Padre Id.Nat. Seashore, 2 mi. E Bird Id., XII-1-1978 P.Perkins, J.Doyen, P.Opler/UC Berkeley EMEC barcodes 1185907-1185908,1185910/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single additional specimen with UC Berkeley barcode 1185916 bearing label, *Ulus maritimus* Csy Det J.Doyen 1986. Single specimen, TEX:Kleberg Co. N.Padre Id., Malaquite Beh. XII-1-1978 J.Doyen, P.Opler P.Perkins/UC Berkeley EMEC barcode 1185913/ PARATYPE *Ulus paniculus* Lumen & Smith 2019. Three specimens, TEXAS: Cameron Co. S.Padre ID., 5mi.N. Port Isabel XII-2-1978 J.Doyen, P.Opler/UC Berkeley EMEC barcodes 1185915,1185918, 1185917/ PARATYPE *Ulus paniculus* Lumen & Smith 2019. Fourteen specimens, TEX: Kleberg Co. North

Padre Isl., dunes nr.rd.to Bird Isl. 1-XII-1978/Doyen Opler, Perkins, Coll./UC Berkeley EMEC barcodes 1184914-1184927/PARATYPE *Ulus paniculus* Lumen & Smith 2019. **(KSC):** Five specimens, Texas: Nueces CO. Padre Island September 25, 2014 sifted from sand dune Kyle E. Schnepf/*Ulus* sp det. MA Johnston 2016./PARATYPE *Ulus paniculus* Lumen & Smith 2019. **(GPC):** Two specimens, USA: TX: Nueces Co. San Padre Island Sep 25th 2014 Col. Gareth S. Powell/On sand dunes WGS84 27.5845 -97.2090 Elv. -5m/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Four specimens, USA: TX: Cameron Co. Boca Chica, washed sand Sep. 24th 2014, beach dune 25.9917, -97.1506 Col. GS Powell, KE Schnepf/PARATYPE *Ulus paniculus* Lumen & Smith 2019. **(TAMU):** Fifteen specimens, USA: TEXAS: Cameron Co. Boca Chica Bch. XI-4-2013 25.99709°N, 97.15198°W E.G. Riley & M.A. Quinn salt flat & dune vegetation/TAMU-ENTO Barcodes X1022886, X1022887, X1022908, X1022914, X1023386, X1024637, X1024697, X1024733, X1024797, X1024816, X1025897, X1025909, X1026546, X1027478, X1033514/Tenebrionid Base Aaron D. Smith Catalog # 16361, 16364, 16369, 16390, 16638-16641, 16643-16649/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Four specimens, TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasure, sand dune area 26°58'38" N, 97°40'11" W IV-6-20-2001, W.Godwin & E.G. Riley, pit-fall trap/TAMU-ENTO Barcodes X1014320, X1013125, X1011702, X1013335/Tenebrionid Base Aaron D. Smith Catalog #16622, 16620, 16634, 16457/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single specimen, Welder Wildlife Refuge, Sinton Tex. IX-14-1963 R.O. Kendall/TAMU-ENT Barcode X1060866/Tenebrionid Base Aaron D. Smith Catalog # 18643/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single specimen, TEXAS: Nueces Co. nr. Mustang Island St.Pk., Feb. 28, 1999 Coll. M. Yoder/sifted from sand at base of *Panicum amarum*/TAMU-ENT Barcode X1010584/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Four specimens, TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°59'22"N, 97°40'11"W IV-21-2001, E.G.Riley/TAMU-ENT Barcode X1017220, X1014297, X1017225, X1016758/Tenebrionid Base Aaron D. Smith Catalog # 16615, 16617, 16613, 16612/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single specimen, TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°58'38"N 97°40'59"W IV-20-2001. E.G. Riley/TAMU-ENT barcode X1013595/Tenebrionid Base Aaron D. Smith Catalog # 16627/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Single specimen, TX Nueces Co. USA/13m. S. Corpus Christi South Padre Island R. Haswell Coll. 4.6.1997 Sand dunes near ocean/ex Richard H. Haswell Collection, October 2008 TAMU Insect Collection/TAMU-ENT barcode X1073323/Tenebrionid Base Aaron D. Smith Catalog # 16767/PARATYPE *Ulus*

paniculus Lumen & Smith 2019. Six specimens, USA: TEXAS: Cameron Co. S.Padre Isl, North end Hwy.1 26.24510°N,97.18601°W III-6-2009, sifting organic debris in sand, M.Quinn & E.Riley-472/Tenebrionid Base Aaron D. Smith Catalog #16637, 16642, 16650-16653/TAMU-ENT barcode X0831589, X0831559, X0831701, X0831604, X0831638, X0831768/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Four specimens, TEXAS: Brazoria Co. Surfside Beach VI-13-1999 A. R. Gillogly/TAMU-ENT barcode X1010936, X1012971, X1016512, X1000126/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Nine specimens, Nueces Co., Texas, USA Corpus Christi, S.Padre I. R. Haswell 10-16-2002 beach dunes under plank/ex Richard H. Haswell Collection, October 2008 TAMU Insect Collection/TAMU-ENT barcode X0091469, X0091588, X0999263, X0999340, X0999387, X0999650, X0999857, X0999929, X1072354/Tenebrionid Base Aaron D. Smith Catalog # 16677, 16768, 16676, 16771, 16766, 16769, 16679, 16770, 16678/PARATYPE *Ulus paniculus* Lumen & Smith 2019. Fifteen specimens, TEXAS: Kleberg Co. Padre Isl. beach, ca.1 mi. S. Nueces Co. line V-15-1999 Coll. E. Riley-808/TAMU-ENT barcode X1001447, X1009763, X1013249, X1013464, X1013851, X1015500, X1015583, X1016010, X1016581, X1016643, X1017102, X1017521, X1017791, X1036305, X1036368/Tenebrionid Base Aaron D. Smith Catalog # 16365, 16367, 16368, 16372-16382, 20980/PARATYPE *Ulus paniculus* Lumen & Smith 2019.

Diagnosis. Endemic to Corpus Christi and Padre Islands in Texas. Difficult to separate from *U. crassus* and *U. hirsutus*, with which it co-occurs. The best combination of characters to delineate *U. paniculus* from the other species are the lateral margins of the pronotum (evenly arcuate in *U. paniculus* versus *U. crassus*), velvety or matte finish on elytral interstices (v.s. shining or nearly nitidous in *U. hirsutus*) and the absence of pro/mesotarsal pencil pads in the males (which are present in both *U. crassus* and *U. hirsutus*).

Description. Length 5.0–5.5 mm, width 2.0–3.5 mm (n = 95). Color shining aeneous to brown or black. **Head:** Densely foveate. **Prothorax:** Pronotum narrowing anteriorly, apices produced, sometimes weakly. Lateral margin arcuate. Densely foveate. Lateral margin costate, with setal fimbriae. Hypomeron punctate and rugose. Hind margin carinate. **Pterothorax:** Epipleuron punctate with small tubercles. Elytron striae shallow and foveate. Intervals punctate and smooth to rugose. Lateral margin costate, with setal fimbriae. Flight wings fully developed. **Abdomen:** Base of aedeagus weakly curved, parameres subtriangular and tapered to point. **Legs:** Anterior tibia apically dilated with lateral projection at apex. Meso and meta tibia slightly curved and dilated apically. **Males:** Tarsi without pencil pads. First three protarsi at

most only feebly dilated, barely more robust than the fourth.

Etymology. The diminutive *panis*, in reference to bread or tuft. Named in reference to the type locality of Corpus Christi, and the habitus of the species.

Distribution (Fig. 5). United States: TX (Corpus Christi and Padre Island).

Ulus steineri Lumen & Smith, sp. nov.
(Fig. 2B; 3A–C; 4F; 5)

Studied material. HOLOTYPE, male (USNM): (a) “USA: Texas: Ward Co., Monahans / Sandhills SP, at night on dunes, / 837m, 31.6375°N 102.8174°W, 7- / 8.vi.2014 KK14_014. K. Kanda, K. / T. Eldredge, J. M. Pflug”; (b) on blue paper “Tenebrionid Base / Aaron D. Smith / Catalog#23147”. PARATYPES: (CSCA): Single specimen, TEXAS Ward Co. Monahans VII-77 Dr.

Lenczy col./*Ulus fimbriatus* Csy Det. Rolf L. Aalbu 1981/PARATYPE *Ulus steineri* Lumen & Smith 2019. Single specimen, USA: TX, Ward Co. Monahans St. Park VII-19 1977 A.V. EVANS/*Ulus fimbriatus* Casey Det. Rolf L. Aalbu 1987/PARATYPE *Ulus steineri* Lumen & Smith 2019. (OSUC): Single specimen, Ward Co., Texas Monahans Sand Hills 16-VII-72/W.E.&C.A. Triplehorn Collectors/ B.W. Triplehorn Collector/*Ulus fimbriatus* Casey Det. C.A. Triplehorn ‘72/OSUC Barcode 717112/PARATYPE *Ulus steineri* Lumen & Smith 2019. Twenty-one additional specimens bearing same labels, OSUC Barcode numbers 717082-717086, 717113-717123, 717128-717132. Single specimen, TEX. Ward Co. 2mi. E Monahans 4-20-1970/sifting sand C.W.O’Brien/*Ulus fimbriatus* Det. C.A. Triplehorn ‘72/OSUC Barcode 717081/ PARATYPE *Ulus steineri* Lumen & Smith 2019. Four additional specimens bearing same labels, OSUC Barcode numbers 717124-

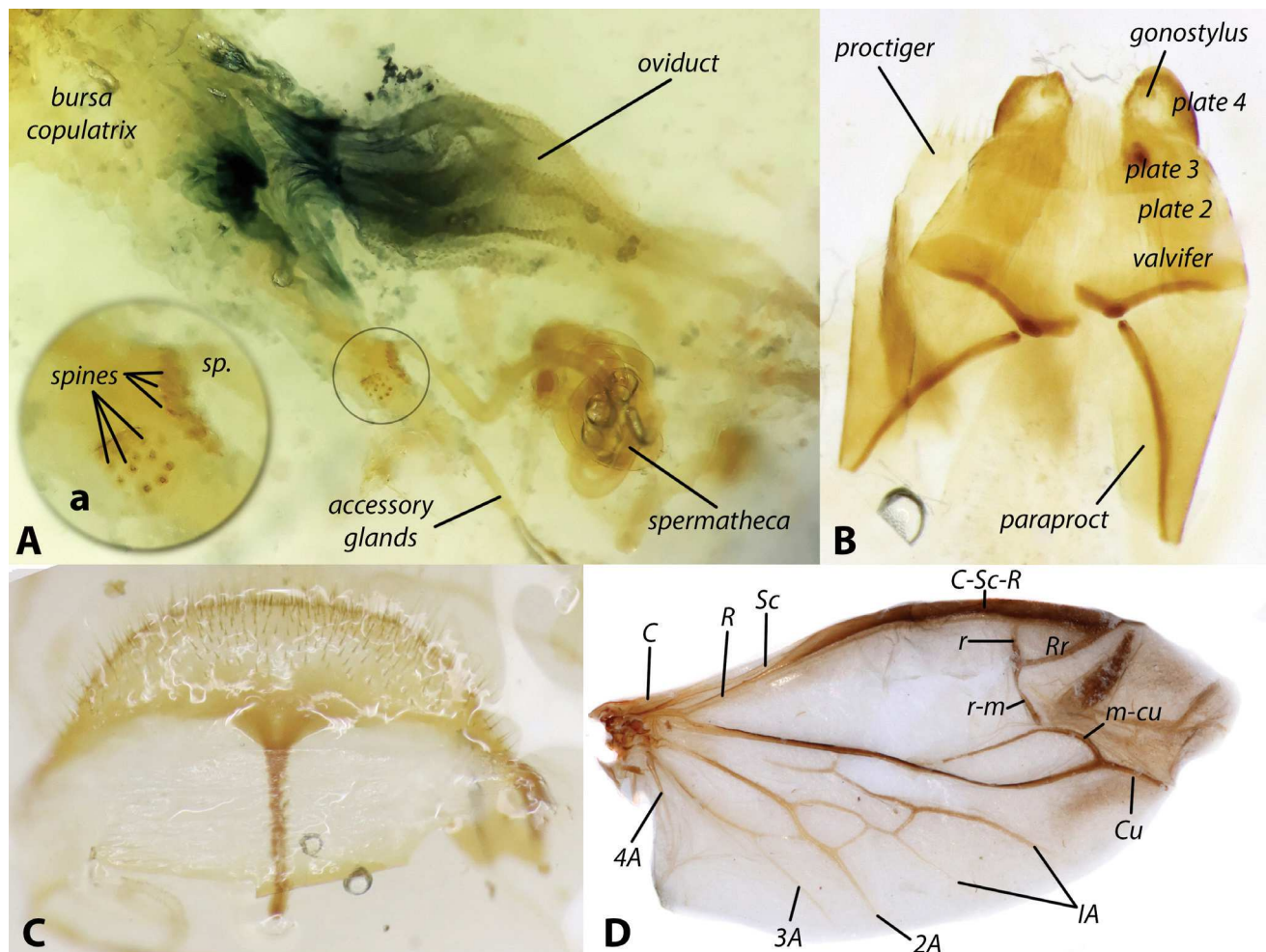


Figure 3. Female terminalia and wing morphology of selected *Ulus* species: (A–B = internal and external genitalia; C = spiculum ventrale) *U. steineri*; (D = wing) *U. obliquus*. Abbreviations: sp. = spermatheca; C = costa, R = radius, Sc = subcosta, r = radial cross vein, Rr = recurrent radius, r-m = radiomedian cross vein, m-cu = mediocubital cross vein, Cu = cubitus, 1–3A = anal veins.

717127. Single specimen, Ward Co., Texas Monahans Sand Hills 28-VII-73/W.E.&C.A. Triplehorn Collectors/Ulus fimbriatus Det. C.A. Triplehorn '73/OSUC Barcode 717087/PARATYPE Ulus steineri Lumen & Smith 2019. Thirty-four additional specimens bearing same labels, OSUC Barcode numbers 717088-717111, 717188-717196, and 717251. **(USNM):** Thirty-three specimens, Monahans Ward Co. Texas/Stephan 7.1972 /Loan from USNM 2079495/ PARATYPE Ulus steineri Lumen & Smith 2019. Single specimen with same labels bearing additional label, Ulus fimbriatus Casey. Single specimen, TEXAS: Winkler Co. Kermit June 1983 Dr. Lenczy/Tenebrionid Base Aaron D. Smith Catalog # 23149/Ulus steineri R.Lumen 2018/Loan from USNM 2079495/PARATYPE Ulus steineri Lumen & Smith 2019. **(KKIC):** Fifteen specimens, USA: Texas: Ward Co., Monahans Sandhills SP, at night on dunes 837m, 31.6375°N 102.8174°W, 7-8.vi.2014. KK14_014. K.Kanda, K. T. Eldredge, J.M. Pflug/PARATYPE Ulus steineri Lumen & Smith 2019. Single specimen with additional labels, KKSP 000000506 K. Kanda Voucher/Tenebrionid Base Aaron D. Smith Catalog # 18321/Ulus steineri R. Lumen 2018. **(EMEC):** Single specimen, TEX: Ward Co. Monahans Sand Dunes, 6mi NE Monahans. IX-30 86 J.T.&E.A. Doyen/UC Berkeley EMEC barcode 1184979/ PARATYPE Ulus steineri Lumen & Smith 2019. **(CASC):** Single specimen, Monahans Ward Co. Texas DrLenczy VII.1977/California State Univ. Long Beach

1996 donation to Calif. Acad. Sci./Ulus fimbriatus Csy Det. R. L. Aalbu 1978/PARATYPE Ulus steineri Lumen & Smith 2019. **(BYU):** Single specimen, TEXAS: Ward Co. Monahans Sandhills State Park 31°38'11"N 102°49'01"W 825 m elevation 1-2 July 1999 C.R. Nelson #6964 & class/ Bringham Young University Arthropod Collection Barcode BYUC084778/Ulus fimbriatus Casey Det. C.A. Triplehorn '04/PARATYPE Ulus steineri Lumen & Smith 2019. **(TAMU):** Four specimens, TEXAS: Ward Co. Monahans sandhills St.Pk, V-5-1994 D.E. Bowles organic debris/TAMU-ENTO Barcode Labels X1011480, X1013908, X1012339, X1010487/ PARATYPE Ulus steineri Lumen & Smith 2019. Twenty-four specimens, USA: TEXAS Ward Co. Monahans Sandhills St. Pk. 31.63714°N 102.81717°W VII-11-13-2011 E.G. Riley on sand among plant debris/TAMU ENTO Barcode labels X0619340, X0619356, X0619460, X0619476 X0619529, X0619586, X0619633, X0619646, X0619657, X0619661, X0619678, X0619689, X0619708, X0619728, X0619729, X0619743, X0619745, X0619749, X0619769, X0619781, X0619785, X0619790, X0619795, X0619798/PARATYPE Ulus steineri Lumen & Smith 2019. Single specimen, TEXAS Crane Co. Jet 1053 & 1233 sand hills 10-26-V-1997 J.E.Wappes/Flight intercept"/"Pitfall trap/Ulus elongatulus Csey CAT./TAMU-ENTO Barcode label X1015641/Tenebrionid Base Aaron D. Smith Catalog #19604/PARATYPE Ulus steineri Lumen & Smith 2019.

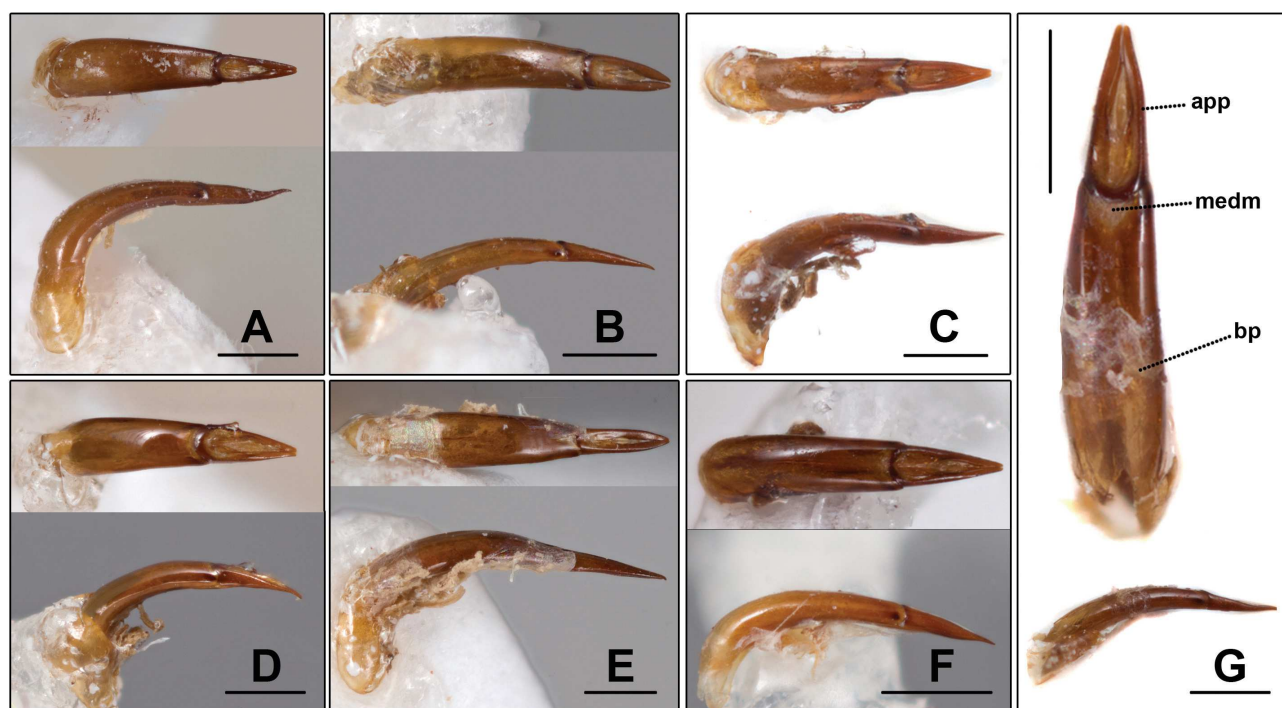


Figure 4. Aedeagal morphology of *Ulus* species. (A) *U. crassus*; (B) *U. guapo*; (C) *U. hirsutus*; (D) *U. lineatulus*; (E) *U. obliquus*; (F) *U. steineri*; (G) *U. paniculus*. Abbreviations: app = Apical portion (parameres) of the tegmen; medm = median membrane; bp = Basal portion of tegmen. Scale = 0.5 mm.

Diagnosis. A known undescribed species for some time, Casey's 1890 key produced the result of *U. fimbriatus* (synonomized here with *U. obliquus*) and most material with determinations examined for this study had this identification. All loaned specimens were collected from outside of the immediate area of Monahans, Texas. However, it is likely that *U. steineri*'s distribution follows the Monahans Sandhills (see Paulsen & Smith 2005). This species is similar to *Ulus guapo* sp. nov. but can be delineated from it and other *Ulus* species through the following combination of characters: wings brachypterous; lateral pronotal and elytral fimbriae longer; elytral intervals densely rugose and tuberculate; protarsi of males at most only feebly dilated, and lacking pencil pads. Base of aedeagus with shallow curve and parameres relatively short.

Description. Length 4.5–5.5 mm, width 2.5–3.5 mm ($n = 185$). Color shining aeneous to brown or black. **Head:** Densely punctate. Puncture diameter nearly equal to setal diameter. **Prothorax:** Pronotum narrowing anteriorly, apices roundly produced, lateral margin arcuate. Densely foveate. Lateral margin costate, with setal fimbriae. Hypomeron punctate and rugose. Hind margin carinate. **Pterothorax:** Epipleuron punctate and densely tuberculate. Elytron striae shallow and punctate. Intervals punctate, rugose, and tuberculate. Lateral margin costate, with setal fimbriae. Flight wings reduced. **Abdomen:** Base of aedeagus straight to weakly curved, parameres subtriangular and tapered to a point. **Legs:** Anterior tibia apically dilated with lateral projection at apex (sometimes variably so). Meso and metatibia slightly curved and dilated apically. **Males:** Tarsomeres without pencil pads. First three protarsi at most only feebly dilated, barely more robust than the fourth.

Etymology. Named for Warren E. Steiner Jr., whose great contributions to tenebrionid work is inspiring and greatly appreciated, and in recognition of his generosity in leaving the description of this species to future workers.

Distribution (Fig. 5). United States: TX (Monahans Dunes).

DISCUSSION

This revision recognizes seven species of *Ulus*. Of these, the most difficult to distinguish are some of those which overlap in the region of Texas and Mexico, i.e. *U. crassus*, *U. hirsutus*, *U. obliquus*, *U. guapo*, and *U. paniculus* (Fig. 5). In addition to subtle differences in the characters uncovered in this revision, many of the specimens from the area appear to have intergrades or variations within characters such as pronotal shape, punctuation, paramere shape, and

pro/mesotarsal pads. Upon examination, and comparison with type material, these variations and thus the species to which they are attributed (*U. elongatulus*, *U. maritimus*, *U. fimbriatus*) are synonomized into *Ulus hirsutus* in this revision. All three of these synonomized species were described by Casey, whose penchant for describing variation is widely known (see Triplehorn 1972). This revision has uncovered non-sexual traits (outlined in the descriptions and key provided) to delineate *U. crassus*, *U. obliquus*, and *U. paniculus* from *U. hirsutus*; however, in areas with high overlap (such as Texas), even these characters can break down and species can become difficult, if not impossible, to determine. Potential reasons for this breakdown could be hybridization, cryptic species, or simply differences between populations (Kubota & Sota 1998); however, the reasons for these similarities are beyond the scope of this revision as molecular work will likely be needed to truly realize the differences between populations of *U. hirsutus* and other potentially sympatric species. Outside of Texas, *U. margaritensis* and *U. venezuelensis* are also synonomized into *U. hirsutus*, extending the species' range down into South America. Marcuzzi (1954) appears to have given species rank to variation within *U. hirsutus*. While he outlined differences in punctuation, setae, and parameres, his type material did not support his descriptions, and the differences fell well-within variation presently observed in *U. hirsutus* outside of South America. While *U. hirsutus* bears the brunt of synonomies in this revision, *U. obliquus* also appears to have some variation described within different species.

Ulus obliquus, as described by Casey and by Blaisdell (who described *U. latus*) in their treatments, is the largest species in the genus; an observation supported by this study. It appears that Blaisdell's (1892) *U. latus* is a male *obliquus* (for which the holotype is female), and Casey (1890) described variation extending into Texas. Upon dissection of material from the type localities, male genitalia is consistent—elongate parameres more than three times longer than wide. *Ulus obliquus* is the only species to possess parameres of this sort within the genus, making separation of males both reliable and straightforward (Fig. 4E). Non-sexual traits that can be used for differentiating *U. obliquus* from other species are the nature of the pronotal shape, punctuation, and setation (narrowing from base to apex; with dense, ovular, sometimes coalescent punctures; bearing short, dense fimbrial setae laterally) (Fig. 1D–E). Unfortunately, paramere morphology does not work for delineating all species.

In particular, *U. crassus* has distinct paramere morphology in the western U.S. (Fig. 4A), but eastward into Texas, the variation in *U. hirsutus* begins to obfuscate the upward curvature in the apex of *U. crassus*' parameres. Additionally, the pronotal morphology

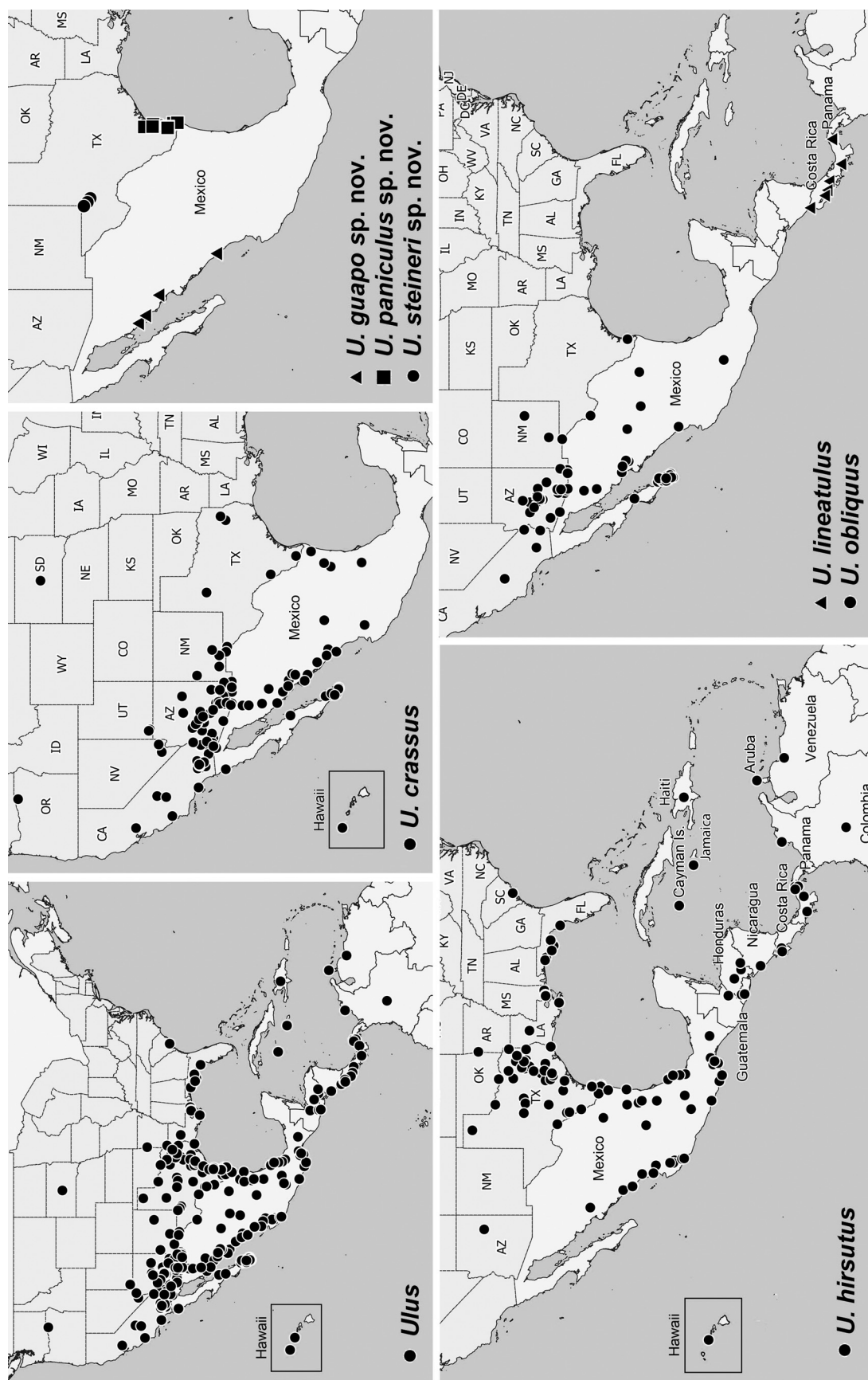
Figure 5. Distribution of *Ulus*.



Figure 6. Holotype of *Ulus minutus* Wickham, 1914 (deposited at AMNH). Impression fossil from the Florissant shale formation in Colorado, USA (approx 34 million years old). Due to lack of synapomorphies it is hereby placed as incertae sedis within Tenebrioninae (Photograph by Warren Steiner).

—normally quite reliable in *U. crassus* (Fig. 1B), breaks down with the variation introduced by *U. hirsutus* and *U. paniculus*. Making matters worse, the texturing of the elytral intervals, another useful character for delineating species, is variable in the region of Texas. As such, it is important to observe all characters as a sum of their parts, rather than relying on a single character for this genus.

Contrastingly, *U. steineri*, *U. guapo*, and *U. lineatulus* are apomorphic compared to the other species. Pronotal/elytral sculpturing, shape, and pelage can all be used for these three to separate them reliably within their range. Additionally, these three species are relatively restricted in their known distributions, and co-occur with other species (Fig. 5). *Ulus guapo* bears a striking resemblance to *U. obliquus* and *U. steineri*. The shape of the foretibia (Fig. 2A), in addition to the shape of the male terminalia (Fig. 4B), can be used to separate *U. guapo* from *U. obliquus*, and the Monahans Dunes endemic *U. steineri* can be separated based on terminalia shape (Fig. 4F), flight wing morphology (Fig. 2B), rugosity/tubercles of the elytra, and isolated range. The aeolian Monahans dunes in Texas are geologically young and mobile, as well as home to other endemic species (Paulsen & Smith 2005). Future studies would benefit by incorporating more species of *Ulus* into the molecular data set provided by Lumen *et al.* (2019) to test whether sympatric or allopatric speciation is taking place within their range.

Examination of female terminalia revealed that all but two *Ulus* species (*U. lineatulus* and *U. obliquus*)

possess sclerotized plates with spines in their bursa copulatrix. These plates are situated near-to the entrance of the spermatheca (Fig. 3A). This structure was overlooked by Iwan & Kamiński (2016) and Lumen *et al.* (2019). However, the spines are clearly visible in Lumen *et al.*'s (2019) paper within the Figure 3B. According to the background provided by Iwan & Kamiński (2016), the presence of such structures is likely restricted to *Ulus* within Blapstinina. However, similar spines were also reported for some closely related tribes such as Platynotina (Iwan 2000, Banaszkiewicz 2006). The function of these structures remains unclear.

ACKNOWLEDGMENTS

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Appendix. Label data for studied non-typical specimens.

Note: Following is additional material examined and corresponding information databased for generation of distribution maps. Format: **Insect collection specimen originated from:** Specimen count; Label Data / Tenebrionid Base Aaron D. Smith Catalog #.

Ulus crassus (LeConte, 1851)

ADDITIONAL MATERIAL: (ADSC): Single specimen; 3 mi. E Borrego Spr., San Diego Co. Calif. 4/17/62 J.E. Prine Coll./Tenebrionid Base Aaron D. Smith Catalog # 17992. Two specimens; Blythe Calif. Aug. 14 19545 A.E.Lewis Col./Tenebrionid Base Aaron D. Smith Catalog # 17989, 17990. Single specimen; Mexico: Baja Cal.Sur toll plaza lights on toll road from Los Cabos airport-Hwy. 1; ix-29- 2003; W.B. Warner/Tenebrionid Base Aaron D. Smith Catalog # 18003. Single specimen; Santa Rosa Mt. Riv.Co.,Calif. VII-15-64; 5300' G. Forister Collector/Tenebrionid Base Aaron D. Smith Catalog # 17991. **(AMNH):** Two specimens; 10 Mi.W.Alamos, Sonora,Mexico July 21,1954 M.Cazier W.Gertsch Bradts Collectors/Tenebrionid Base Aaron D. Smith Catalog # 19540, 19541. Single specimen; ARIZ.,Cochise Co. Douglas Aug 20 1969/Tenebrionid Base Aaron D. Smith Catalog # 20354 Single specimen; ARIZ.,Cochise Co. Douglas AUG. 16 1969/Tenebrionid Base Aaron D. Smith Catalog # 2352. Single specimen; ARIZ.,Cochise Co. Douglas July 21 1968/Tenebrionid Base Aaron D. Smith Catalog # 20353. Five specimens; Green Valley Pima Co. Arizona Dr. Lenczy 9.1970/Tenebrionid Base Aaron D. Smith Catalog # 20363 – 20366, 20394. Single specimen; MEX.,Sinaloa 5 mi. NW Mazatlan, El. S.L., X-3-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 19534. Single specimen; Naco, Sonora, Mex.5000 ft. 8-15-49 G.M.Bradt/Tenebrionid Base Aaron D. Smith Catalog # 19509. Three specimens; Near Aragon Catron Co.,N.Mex. C.Clayton Hoff B-119 See Clayton Hoff card file for additional data/Tenebrionid Base Aaron D. Smith Catalog # 19535 – 19537. Eight specimens; Obregon, Sonora,MEx. VII-29-1952 C.&P.Vaurie/Tenebrionid Base Aaron D. Smith Catalog # 19501 – 19508. Single specimen; Phoenix Ariz/Tenebrionid Base Aaron D. Smith Catalog # 20512. Two specimens; S. Dak./Tenebrionid Base Aaron D. Smith Catalog # 20099, 20100. Single specimen; Senator Ariz. Ac. 5409 CollChasPalm/Tenebrionid Base Aaron D. Smith Catalog # 20496. Four specimens; Tucson,Ariz. Pima Co. VII-29-49 2700 ft. G.M.Bradt/Tenebrionid Base Aaron D. Smith Catalog # 19545 – 19548. Single specimen; Tucson,Ariz. Pima Co. VIII-1-1953 G.M.Bradt/Tenebrionid Base Aaron D. Smith Catalog # 19510. Single specimen; Yuma, Ariz. Yuma Co. VIII-6-48 C&P. Vaurie/Tenebrionid Base Aaron D. Smith Catalog # 19551. **(CASC):** Single specimen; 30 Mi So Nogales Sonora July141958 TEKendrick/Tenebrionid Base Aaron D. Smith Catalog # 18444. Single specimen; Ariz.- Pima Co. Continental VII-10-1974/Tenebrionid Base Aaron D. Smith Catalog # 20331. Single specimen; Ariz.- Pima Co. Green Valley 23-VIII-72 Nite Lite P.Schroeder Coll./Tenebrionid Base Aaron D. Smith Catalog # 20330. Five specimens; Ariz. Pima Co. Green Valley VII-1972/Tenebrionid Base Aaron D. Smith Catalog # 20332, 20358, 20359, 20360, 20362. Single specimen; ARIZ.Yuma Co. 33 mi.S Quartz 7217 J.A.Gruwell Coll.VIII-30-69 Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # , 18198. Two specimens; ARIZONA, Maricopa Co. Gila river at airport road VI-18-1990 flight intercept trap W.B. Warner col./Tenebrionid Base Aaron D. Smith Catalog # 19574, 19576. Three specimens; Borrego Sprs., San Diego Co., IV-19-58 E.L. Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 18186 – 18188. Single specimen; Borrego Sprs., San Diego Co., X-20-57 Cal. E. L. Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 18185. Four specimens; CALIF. VIII-18-68 Josh.Tree NM Pleasant Vly.3 Collected by BLACKLITE E.L. Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 18192 – 18194, 18196. Two specimens; CALIF.VIII-15-69 Josh.Tree NM Pleasant Vly.3 Collected at BLACKLITE E.L. Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 18190, 18191. Single specimen; Coachella V-9.27.Cal. F.H. Wymore Collector/Tenebrionid Base Aaron D. Smith Catalog # 19347. Single specimen; Dome Ariz. July21, 1924 EPVanDuzee Collector/Tenebrionid Base Aaron D. Smith Catalog # 19601 Single specimen; Ehrenberg, Ariz. VII-28-1938 F.H. Parker Blaisdell Collection/Tenebrionid Base Aaron D. Smith Catalog # 19600. Two specimens; Hermosillo Mex. IV.19, 1897/Tenebrionid Base Aaron D. Smith Catalog # 18203, 18204. Two specimens; HotSprings VIII-10Ariz E. Schifel Coll.1918 J.W.GREEN COLLECTION/Tenebrionid Base Aaron D. Smith Catalog # 20326, 20327. Five specimens; Indio, Cal. IV.24.1952 Bryant Lot32/Tenebrionid Base Aaron D. Smith Catalog # 19925 – 19928, 19930. Five specimens; Indio, Calif. 14 Sept. 1951 N.A. Lewis Collector/Tenebrionid Base Aaron D. Smith Catalog # 19763 – 19767. Single specimen; Los Angeles Co., Long Beach Cal. X-6-60 E.L. Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 18189. Three specimens; MEX. Baja Calif. Sur, 2.5 mi. SE Todos Santos, El.200', X-6/17-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE California State Univ. Long Beach 1996 donations to Calif. Acad. Sci./Tenebrionid Base Aaron D. Smith Catalog # 17890, 19299, 19300. Two specimens; MEX. Baja Calif. Sur, 7.5 mi. W El Triunfo, El.1500', X-11/12-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE California State Univ. Long Beach 1996 donations to Calif. Acad. Sci./Tenebrionid Base Aaron D. Smith Catalog # 17888, 19306. Four specimens; Mex. Sonora 6 mi. S Benjamin Hill VII-6-63 Blacklite E.Sleeper, W. Agnew, G Noonan P.SullivanCollr./Tenebrionid Base Aaron D. Smith Catalog # 18183, 19730 – 19732. Two specimens; MEX.,

Appendix. Continued.

Baja Calif. Sur, 4 mi. S E, Pescadero, El.50', X-23/24-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 18443, 19812. Two specimens; MEX., Baja Calif. Sur, 8 mi. SE La Paz, El. 1000', X-13-68 E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 18441, 21751. Four specimens; MEX., Baja Calif.Sur, La Paz, El.50', X-6-68, E.L.Sleeper&F.J.Moore/Tenebrionid Base Aaron D. Smith Catalog # 21752 – 21754, 21756. Single specimen; MEX., BajaCalif. Sur, 6 mi. E SanJose del Cabo, El.200', X-26/27-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 18439. Single specimen; MEX., Sinaloa Rio Piaxtla 1 mi. W Mex. No. 15 Blacklite 20w E. Sleeper,R.An- derson, A. Hardy R.Somerby Collr. /Tenebrionid Base Aaron D. Smith Catalog # 18199. Two specimens; Mex., Sinaloa, 12mi. NE El Fuerte E.Sleeper,R.An- derson,A.Hardy, R.Somerby Collr. Blacklite 20w/Tenebrionid Base Aaron D. Smith Catalog # 18184, 19293. Two specimens; MEX., Sinaloa, 26 mi. NE Villa Union El.1000 ft. E. Sleeper,R.An- derson,A.Hardy, R.Somerby_Collr/Tenebrionid Base Aaron D. Smith Catalog # 19288, 19289. Single specimens; MEX.,Baja Calif. Sur 6 mi.E SanJose del Cabo, El.200', X-26/27-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 19296. Two specimens; MEX.,Baja Calif. Sur, 3 mi. La Burrera El.1800', X-17/19-68, E.L.Sleeper&F.J.Moore/Tenebrionid Base Aaron D. Smith Catalog # 19866, 19867. Two specimens; MEX.,Baja Calif.Sur, 2.7 mi. SE VallePerdido El.1800', X-15/16-68 E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 19307, 19308. Single specimen; MEX.Baja Calif.Sur 1 mi.SW Sta.Catarina June 29-30, 1967 ELSleeper, EMFisher BLACKLITE/Tenebrionid Base Aaron D. Smith Catalog # 18200. Thirty-two specimens; MEX.Sonora Hermosillo VII-9 to 16-53 B.Malkin/Tenebrionid Base Aaron D. Smith Catalog # 19358 – 19369, 19374, 19870 – 19888. Eight specimens; MEX: Sonora, Novojoa IX-26-1953 B.Malkin/Tenebrionid Base Aaron D. Smith Catalog # 19355 – 19357, 19889, 19890, 19892 – 19894. Two specimens; MEXICO: BAJA CALI- FORNIA SUR: 3 km E La Burrera, 515m 2-IX-1977 E.Fisher, R.Westcott Calif.Acad.Sci.Coll./Tenebrionid Base Aaron D. Smith Catalog # 17880, 17895. Single specimen; MEXICO: Sonora, Alamos, VIII-12-60 P.H.ARNAUD,JR. E.S.ROSS D.C.RENTZ/Tenebrionid Base Aaron D. Smith Catalog # 19352. Single specimen; MEXICO:Sonora Corral, Yaqui River area VII-15-1950 Col.by J.P. Figg-Hoblyn/Tenebrionid Base Aaron D. Smith Catalog # 19348. Twenty-nine specimens; Salton Sea beach Imperial Co.Calif VII-24-1952 J.W. Green Collectors Ulus spp. Det. J. Doyen, 1994/Tenebrionid Base Aaron D. Smith Catalog # 19349, 19897 – 19924. Four specimens; St Xavier Msq. Tucson Ariz. July 29,1924 J. O. Martin Collector/Tenebrionid Base Aaron D. Smith Catalog # 19569 – 19572. Single specimen; Tamazunchale S.L.P., Mex. XI-23-46 E.S.Ross Collector/Tenebrionid Base Aaron D. Smith Catalog # 19896. Single specimen; Tucson Pima Co. Ariz.IV.19.39 B. P. Bliven Collector Lot 173Sub47 BRUNSON P. BLIVEN COLLECTION 1981 Accession CALIF. ACAD. OF SCI./Tenebrionid Base Aaron D. Smith Catalog # 17881. Single specimen; Tucson, Ariz. Aug. 1936 Bryant. /Tenebrionid Base Aaron D. Smith Catalog # 18455. Single specimen; Tucson, Arizona Alt. 2400 ft. Light July 25, 1925 R.B. Streets 12195 Blais. R.Hopping Collection/Tenebrionid Base Aaron D. Smith Catalog # 20325. Single specimen; U. S. A.: ARIZONA: Yavapai County Wickenburg, 10-VIII- 1955 Paul W. Johnson Pres.to Calif.Acad./Tenebrionid Base Aaron D. Smith Catalog # 19595. Two specimens; U.S.A.: California, Riverside County, 10 mi N of Indio 7 April 1953 donated by E.L.Klee/Tenebrionid Base Aaron D. Smith Catalog # 17878, 17879. Four specimens; Yuma Ariz. April 14 1923 EPVanDuzee Collectors/Tenebrionid Base Aaron D. Smith Catalog # 19596 – 19599.

(CSCA): Single specimen; ARIZ: Yavapai Co. Date Creek Wash at Highway 93 IX-29-80 FG Andrews & AR Hardy Cereal bowl pit trap/Tenebrionid Base Aaron D. Smith Catalog # 20350. Twenty specimens; ARIZ:Maricopa Co. 8mi SE Wickenburg IV-29-78 A.R.Hardy and Fred G.Andrews/Tenebrionid Base Aaron D. Smith Catalog # 20506 – 20511, 20513 – 20523, 20525 – 20527. Single specimen; MEX: Baja Calif. Sur 3.3mm. S El Cien IX-26-1981 D.Faulkner & F.Andrews coll. at blacklight/Tenebrionid Base Aaron D. Smith Catalog # 21748. Single specimen; MEX: Baja Sur 5 mi.N Mulege X-14-83 F.Andrews & D.Faulkner BLACKLIGHT/Tenebrionid Base Aaron D. Smith Catalog # 21757. Single specimen; MEX: Sonora Navajoa VII-22-1967 At motel lights/Tenebrionid Base Aaron D. Smith Catalog # 23150. Single specimen; NEVADA: Clark Co. 2mi.N Logandale, 1500' sand dunes D.Giuliani IX-83 to III-1984 Antifreeze pit trap/Tenebrionid Base Aaron D. Smith Catalog # 20098. Single specimen; USA: CA. Riverside Co. Riverside viii.2003, K.W.Cooper, blk./Tenebrionid Base Aaron D. Smith Catalog # 18446. **(EMEC):** Single specimen; 0 mi. Virgin Washington Co. UTAH, 3400' IV-7-1963 L.R.O'Brien Collector/Tenebrionid Base Aaron D. Smith Catalog # 20096. Single specimen; Ariz:CochiseCo., GuadalupeCyn.,31mi. NE.DouglasVII-27-63 A.Riske Collector/Tenebrionid Base Aaron D. Smith Catalog # 20725. Single specimen; Ariz:Yuma Co., Colorado Riv.at ParkerVIII-15-63 M.J.Tauber C.A.Toschi Collectors/Tenebrionid Base Aaron D. Smith Catalog # 20724. Two specimen; CA:Blythe Mayflower Co. Pk. 13 APR 1981 J.K.Liebherr/Tenebrionid Base Aaron D. Smith Catalog # 17368, 17369. Single specimen; Casa Grande Ariz.iii.3.55 under carrion R.S.Beal Collector/Tenebrionid Base Aaron D. Smith Catalog # 20731. Single specimen; Douglas 3/14/33 Ar. W.W.Jones FHParker/Tenebrionid Base Aaron D. Smith Catalog # 21659. Two specimens; in vicinity Mesa Maricopa Co. Ariz.VII-23-64 J.Haddock at Blacklight/Tenebrionid Base Aaron D. Smith Catalog # 21675, 21676. Single specimen; SEDONA Az 4.3.47 R.S.Beal/Tenebrionid Base Aaron D. Smith Catalog #

Appendix. Continued.

20727. Single specimen; Tucson VII Pima Co. Ariz.20.53 R.S.Beal Collector/Tenebrionid Base Aaron D. Smith Catalog # 21668. Single specimen; Tucson, Az. Sept. 1 1947 R.S. Beal/Tenebrionid Base Aaron D. Smith Catalog # 21669. Two specimens; U.S.A. ARIZ. Santa Cruz Co. Pena Blanca At light 427 VII-25-1959 R.H.Arnett, Jr./Tenebrionid Base Aaron D. Smith Catalog # 20705, 20706. Four specimens; Whittaker's Forest Sequoia Natl. Park, Calif. Aug. 73 Collected at light/Tenebrionid Base Aaron D. Smith Catalog # 17341 – 17344. **(FMNH)**: Five specimens; ARIZONA: Pima Co. Tucson (10 Mi E) 30.VII.1969 At Light W. Suter leg/Tenebrionid Base Aaron D. Smith Catalog # 20489 – 20493. Three specimens; Green Vall Pima Co Az IX-1970 R. Lenczy/Tenebrionid Base Aaron D. Smith Catalog # 20539 – 20541. Three specimens; Nogales St Cruz Co, Ariz. VIII.12.06 COLL'D BY FW NUNENMACHER/Tenebrionid Base Aaron D. Smith Catalog # 20494, 20495, 20497. Single specimens; Pt Mts Arizona/Tenebrionid Base Aaron D. Smith Catalog # 20542. **(KKIC)**: Single specimen; Pt Mts Arizona/Tenebrionid Base Aaron D. Smith Catalog # 20688. Single specimen; USA: Arizona: Pima Co., Green Valley rest area off I-19, 919m, N 31.7708, W 111.0343 10.viii.2013. KK13_052 K. Kanda/Tenebrionid Base Aaron D. Smith Catalog # 15719. Single specimen; USA:California:Solano Co. Sandy Beach Park 38.1378,-121.6958 KK10_054, 3m K. Kanda, 21.vi.2010/Tenebrionid Base Aaron D. Smith Catalog # 17383. Single specimen; Willcox 25-7 CollHubbard &Schwarz 1976/Tenebrionid Base Aaron D. Smith Catalog # 20685. Single specimen; Willcox playa KK08_125/Tenebrionid Base Aaron D. Smith Catalog # 15722. **(MCZ)**: Sixteen specimens; Phoenix Ari Liebeck Collection/Tenebrionid Base Aaron D. Smith Catalog # 20746 – 20761. Four specimens; Phoenix Ariz Roland Hayward Coll./Tenebrionid Base Aaron D. Smith Catalog # 21604 – 21607. **(RLAC)**: Three specimens; 32.13'25"N/109.46'56"W USA:Arizona:Cochise Co. 5.7km SEof Willcox, Blue Sky Road 15.viii.2000[AZ15VIII00.2]/Tenebrionid Base Aaron D. Smith Catalog # 20081, 20085, 20543. Single specimen; 6 mi. E. Mecca Riverside Co.,CALIF. 11 May 1974 P. H. Sullivan, coll./Tenebrionid Base Aaron D. Smith Catalog # 18011. Single specimen; 7 APRIL 1966 MEXICO Sonora Santa Ana D.G.Marqua Collector/Tenebrionid Base Aaron D. Smith Catalog # 20082. Three specimens; ARIZ., Santa Cruz Co., Nogales, VII-15-73 Rolf L. Aalbu collr. BLACKLIGHT/Tenebrionid Base Aaron D. Smith Catalog # 19577 – 19579. Two specimens; ARIZ.: Pima Co., Green Valley Sept. 1970 leg. R. Lenczy gift of N.M.Downie Purdue Univ./Tenebrionid Base Aaron D. Smith Catalog # 20432, 20433. Single specimen; ARIZONA, Maricopa Co. Gila river at airport road VI-18-1990 flight intercept trap W.B. Warner col./Tenebrionid Base Aaron D. Smith Catalog # 19575. Single specimen; AZ: Navajo Co., Joseph City, el.5000' vii-26-1995 UV light K. W. Brown collr./Tenebrionid Base Aaron D. Smith Catalog # 20084. Single specimen; CALIF., Imperial Co., East Mesa Geothermal Site 8.0 mi. ESE Holtville, III-22/23-78, El. 55', Rolf L. Aalbu Collr./Tenebrionid Base Aaron D. Smith Catalog # 19792. Seven specimens; CALIF., Solano Co. 1 mi. Rio Vista, Sandy Beach Park IX-18-2010 38.8' 17.41"N 121.41'45.15"W 3 m.el. R.L. Aalbu col./Tenebrionid Base Aaron D. Smith Catalog # 20071 – 20077. Single specimen; CALIF.Imperial Co 1.2 mi. SW Glamis IX-14-1984 R A Cunningham Colr/Tenebrionid Base Aaron D. Smith Catalog # 18017. Single specimen; MEXICO : Baja CA Sur Naranjas Road, 7 km W. Hwy 1; 100 m. el. 5-X-1991 BL+MV RA Cunningham coll/Tenebrionid Base Aaron D. Smith Catalog # 18006. Single specimen; Mexico: Baja Cal.Sur toll plaza lights on toll road from Los Cabos airport-Hwy. 1; ix-29- 2003; W.B. Warner/Tenebrionid Base Aaron D. Smith Catalog # 18004. Single specimen; USA CA RIV. CO. JCT. HWY 10 + DILLON RD. 20-VII-1985 RA Cunningham Collector/Tenebrionid Base Aaron D. Smith Catalog # 18012. Single specimen; USA CA RIV. CO. Palm Springs vic. Bogert Trl. Rd + Palm Cyn. Dr. 8-IV-1989 RA CUNNINGHAM LEC/Tenebrionid Base Aaron D. Smith Catalog # 18016. **(RLIC)**: Single specimen; MEXICO:Baja Calif. Sur: 6.2 mi. E. Todos Santos 9 OCT 1975 T.Taylor. R. Snelling/Tenebrionid Base Aaron D. Smith Catalog # 20090. **(SBMN)**: Single specimen; Cal. S.L.O. Co. PASO ROBLES V-14-1978 I. Stramas Coll./Tenebrionid Base Aaron D. Smith Catalog # 20080. **(TAMU)**: Two specimens; ARIZ: Yuma Co. Dateland VII-23-1966 D.G. Marqua/Tenebrionid Base Aaron D. Smith Catalog # 16667, 16668. Two specimens; ARIZONA: Yuma Tacna VII-23-1966 D.G. Marqua/Tenebrionid Base Aaron D. Smith Catalog # 16669, 16670. Five specimens; AZ Sta.Cruz Co. Rio Rico Lenczy VIII-76/Tenebrionid Base Aaron D. Smith Catalog # 19585, 19588, 19589, 19591, 19592. Single specimen; CALIF: Tulare Co. Porterville VIII-2-4-1997 E.G. Riley, at light/Tenebrionid Base Aaron D. Smith Catalog # 18661. Two specimens; Cherokee Co. Tx. IV-20-1944 P.A. Young Collector/Tenebrionid Base Aaron D. Smith Catalog # 19442, 19444. Single specimen; Dimmit Co 4-24-34 Tx Tex.Exp.Sta Light Trap S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 21591. Single specimen; Dimmit Co 4-9-33 Tx S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 19955. Single specimen; Dimmit Co 6-10-33 Tx Tex.Exp.Sta Light Trap S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 19967. Single specimen; Dimmit Co 6-21-33 Tx Tex.Exp.Sta. Light Trap S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 19969. Single specimen; Dimmit Co 6-22-33 Tx Tex.Exp.Sta Light Trap S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 19966. Single specimen; Dimmit Co 6-22-35 Tx Tex.Exp.Sta. Light Trap S E Jones Collector/Tenebrionid Base Aaron D. Smith Catalog # 19459. Single specimen; El Paso, Texas July 16, 1967 R. A. Smith/Tenebrionid Base Aaron D. Smith Catalog # 19453. Single specimen; Hidalgo County 10-24 1934 Tex/Tenebrionid Base Aaron D. Smith Catalog # 19958. Single specimen; Hidalgo County 6-5 1930 Tex Tex.Exp.Sta. Light Trap J C Gaines

Appendix. Continued.

Collector/Tenebrionid Base Aaron D. Smith Catalog # 19950. Single specimen; Hidalgo County July 1931 Tex. Tex.Exp.Sta. Light Trap/Tenebrionid Base Aaron D. Smith Catalog # 19956. Single specimen; MEX: Baja Cal. Sur 13 mi. E hwy. 19, E of Todos Santos IX-17-1988: E.Riley/Tenebrionid Base Aaron D. Smith Catalog # 20093. Four specimens; MEXICO: Baja California Norte El Faro Beach, 9 km. S. Ensenada 21 November 1981 W. E. Steiner/Tenebrionid Base Aaron D. Smith Catalog # 16782 – 16785. Single specimen; Post,Tex 6-10-30 31/Tenebrionid Base Aaron D. Smith Catalog # 19960. Single specimen; Rusk Co. TEX June 5, 1925 elongatulus Determined by FEBlaissdell/Tenebrionid Base Aaron D. Smith Catalog # 20370. Single specimen; USA: TEXAS: El Paso Co Co. Rd. 1281, 15 km E Horizon City, 1245 m 31°40'40"N, 106°02'29"W VIII-18-2001, J.D.Oswald ex. orange dunes. MV/Tenebrionid Base Aaron D. Smith Catalog # 16776. (UCDC): Two specimens; 10 mi. S Tucson Ariz. VIII-18 1963 V.L. Vesterby Collector/Tenebrionid Base Aaron D. Smith Catalog # 20333, 20502. Single specimen; 3 mi.s.e.Plan de Barrancas Jal. MEX. VII 8 1963 F.D. Parker L.A. Stange Collectors/Teneb_list 18119. Single specimen; 4mi.SE.Willcox, CochiseCo.,ARIZ. IX-14-1972 DSChandler & K.Stephan/Teneb_list 20334. Thirteen specimens; 5.5 mi NW Choix Sin Mex VII 14 1968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18062, 18066, 18066 – 18068, 18070 – 18074, 18077, 18079, 18080, 18089. Single specimen; 5.5 mi NW Choix Sin. MEX. 13 July 1968 T A Spars Colr/Tenebrionid Base Aaron D. Smith Catalog # 19375. Nine specimens; 8 mi.south Elota Sin MEXICO VII 2 1963 F.D.Parker L.A. Stange Collectors/Tenebrionid Base Aaron D. Smith Catalog # 18109 – 18117. Single specimen; Anderson Jct. Wash. Co.,Utah IX-6-1953 At Light PD Ashlock Collector/Tenebrionid Base Aaron D. Smith Catalog # 20097. Single specimen; Benson Ariz. Cochise Co. VII-30-1958 D.D.Linsdale Collector/Tenebrionid Base Aaron D. Smith Catalog # 20504. Two specimens; Choix Sin Mex VIII51968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18057, 18059. Single specimen; Ft.McDowell Maricopa Co. Ariz. X-4-1962 M.E.Irwin Collector/Tenebrionid Base Aaron D. Smith Catalog # 20355. Two specimens; Madera Cyn Sta Cruz,Co Ariz 4880' VII-15 1963 V.L.Vesterby Collector/Tenebrionid Base Aaron D. Smith Catalog # 18121, 18123. Single specimen; Madera Cyn. Santa Cruz Co.Ariz.4880 ft.VII-21-1963 V.L.Vesterby Collector/Tenebrionid Base Aaron D. Smith Catalog # 19583. Four specimens; Mex 5.5 mi NW Choix Sin VII 18 1968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18092 – 18095. Single specimen; Picacho Ariz. 6 mi. south Pinal Co. V.21 1953 T.R. Haiz Collector/Tenebrionid Base Aaron D. Smith Catalog # 20529. Two specimens; Sabino Cyn. Pima Co. Ariz.19-VIII-1963 V.L.Vesterby Collector/Tenebrionid Base Aaron D. Smith Catalog # 19580, 19581. Two specimens; Safford Ariz. Graham Co. VIII-3 1958 R.O.Schuster Collector/Tenebrionid Base Aaron D. Smith Catalog # 20343, 20344. Two specimens; Safford Ariz. Graham Co. VIII-5-1958 R.O.Schuster Collector/Tenebrionid Base Aaron D. Smith Catalog # 20345, 20346. Single specimen; SWRS,Portal Cochise Co. Ariz.VIII-3-1966 C.R.Kovacle Colr/Tenebrionid Base Aaron D. Smith Catalog # 18120. Two specimens; Thatcher Ariz. VIII-2 1951 E.J. Taylor Collector/Tenebrionid Base Aaron D. Smith Catalog # 20466, 20467. Single specimen; Toltec Ariz. 8 mi.south Pinal Co VI.14.1953 T.R.Haiz Collector/Tenebrionid Base Aaron D. Smith Catalog # 20503. Two specimens; Tucson,Ariz Pima Co. VII-27-1954 H.E.Cott Collector/Tenebrionid Base Aaron D. Smith Catalog # 20348, 20349. Single specimens; Wickenburg Ariz.IX-2-1961 J.S.Buckett Collector/Tenebrionid Base Aaron D. Smith Catalog # 19582. (USNM): Single specimen; 30Mi NW of LAS VEGAS NEV CORN CREEK DESERT 25.VIII 1965 W.Rosenberg Collection/Tenebrionid Base Aaron D. Smith Catalog # 18438. Single specimen; Ari 7432/Tenebrionid Base Aaron D. Smith Catalog # 20669. Single specimen; Ari Collection C.V.Riley Det by Casey Ulus Crassus/Tenebrionid Base Aaron D. Smith Catalog # 20723. Two specimens; Ariz. Santa Cruz Co. Pena Blanca Cyn. U.V.Light 8.VIII 1973 W. H. Tyson-coll/Tenebrionid Base Aaron D. Smith Catalog # 20703, 20704. Two specimens; Ariz.,Santa Cruz Co. Pantagonia 1mi S. VII-29-30-64 D.R.Davis/Tenebrionid Base Aaron D. Smith Catalog # 20678, 20679. Three specimens; Ariz.,Santa Cruz Co. Pence Blanca Canyon VII-27-28-1964 D.R.Davis/Tenebrionid Base Aaron D. Smith Catalog # 17914, 20707, 20708. Single specimen; Ariz:PimaCo.5m SE Centinental,VII-30-73 J.Powell/Tenebrionid Base Aaron D. Smith Catalog # 20681. Eight specimens; ARIZnr Douglas 11 viii 58 JHRussell at light/Tenebrionid Base Aaron D. Smith Catalog # 21635, 21641, 21642, 21645, 21649, 21650 – 21652. Single specimen; ARIZONA Benson, San Pedro River 7 June 1968 Menke & Flint/Tenebrionid Base Aaron D. Smith Catalog # 16506. Five specimens; ARIZONA Douglas 28-VII-64 JHRussell blacklight Doug. 16798 65-2 4038/Tenebrionid Base Aaron D. Smith Catalog # 17737 – 17741. Four specimens; ARIZONA Mesa 23 July 1957 R. S. Beal/Tenebrionid Base Aaron D. Smith Catalog # 21671 – 21674. Single specimen; ARIZONA: COCHISE Co., SOUTHWESTERN RESEARCH STATION PORTAL 15-IX-73 ROSENBERG COLLECTION/Tenebrionid Base Aaron D. Smith Catalog # 17724. Twelve specimens; ARIZONA: Maricopa Co.; Mesa. 12 AUG 1957/Tenebrionid Base Aaron D. Smith Catalog # 16403 – 16414. Single specimen; ARIZONA: Sedona, Red Rock Crossing 30-VII-1972 Robert Gordon/Tenebrionid Base Aaron D. Smith Catalog # 20726. Single specimen; ARIZONA:Pima Co.TUeson Aug. 17 1968 K.Stephan leg/Tenebrionid Base Aaron D. Smith Catalog # 21663. Two specimens; ARIZONA:Pima Co.TUeson July 24 1969 K.Stephan leg/Tenebrionid Base Aaron D. Smith Catalog # 21664, 21665. Two specimens; ARIZONA:Pima Co.Tucson July 27 1969 K.Stephan leg/Tenebrionid Base Aaron D. Smith Catalog # 21666, 21667. Two specimens; at

Appendix. Continued.

the base of cotton plant 2mi.W.Chandler Ariz.IV.27.34 T.P.Cassedy/Tenebrionid Base Aaron D. Smith Catalog # 16508, 16509. Four specimens; Buckeye Ariz.VII-14'39 L.W.Sheets/Tenebrionid Base Aaron D. Smith Catalog # 20717 – 20720. Seven specimens; Buckeye, Ariz. Sept.25, '36 L.D.Christiansan #C 670/Tenebrionid Base Aaron D. Smith Catalog # 17716, 20711 – 20716. Two specimens; CatalSpgs 10.4 Ar CollHubbard &Schwarz/Tenebrionid Base Aaron D. Smith Catalog # 20709, 20710. Two specimens; CD. OBREGON, SON. MEX. 29-IX-55 CERCA LUZ F. PACHECO M./Tenebrionid Base Aaron D. Smith Catalog # 17908, 17912. Single specimen; Ciudad Victoria Mexico Sept 4 1954/Tenebrionid Base Aaron D. Smith Catalog # 16513. Single specimen; Douglas, Ariz. 14.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21617. Single specimen; Douglas, Ariz. 8.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21612. Single specimen; Echo 15.5.04Or ESG Titus Collector/Tenebrionid Base Aaron D. Smith Catalog # 17535. Single specimen; Green Valley Pima Co. Arizona Dr. Lenczy 9.1970/Tenebrionid Base Aaron D. Smith Catalog # 20668. Four specimens; Green Valley Pima Co. Arizona DrLenczy 6.1972/Tenebrionid Base Aaron D. Smith Catalog # 20658 – 20661. Six specimens; Green Valley Pima Co. Arizona DrLenczy 7.1972/Tenebrionid Base Aaron D. Smith Catalog # 20662 – 20667. Single specimen; GreenValley Pima Co. Arizona Dr. Lenczy 11.1968/Tenebrionid Base Aaron D. Smith Catalog # 17720. Eighteen specimens; GreenValley Pima Co. Arizona DrLenczy July 1972/Tenebrionid Base Aaron D. Smith Catalog # 20639 – 20643, 20645 – 20657. Single specimen; Guasave, Sin. 7.5.53, G. Murillo 41/Tenebrionid Base Aaron D. Smith Catalog # 17717. Two specimens; GUAYMAS, SON. MEX. 24-I-56 ALGODON Colector F. PACHECO M./Tenebrionid Base Aaron D. Smith Catalog # 17906, 17907. Single specimen; HAWAII: Kauai Polihale St. Pk. 7 km. N. Mana 1 January 1982 W. E. Steiner Under leaf litter of spreading plants on sand/Tenebrionid Base Aaron D. Smith Catalog # 23129. Single specimen; Indian Fish Traps ACDavis Indio Cal./Tenebrionid Base Aaron D. Smith Catalog # 17818. Two specimens; Indio, Calif. IV-16-62 T.L.Erwin Collector #263/Tenebrionid Base Aaron D. Smith Catalog # 17730, 17732. Single specimen; La Quinta 19.3.60 CAL ALMelander ALMelander Collection 1961/Tenebrionid Base Aaron D. Smith Catalog # 18431. Two specimens; Los Mochis,Sin- aloa,Mex.,July 22,55. light RB&JM Selander/Tenebrionid Base Aaron D. Smith Catalog # 16445, 16446. Five specimens; MaderaCn Pima Co. Arizona Dr. Lenczy 7.1968/Tenebrionid Base Aaron D. Smith Catalog # 20672 – 20676. Single specimen; Mesilla Park,N.M. April 23, 1964 D. Sullivan/Tenebrionid Base Aaron D. Smith Catalog # 17915. Five specimens; MEXICO, Sinaloa Culiacan VII-16-1963 PaulJ.Spangler Collected at black light/Tenebrionid Base Aaron D. Smith Catalog # 17820, 17821, 17909 – 17911. Two specimens; MEXICO,Son. Navojoa VII-14-1965 Paul Spangler/Tenebrionid Base Aaron D. Smith Catalog # 16447, 16448. Single specimen; MEXICO,Tamps. 44Mi.S.Matamoros VI-28-1965 Paul J. Spangler/Tenebrionid Base Aaron D. Smith Catalog # 17819. Single specimen; NEW MEX.: LUNA Co. DEMING 23.VII 1977 ROSENBERG COLLECTION/Tenebrionid Base Aaron D. Smith Catalog # 18430. Single specimen; PenaBlanca StaCruzCo. Arizona DrLenczy 8.1972/Tenebrionid Base Aaron D. Smith Catalog # 20670. Four specimens; Phoenix Ar. June 23 '21 FASates collection/Tenebrionid Base Aaron D. Smith Catalog # 20742 – 20745. Seven specimens; Phoenix Ariz p.'22 D.C.Mote Coll. On tomato/Tenebrionid Base Aaron D. Smith Catalog # 20732, 20734 – 20739. Single specimen; Phoenix, Ariz. July 16-18 Wickham Wickham Colln./Tenebrionid Base Aaron D. Smith Catalog # 20741. Single specimen; Portal, Ariz. 2.VIII.1966 W.Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 20728. Single specimen; Portal, Ariz. 4.VIII.1966 W.Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 20729. Three specimens; Pt Mts Arizona/Tenebrionid Base Aaron D. Smith Catalog # 20687, 20697, 20698. Single specimen; Rio Rico StaCruzCo Arizona DrLenczy VII.1978/Tenebrionid Base Aaron D. Smith Catalog # 20682. Single specimen; Sabino Canyon,Ariz. VIII-9-53 G D Butler/Tenebrionid Base Aaron D. Smith Catalog # 15841. Three specimens; StateCollegeN.M. Jan.21,1957 Coll.J.Chilton Feeding on cotton leaves greenhouses/Tenebrionid Base Aaron D. Smith Catalog # 19557 – 19559. Single specimen; Tamp co Mex 17 07 E A Schwarz collector/Tenebrionid Base Aaron D. Smith Catalog # 17713. Single specimen; Thermal Riverside Co. Calif. 1 Feb 65/Tenebrionid Base Aaron D. Smith Catalog # 16444. Two specimens; Thermal Riverside Co. Calif. 1 Feb 65 T.L.Erwin Collector 263/Tenebrionid Base Aaron D. Smith Catalog # 17729, 17731. Two specimens; Tucson 1.5 Ar CollHubbard &Schwartz/Tenebrionid Base Aaron D. Smith Catalog # 21660, 21661. Single specimen; Tucson, Ariz. July 13-15 2300-2500 ft. Wickham Wickham Colln./Tenebrionid Base Aaron D. Smith Catalog # 21670. Two specimens; Tucson,Arizona Aug. 1 1946 H.E.Evans/Tenebrionid Base Aaron D. Smith Catalog # 17733, 17734. Four specimens; VALLE DEL YAQUI, SON. MEX. Block 910 -23-VII-57 Colector F. PACHECO M. EN HABITACION/Tenebrionid Base Aaron D. Smith Catalog # 17899 – 17902. Single specimen; White Sands Otero Co. New Mexico DrLenczy VIII.1978/Tenebrionid Base Aaron D. Smith Catalog # 19554. Four specimens; Willcox, CochiseCo. Ariz. 4200' Aug.29, 1970 Coll. D. Richman/Tenebrionid Base Aaron D. Smith Catalog # 20699 – 20702. Single specimen; With driveway San Luis AxZ VIII-16-58 F.C.Stephenson, coll. San Luis, Ariz. 22 lot 58-17357/Tenebrionid Base Aaron D. Smith Catalog # 17736. Single specimen; Yuma Ariz Aug. 1902 HHBrown/Tenebrionid Base Aaron D. Smith Catalog # 20680.

Appendix. Continued.

Ulus hirsutus Champion, 1885

ADDITIONAL MATERIAL: (ADSC): Three specimens; 10 miles north of Nautla, Ver., Mex. XII-8-91, At Light W.F.Chamberlain/Teneb_base 17997, 17999 – 18001. Single specimen; 15.VII.2018 Concepcion Bamba TexMex2018 #21/Teneb_base 22616. **(AMNH):** Single specimen; El Mante, Mex. VI-8-47 F. Johnson Donor, Cols. C&P Vaurie/Teneb_base 19550. Single specimen; La Pesca, Mex. Tamaulipas V-17-1952 M.Cazier W.Gertsch R.Schrammel Collectors/Teneb_base 19517. Single specimen; Mex. Oaxaca Tehuantepec VI-11-1964 Collectors: J.C.& D.Pallister/Teneb_base 19549. Four specimens; MEX., Sinaloa 5 mi. NW Mazatlan, El. S.L., X-3-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Teneb_base 19530 – 19533. Single specimen; Oklahoma, Tex. Wilbarger Co. VI-27-48 C&P. Vaurie/Teneb_base 19511. Thirty-nine specimens; San Blas, Nay., Mex. 0' 4-18-49 G. M. Bradt/Teneb_base 19462 – 19500. Three specimens; Tehuantepec Oaxaca, Mex. Dec.13,47-Jan.23,48 T.MacDougal/Teneb_base 19542 – 19544. Single specimen; Texas a Schaeffer elongatulus Cowey./Teneb_base 20763. Five specimens; Victoria, Mex. Tamaulipas V-22-1952 M.Cazier W.Gertsch R.Schrammel Collectors/Teneb_base 19512 – 19516. **(CASC):** Single specimen; COLOMBIA: Bolivar Cartagena, Boca Grande, 20-XII-64 P.R. & D.L. Craig/Teneb_base 23136. Single specimen; MEX. Nayarit, Acaponeta VIII-15-60 P.H. ARNAUD JR, E.S.ROSS D.C.RENTZ/Teneb_base 19298. Single specimen; MEX., Sinaloa 5 mi. NW Mazatlan, El. S.L., X-3-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/Teneb_base 19285. Ten specimens; MEXICO: Guerrero 3.7 mi. e. Marquelia July 10, 1974 taken at light Clark, Murray, Ashe, Schaffner/Teneb_base 19836 – 19844, 19846. **(EMEC):** Single specimen; 23-9-77 Siguat. Hond. J.V. Mankins Collector/Teneb_base 16810. Two specimens; Costa Rica: Canas Guanacaste Prov- I-5-1972, F.Cordero/Teneb_base 17366, 17367. Twenty specimens; FL: Bay Co. Pt. St. Joe Beh. 28-IV-85 P.A. Opler/Teneb_base 17346 – 17365. Fifteen specimens; FLA: Franklin CO. Alligator Pt., nr. Panacea VII-1-77 J.Doyen & P.Opler/Teneb_base 17316 – 17330. Two specimens; FLA: Franklin Co. St. George Id. VII-I-77 J.Doyen & P.Opler/Teneb_base 17315, 17377. Single specimen; HONDURAS: Siguatepeque VI-18-1979 at light J.A.Chemsak, A.& M.Michelbacher W.W.Middlekauff collectors/Teneb_base 20094. Single specimen; LA: Lafurche P. Grand Isle S.P. VIII-7-1983. P.A.Opler/Teneb_base 17331. Single specimen; MEX: Veracruz Puente Nacional 6 mi SE Rinconada IX-29-75 at light J. A. Powell J. A. Chemsak Collectors/Teneb_base 16809. Single specimen; MEXICO: Oaxaca Puerto Angel XII-12-1982 S. Meredith/Teneb_base 17345. Sixteen specimens; MS: Harrison Co. Henderson Pt. VII-25-1983 P.A.Opler/Teneb_base 16790, 16792 – 16796, 16798, 16799, 16801 – 16808. Fifty-five specimens; MS: Harrison Co. Waveland III-9-83 P.Opler/Teneb_base 17332 – 17340, 21677 – 21692, 21694 – 21723. **(MCZ):** Two specimens; Cedar Key III 19 Fl F. C. Bowditch Coll./Teneb_base 23140, 23141. Two specimens; Tex/Teneb_list 20769, 20771. Single specimen; Tex. Del Rio, June 2/Teneb_base 20765. **(MSNG):** Single specimen; Las Vueltas, M.450 Edo.Carabobo 6.VII.66 Fur.Agr./Teneb_base 23144. **(OSU):** Two specimens; Okla. Marshall Co. 2mi.E.Willis June 1967 Collrs.B.&B. Valentine/Teneb_base 23151, 23154. **(RLAC):** Single specimen; AZ: Navajo Co., Joseph City, el.5000' v-18-1995 K.W.Brown/Teneb_base 20083. Single specimen; HONDURAS: Francisco Morazan, Zamarana 14.00.88N, 86.58.37W VI-3-1996, blacklight F. Andrews, & A. Gilbert/Teneb_base 19552 Four specimens; MEXICO, SLP, at light, Tamazunchale 25-V-1974, CW. O'Brien&GB.Marshall/Teneb_base 20086 – 20089. Single specimen; N2. 368-1 Date. 7-XII-52 Loc. SAN ANDRGS Col. gARCIA/Teneb_base 18018. **(TAMU):** Four specimens; 1 mile northwest of Ayutla, Queretaro, Mexico July 24, 1970 Taken at light. Murray, Phelps, Hart, Schaffer/Teneb_base 19406, 19407, 19454, 19455. Two specimens; 1 mile southwest Tamazunchale, S. L. P., Mexico at light VII-7-66 P.M. & P.K. Wagner/Teneb_base 18644, 19414. Four specimens; 10 mi. S.W. Elkhart Tx. IX.21.1963 H.R.Burke/Teneb_base 18637 – 18640. Two specimens; 10 mi. S.W. of Elkhart, Texas VIII-26-1960 H.R. Burke/Teneb_base 18641, 18642. Four specimens; 10 miles north of Nautla, Ver., Mex. XI-8-91, At Light W.F.Chamberlain/Teneb_base 18685 – 18688. Six specimens; 10 miles north of Nautla, Ver., Mex. XII-8-91, At Light W.F.Chamberlain/Teneb_base 16383 – 16386, 16392, 17998. Single specimen; 2 km west Cinco Cerros, Chiapas, Mex. At Light, VI-26-87 W. F. Chamberlain/Teneb_base 16780. Single specimen; 5 miles sse. of Gomez Farias, Tamaulipas, Mexico July 19-20, 1970 Murray, Phelps, Hart, Schaffner/Teneb_base 19410. Single specimen; 8 miles west of El Limon, Tamaulipas, Mexico July 20, 1970 Taken at light. Murray, Phelps, Hart, Schaffner/Teneb_base 19412. Four specimens; Center 6-10-35 Tx/Teneb_base 19437, 19438, 19445, 19446. Single specimen; Cherokee Co. Tx. IV-20-1944 P.A. Young Collector/Teneb_base 19443. Single specimen; Chorreadero Canyon, Tuxtla Gutierrez, Chis. Mex. VI-20-87 W.F. Chamberlain/Teneb_base 16394. Two specimens; College Sta., Brazos Co, Tx X.5.1963 H.R. Burke/Teneb_base 18649, 18650. Single specimen; College Station May 20, 1930 Tex H J Reinhard Collector/Teneb_base 19458. Two specimens; Comanche Co. 5-21-30 Tex. On Watermelon/Teneb_base 19447, 19448. Single specimen; Conroe TEX 6-15, 1923/Teneb_base 19456. Single specimen; COSTA RICA: Guanacaste Comelco Property Feb. 13, 1976 H. C. Reed/Teneb_base 19853. Single specimen; Dimmit Co 6-10-33 Tx Tex.Exp.Sta Light Trap S E Jones Collector/Teneb_base 19968. Single specimen; Dimmit Co 6-22-33 Tx Tex.Exp.Sta Light Trap S E Jones Collector/Teneb_base 19965. Three specimens; Elkhart, Tex. Anderson Co

Appendix. Continued.

IX.21.1963 H.R.Burke/Teneb_base 18634 – 18636. Single specimen; Hidalgo County 10-24 1934 Tex/Teneb_base 19957. Single specimen; MEXICO: Puebla 8 m E. of Atlizco R. Haswell 3-4-76/Teneb_base 16391. Single specimen; MEXICO: Guerrero 3.7 mi. e. Marquelia July 10, 1974 taken at light Clark, Murray, Ashe, Schaffner/Teneb_base 19845. Single specimen; MEXICO: Guerrero Iguala July 8, 1974 taken at light Clark, Murray, Ashe, Schaffner/Teneb_base 19413. Two specimens; MEXICO: Jalisco 11 km. n. Autlan July 30-Aug. 1, 1978 taken at light Plitt & Schaffner/Teneb_base 19408, 19409. Single specimen; MEXICO: Oaxaca 6 miles west of Jalapa del Marques July 23, 1973 Taken at light Mastro & Schaffner/Teneb_base 19430. Single specimen; MEXICO: Oaxaca 8 mi. n. La Ventosa July 22, 1973 Taken at light Mastro & Schaffner/Teneb_base 19411. Single specimen; MEXICO:Nayarit Lake Sta Maria del Oro 20 mi E., 14 mi N. Tepic 28 December 1971 R.R. & M.E. Murray at light/Teneb_base 19852. Four specimens; MEXICO:Oaxaca 2.7 mi. NW. El Cameron July 14 1971 Clark, Murray, Hart, Schaffner/Teneb_base 19433 – 19436. Single specimen; MS:Harrison Co. Henderson Pt. VII-25-1983 P.A.Opler/Teneb_base 16800. Single specimen; Navasota,Tx. 4-1-18/Teneb_base 19457. Single specimen; NICARAGUA:Leon 16.3 Mi. SE. Leon June 18, 1972 at light M.E. & R.R. Murray/Teneb_base 19429. Fourteen specimens; OKLAHOMA: Marshall Co. Fobb Bottom Wdlf. Mgt. Ar. 33.87189°N, 96.84466°W IV-28-2012, E. G. Riley littoral zone/Teneb_base 16371, 16654 – 16660, 16662 – 16666, 16779. Single specimen; Palitla, S.L.P., Mexico July 21 1970 Taken at light. Schaffner, Murray Phelps, Hart/Teneb_base 19432. Two specimens; Stinnett Co. 4-10-30, Tx On Tomato/Teneb_base 19439, 19440. Single specimen; TEXAS Karnes Co. Eceto Metz Rnch 24-III-1997 JE Wappes/Teneb_base 19603. Single specimen; TEXAS: Anderson Co. Engeling Wdlf.Mgt. Ar. V-4-2002, UV light Coll. E. G. Riley/Teneb_base 16765. Single specimen; TEXAS: Brazos Co. College Station VIII-9-1996 Coll. E. G. Riley, UV/Teneb_base 16777. Single specimen; TEXAS: Brazos Co., College Station. 10/VI/1979. coll. C.W. Agnew Ulus elongatus Casey, 1905 Det. R. L. Aalbu 1994/Teneb_base 19422. Three specimens; TEXAS: Cameron Co. 1.5 mi.E jct. FM 1419 on Hwy. 4, E of Brownsville X-19-2002, uv light B. Raber & E. Riley/Teneb_base 16773 – 16775. Two specimens; TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, San Pedro Camp 26°57'04"N. 97°39'22"W IV-21-22-2001 B. Raber & E. Riley snake carrion pit-fall/Teneb_base 16559, 16661. Thirteen specimens; TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°58'38" N, 97°40'59"W IV-6-20-2001, W. Godwin & E.G. Riley, pit-fall trap/Teneb_base 16389, 1649, 16525, 16621, 16623 – 16626, 16629, 16630, 16632, 16633, 16635. Single specimen; TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°58'38"N. 97°40'59"W IV-20-2001, E.G. Riley/Teneb_base 16797. Ten specimens; TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°59'22"N. 97°40'11"W IV-21-2001, E. G. Riley/Teneb_base 16593, 16608 – 16611, 16614, 16616, 16618, 16619, 16695. Single specimen; TEXAS: Leon Co. 2mi. NW Centerville 31°16'N,96°00'W Sept. 10-19, 2001 Coll. J. Yantis-30, pit-fall/Teneb_base 19602. Six specimens; Texas: Leon Co. 5 mi. N Flynn v-24-1994 E. Riley, UV Light/Teneb_base 19441, 19619 – 19623. Single specimen; TEXAS: Wood Co. Little Sandy Nat'l Wdlf. Ref. 5 km. W Hawkins IX-19-1998, MV light Coll. J. D. Oswald-197/Teneb_base 16778. Single specimen; Tyler, Tex. Sept. 1937 St. Pr., Sur. Light Trap/Teneb_base 19460. Three specimens; USA: TEXAS: Brazos Co. College Sta., Riley Estate 30.58849°N, 96.25366°W VI-28-30-2011,E.Riley,UV/Teneb_base 16673 – 16675. Single specimen; USA: TEXAS: Brazos Co. College Sta., Riley Estate 80°35'18"N, 96°15'12"W V-19-2003. E. G. Riley/Teneb_base 16772. Single specimen; Weslaco, Texas. Sept. 15, 1931 S. W. Clark. elongatulus Determined by FEBlaissdell/Teneb_base 19428. Two specimens; Winter Haven 10/5/32 Tex E. Mortcueen Coll. 1596/Teneb_base 20762, 20764. Single specimen; Winter Haven, 4-1 1934 Tex. S.E.Jones, Coll. on s. potato/Teneb_base 19461. (UCDC): Five specimens; 10 mi. N Quezaltepeque El Salvador VII-30-1961 M.E. Irwin Collector/Teneb_base 18104 – 18108. Single specimen; 4 mi NW Choix Arroyo del Sauc illo Sin Mex VII 10 1968 T A Sears BC Gardner CS Glaser/Teneb_base 18129. Two specimens; 5.5 mi NW Choix Sin Mex VII 14 1968 T A Sears R C Gardner C S Glaser/Teneb_base 18060, 18061. Single specimen; 8 mi.south Elota Sin MEXICO VII 2 1963 F.D.Parker L.A. Stange Collectors/Teneb_base 18118. Seven specimens; El Paraiso HONDURAS VI-11 1964 G.A. Axtell Collector/Teneb_base 18097 – 18103. Single specimen; Mex 5.5 mi NW Choix Sin VII 18 1968 T A Sears R C Gardner C S Glaser/Teneb_base 18091. (UCR): Single specimen; San Blas,Nay,Mex. II-4-64;sand dunes E. Schlinger,M.Irwin/Teneb_base 23146. (USNM): Single specimen; DOM. REP: Dajabon Prov Rio Massacre, 40m., Balneario Don Miguel 7 km SW. Dajabon 26 May 1973 Don & Mignon Davis/Teneb_base 23944. Thirty-three specimens; Alhajuella Pan. 17.6.07 Aug. Busck Collector/Teneb_base 17430 – 17462. Single specimen; Alhajuelo PanApr 12.11 AugustBusck/Teneb_base 17464. Single specimen; Alhajuelo PanApr 17.11 AugustBusck/Teneb_base 17463. Single specimen; Alhajuelo PanApr 19.11 AugustBusck/Teneb_base 17465. Single specimen; ARUBA: California Dunes near lighthouse 12°37'03"N, 70°03'07"W 19 February 2017 On sand under leaf litter and spreading plants, dune slopes; Colls. W.E. Steiner & J. M. Swearingen/Teneb_base 23137. Twenty-nine specimens; Atlanta, Tex. VII.35 J.W.Folsom/Teneb_base 16450 – 16456, 16459 – 16480. Three specimens; Brownsville Texas Sept 10 1994/Teneb_base 16604 – 16606. Single specimen; Brownsville, Tex. ex Mex 17-VII-53 Baker With seed cotton 53-9629/Teneb_base 17917. Single specimen; C.H.T Townsend Brownsville, Tex/Teneb_base 18248. Single specimen; Cameron Co 1953 Texas DADREYER Mesquite/Teneb_base 17409. Single specimen; CAYMAN ISLAND: Grand

Appendix. Continued.

Cayman Rum Point 19°22'N, 81°16'W 22 February 1993 W. E. Steiner & J. M. Swearingen collectors/Teneb_base 23139. Single specimen; Colfax, La 5-30-32 Coll. Under Wilted Water- Melon Vines Blapstinus sonora? Ch'32 Csy. See Csy coll./Teneb_base 17536. Seven specimens; Colfax, La 5-30-32 Coll. Under Wilted Water- Melon Vines W.J.LaCroix Collector/Teneb_base 17537, 17539 – 17544. Single specimen; Colima Col. Mex Conradt 476/Teneb_base 17714. Single specimen; Colima VulcanoMex L.Conrad/Teneb_base 17723. Single specimen; Colombia V-28-63 B.K. Dozier Coll/Teneb_base 16565. Three specimens; Columbus 10.7 Texas Hubbard & Schwarz/Teneb_base 19325, 19330, 19346. Single specimen; Columbus 17-8 Texas CollHubbard & Schwarz/Teneb_base 18086. Two specimens; Columbus 20-8 Texas CollHubbard & Schwarz/Teneb_base 17984, 19311. Single specimen; Columbus 30-6 Texas CollHubbard & Schwarz/Teneb_base 18087. Three specimens; Columbus 3-8 Texas CollHubbard & Schwarz/Teneb_base 17985, 17986, 18088. Two specimens; Columbus 8.6 Texas Hubbard & Schwarz/Teneb_base 19324, 19325. Single specimen; COSTA RICA, S.J. 1mi.S.San Isidro, Rio General VII-1-1967 Paul J. Spangler/Teneb_base 17916. Single specimen; COSTA RICA:Guanacaste 18.7 km NW. Bagaces Hwy 1, Rio Carana 91 mts. 04 June 1973 Erwin & Hevel Central American Expedition, 1973/Teneb_base 17913. Single specimen; Cotaxtla. Ver. MEXICO.24III56 ALEJANDRO ORTEGA COLECTOR./Teneb_base 17918. Single specimen; DallasTx VI.8.06 WA Hooker Collector/Teneb_base 17525. Four specimens; Del Rio Texas ULUS Wickham Collection/Teneb_base 17742 – 17745. Single specimen; Del Rio, Tex 955 ft. Wickham/Teneb_base 18249. Single specimen; El Salvador Mi. 15407 61-1866 Stowaway/Teneb_base 16510. Two specimens; ex plants potato & tomato #1 Jackson- ville Tex FLThomas/Teneb_base 18246, 18250. Single specimen; ex plants potato & tomato #1 Jackson- ville Tex. FLThomas eating tops off potato/Teneb_base 18254. Single specimen; Florida: Bay Co. Laguna Beach 12 November 1983 W. Steiner, A.Gerberich & J.E. Lowry collrs./Teneb_base 23934. Single specimen; Florida: Franklin Co. Alligator Point beach & small dunes 1 March 1991 W. Steiner & J.Hill/Teneb_base 23935. Single specimen; FLORIDA: Franklin Co. Carabelle 1 March 1991 W. Steiner & J. Hill/Teneb_base 23937. Single specimen; Florida: Franklin Co. St. Georges Island, eastern part, dunes 28 February 1991 W. Steiner & J.Hill/Teneb_base 23938. Single specimen; Florida: Wakulla Co. 8 km SE Panacea, beach at point 1 march 1991 W.Steiner & J. Hill/Teneb_base 23939. Single specimen; Florida: Walton Co. Grayton Beach 12 November 1983 W. Steiner, A. Gerberich & J.E. Lowry collrs./Teneb_base 23936. Single specimen; from HONDURAS at Charleston SC with misc. cargo 15 December 2001 M. G. Bradford 015848-0200737/Teneb_base 23138. Single specimen; ft Smith 8.VII. ark HSBarber Collector/Teneb_base 19312. Single specimen; Greenville Texas USA Dr. Lenczy 7 1966/Teneb_base 17722. Twelve specimens; Henderson VII.12.10 Tx in cottn fld in cottn fld/Teneb_base 17506 – 17517. Three specimens; Henderson VII.26.11 Tx. in cottn fld H Pinkus collector/Teneb_base 15718 – 17520. Twelve specimens; Henderson VII.28.10 TX in cottn fld in cottn fld ESTucker Collector/Teneb_base 16583, 17492 – 17502. Single specimen; Henderson X.12.10 Tx. ESTucker Collector/Teneb_base 17521. Three specimens; Jacksonville X.17.10Tx in cottn fld in cottn fld Hunter No 2322 ESTucker Collector/Teneb_base 17503 – 17505. Single specimen; Jan.20, 1905 Gualan Guatemala Chas. C. Deam./Teneb_base 17527. Single specimen; Kerrville 30.V.06 Tx at light FCPratt Collector/Teneb_base 18252. Two specimens; Kunia, OAHU 24.x.2001 Ex. Sunflower seedling A. Ota/01-146/Teneb_base 23127, 23128. Single specimen; La Grange 17.8 Tex. E A Schwarz Collector/Teneb_base 19344. Two specimens; Lee Co. Tex. VI- 1912 Rev. G. Birkmann Ernest Shoemaker Collection 1956/Teneb_base 18122, 18257. Single specimen; Lee Co. Texas, aug, 1912 RevGBirkmann Ernest Shoemaker Collection 1956 Ulus elongatulus 12193 Csy/Teneb_base 18255. Three specimens; Lee Co. Texas, VIII, 1912 RevGBirkmann 12193 Ernest Shoemaker Collection 1956/Teneb_base 18245, 18256, 18258. Three specimens; Longview VII.27.10 Tx fields in cotton ESTucker Collector/Teneb_base 17522 – 17524. Six specimens; LOUISIANA: Jefferson Parish; Grand Isle 6-7 December 1990 W. E. Steiner & J. M. Swearingen/Teneb_base 16539, 16540, 16537, 16538, 16541, 16577. Five specimens; lx Mexico at Laredo #15300 Chamaedorea sp. leaf 81.12173/Teneb_base 17530 – 17534. Single specimen; MEXICO Armeria Colima atLardo69438 II-X-1968 DAGutierrez withAnanas sativus fruit 68-26735/Teneb_base 18434. Single specimen; MEXICO, Nuevo Leon,Monterrey VIII-8-1963 P.J.Spangler/Teneb_base 17735. Single specimen; MEXICO,Sinaloa Mazatlan VII-17-23-1963 P.J.Spangler/Teneb_base 15844. Two specimens; MEXICO,Tamps. 44Mi.S.Matamoros VI-28-1965 Paul J. Spangler/Teneb_base 17903, 17904. Forty-three specimens; MEXICO: Oaxaca; Tehuantepec 24 June 1955 at light R.B.&J.M.Selander/Teneb_base 16388, 16396 – 16401, 16416 – 16420, 16425 – 16438, 21724 – 21741. Single specimen; MEXICO: Veracruz Santa Ana 12 July 1981 W. E. Steiner/Teneb_base 16786. Seven specimens; MISSISSIPPI: Harrison County Biloxi 7 December 1990 W. E. Steiner & J. M. Swearingen/Teneb_base 16527 – 16532, 16544. Four specimens; MISSISSIPPI: Harrison County Biloxi 8 December 1990 W. E. Steiner & J. M. Swearingen/Teneb_base 16533 – 16536. Single specimen; N2. 368-1 Date. 7-XII-52 Loc. SAN ANDRGS Col. gARCIA/Teneb_base 18019. Two specimens; navasota,TX 4-1-18 F.B. Paddock Collector/Teneb_base 18083, 18084. Single specimen; PANAMA: Chiriqui. Playa de Lajas, 8 km S Las Lajas 5 June 1983 W. E. Steiner/Teneb_base 16597. Single specimen; PANAMA: Cocle 13 km SW Penonome at Rio Cocle Auxiliar 6 June 1983 W. E. Steiner/Teneb_base 16564. Single specimen; Port Arthur Texas Sept 11 1954/Teneb_base 16504. Two specimens; San Benito Texas R.L.McGarr/Teneb_base 16511,

Appendix. Continued.

16512. Single specimen; San Salvador 11, 15-V-58 O.D.Cartwright/Teneb_base 17727. Single specimen; San Salvador 25 XII-27 E.S.C.A. K.A.Salman Collector/Teneb_base 17410. Single specimen; San Salvador 3,4-V-18 O.D.Cartwright at light/Teneb_base 17726. Single specimen; San Salvador V-17,19-58 O.D.Cartwright/Teneb_base 17728. Four specimens; Tabernilla Canal Zone Panama May 13-07 Aug. Busck Collector/Teneb_base 17417, 17420 – 17422. Five specimens; Tabernilla Canal Zone Panama May 14-07 Aug. Busck Collector/Teneb_base 17418, 17425, 17426, 17428, 17429. Ten specimens; Tabernilla Canal Zone Panama May 16-07 Aug. Busck Collector/Teneb_base 17411 – 17416, 17419, 17423, 17424, 17538. Single specimen; Tex. Coll MLLinell/Teneb_base 19343. Single specimen; Tex. Collection C.V. Riley/Teneb_base 19310. Single specimen; Tex. Det by Casey/Teneb_base 19329. Two specimens; Texas Collection C.V. Riley Det by Casey/Teneb_base 19327, 19328. Single specimen; TEXAS LkBrownwood StatePark 13 IX 1966 Blanchard/Teneb_base 17746. Single specimen; TEXAS Summey of 1918 A.H.Hollingley Collector/Teneb_base 17919. Five specimens; TEXAS, Santa Ana Wildlife Ref. nr. Alamo, XI-18-66 A.&M.E. Blanchard/Teneb_base 16421, 16422, 16439, 16440, 17725. Eleven specimens; TEXAS: Colorado Co. 16 km W. Sealy at San Bernard River 13-14 December 1989 W. E. Steiner & R. D. Gordon/Teneb_base 16566 – 16576. Single specimen; TEXAS: Santa Ana Wildlife Refuge (Hidalgo) 20 X 1970 A.& ME Blanchard/Teneb_base 15842. Single specimen; TEXAS: Santa Ana Wildlife Refuge (Hidalgo) 22 X 1970 A.& ME Blanchard/Teneb_base 15843. Single specimen; Victoria 31-3 Tex EASchwarz Collector/Teneb_base 18085. Forty-four specimens; Victoria 4-12-18 Tex F. Webber collector/Teneb_base 18247, 19309, 19326, 19331 – 19342, 19381 – 19386, 19395 – 19401, 19415 – 19421, 19423 – 19427, 19449 – 19452. Twenty-one specimens; Victoria IV-12 -18 Tex JDMitchell Collector/Teneb_base 16481 – 16490, 16493 – 16503. Two specimens; Victoria Tex/Teneb_base 18251, 18253. Single specimen; With Tomatoes Dominican Republic I-18-61 Burke et al/Teneb_base 16505. (RLIC): Single specimen; JAMAICA, St.CatherinePar. SW Ft. Clarence, PortHendersonHills, (ThornScrub) 1776Aa, XII-7-74, 5m, E.L. Sleeper/Teneb_base 23126.

Ulus lineatulus Champion, 1885

ADDITIONAL MATERIAL: (ADSC): Single specimen; Panama: Panama Vera Cruz, Playa Venado N8°53.642' W79°36.414' 17.VIII.2008, ADSmith/Tenebrionid Base Aaron D. Smith Catalog # 22615. (OSUC): Two specimens; NICA: Rivas: RVS La Flor 11-XII-2004. 9-11PM en nido de huevos de tortuga col. Walter Vaughan/Teneb_base 23945, 23946. (RLAC): Two specimens; Bruja Pt. Canal Zone 1.25.1929 Collector C. H. Curran/Tenebrionid Base Aaron D. Smith Catalog # 20078, 20079. (UCR): Single specimen; Acajutla, EL SALV. Sonsonante XII-29-64 M. Irwin/Teneb_base 23947. (USNM): Single specimen; COSTA RICA Guanacaste Prov. Murcielago 1 April 1988 W. E. Steiner J. M. Hill J. M. Swearingen J. M. Mitchell/Tenebrionid Base Aaron D. Smith Catalog # 18429. Thirty-nine specimens; COSTA RICA Puntarenas Prov. Playa Jaco 29 March 1988 W. E. Steiner J. M. Hill J. M. Swearingen J. M. Mitchell/Tenebrionid Base Aaron D. Smith Catalog # 17747, 17748, 17765 – 17782, 17822 – 17840. Eight specimens; COSTA RICA: Puntarenas Playa Manuel Antonio 6 km SE Puerto Quepos 29 March 1988 W. E. Steiner, J. M. Hill, J. M. Swearingen, J. M. Mitchell/Tenebrionid Base Aaron D. Smith Catalog # 17841, 17842, 16584 – 16589. Fifteen specimens; PANAMA: Chiriqui. Playa de Lajas, 8 km S Las Lajas 5 June 1983 W. E. Steiner/Tenebrionid Base Aaron D. Smith Catalog # 16561 – 16563, 16590 – 16592, 16594, 16596, 16598 – 16603, 18788. Single specimen; Puntarenas 7.9.05 CR Fred k Knab/Tenebrionid Base Aaron D. Smith Catalog # 17715.

Ulus obliquus (LeConte, 1866)

ADDITIONAL MATERIAL: (AMNH): Single specimen; Green Valley Pima Co. Arizona Dr. Lenczy 9 1970/Tenebrionid Base Aaron D. Smith Catalog # 20395. Two specimens; Hermosillo Sonora, Mex July 17,1954 M.Cazier W.Gertsch Bradts Collectors/ Tenebrionid Base Aaron D. Smith Catalog # 19538, 19539. Single Specimen; Utah Ac. 5409 CollChasPalm/Tenebrionid Base Aaron D. Smith Catalog # 20070. (CASC): Single specimen; 5 miles S. Acaponeta, Nay. Mex. XI-26-48 H.B.Leech Collector/Tenebrionid Base Aaron D. Smith Catalog # 19297. Single specimen; Arivaipa, Ariz. Aug. 25 1933 Bryant, 203/Tenebrionid Base Aaron D. Smith Catalog # 20328. Single specimen; Long Beach 1996 donation to Calif. Acad. Sci./Tenebrionid Base Aaron D. Smith Catalog # 17898. Twenty-one specimens; ARIZ. Maricopa Co. Granite Reef. IV-24-72 B+S E.L. Sleeper. Collr./Tenebrionid Base Aaron D. Smith Catalog # 19813 – 19830, 19832 – 19834. Single specimen; ARIZ. Organ Pipe Cac. N.M. Quitobaquito E.L. Sleeper collr./Tenebrionid Base Aaron D. Smith Catalog # 18195. Single specimen; ARIZ., Yuma Co., 63mi.EYuma X-1-64 Blacklite 20w E.L.Sleeper Collr./Tenebrionid Base Aaron D. Smith Catalog # 19292. Two specimens; Bumble Bee Ariz E. Schiffel V-24-19 J.W. Green COLLECTION/Tenebrionid Base Aaron D. Smith Catalog # 18453, 18454. Single specimen; Indio, Cal. IV.24.1952 Bryant Lot32/ Tenebrionid Base Aaron D. Smith Catalog # 19929. Single specimen; MEX. Baja Calif. Sur Echo. El Palomar x.20.1972 E.M.&J.L.Fisher, coll California State Unit. Long Beach 1996

Appendix. Continued.

donation to Calif. Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog # 17897. Two specimens; MEX. Baja Calif. Sur, 2.5 mi. SE Todos Santos, El.200', X-6/17-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE California State Univ. LongBeach 1996 donations to Calif Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog # 17889, 19301. Three specimens; MEX. Baja Calif. Sur, 3 mi. N Sa. Antonio, X-9/10-68, El. 1200', E.L.Sleeper &F.J.Moore Collected at BLACKLITE California State Univ. LongBeach 1996 donations to Calif. Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog # 17886, 19294, 19295. Two specimens; MEX. Baja Calif. Sur, 7.5 mi. W El Triunfo, El.1500', X-11/12-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE California State Univ. LongBeach 1996 donations to Calif. Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog #19304, 19305. Two specimens; MEX. BajaCalif. Sur, Sa. Victoria, El Chorro, El.1000', X-29/30-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE California State Univ. LongBeach 1996 donations to Calif. Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog # 17884, 17885. Single specimen; Mex. Sonora 6 mi. S Benjamin Hill VII-6-63 Blacklite E.Sleeper, W. Agnew, G Noonan P.Sullivan Collr./ Tenebrionid Base Aaron D. Smith Catalog # 19373. Single specimen; MEX., Baja Calif. Sur, 1.5 mi.NW Miraflores El. 700', X-28/29-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 19303. Two specimens; MEX., Baja Calif. Sur, 4 mi. S E, Pescadero, El.50', X-23/24-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 18442, 19302. Single specimen; MEX., Baja Calif. Sur, Sa. Victoria, 7 mi. W Santiago, X-30/31-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 18440. Single specimen; MEX., Baja Calif.Sur, La Paz, El.50', X-6-68, E.L.Sleeper&F.J.Moore/ Tenebrionid Base Aaron D. Smith Catalog # 21755. Single specimen; MEX., BajaCalif. Sur, 6 mi. E SanJose del Cabo, El.200', X-26/27-68, E.L.Sleeper&F.J.Moore Collected at BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 19811. Single specimen; Mex., Sinaloa, 12mi. NE El Fuerte E.Sleeper,R.An- derson,A.Hardy, R.Somerby Collr. Blacklite 20w/ Tenebrionid Base Aaron D. Smith Catalog # 18452. Single specimen; MEX., VI-22-62 Sonora. 1 mi. NW Navojoa/ Tenebrionid Base Aaron D. Smith Catalog # 19869. Single specimen; MEX.Baja Calif. Sur 1 mi. SW Sta. Catarina June 29-30, 1967 ELSleeper, EMFisher Collected at BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 19290. Two specimens; MEX.Baja Calif.Sur 1 mi.SW Sta.Catarina June 29-30, 1967 ELSleeper, EMFisher BLACKLITE/ Tenebrionid Base Aaron D. Smith Catalog # 18201, 18202. Single specimen; MEX:B.Calif. 1.6 mi.ENE. of Cabo San Lucas on highway Sur No.19.I-I-1959 H.B.Leech Collector/Tenebrionid Base Aaron D. Smith Catalog # 18168. Thirty-one specimens; MEX:B.Calif. Rancho de la Ventana, Bahia de la Ventana 19-XII-1958 H.B. Leech Collectors/ Tenebrionid Base Aaron D. Smith Catalog # 18169 – 18182, 19794 – 19810. Single specimen; MEXICO, BajaCalif.Sur,30.6 km SW SanJoseComondu, 244m 25112Bb.(DesertWash), VI-16/17-73 E.L. Sleeper/Tenebrionid Base Aaron D. Smith Catalog # 19868. Single specimen; MEXICO,Baja Calif.,SUR X-14-1968 5.5 mi.SE of VallePerdido 1600 ft. E.L.Sleeper &F.J.Moore Collectors/Tenebrionid Base Aaron D. Smith Catalog # 19318. Five specimens; MEXICO,BajaCalif.,Sur, 3.8 km SE VallePerdido,23110Be (Trans.Cp.Thin.) ,VI-8/9-73, 549m, B&S, E.L. Sleeper California State Univ. Long Beach 1996 donation to Calif. Acad. Sci./ Tenebrionid Base Aaron D. Smith Catalog # 17883, 17887, 17891 – 17893. Two specimens; MEXICO: BAJA CALI- FORNIA SUR: 28-29 km N Todos Santos (km23-24) 275m 26-VIII-1977 E.Fisher, R.Westcott Calif.Acad.Sci.Coll./ Tenebrionid Base Aaron D. Smith Catalog # 17876, 17877. Four specimens; MEXICO: BAJA CALI- FORNIA SUR: 3 km E La Burrera, 515m 2-IX-1977 E.Fisher, R.Westcott Calif.Acad.Sci.Coll./ Tenebrionid Base Aaron D. Smith Catalog # 17873 – 17875, 17894. Four specimens; MEXICO: Sonora, Alamos, VIII-12-60 P.H.ARNAUD,JR. E.S.ROSS D.C.RENTZ/Tenebrionid Base Aaron D. Smith Catalog # 19350, 19351, 19353, 19354. Single specimen; MEXICO:BAJA CALIFORNIA SUR: San Jose del Cabo 7-9 March 1988 coll:Daniel F. Gross Ex:pitfall trap/Tenebrionid Base Aaron D. Smith Catalog # 19760. Two specimens; MEXICO:Sinaloa, RioFuerte & Hwy.15, 2526/10858, 20m, (DryThrnFst), VII-8/9-79 BL, E.L.&K.W.Sleeper/Tenebrionid Base Aaron D. Smith Catalog # 19761, 19762. Five specimens; Salt River Canyon Gila Co., Arizona April 16, 1969 H. M. Ohlendorf/ Tenebrionid Base Aaron D. Smith Catalog # 19847 – 19851. Single specimen; St Xavier Msq. Tucson Ariz. July 29,1924 J. O. Martin Collector/Tenebrionid Base Aaron D. Smith Catalog # 19573. Single specimen; U.S.A.: Arizona, Santa Cruz County, Nogales 8 August 1963 A. R. Moldenke collector Cal. Acad. Sci. Coll./ Tenebrionid Base Aaron D. Smith Catalog # 17882. **(CSCA)**: Single specimen; ARIZ: Yavapai Co. Date Creek Wash at Highway 93 IX-29-80 FG Andrews & AR Hardy Cereal bowl pit trap/Tenebrionid Base Aaron D. Smith Catalog # 20351. Single specimen; ARIZ:Maricopa Co. 8mi SE Wickenburg IV-29-78 A.R.Hardy and Fred G.Andrews/Tenebrionid Base Aaron D. Smith Catalog # 20528. Three specimens; ARIZONA, Maricopa Co. Gila river at airport road VI-18-1990 flight intercept trap W.B. Warner col./Tenebrionid Base Aaron D. Smith Catalog # 20530 – 20532. Single specimen; Mex: Baja Cal. Sur. 9.4 mi. Whwy 1 on Ramal a San Felipe IX-10-88: A.J. Gilbert/Tenebrionid Base Aaron D. Smith Catalog # 21750. Single Specimen; MEX: Baja Calif. Sur 3.3mm. S El Cien IX-26-1981 D.Faulkner & F.Andrews coll. at blacklight/Tenebrionid Base Aaron D. Smith Catalog # 21749. **(EMEC)**: Three specimens; 2mi.N.E.Douglas Cochise Co. Ariz.IX-5-59 G.I.Stage Collector/Tenebrionid Base Aaron D. Smith Catalog # 21656 – 21658. Single specimen; cottonwood Ariz.,8-10-33 Crassus Determined by FEBlaissdell/Tenebrionid Base Aaron D. Smith Catalog # 20730. Two

Appendix. Continued.

specimens; Douglas, Ariz. Cochise Co. VIII.15.58 P.A.Opler Collector/Tenebrionid Base Aaron D. Smith Catalog # 21654, 21655. Seven specimens; Mex. Sonora Alamos Acosta Traylor Rancho U.V. light 11 Sept. 1979 Collectors: D.W. Moss, C.Y. Kitayama, and G.W. Ulrich/Tenebrionid Base Aaron D. Smith Catalog # 17370 – 17376. Five specimens; MEX: Baja Ca Sur Cabo San Lucas Jet 19 & 29 30 IX-91 John D. McCarty/Tenebrionid Base Aaron D. Smith Catalog # 21743 – 21747. Single specimen; MEX:Baja Cal.Norte Arroyo Catavina,35 mi.S.El Progreso 2-IV-76 J.Doyen/Tenebrionid Base Aaron D. Smith Catalog # 21742. Single specimen; N.Mexico:DeBaca Co. Sumner Lake State Park IX-18-86. J.Doyen./Tenebrionid Base Aaron D. Smith Catalog # 19553. Single specimen; Navajoa. Son. MEX., VII-18-72 J. & M.A. Chemsak A.&M. Michelbacher At light/Tenebrionid Base Aaron D. Smith Catalog # 23152. (FMNH): Two specimens; Douglas, Ariz. 6.IX.1957 W.Rosenberg Coll./ Tenebrionid Base Aaron D. Smith Catalog # 20367, 20368. (RLAC): Single specimen; 31.35°N/11.19°W USA:Arizona Pima Co Arivaca-Cienega Wetland 20.viii.2000. UV light Coll. K. Will/Tenebrionid Base Aaron D. Smith Catalog # 20498. Six specimens; ARIZ., Maricopa Co. Jct. Airline Rd. & Salt Riv. N of Rainbow Valley Sand Dunes IV-15/30-86 W. B. Warner Col./Tenebrionid Base Aaron D. Smith Catalog # 18014, 18015, 20534, 20535, 20537, 20538. Single specimen; ARIZ., Santa Cruz Co. Tubac VIII-2-1986 lights W. B. Warner/Tenebrionid Base Aaron D. Smith Catalog # 18007. Two specimens; ARIZ.: Pima Co., Green Valley Sept. 1970 leg. R. Lenczy gift of N.M.Downie Purdue Univ./Tenebrionid Base Aaron D. Smith Catalog # 20430, 20431. Single specimen; ARIZ:Maricopa Co. 8mi SE Wickenburg IV-29-78 A.R.Hardy and Fred G.Andrews/Tenebrionid Base Aaron D. Smith Catalog # 20505. Single specimen; ARIZONA, Maricopa Co. Gila river at airport road VI-18-1990 flight intercept trap W.B. Warner col./Tenebrionid Base Aaron D. Smith Catalog # 20533. Single specimen; AZ.Sta.CruzCo., PenaBlancaLake, White Rock Campground 8-21-2011 at UV&HG. vapor light,CWO'Brien/Tenebrionid Base Aaron D. Smith Catalog # 20499. Single specimen; AZ: Amado Sta.Cruz Co VII-I-1986 at light collector: W.B.Warner/Tenebrionid Base Aaron D. Smith Catalog # 18009. Single specimen; AZ: Pima Co. Green Valley Aug-3-5-1988 at lights/Tenebrionid Base Aaron D. Smith Catalog # 20434. Single specimen; AZ: Tubac Sta.Cruz Co VIII-3-5-1988 at light W.B. Warner/Tenebrionid Base Aaron D. Smith Catalog # 18008. Single specimen; AZ:Santa Cruz Co. 1 km S. Rio Rico viii-5-1988;U.V. light; W.B.Warner/Tenebrionid Base Aaron D. Smith Catalog # 19793. Single specimen; MEXICO : Baja CA Sur Naranjas Road, 7 km W. Hwy 1; 100 m. el. 5-X-1991 BL+MV RA Cunningham coll/Tenebrionid Base Aaron D. Smith Catalog # 18005. (TAMU): Single specimen; ARIZ. PIMA Co., ROBLES JCT 25.VII.70 R.R. JILLSON/Tenebrionid Base Aaron D. Smith Catalog # 16370. Single specimen; ARIZONA: Cochise Co. Cazador, at Silver Creek 31°28'N, 109°24'W 22 October 2007/Tenebrionid Base Aaron D. Smith Catalog # 16781. Single specimen; ARIZONA: Santa Cruz Co. nr. Pena Blanca Lake 31°22'58"N, 111°05'30"W VIII-7-2003, E. Riley, UV/Tenebrionid Base Aaron D. Smith Catalog # 16763. Six specimens; AZ Sta.Cruz Co. Rio Rico Lenczy VIII-76/Tenebrionid Base Aaron D. Smith Catalog # 19584, 19586, 19587, 19590, 19593, 19594. Two specimens; Calif. Imperial Co. 3 Mi E. Palo Verde 9 Apr 1974 D. G. Marqua, Coll./Tenebrionid Base Aaron D. Smith Catalog # 16363, 16526. Single specimen; Calif.-SanBernardinoCo. 11 mi S. Needles 20-VII-72 Night Light P. Schroeder, Coll./Tenebrionid Base Aaron D. Smith Catalog # 16729. Twenty-two specimens; CALIF: Tulare Co. Porterville VIII-24-1997 E. G.Riley, at light/Tenebrionid Base Aaron D. Smith Catalog # 18662 – 18683. Nine specimens; CALIF: Tulare Co. Porterville VIII-2-4-1997 E.G. Riley, at light/Tenebrionid Base Aaron D. Smith Catalog # 18652 – 18660. Single specimen; El Paso El Paso Co., Tex. July 1 1967 Robert Smith/Tenebrionid Base Aaron D. Smith Catalog # 19854. Single specimen; MEX: Baja Cal. Sur 13 mi. E hwy. 19, E of Todos Santos IX-17-1988: E.Riley/Tenebrionid Base Aaron D. Smith Catalog # 18684. Single specimen; MEX: Baja Cal. Sur 9.4 mi. W.hwy.1. on Ramal a San Felipe IX-10-11-88:E.Riley/Tenebrionid Base Aaron D. Smith Catalog # 16393. Three specimens; MEX:Baja Cal. Sur 9 mi. N. Cabo San Lucas, IX-15-1988 Coll. E. G. Riley blacklight/Tenebrionid Base Aaron D. Smith Catalog # 16366, 16607, 20979. Two specimens; MEXICO: Colima Playa de Oro n. of Manzanillo July 8, 1984 L. E. Carroll/Tenebrionid Base Aaron D. Smith Catalog # 20091, 20092. Two specimens; Presidio, Texas July 15 1960 J. E. Hafernik Taken at „black light"/Tenebrionid Base Aaron D. Smith Catalog # 18647, 18648. Two specimens; Presidio, Texas July 30 1960 J. E. Hafernik Taken at „black light"/Tenebrionid Base Aaron D. Smith Catalog # 18645, 18646. Single specimen; TEXAS: Kenedy Co. Kenedy Ranch, Jaboncillos Pasture, sand dune area 26°58'38" N, 97°40'59"W IV-6-20-2001, W. Godwin & E.G. Riley, pit-fall trap/Tenebrionid Base Aaron D. Smith Catalog # 16636. (UCDC): Ten specimens; 5.5 mi NW Choix Sin Mex VII 14 1968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18063 – 18065, 18069, 18075, 18076, 18078, 18081, 18082, 18090. Single specimen; 6 mi. S Villa Matamoros Chih. Mex. VII-21-1967 R.C Gardner C.R.Kovacic Colrs./Tenebrionid Base Aaron D. Smith Catalog # 18124. Two specimens; 6 mi. S Villa Matamoros Chih. Mex. VII-26-1967 R.C. Gardner C.R. Kovacic K. Lorenzen/Tenebrionid Base Aaron D. Smith Catalog # 18125, 18126. Single specimen; 8 mi. S Villa Matamoros Chih. Mex. VII-18-1967 R.C. Gardner C.R. Kovacic K. Lorenzen/Tenebrionid Base Aaron D. Smith Catalog # 18128. Single specimen; 8 mi. S Villa Matamoros Chih. Mex. VII-26-1967 R.C. Gardner C.R. Kovacic K. Lorenzen/Tenebrionid Base Aaron D. Smith Catalog # 18127. Single specimen; Choix Sin Mex VIII51968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18058. Three specimens;

Appendix. Continued.

Mex 5.5 mi NW Choix Sin VII 18 1968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18096, 19376, 19377. Two specimens; Mex 6.5 mi NW Choix Sin VII-18 1968 T A Sears R C Gardner C S Glaser/Tenebrionid Base Aaron D. Smith Catalog # 18055, 18056. (USNM): Single specimen; Amacuzac Mo Mex. VI-13-57 Wm.W.Gibson collector/Tenebrionid Base Aaron D. Smith Catalog # 17719. Single specimen; Amacuzac Mor Mex. VI.17.57 CERCA LUZ Wm.W.Gibson Collector/Tenebrionid Base Aaron D. Smith Catalog # 16507. Single specimen; Amacuzac Mor. Mex VI-15-57 CERCA LUZ Wm. W. Gibson Collector/Tenebrionid Base Aaron D. Smith Catalog # 17905. Fourteen specimens; ARIZnr Douglas 11 viii 58 JHRussell at light/Tenebrionid Base Aaron D. Smith Catalog # 21632 – 21634, 21636 – 21640, 21643, 21644, 21646 – 21648, 21653. Single specimen; ARIZONA Tucson, 2500ft desert scrub 24-VII-1972 Robert Gordon/Tenebrionid Base Aaron D. Smith Catalog # 16402. Single specimen; CatalSpgs 27 4 Ar CollHubbard & Schwarz/Tenebrionid Base Aaron D. Smith Catalog # 17996. Single specimen; Douglas, Ariz. 1.VIII 1966 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21608. Two specimens; Douglas, Ariz. 13.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21614, 21615. Three specimens; Douglas, Ariz. 14.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21616, 21618, 21619. Two specimens; Douglas, Ariz. 6.IX.1957 W.Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21609, 21610. Twelve specimens; Douglas, Ariz. 7.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21620 – 21631. Single specimen; Douglas, Ariz. 8.IX 1957 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21613. Single specimen; Enter Identification Card No. 1643 Bofo * New Mexico/Tenebrionid Base Aaron D. Smith Catalog # 17817. Single specimen; GreenValley Pima Co. Arizona DrLency July 1972/Tenebrionid Base Aaron D. Smith Catalog # 20644. Single specimen; LerdoDurango Mex.McKinney & Loftin16 6'18/Tenebrionid Base Aaron D. Smith Catalog # 17712. Single specimen; Mexico IX-3-63 A. Lopez etal with cotton Gossypium sp. Calxico 6211 63-22441/Tenebrionid Base Aaron D. Smith Catalog # 18432. Single specimen; MEXICO,Son. Navojoa VII-14-1965 Paul Spangler/Tenebrionid Base Aaron D. Smith Catalog # 16449. Two specimens; MEXICO: Baja California Sur Rancho La Burrera, 24 km.E.Todos Santos 14 November 1981 W. E. Steiner/Tenebrionid Base Aaron D. Smith Catalog # 16787, 16788. Single specimen; Portal, Ariz. 1.VIII.1966 W. Rosenberg Coll./Tenebrionid Base Aaron D. Smith Catalog # 21611. Nine specimens; Pt Mts Arizona/Tenebrionid Base Aaron D. Smith Catalog # 20686, 20689 – 20696. Single specimen; Tempe Ariz EVWalter Collector Aug 14 1922/Tenebrionid Base Aaron D. Smith Catalog # 18433. Single specimen; Tucson 1.5 Ar CollHubbard & Schwartz/Tenebrionid Base Aaron D. Smith Catalog # 21662. Two specimens; Ulus crassus Arizona/Tenebrionid Base Aaron D. Smith Catalog # 20721, 20722. Single specimen; White Sands New Mexico USA Dr. Lency 7 1963/Tenebrionid Base Aaron D. Smith Catalog # 17721. Two specimens; White Sands Otero Co. New Mexico DrLency VIII.1978/Tenebrionid Base Aaron D. Smith Catalog # 19555, 19556.