



Research article

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**Once upon a time in America: recognition of the species
of *Libitoides* from USA, with comments on other American
Cosmetidae (Opiliones, Laniatores)**

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Abstract. The American species of Cosmetidae, in spite of being clearly distinguished in the older literature, were mixed-up by Roewer. This, aggravated by groundless synonymies done by Goodnight & Goodnight, prevented all subsequent authors from properly recognizing and adequately naming those species. Herein, we define and characterize the three most widespread species of Cosmetidae in the USA, explaining the misleading synonymies and misidentifications in the taxonomic literature. A recent phylogenetic analysis revalidated *Libitoides* Roewer, 1912 from the synonymy of *Vonones* Simon, 1879 to include three American species: *Gonyleptes ornatum* Say, 1821 (from southeastern USA), *Cynorta sayi* Simon, 1879 (from central-southern USA) and *Cosmetus albolineatus* Sørensen, 1884 (from eastern USA). Expanding on that, we herein aggregate another two species to *Libitoides*: *Vonones modestus* Banks, 1909 (from Cuba, herein revalidated from the synonymy of *Libitoides ornata* Roewer, 1912) and *Libitoides scabrissima* Roewer, 1912 (from Mexico, restored from the current combination with *Vonones*). The following subjective synonymies are proposed: (1) *Platycynorta* Mello-Leitão, 1933 and *Denticynorta* Roewer, 1947 = *Libitoides*; (2) *Metacynorta denticus* Walker, 1928 = *Cosmetus albolineatus*; (3) *Platycynorta secunda* Roewer, 1947 = *Vonones modestus*; (4) *Libitoides ornata* Roewer, 1912 and *Cynorta (Cynorta) depressa* Sørensen, 1932 = *Cynorta sayi*. Outside *Libitoides*, *Cynorta bimaculata* Banks, 1893, currently combined under *Calicynorta* Goodnight & Goodnight, 1943, and originally reported from California (due to a misinterpretation of label) has its type locality corrected as to be in Costa Rica instead and is transferred to *Holovonones* Roewer, 1912. Accordingly, *Calicynorta* is herein considered a junior subjective synonym of *Holovonones* Roewer, 1912. *Platycynorta clavifemur* Roewer, 1957 from Peru is newly combined under the genus *Ambatoiella* Mello-Leitão, 1943, otherwise known from Ecuador. The present analysis of the distributional data suggests that the occurrence of Cosmetidae is determined not directly by temperature, but by the absence of a dry season and the presence of a hot summer.

Keywords. Arachnida, harvestmen, Grassatores, Nearctic, United States.

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Introduction

The family Cosmetidae C.L. Koch, 1839 recently underwent a cladistic analysis (Medrano *et al.* 2021) in which several subfamilial and generic taxa were defined. The genus *Libitioides* Roewer, 1912, was then retrieved as the sister-group of the Taitoinae Medrano, Kury & Mendes, 2021. But because of the weak support, and the lack of the conspicuous synapomorphies defining an expanded Taitoinae, it was left unassigned to any subfamily. *Libitioides* currently has a few species in North America and the Caribbean. The three species of *Libitioides* which occur in the United States were used in that analysis. These species appear both in the literature and on internet websites of macro photographers mostly identified as “*Vonones ornata*” or “*Vonones sayi*” (see below in the Examples of misidentifications section, within Results).

In this project we treat in detail the taxonomy of *Libitioides* and for that we access other species recorded from the USA which are allocated in other genera (such as *Calicynorta* Goodnight & Goodnight, 1943, and *Cynortoides* Roewer, 1912).

Aiming to reach diagnoses for the American species of *Libitioides* and to define their geographic distribution, we have examined material from several museums, some of it destroyed in the 2018 fire of the Brazilian National Museum (MNRJ). Besides non-type specimens from the USA, we studied type material of the relevant species, whenever possible, or at least photographic images of this material.

In order to maximize the number of geographic records and to refine the areas of distribution of each species, additionally to the study of specimens, we also gleaned information from a large number of photographic records as published on the Internet websites of naturalists/macrophotographers (Flickr, Bugguide, iNaturalist, Instagram).

Material and methods

We have looked for phenotypic characters with potential to allow distinction among the species, and easily verifiable by the study of photographs only. Five characters were then selected and mapped against individual records onto a political map of the eastern USA. We then tabulated the combinations of those five characters against the distribution to find unique combinations of characters that defined discrete species.

Abbreviations of nomenclatural acts are:

comb. nov. = combinatio nova = new combination
comb. rest. = combinatio restaurata = reinstated (or restored) combination
nom. rest. = nomen restitutum = name revalidated (or reinstated) from synonymy
syn. nov. = synonymum novum = new synonym (or new synonymy).

Because of the complex taxonomic story of the taxa involved, not only protonyms and aponyms (*sensu* Dubois 2000) are used in the logonymies of genera and species herein, rather a complete logonymy is given including chresonyms.

Terminology of scutal blots (chromatic designs, Fig. 1) on the dorsal scutum follows Kury & Medrano (2018) and Kury & Medrano (2016) for the outline of the dorsal scutum. We use herein Kury & Villarreal

(2015) and Medrano & Kury (2016) for the chaetotaxy of macrosetae on the ventral plate of the penis; and Kury (2016) for terminology of the microsetae.

Scanning electron microscopy was carried out with JEOL JSM-6390LV at the Center for Scanning Electron Microscopy of MNRJ and Rudolf Barth Electron Microscopy Platform of the Oswaldo Cruz Institute/ Fiocruz.

Abbreviations of the repositories cited are:

AMNH	=	American Museum of Natural History – Entomology, New York, USA
MCZ	=	Museum of Comparative Zoology, Harvard University, Cambridge, USA
MNHN	=	Muséum national d’histoire naturelle, Paris, France
MNRJ	=	Museu Nacional/UFRJ, Rio de Janeiro, Brazil
MTD	=	Museum of Zoology Senckenberg Dresden, Dresden, Germany
NHMUK:GD SLV	=	The Natural History Museum, London, UK – Collection Godman & Salvin
SMF	=	Naturmuseum Senckenberg, Frankfurt, Germany, Sektion Arachnologie
USNM	=	Smithsonian National Museum of Natural History – Entomology, Washington, DC, USA
ZMB	=	Zoologisches Museum (Humboldt Universität) [or Museum für Naturkunde der Humboldt-Universität zu Berlin], Berlin, Germany
ZMUC	=	Zoologisches Museum (Humboldt Universität), Berlin, Germany

Results

Examples of misidentifications of the American species of Libitioides

There are several examples of species of “*Vonones*” reported in websites dedicated to imaging wildlife. USA-based users are predominant in this kind of site (e.g., iNat reports that there are 14 million observations from the American territory, <https://www.inaturalist.org/posts/26101-world-inaturalist-participation>). Accordingly, the names of the commonest or most conspicuous American species have a broader exposure

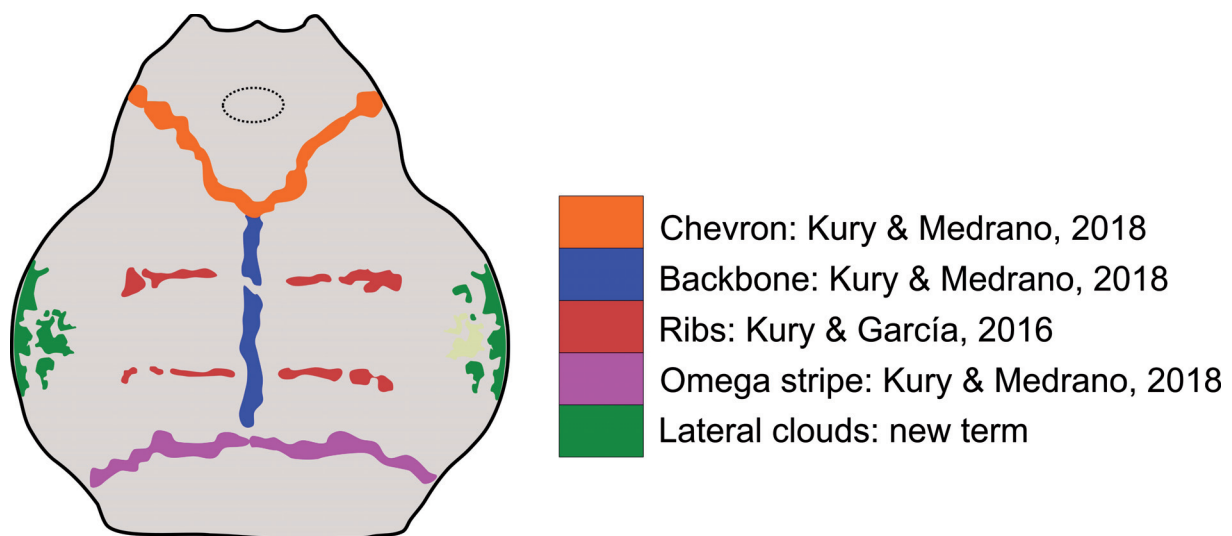


Fig. 1. Explanation of the terminology used here for the yellowish-white markings of the dorsal scutum in *Cosmetidae* C.L. Koch, 1839.

Table 1. Examples of misidentification in reports of “*Vonones*” spp.

Original ID	Our revised ID	Locality	Reference
<i>Vonones sayi</i>	<i>Pseudopucroliia discrepans</i> (Roewer, 1943) [Gonyleptidae]	Alagoas, northeastern Brazil	danpostou oficial (2022) O estranho aracnídeo <i>Vonones sayi</i> que encontrei no mato Você já viu um desses? YouTube video online at: https://www.youtube.com/watch?v=prD09eJ3TQ8
<i>Vonones ornata</i> ; <i>Vonones sayi</i>	<i>Libitioides albolineata</i> (Sørensen, 1884)	Letcher County, Kentucky, USA	Lisa I. (2013) Photo#852380. Image online at: https://bugguide.net/node/view/852380/bgimage
<i>Vonones sayi</i>	<i>Libitioides albolineata</i> (Sørensen, 1884)	Fort Bragg, Cumberland County, North Carolina, USA	Elliott L. (2005) Photo#12435. Image online at: https://bugguide.net/node/view/12435
<i>Vonones ornata</i>	<i>Libitioides albolineata</i> (Sørensen, 1884)	Bossier City, Louisiana, USA	Dallas Krentzel (2012) Purple harvestman (<i>Vonones ornata</i>), a North American cosmetid. Image online at: https://flic.kr/p/boemkR
<i>Vonones sayi</i>	<i>Libitioides albolineata</i> (Sørensen, 1884)	Dorchester Co., Maryland, USA	Ashley Bradford (2020) Record 772290 in Maryland Biodiversity Project. Image online at: https://www.marylandbiodiversity.com/record/772290

in several reports and may end up as part of the popular culture. On Table 1, a few examples illustrate the wide use of misidentified “*Vonones*” spp.

Taxonomic history of Libitioides

[1] The first cosmetid (*ornatus*)

There were already 54 species of harvestmen described in the world, when William Kirby (1819) described the first three Laniatores Thorell, 1876 (two from Brazil, one from Uruguay), placing them in the new genus *Gonyleptes* Kirby, 1819. In the very next paper in the taxonomic story of Opiliones Sundevall, 1833, Thomas Say (1821) described the first laniator from the USA, *Gonyleptes ornatum* Say, 1821. This was also the first species described of what we now know as Cosmetidae. Say was, therefore, the first to conceive what would later become the Laniatores (as we consider today), by recognizing the intimate relationship between what are now gonyleptids and cosmetids. Soon later, other researchers (Perty 1833; Hope 1836) proposed a different hypothesis (today refuted), by joining the cosmetids with what are now the Eupnoi Hansen & Sørensen, 1904.

Say described the new species *Gonyleptes ornatum* Say, 1821 (incidentally getting the grammatical inflection incorrectly, in what should have been *ornatus*, masculine instead of neuter gender) from Cumberland Island, Georgia and East Florida. Say’s description is detailed and accurate enough to allow this species to be recognized without mistake (Fig. 2a). The name ‘ornatus’ (‘decorated’), as applied to a cosmetid, is adequate enough, but it has exceedingly low discriminatory value, and indeed, it was later used to name several unrelated species. This species was first combined with *Cosmetus* Perty, 1833 only 50 years later by Butler (1873).

[2] The Texan caramel cosmetid (*sayi*)

Almost half a century after the description of *Gonyleptes ornatum*, Horatio Wood (1868) recorded this species from Texas. Wood’s redescription is clear enough to make evident it was an entirely different species, unarmed, “dark ferruginous” or light coffee colored with a pair of large diffuse “nearly black spots” on the posterior part of abdominal scutum (Fig. 2b).

Eleven years later, Simon (1879) noticed that this “*Gonyleptes ornatum*” of Wood was a misidentification of a yet undescribed species. He strangely enough named this new species *Cynorta sayi*, in homage to Say (when the standard practice would have been to call it “*woodi*” after the person who did the misidentification). Simon also transferred both American cosmetids to the genus *Cynorta* C.L. Koch, 1839, erected 40 years earlier for Brazilian species.

[3] The northernmost cosmetid (*albolineatus*)

Only five years after Simon had named *Cynorta sayi*, Sørensen (1884) baptized a third American cosmetid – *Cosmetus albolineatus* Sørensen, 1884 from New Orleans, Louisiana. Sørensen’s lengthy

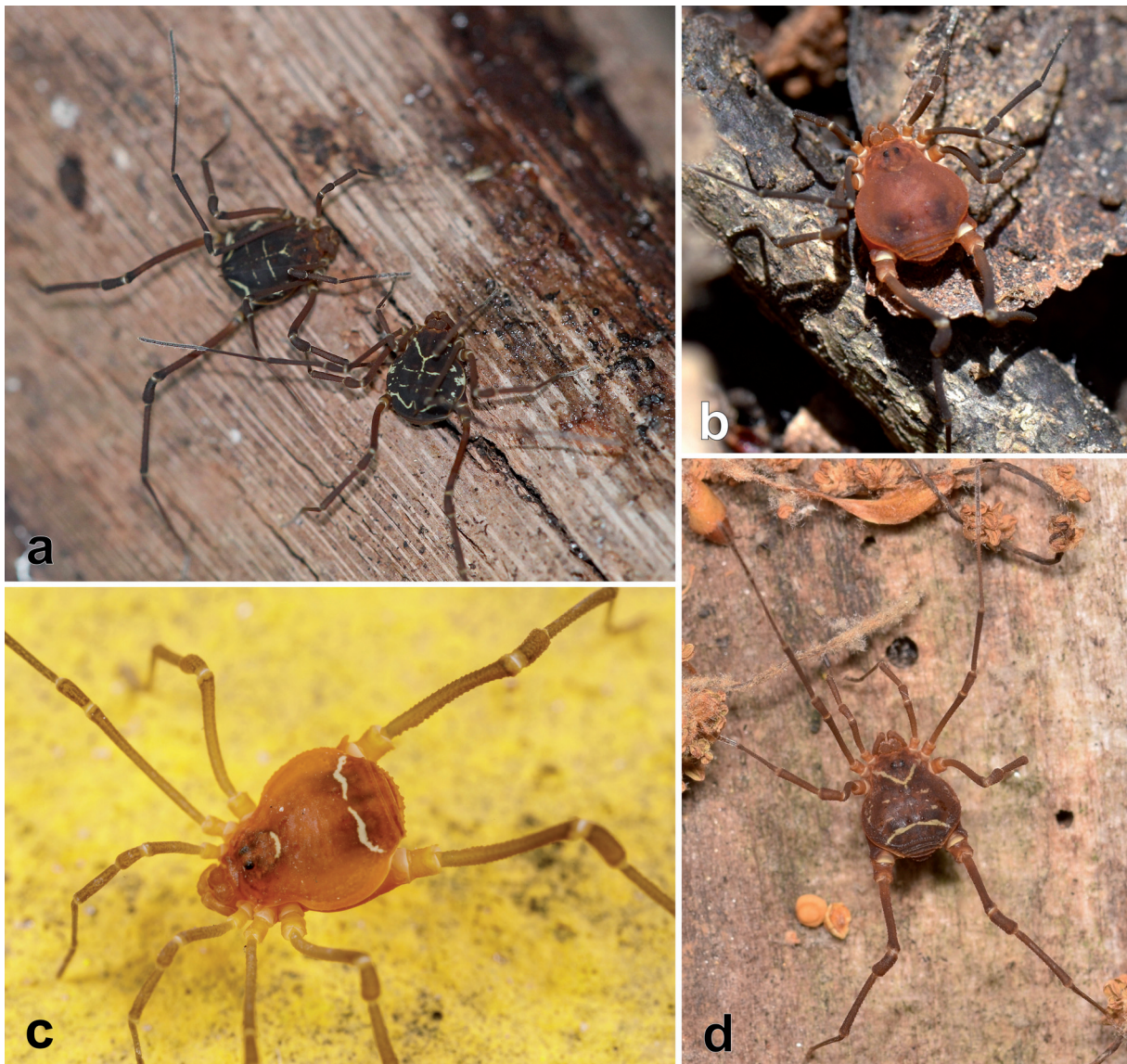


Fig. 2. *Libitioides* spp. from USA, in vivo. **a.** *L. ornata* (Say, 1821) (morph A), ♂ and ♀, Florida, Orange, Orlando Wetlands Park (©Mary Keim). **b.** *L. sayi* (Simon, 1879) (morph B, “clean”), ♂, Texas, Sherman Co. (©Kate Farkas). **c.** *L. sayi* (morph C, “depressa”), ♂, Texas, Kleberg Co., Padre Island National Seashore (©Meghan Cassidy). **d.** *L. albolineata* (Sørensen, 1884) (typical morph D), ♂, Georgia, Fulton Co. (©E. Christina Butler). Photos are somewhat cropped. All images used here under written permission.

Latin description is enough to allow recognition of this species (Fig. 2d). By then, the recognition of three USA species was clear enough, so that Weed (1893) also transferred *albolineatus* to *Cynorta* and easily summarized the distinction of the three American species of *Cynorta*. Weed offered redescriptions of those *Cynorta*, providing some additional records – in the case of *C. sayi* he also mentioned a distinct morph (see [7]) with a “yellow marking on dorso-meson behind eye eminence, and a transverse line near posterior margin of abdominal scutum.” In the case of *C. albolineata*, he also provided illustrations which match precisely Sørensen’s description and also considerably expanded the known distribution of the species. As for *C. ornata*, Weed described the variation of the “canary-yellow” markings and noted it as “exceedingly abundant in the pine woods under logs.”

[4] The humble Cuban cousin (*modestus*)

Banks (1909: 171) described the new species *Vonones modestus* Banks, 1909 from Cuba. This species was wrongly synonymized (by Roewer 1912, see [5]) with *Libitioides ornata*, a name used by Roewer (see [5]) which included all American cosmetids, and subsequently forgotten.

Four decades later Roewer (1947, see [7]) described a similar species from Cuba, placing it in *Platycynorta* Mello-Leitão, 1933, as *P. secunda* Roewer, 1947. In spite of Banks’ type of *V. modestus* being lost, his description matches in all details the male holotype of *P. secunda* (Fig. 3).

This Cuban species is extremely similar to *L. albolineata* and only a specific focused study will be able to establish its status. This species does not closely resemble any other Cuban cosmetid, and the hypothesis of introduction should also be considered.

[5] Roewer’s jumble

Carl-Friedrich Roewer created the new genus *Libitioides* Roewer, 1912 for *Cynorta sayi* and the new Mexican species *L. scabrissima* Roewer, 1912. Roewer (1912) consistently disregarded Simon’s name by using *Libitioides* “sayi” (between quotation marks). Alternatively, Roewer named that species “*Libitioides ornata* (Wood)”. Subsequently, he buried *C. albolineatus* (and *Vonones modestus*), in its synonymy (without seeing the holotypes).

[6] The *Metacynorta* / *Denticynorta* interlude

Pickard-Cambridge (1904) had created the new genus *Metacynorta* Pickard-Cambridge, 1904 for the new species *Metacynorta gracilipes* Pickard-Cambridge, 1904 from Guatemala, and Roewer (1912) placed *Gonyleptes ornatus* Say, 1821 in *Metacynorta*. Mary Elizabeth Walker (1928), in her study of Ohio harvestmen, described the new species *Metacynorta denticus* Walker, 1928 from Clear Creek. She compared *M. denticus* to *M. ornata*, saying that it: “differs from it [*M. ornata*] in a sufficient number of characters to permit describing it as a new species.” However, she did not care to elaborate on those characters.

Roewer (1947) created the new genus *Denticynorta* Roewer, 1947 for *Metacynorta denticus*, inflecting it as *dentica*, which later was proven incorrect (Kury & Alonso-Zarazaga 2011). Cokendolpher & Jones (1991) combined it into *Vonones* Simon, 1879, following the Goodnight’s paradigm (see below). Kury (2003) revalidated *Denticynorta* without further comments.

[7] The striped Texan morph (*Platycynorta depressa*)

Sørensen (in Henriksen 1932) described the new species *Cynorta depressa* Sørensen, 1932 from “America centralis” based on males and females in the Dresden Museum. The arachnid collection in Dresden has been destroyed during World War II, but a subsample survived in ZMUC, which has been examined by ABK (Fig. 4). Henriksen (the editor of Sørensen’s notes posthumously published) placed this species in the subgenus *Cynorta*, into which he synonymized a great number of generic nomina by

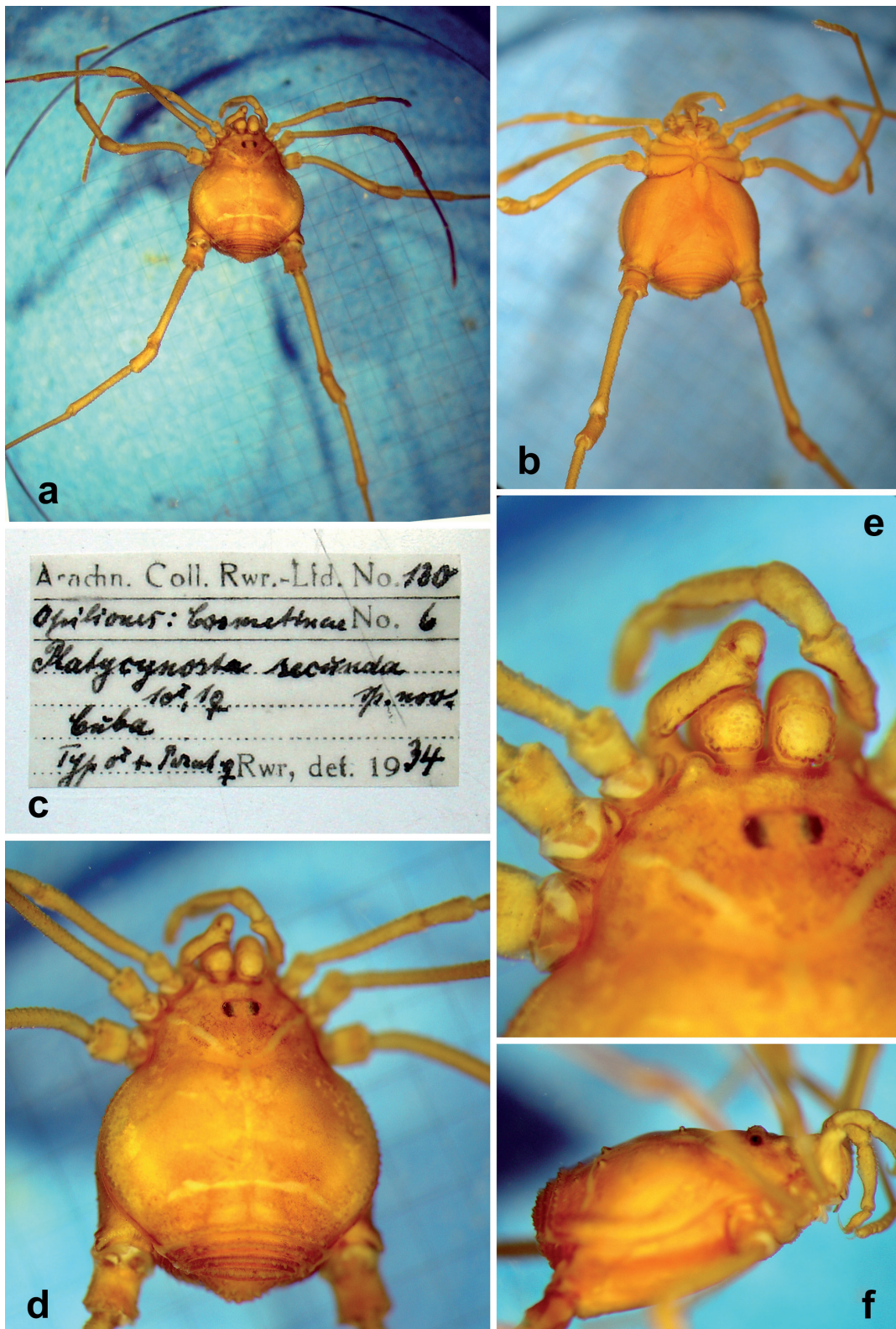


Fig. 3. *Libitoides modesta* (Banks, 1909), holotype ♂ of *Platycynorta secunda* Roewer 1947 (SMF RII 130) from Cuba. **a.** Habitus, dorsal view. **b.** Same, ventral view. **c.** Original Roewer's label. **d.** Same as (a), detail of dorsal scutum and basal part of legs. **e.** Same, detail of basichelicerite, trochanters I-III, protoglyphs and deutoglyphs. **f.** Same, dextrolateral view. Images courtesy Abel Pérez-González.

Roewer, including *Libitioides*. He commented: “This species is nearly [sic] related to *C. ornata* Wood, described above, and is thus to be referred to the genus *Libitioides* in the Roewerian system in spite of the different armature of the third and fourth abdominal somites.”

Mello-Leitão (1933) made this *Cynorta depressa* the type of his new genus *Platycynorta* (Fig. 2c). The rationale for the separation of both genera was given as: “Area III tuberculis rotundis areae primae similibus munita” [*Platycynorta*] X “Area III processis conicis duobus armata” [*Libitioides*].

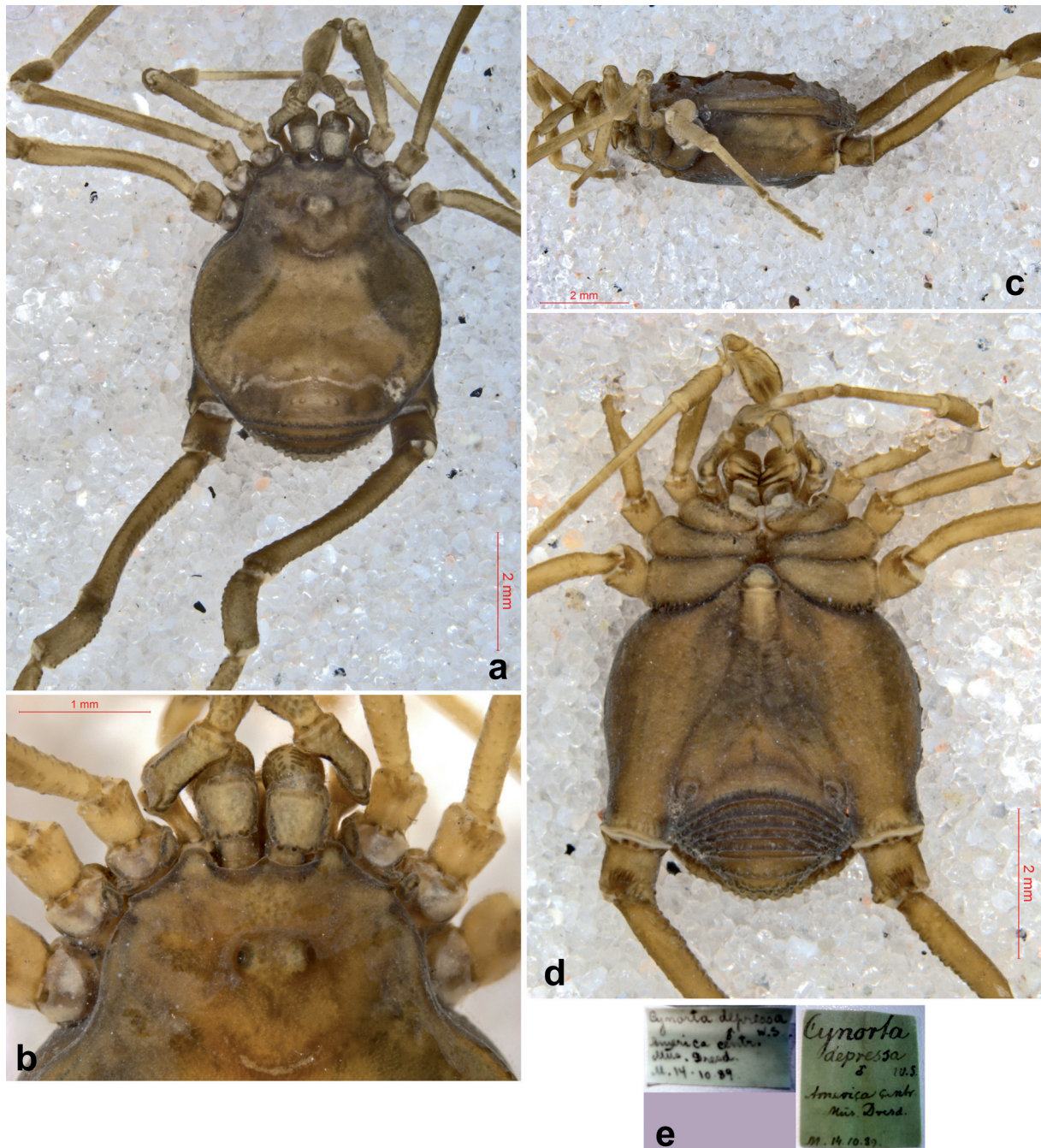


Fig. 4. *Libitioides sayi* (Simon, 1879), morph C, syntype, ♂ (ZMUC). **a.** Habitus, dorsal view. **b.** Same, sinistrolateral view. **c.** Same, ventral view. **d.** Same, detail of carapace, dorsal view. **e.** Labels.

Roewer (1947: 8) described *Platycynorta secunda* from Cuba. Our colleague Abel Pérez-González kindly shared his images of the holotype, and to our astonishment, we could not find any difference with Sørensen's species *C. albolineata* from USA. We do not know if under more thorough examination this species proves different from *L. albolineata* (or even if the locality was mislabeled), therefore we simply associate this species with the Cuban *Vonones modestus* and make the transfer to *Libitioides* leaving it otherwise undisturbed.

Roewer (1952: 42) described the new species *Platycynorta transversalis* Roewer, 1952 from Seagoville near Dallas, Texas. Roewer's illustration is surprisingly faithful (showing the sinuous omega-stripe) and his text clearly mentions the typical granulated retrolateral patch on femur IV of male. Cokendolpher & Jones (1991: 86) commented about the unsatisfactory state of the taxonomy of American cosmetids and synonymized *Platycynorta transversalis* with *Vonones sayi*.

Finally, Roewer (1957: 89) described yet another *Platycynorta*, *P. clavifemur* Roewer, 1957 from Peru. It does not have anything to do with any of the species treated here and is referred below to the genus *Ambatoiella* Mello-Leitão, 1943, to which we herein give an extended diagnosis.

[8] California dreaming (*Calicynorta bimaculata*)

Banks (1893: 150) described the new species *Cynorta bimaculata* Banks 1893 from "California, San Diego". After inclusion in the genus *Eucynortella* by Roewer (1912), *C. bimaculata* was given a genus of its own by Goodnight & Goodnight (1943: 643) – *Calicynorta* Goodnight & Goodnight, 1943, the name emphasizing the occurrence in California. They presented an illustration of Banks type. Ten years later, *Calicynorta* was synonymized with *Vonones* by Goodnight & Goodnight (1953a, see [9]). Kury (2003) revalidated *Calicynorta*.

Cokendolpher & Jones (1991: 86) and Cokendolpher (pers. com. to ABK, 1995) doubted California as correct finding locality, since no Cosmetidae has ever been collected anywhere in the USA west of Texas (Fig. 5). Moreover, the label only says "San Jose", possibly in Costa Rica.

[9] The Goodnights blender

Goodnight & Goodnight (1953a) performed an important setback, clustering 64 genera of Cosmetidae into three genera, thus inexplicitly synonymizing *Metacynorta* with *Vonones*, only mentioning the combination *Vonones ornata* (instead of *ornatus*, see Kury (2003)) five years later (Goodnight 1958). Goodnight overlooked the fact that *Vonones* is masculine, so the specific epithet should be inflected to match it as *Vonones ornatus*. This error propagated for decades until Kury (2003) noticed and corrected it.

[10] What we are proposing herein

We propose herein the recognition of three species of American *Libitioides* based on our interpretation of exclusive sets of morphological features. After discarding the spurious report of occurrence of Cosmetidae in California, we find that the members of *Libitioides* occur only in the eastern portion of the USA, with clear climatic constraints. *L. ornata* occurs in the southeastern tip of this area (mostly the Florida Peninsula). The other two species are mostly allopatric, *L. sayi* occurs almost exclusively in Kansas, Oklahoma and Texas while *L. albolineata* occurs to the east of this area, up to the Atlantic coast.

Distribution and climate

The cosmetids of the genus *Libitioides* in the USA are distributed exclusively in the Köppen-Geiger climate regions Cfa and Dfa (Fig. 5). The letters C and D (at the beginning of the acronyms) stand respectively for mesothermal and microthermal climates. This strongly suggests that the factors determining the distribution of these species are not directly temperature, but the absence of a dry season (second letter "P") and the presence of a hot summer (third letter "a"). However, the Cosmetidae are conspicuously absent from the northern half of Dfa.

Recognition of morphs in *Libitoides*

We can recognize five morphs for the American species treated herein (Fig. 6), two pairs of them (B, C and D, E) merge into each other. Their marked features are listed below:

Morph A: *Libitoides ornata* (Fig. 6a). The strongly spined and profusely marked Floridan species. It seems endemic to the WWF ecoregion NA0529 (Southeastern conifer forests).

Morph B: “clean” *Libitoides sayi* (Fig. 6b). The Texan unmarked caramel *Libitoides sayi* (Simon, 1879) to the eastern part of Texas, Oklahoma and Kansas. This morph occurs exclusively in the type 8 biome of WWF (Temperate Grasslands, Savannas, & Shrublands), massively in WWF ecoregion NA0804 (Central forest-grasslands transition), extending marginally also into NA0805 (Central tall grasslands) and NA0806 (Edwards Plateau savanna).

Morph C: *Libitoides sayi*, morph “*depressa*” (Fig. 6c). The striped Texan morph recognized (but not named) by Weed is not viewed here as a separate species, which would have been properly called *Libitoides depressa* (Sørensen, 1932). This morph may be recognized by the caramel color (with dark patches on area III) just as in the typical *L. sayi*, but possessing a reduced arched chevron and well-formed omega-stripe almost as solid as in *L. albolineata*. Accordingly, Roewer’s *Platycynorta transversalis* fits with this morph but without any chevron. It occurs intertwined with the more typical *L. sayi* D morph, mainly in the Gulf Coastal Plain of Texas. WWF ecoregions: NA0523 (Piney Woods forests), NA0701 (Western Gulf coastal grasslands), NA0814 (Texas blackland prairies).

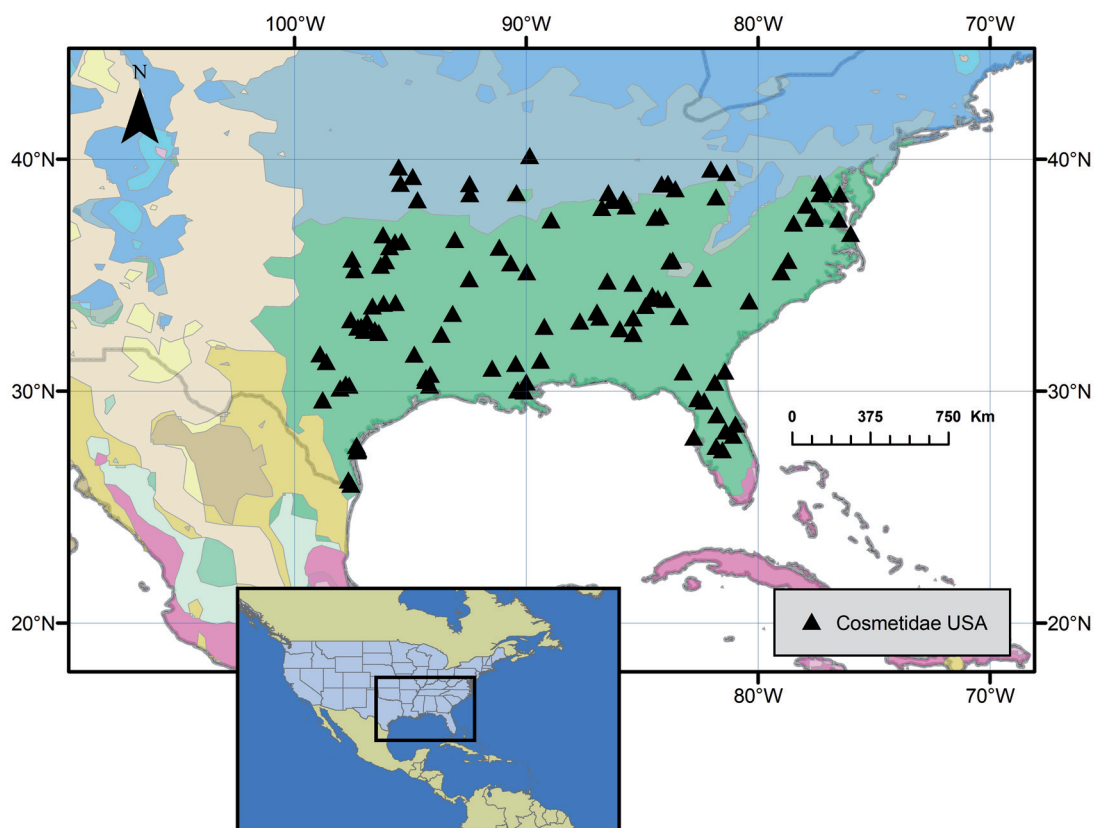


Fig. 5. Southeastern USA, with the Köppen-Geiger climate regions superimposed, showing the distribution of the American Cosmetidae C.L. Koch, 1839.

Morph D: *Libitioidea albolineata* (Fig. 6d). The broad definition of *Vonones sayi* (sensu Cokendolpher & Jones 1991) is not supported here, so we recognize the widespread northeastern-most species (from Appalachian Highlands, including Piedmont, and Interior Plains, outspreading into Atlantic Plain) as *Libitioidea albolineata* (Sørensen 1884) comb. nov. This species has a tuning-fork chevron (with a clear backbone at least over area I), omega-stripe open, arched frontwards, dissociated ribs, and dissociated marking on lateral areas. It occurs massively in the WWF biome 4 (Temperate Broadleaf & Mixed Forests), extending a little into biomes type 5 (Temperate Coniferous Forests) and 8 (Temperate Grasslands, Savannas, & Shrublands). WWF ecoregions with major occurrence of this species are: NA0402 (Appalachian mixed mesophytic forests), NA0403 (Appalachian-Blue Ridge forests), NA0404 (Central U.S. hardwood forests), NA0409 (Mississippi lowland forests), NA0412 (Ozark Mountain forests) and NA0413 (Southeastern mixed forests).

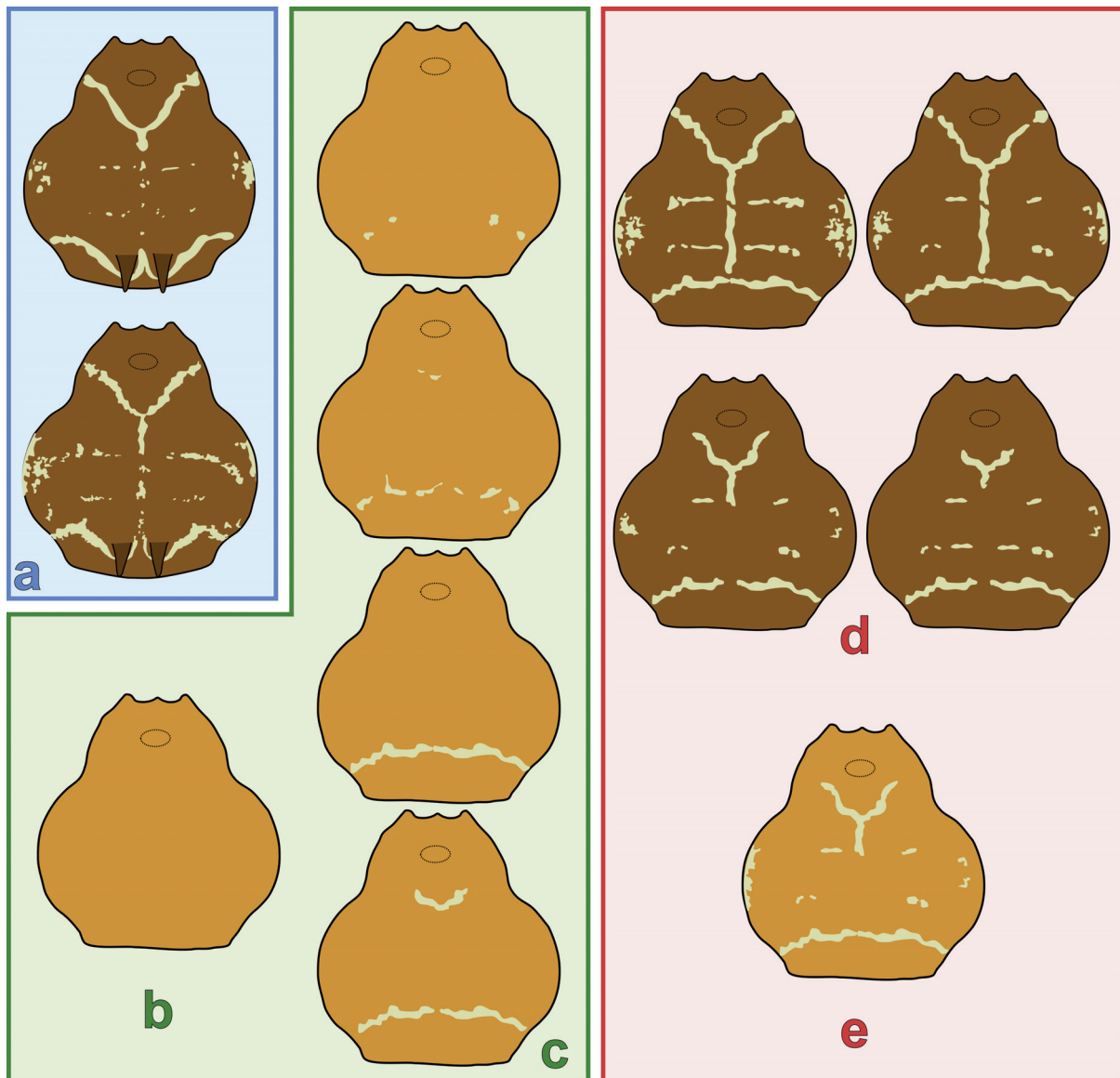


Fig. 6. Schemes of scutal yellow markings and other features diagnosing the morphs discussed herein. **a.** Morph A: *Libitioidea ornata* (Say, 1821). **b.** Morph B: “clean” *Libitioidea sayi* (Simon, 1879). **c.** Morph C: *Libitioidea sayi*, striped Texan morph “*depressa*”. **d.** Morph D: *Libitioidea albolineata* (Sørensen, 1884). **e.** Morph E: “yellow *Libitioidea albolineata*”.

Morph E: “yellow *Libitoides albolineata*” (Fig. 6e). It occurs in the contact zone of *L. sayi* and *L. albolineata*, restricted to a small area mainly in the Gulf Coastal Plain of Texas. WWF ecoregions: NA0523 (Piney Woods forests) and NA0701 (Western Gulf coastal grasslands).

We are also marginally dealing with other species associated with *Libitoides* and its synonyms as well as the monotypic *Calicynorta*, mistakenly reported as being from the USA.

Platycynorta clavifemur does not share any special similarity with any *Libitoides*. Its distribution in NW Peru already hints at the alienness of it compared to *Libitoides*. We made an effort to relate this species to the described Andean genera, and found special similarity with *Ambatoiella* Mello-Leitão, 1943, so this species is below formally combined under that genus. Other genera from the Peruvian Andes such as *Moselabius* Roewer, 1956 and *Socotabius* Roewer, 1957 are surely closely related to *Ambatoiella*, and at least members of the Libitiinae, but in the absence of detailed information of those genera and of a phylogenetic analysis to test those hypotheses, we refrain from proposing a formal transfer.

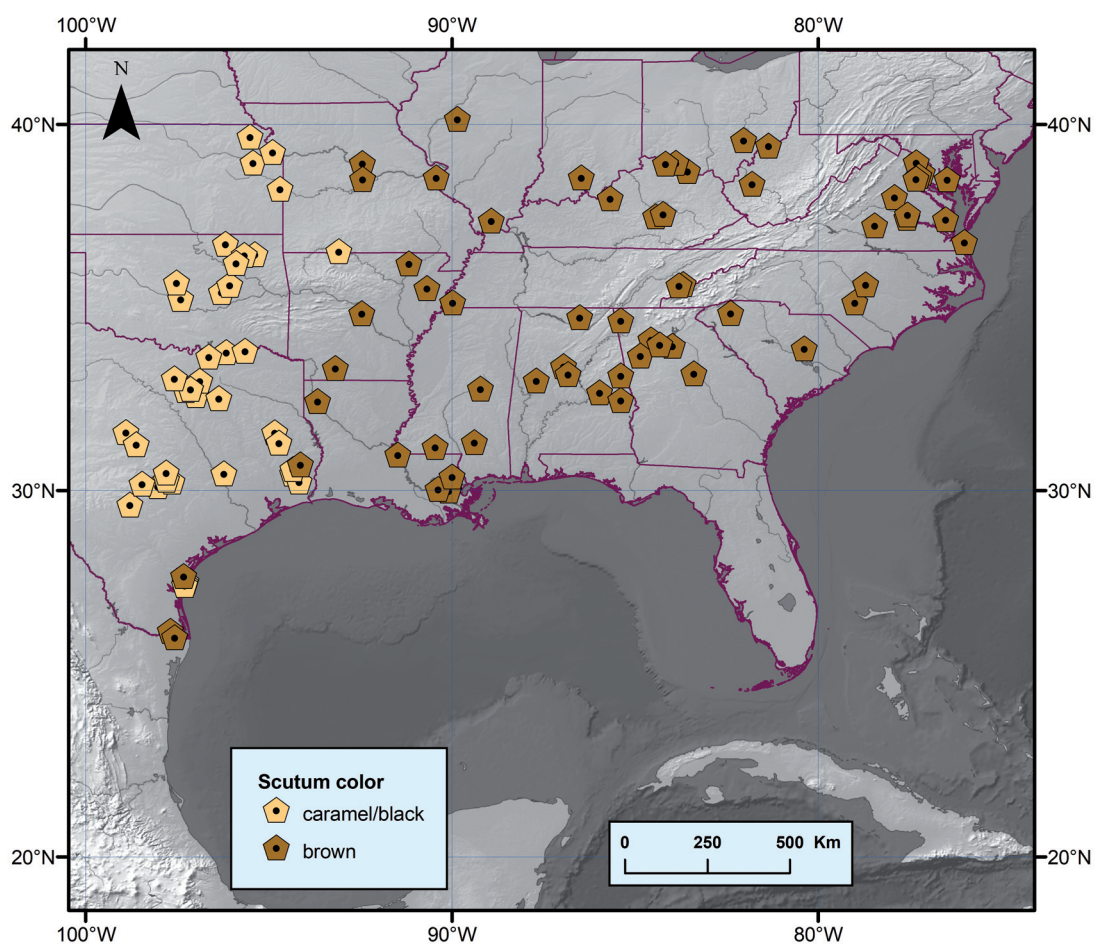


Fig. 7. Southeastern USA, showing the contrasting occurrences of prevailing body color backgrounds in the four morphs B/C/D/E of *Libitoides* Roewer, 1912.

Calicynorta bimaculata is very similar to *Holovonones compressus*, a common south Mexican species. As it is known by a female only, we do not know if there are significant contrasts between Costa Rican and Mexican/Guatemaltecan populations. There seems to be small differences in the scutal armature and the two longitudinal stripes. Therefore, we include *C. bimaculata* in *Holovonones* as a distinct species and assume that the Costa Rican *H. compressus* must be *H. bimaculatus* instead.

[11] Diagnostic characters within *Libitioides*

Because the easy distinction of *L. ornata* from the other *Libitioides*, we have tackled here only the issue of distinction of the western species (morphs B and C: *L. sayi*) from the eastern species (morphs D and E: *L. albolineata*) by listing the main features which can be used for that purpose.

- 1) Color background of dorsal scutum and legs (Fig. 7). This character sharply distinguishes two almost allopatric species: (a) western (morph B, C, but also E): yellow to rusty-orange background, with two fuzzy dark spots on scutal area III; trochanters I–IV yellow, gradually getting darker (olive) distally and (b) eastern (morph D): body and legs uniform dark chestnut brown, with only a faint hint of darker spots at area III.

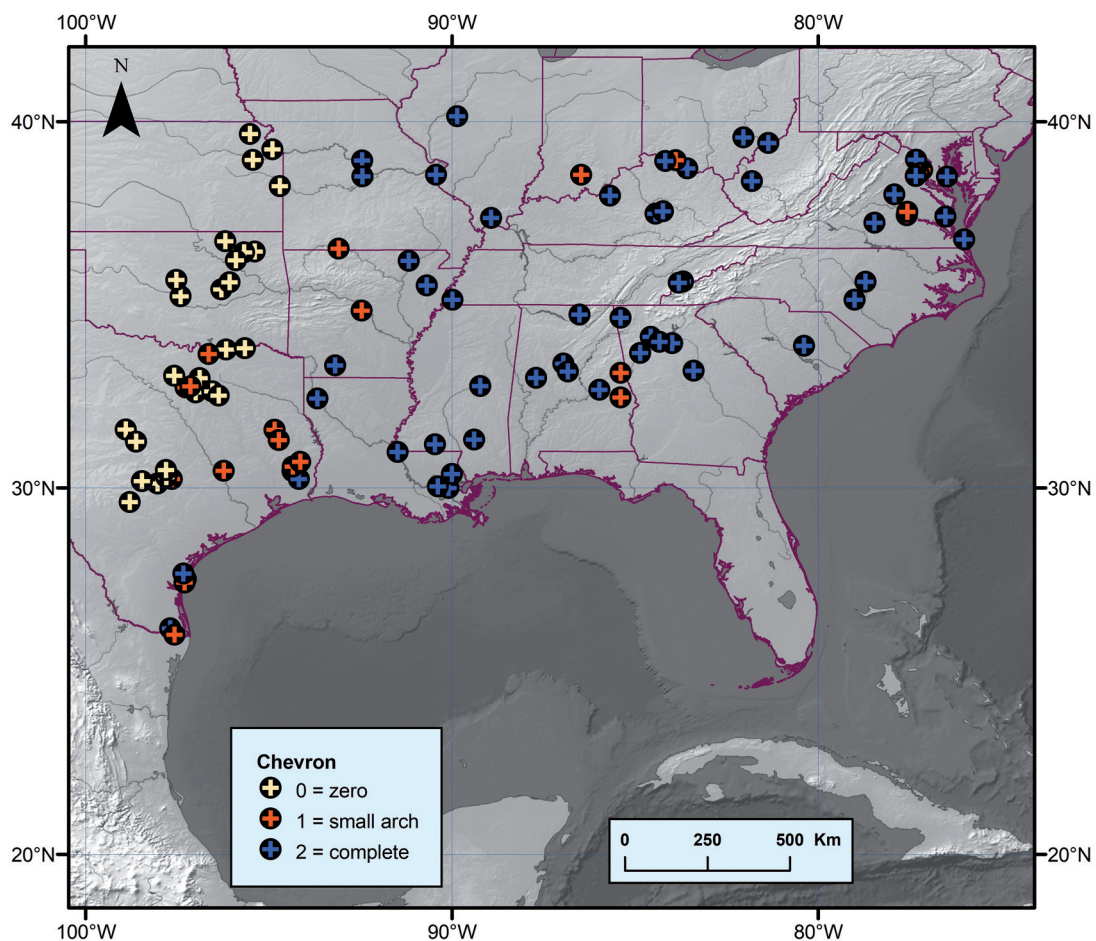


Fig. 8. Southeastern USA, showing the contrasting conformations of the chevron in the four morphs B/C/D/E of *Libitioides* Roewer, 1912.

- 2) Chevron (Fig. 8). We may distinguish three states of this character: [0] chevron entirely absent, [1] chevron reduced to a small median arch, [2] chevron complete, reaching laterals of carapace. The western species (morphs B, C) mainly lacks chevron or has it reduced ($0 \gg 1$), while the eastern species (morphs D, E) mainly has well-developed chevron, sometimes reduced ($2 \gg 1$).
- 3) Backbone (Fig. 9). We may distinguish four states of this character: [0] backbone entirely absent, [1] backbone formed by scattered dots, [2] backbone formed by one dash, [3] backbone complete, formed by chained dashes connecting chevron and omega stripe. The western species (*L. sayi*) always lacks any sort of backbone (only state 0), while the eastern species (*L. albolineata*) possesses an entire backbone which undergoes all stages of dissociation (1, 2, 3, and rarely 0).
- 4) Omega stripe (Fig. 10). We may distinguish seven states of this character: [0] omega stripe entirely absent (the classical *sayi* facies), [1] omega stripe almost entirely deteriorated, reduced to a single marginal dot, [2] a pair of minute lateral dots, [3] only a pair of tear-shapes dots on posterior margin

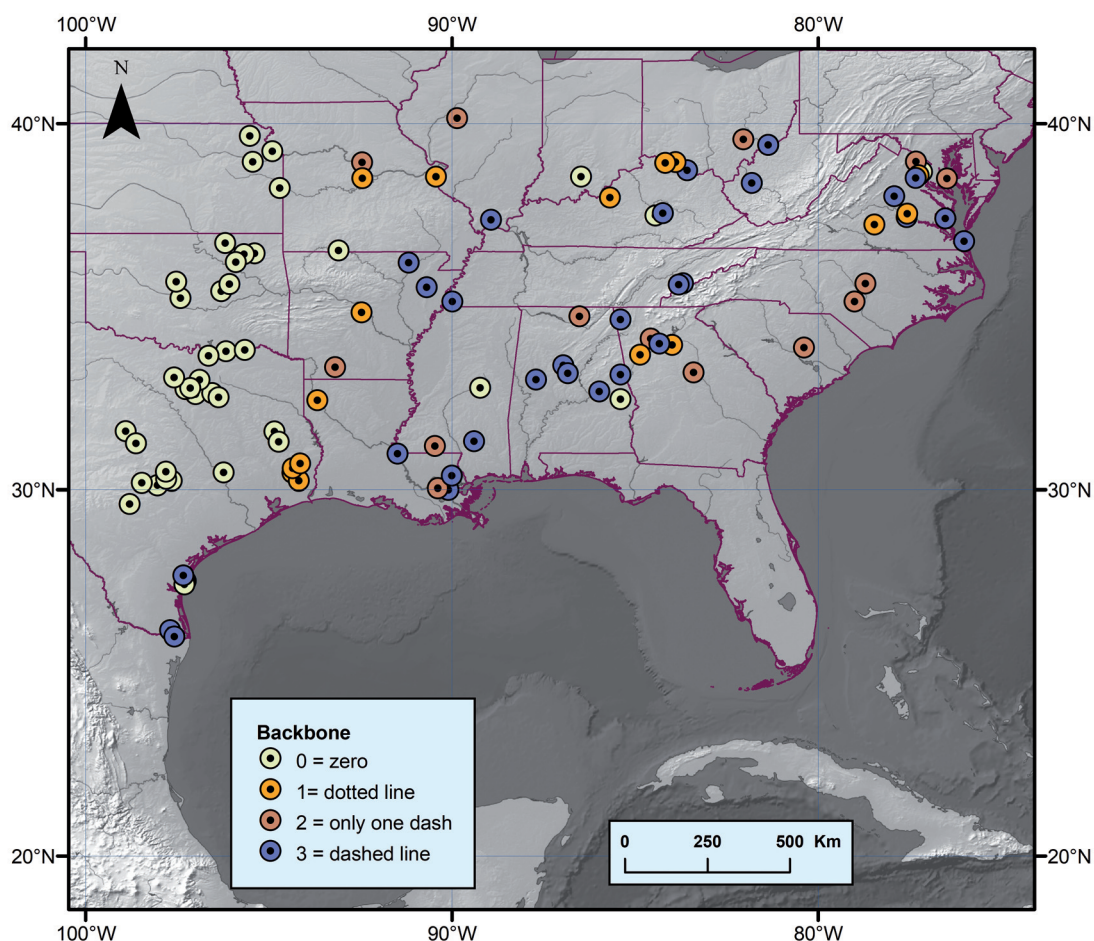


Fig. 9. Southeastern USA, showing the contrasting conformations of the backbone in the four morphs B/C/D/E of *Libitoides* Roewer, 1912.

of area III, sometimes broken in two, [4] a pair or arches almost formed, but each one severed in more than one place, [5] a pair of entire arches, but clearly separated in the middle, [6] omega stripe complete, left and right halves joined in the middle. The western species mostly has no omega stripe and even when present it is rarely complete (states 1 to 4, the more dissociated shapes, correspond to the *L. depressa* morph C) while the eastern species has only the two more complete stages (states 5 and 6).

- 5) Ribs (Fig. 11). We may distinguish three states of this character: [1] ribs absent, [2] ribs poorly defined, formed by a few dots on groove I, [3] ribs more well-formed by dashed lines on grooves I and II. The western species (morphs B, C) entirely lacks ribs while the eastern species (morphs D, E) has all degrees of dissociation from entire ribs to none.
- 6) Markings on lateral areas. This character is exclusively present in the eastern species (morphs D, E) and it is very variable, from absent in both sides to present in a single side (asymmetric).

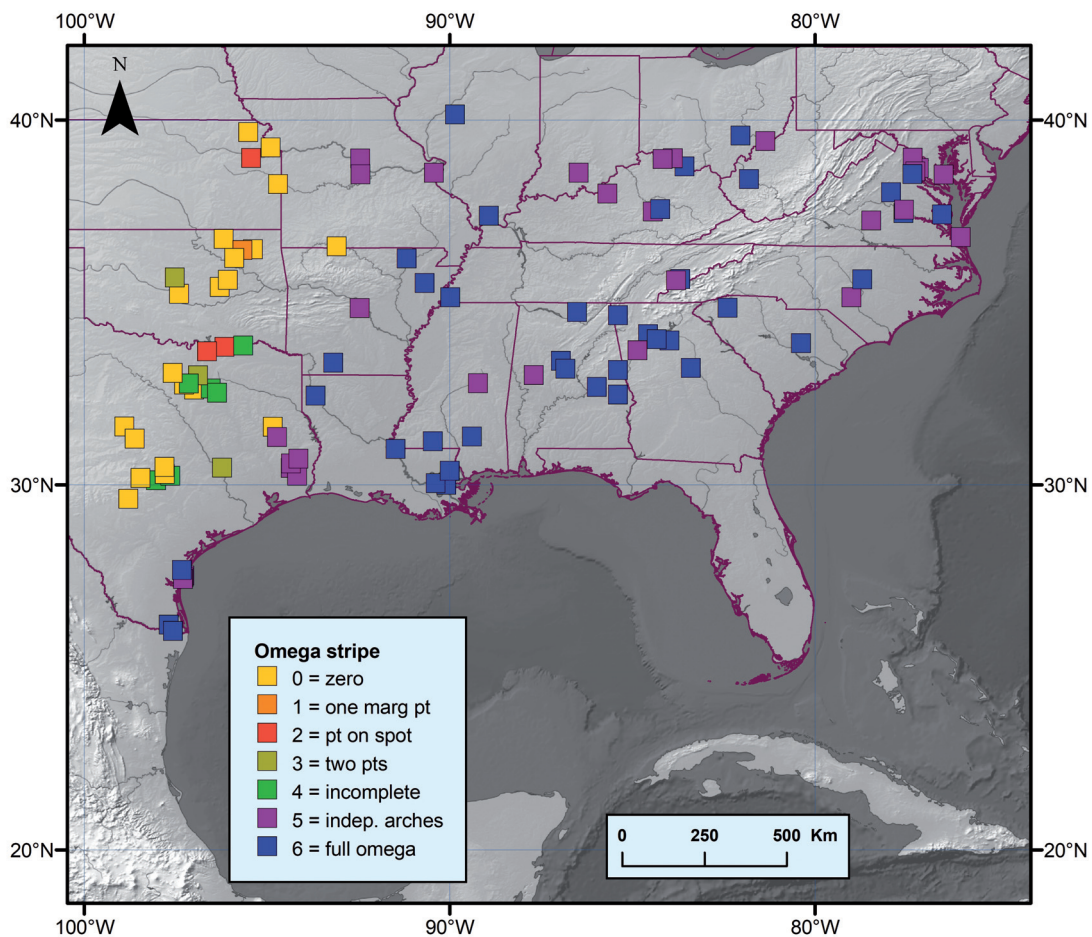


Fig. 10. Southeastern USA, showing the contrasting conformations of the omega stripe in the four morphs B/C/D/E of *Libitoides* Roewer, 1912.

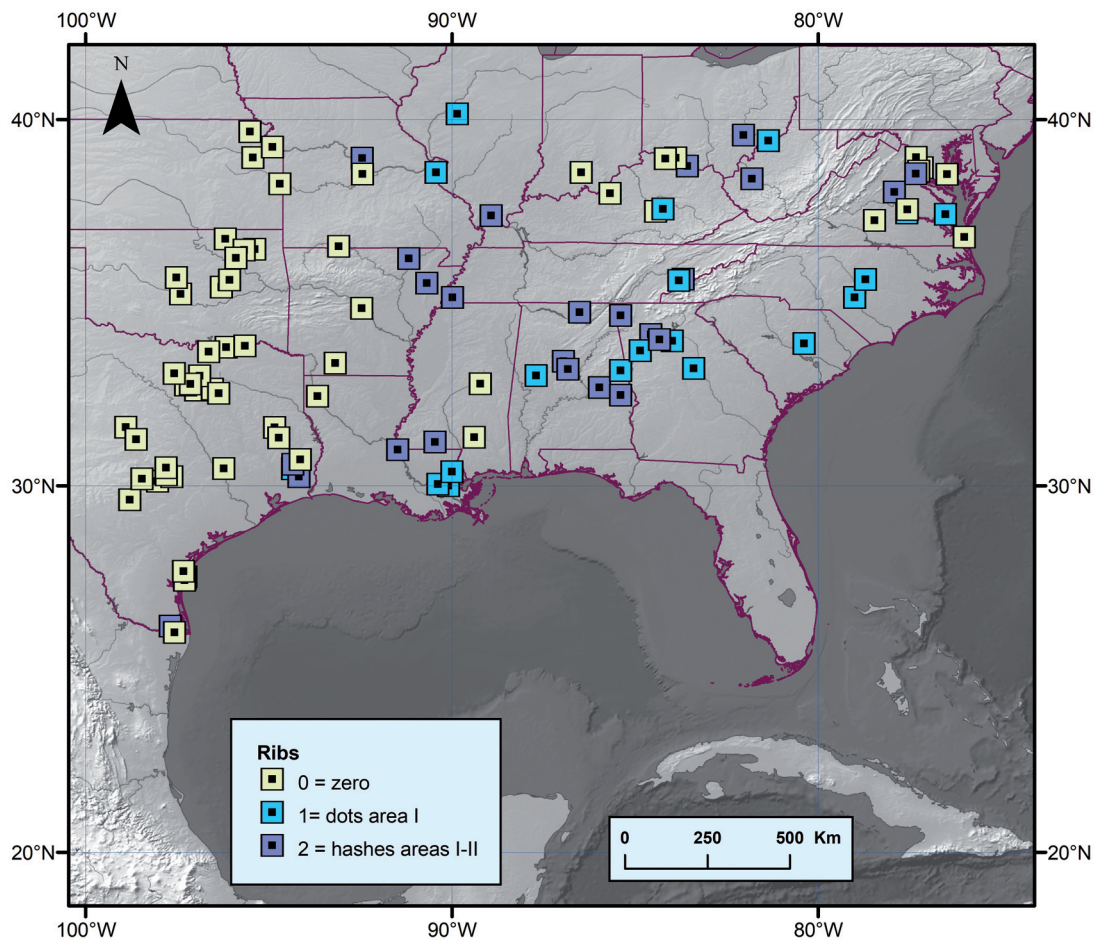


Fig. 11. Southeastern USA, showing the contrasting conformations of the ribs in the four morphs B/C/D/E of *Libitioides* Roewer, 1912.

Systematic accounts

Class Arachnida Lamarck, 1801
Order Opiliones Sundevall, 1833
Suborder Laniatores Thorell, 1876
Infraorder Grassatores Kury, 2002
Superfamily Gonyleptoidea Sundevall, 1833
Family Cosmetidae C.L. Koch, 1839
Subfamily Libitiinae Medrano, Kury & Mendes, 2021

Genus *Ambatoiella* Mello-Leitão, 1943

Ambatoiella Mello-Leitão, 1943: 8 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a: 60); synonymy rejected by Kury (2003: 37)]. Type-species by original designation: *Ambatoiella vigilans* Mello-Leitão, 1943.

Diagnosis

Scutum outline alpha-type, with much elongated coda, lateral border in posterior view following the general body curvature. Protoglyph guards are very robust, triangular. Mesotergal grooves are shallow, straight. All scutal areas unarmed, III–IV however each with a transverse row of minute tubercles. Areas I–IV each with a pair of faintly colored rounded flecks. Cheliceral hand is not swollen, but basichelicerite of male is slightly stouter, with coarsely tuberculate posterior rim. Legs very short (all femora shorter than scutum). Coxa IV oblique, not surpassing coda in situ and projected laterally in dorsal view, with reduced apical apophysis and with groin warts. Femur IV sexually dimorphic, either with strongly clavate prolateral crest on proximal half (in *A. clavifemur*) or with a row of strong proventral spines increasing in size posteriorly (in *A. vigilans*). Basitarsus I thickened in male. Tarsal counts: 5(3)/7–10(3)/6/6. Male genitalia (only known from *A. vigilans*): VP (ventral plate) latero-distal corners wide, projected. Wattle is complete. MS (macrosetae) D1 is clearly smaller than C. Two long lateral patches of microsetae T4 without midfield.

Etymology

From the toponym Ambato + Latin diminutive suffix ‘-ella’. Gender feminine.

Placement

Originally in Cosmetinae, transferred to Libitiinae by Medrano *et al.* (2021).

Included species

Ambatoiella vigilans Mello-Leitão, 1943, *Ambatoiella sexpunctata* (Roewer, 1914) and *Ambatoiella clavifemur* (Roewer, 1957) comb. nov.

Combined distribution

PERU, Cajamarca and ECUADOR, Tungurahua.

Ambatoiella clavifemur (Roewer, 1957) comb. nov.

Platycynorta clavifemur Roewer, 1957: 89, figs 40–41.

Type data

Holotype

PERU • ♂; western Andean slope, Cajamarca, Llama; alt. 2200 m; 10 Jun. 1956; [Wolfgang Karl] Weyrauch leg.; SMF RII 11652 (examined).

Paratypes

PERU • 3 ♂♂, 4 ♀♀; same collection data as for holotype; SMF RII 11652 • 4 ♂♂, 4 ♀♀; Cajamarca, Cerro Churun, near Llama, between Chiclayo and Cutervo; alt. 2350 m; [Wolfgang Karl] Weyrauch leg.; Private Collection Weyrauch.

Comment

The species does not match the diagnosis of *Libitioides* (which in principle the former species of *Platycynorta* are expected to be assigned to), and in turn it matches the diagnosis of *Ambatoiella*. Emended diagnoses for both genera are given here so they can be compared.

Ambatoiella vigilans Mello-Leitão, 1943
Fig. 12a

Ambatoiella vigilans Mello-Leitão, 1943: 8, fig. 5.

Vononesta sexpunctata Roewer, 1959: 79, fig. 13. **Syn. nov.**

Vonones vigilans – Goodnight & Goodnight 1953a: 60.

Type data

Lectotype of *Ambatoiella vigilans*

ECUADOR • ♂, herein designated; Tungurahua, Ambato; [-1.24°, -78.62°]; 9 Jun. 1943; Harriet [Idola] Exline Frizzell & D[onald] L[eslie] Frizzell leg.; MNRJ 5018 (examined).

Paralectotypes of *Ambatoiella vigilans*

ECUADOR • 2 specs; same collection data as for lectotype; MNRJ 5018.

Holotype of *Vononesta sexpunctata*

ECUADOR • ♂; Tungurahua, “Baños de Tungurahua”; alt. 1800 m; SMF RII 12777 (examined).

Comment

Ambatoiella vigilans and *V. sexpunctata* are nearly sympatric, both coming from Tungurahua State in Ecuador. The description and illustrations by Roewer are detailed enough to allow recognition of both being the same species.

Subfamily Cynortinae Mello-Leitão, 1933

Genus *Cynortoides* Roewer, 1912

Cynortoides Roewer, 1912: 61 [junior subjective synonym of *Cynorta* C.L. Koch, 1839 by Goodnight & Goodnight (1953a: 38); synonymy rejected by Kury (2003: 50)]. Type species by original designation: *Cynorta cubana* Banks, 1909.

Diagnosis

Scutum outline beta-type, scutum in lateral view growing strongly convex backwards. Protoglyph guards are small, blunt triangular. Scutal areas I, III and IV each with a pair of acuminate tubercles, growing larger backwards, so that those of area IV are clearly larger. Cheliceral hand is not swollen, but basichelicerite of male is clearly stouter, with a coarsely tuberculate posterior rim. Coxa IV with oblique orientation. Femur IV clavate and keeled only distally, pro-ventrally armed with a comb of tubercles somewhat fused to each other in the base. Basitarsus I thickened in male. Tarsal counts: 6(3)/14–17(3)/7–8/8–11. Male genitalia: VP subrectangular. Wattle is complete. MS D1 is almost as large as C. Two long lateral patches of microsetae T4 without midfield.

Etymology

Cynortoides derives from pre-existing genus *Cynorta* + Greek ‘εἶδος’ (‘form’, ‘shape’). Gender feminine, as treated originally by its author (ICZN Art. 30.1.4.4) (Kury & Alonso-Zarazaga 2011: 50). ICZN Code Art 30.1.4.4: “A compound genus-group name ending in the suffix -ites, -oides, -ides, -odes, or -istes is to be treated as masculine unless its author, when establishing the name, stated that it had another gender or treated it as such by combining it with an adjectival species-group name in another gender form.”

Placement

Originally in Cosmetinae, transferred to Cynortinae by Medrano *et al.* (2021).

Included species

Cynortoides albiadpersa Goodnight & Goodnight, 1946, *Cynortoides caraibica* (Sørensen, 1932), *Cynortoides cubana* (Banks, 1909), *Cynortoides lateralis* Roewer, 1947, *Cynortoides lithoclasica* (Avram, 1981), *Cynortoides marginata* Goodnight & Goodnight, 1942, *Cynortoides quadrispinosa* Goodnight & Goodnight, 1942, *Cynortoides quibijana* (Avram, 1981), *Cynortoides roeweri* (Henriksen, 1932) and *Cynortoides v-album* (Simon, 1879).

Combined distribution

Bahamas, SE tip of Florida, Greater Antilles, except Puerto Rico.

Cynortoides quadrispinosa Goodnight & Goodnight, 1942
Fig. 12b

Cynortoides quadrispinosa Goodnight & Goodnight, 1942: 10, fig. 22.

Type data

Holotype

JAMAICA • ♀; Port Antonio; 25 Mar. 1935; F. Miller leg.; AMNH.

Paratype

JAMAICA • 1 ♀; same collection data as for holotype; AMNH.

Comment

Besides the species of *Libitoides*, there are unpublished records which should probably belong to *C. quadrispinosa* from the southeastern tip of Florida, around Miami City. The more typical species of *Cynortoides* hail from Cuba, while there are at least four others in Jamaica and Hispaniola which resemble more closely this Floridan cosmetid. Those Jamaican/Haitian/Dominican species are poorly studied, some only known from the female holotypes, therefore, it is not possible for now to use masculine sexually dimorphic features to look for identification clues. Due to the gap in distribution between these species, it is likely that the USA specimens are introduced from the Greater Antilles.

Genus *Holovonones* Roewer, 1912

Holovonones Roewer, 1912: 21 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a); synonymy rejected by Kury (2003: 64)]. Type species by original designation: *Paravonones compressus* Pickard-Cambridge, 1904.

Calicynorta Goodnight & Goodnight, 1943: 643 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a: 60); synonymy rejected by Kury (2003: 38)]. Type species by original designation: *Cynorta bimaculata* Banks, 1893. **Syn. nov.**

Vononesta Roewer, 1947: 10 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a); synonymy rejected by Kury (2003: 86)]. Type species by original designation: *Vononesta biangulata* Roewer, 1947. **Syn. nov.**

Diagnosis

Scutum outline alpha-type, scutum flattened in lateral view, lateral border in posterior view following the general body curvature. Protoglyph guards are triangular. Mesotergal grooves are shallow, straight.

Scutal areas I–IV are each armed with a pair of small flat tubercles which are white, sharply contrasting with the brown background, area V with a transverse row of a few such tubercles. Cheliceral hand is somewhat swollen in male, and the basichelicerite of male is clearly stouter, with a coarsely tuberculate posterior rim. Coxa IV with oblique orientation. Femur IV sexually dimorphic, clavate in males, in female thinner and curved proximally. Basitarsus I thickened in male. Tarsal counts: 5(3)/8–9(3)/6–7/7. Male genitalia: VP subrectangular. Wattle is complete. MS D1 is clearly smaller than C. Two long lateral patches of microsetae T4 without midfield.

Etymology

Holovonones from Greek ‘ὅλος’ (‘whole’, ‘entire’, ‘complete’) + pre-existing genus *Vonones*. Gender masculine. *Calicynorta* from ‘cali-’, truncation of California (in spite of the type-species not actually occurring there) + pre-existing genus *Cynorta*. Gender feminine. *Vononesta* from pre-existing genus *Vonones* + Latin suffix ‘-esta’. Gender feminine.

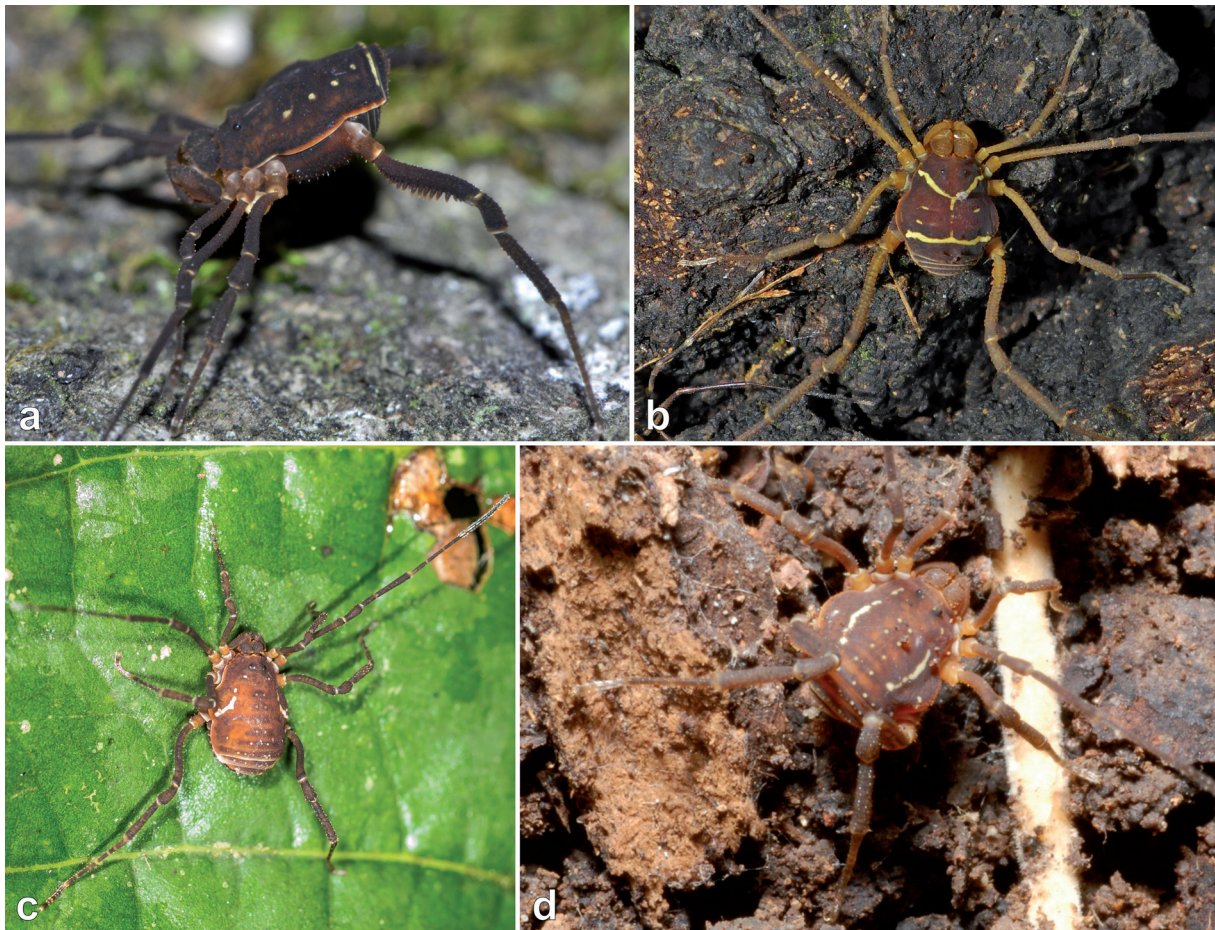


Fig. 12. Cosmetidae C.L. Koch, 1839, species relevant to the present study, in vivo. **a.** *Ambatoiella vigilans* Mello-Leitão, 1943 from Ecuador, Tungurahua (©AB Kury & MA Medrano). **b.** *Cynortoides quadrispinosa* Goodnight & Goodnight, 1942 from USA, Florida (©Robin Gwen Agarwal). **c.** *Holovonones biangulatus* (Roewer, 1947) from Mexico, Chiapas (©Felix Fleck). **d.** *Holovonones compressus* (Pickard-Cambridge, 1904) from Mexico, Campeche (©Roberto Rojo). Photos are somewhat cropped. All images used here under written permission.

Placement

Originally in Cosmetinae, transferred to Cynortinae by Medrano *et al.* (2021).

Included species

Holovonones biangulatus (Roewer, 1947) comb. nov., *Holovonones bimaculatus* (Banks, 1893) comb. nov. nomen inquirendum and *Holovonones compressus* (Pickard-Cambridge, 1904).

Combined distribution

SE Mexico, Guatemala and Belize, with an isolated occurrence in Costa Rica.

Holovonones biangulatus (Roewer, 1947) comb. nov.
Fig. 12c

Vononesta biangulata Roewer, 1947: 10, pl. 2 fig. 3.

Type data

Holotype

GUATEMALA • ♀; Quetzaltenango; SMF RII 1517 (examined).

Comment

Holovonones biangulatus is a species from southern Guatemala and adjacent part of the Mexican state of Chiapas. It is recognizable by the L-shaped stripes on the laterals of the abdominal scutum, contrasting with the thicker arches of *H. bimaculatus* and *H. compressus*. No male has been reported so far.

Holovonones bimaculatus (Banks, 1893) comb. nov. nomen inquirendum

Cynorta bimaculata Banks, 1893: 150.

Eucynortella bimaculata – Roewer 1912: 53.

Calicynorta bimaculata – Goodnight & Goodnight 1943: 643, fig. 1.

Vonones bimaculatus – Goodnight & Goodnight 1953a: 60.

Vonones bimaculata – Edgar 1990: 546.

Type data

Holotype

COSTA RICA • ♀; [San José]; MCZ IV 14667 (examined by photo).

Comments on type data

Specimen originally reported by Banks as from “California, San Diego”. On MCZ website there are images of the holotype and the labels. One of them says clearly “San Jose”, and the specimen sheet reads “COSTA RICA, San José”. Neither San Diego nor California are mentioned anywhere in the labels or the associate data. Also in the same website it is said [incorrectly]: “there is no locality label with specimen”. Therefore, the ascription of “Costa Rica” to this locality “San José” is doubtful. There is no record of anything similar from Costa Rica. San José must be one of the commonest toponyms in Latin America. Given the great similarity of the images of the female holotype with *H. compressus*, and if this “San José” refers to a toponym in Mexico or Guatemala, this species could well be a senior synonym of *Holovonones compressus*. However, with such fragmentary evidence, we refrain from doing this synonymy here, especially because *Holovonones compressus* is a much more widely used name.

Holovonones compressus (Pickard-Cambridge, 1904)

Fig. 12d

Paravonones compressus Pickard-Cambridge, 1904: 552, pl. 52 fig. 4, 4a–b.

Disvonones albilineatus Goodnight & Goodnight, 1944: 106, figs 2, 4 [junior subjective synonym of *Paravonones compressus* Pickard-Cambridge, 1904 by Goodnight & Goodnight (1953a: 62)].

Disvonones bilineata Goodnight & Goodnight, 1944: 107, fig. 1 [junior subjective synonym of *Paravonones compressus* Pickard-Cambridge, 1904 by Goodnight & Goodnight (1953a: 62)].

Disvonones albiornatus Goodnight & Goodnight, 1944: 107, fig. 3 [junior subjective synonym of *Paravonones compressus* Pickard-Cambridge, 1904 by Goodnight & Goodnight (1953a: 62)].

Tecavonones clavipes Goodnight & Goodnight, 1944: 109, figs 5–6 [junior subjective synonym of *Paravonones compressus* Pickard-Cambridge, 1904 by Goodnight & Goodnight (1953a: 62)].

Holovonones compressus – Roewer 1912: 21.

Vonones compressus – Goodnight & Goodnight 1953b: 179.

Type data

Holotype of *Paravonones compressus*

GUATEMALA • ♂; Cahabon; Sarg. leg.; NHMUK:GD SLV (not examined).

Paratype of *Paravonones compressus*

COSTA RICA • 1 ♀; without further locality data; Sarg. leg.; NHMUK:GD SLV (not examined).

Holotype of *Disvonones albilineatus*

MEXICO • ♂; Oaxaca, Palomares; Jul. 1909; A[lexander] Petrunkevitch leg.; AMNH (examined).

Holotype of *Disvonones bilineata*

BELIZE • ♀; without further locality data; 9 Sep. 1939; I. Sanderson leg.; FMNH (not examined).

Holotype of *Disvonones albiornatus*

MEXICO • ♀; Quintana Roo, Chetumal; Mar. 1940; I. Sanderson leg.; FMNH (not examined).

Paratype of *Disvonones albiornatus*

MEXICO • 1 ♂; same collection data as for holotype; FMNH (not examined).

Holotype of *Tecavonones clavipes*

MEXICO • ♂; Yucatán, Tecax, alrededores de la Cueva de Sabacá; 26 Sep. 1943; B. Osorio leg.; AMNH (not examined).

Paratype of *Tecavonones clavipes*

MEXICO • 1 ♂; Quintana Roo, Chetumal; 6 Mar. 1940; I. Sanderson leg.; FMNH (not examined).

Distribution

BELIZE, GUATEMALA, MEXICO, Campeche, Chiapas, Oaxaca, Quintana Roo, Tabasco, Yucatán. The original record from Costa Rica probably refers to *H. bimaculatus*.

Not currently included in any subfamily

Genus *Libitioides* Roewer, 1912

Libitioides Roewer, 1912: 14 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a: 60); synonymy disclaimed by Medrano *et al.* (2021: 26)]. Type species by original designation: *Libitioides ornata* Roewer, 1912.

Platycynorta Mello-Leitão, 1933: 112. Type species by original designation: *Cynorta depressa* Sørensen, 1932. **Syn. nov.**

Denticynorta Roewer, 1947: 9 [junior subjective synonym of *Vonones* Simon, 1879 by Goodnight & Goodnight (1953a); synonymy disclaimed by Kury (2003). Type species by original designation: *Metacynorta denticus* Walker, 1928. **Syn. nov.**

Diagnosis

Scutum outline lambda-type, scutum flattened in lateral view, lateral border in posterior view clearly marked by a deep groove and raised to break the outline of scutum. Protoglyph guards are blunt triangular. Mesotergal grooves are obsolete. Scutal areas I, III and IV each with a pair of blunt tubercles (*L. ornata*: area III with robust spines tilted backwards and IV unarmed). Cheliceral hand and basichelicerite are sexually monomorphic. Legs moderately elongate (femora II and IV barely longer than scutum). Coxa and trochanter IV of male almost entirely parallel to the main body axis, so that femur IV lies straight, while in females the coxa/trochanter are inserted more obliquely and the femur is slanted. Coxa IV surpasses coda in situ only by its apical region, with well developed proapical apophysis and without groin warts. Femur IV sexually dimorphic, in male more thickly granulous and straight, in female thinner and curved proximally. Basitarsus I thickened in male. Tarsal counts: 5(3)/8–9(3)/6/6. Male genitalia: VP subrectangular. Wattle extends from the middle to the tip of the stylus. MS D1 is almost as large as C. Two long lateral patches of microsetae T4 without midfield.

Etymology

Libitioides from pre-existing genus *Libitia* + suffix ‘-oides’. Gender feminine, originally established by Roewer by inflecting the adjectival specific nomina in the feminine (ICZN Art. 30.1.4.4). *Platycynorta* from Greek ‘πλατύς’ (‘flat’) + pre-existing genus *Cynorta*. Gender feminine. *Denticynorta* from Latin ‘dens’ (‘tooth’) + pre-existing genus *Cynorta*. Gender feminine.

Placement

Libitioides, *Platycynorta* and *Denticynorta* originally in Cosmetidae Cosmetinae; left as Cosmetidae incertae sedis by Medrano *et al.* (2021).

Included species

Libitioides albolineata (Sørensen, 1884), *Libitioides modesta* (Banks, 1909) nom. rest., *Libitioides ornata* (Say, 1821), *Libitioides sayi* (Simon, 1879) and *Libitioides scabrissima* Roewer, 1912.

Spurious included species

Because the relevant genera were heterogeneous to begin with, there was a legacy of species of uncertain taxonomic position and which are all treated here: *Platycynorta secunda* Roewer, 1947 (Cuba), *Platycynorta clavifemur* Roewer, 1957 (Peru), *Libitioides riveti* Roewer, 1914 (Ecuador).

Combined distribution

Cuba, NE tip of Mexico, eastern/southeastern USA (map in Fig. 13).

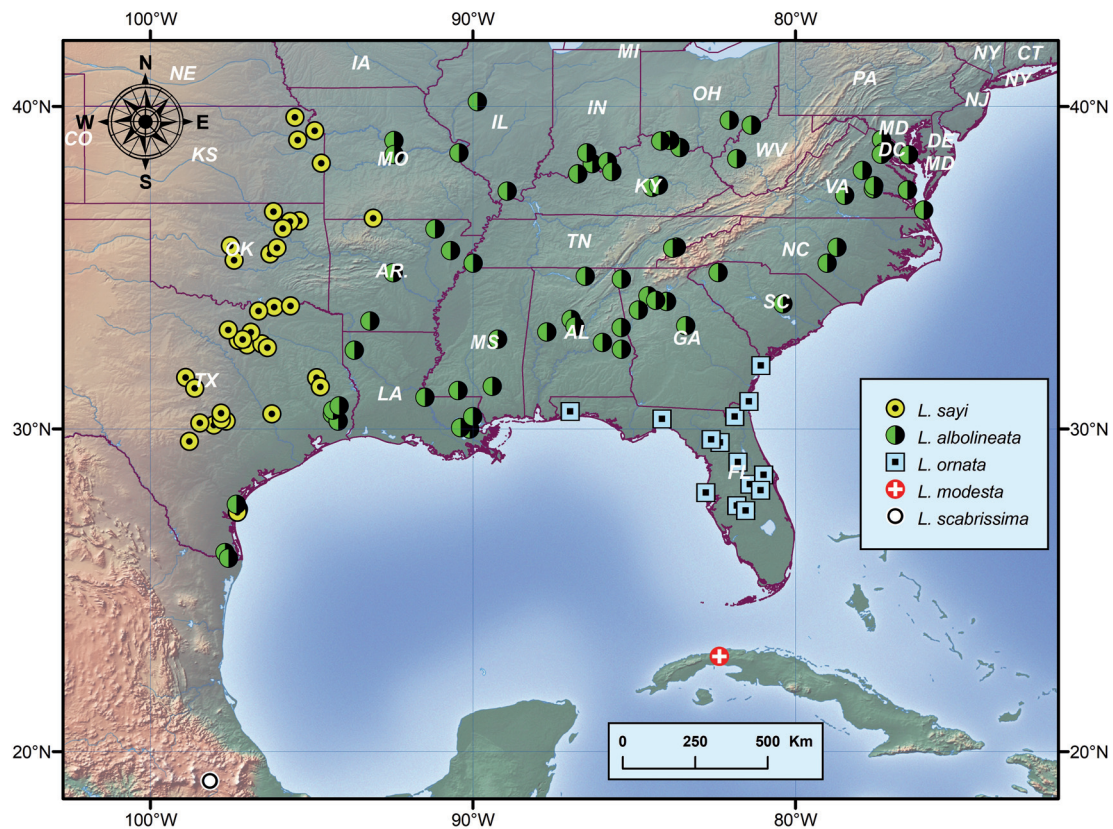


Fig. 13. Southeastern USA, marked with abbreviations of American states, showing the distribution of the five species of *Libitoides* Roewer, 1912 as proposed in this paper.

Comment on relationships

Libitoides resolved as the sister-group of the Taitoinae in the phylogenetic analysis of Medrano *et al.* (2021). The authors, however, then refrained from including it in this subfamily because of the low resampling support, choosing instead to present a tighter Taitoinae (better supported by synapomorphies) as opposed to the “quasi-taitoine” with *Libitoides*. We here note that *Libitoides* seems to be also very closely related to the genera *Paravonones* Pickard-Cambridge, 1904 and *Boneta* Goodnight & Goodnight, 1944, which currently include six nominal species from Mexico, El Salvador and Guatemala and were not included in that analysis. Both genera share the scutal outline and armature, the vaulted laterals of dorsal scutum, monomorphic chelicerae, the sexually dimorphic insertion of coxa and trochanter IV. The species of *Paravonones* contrast with *Libitoides* by possessing more sinuous leg IV on males, with stronger armature. The type species of *Boneta* is very similar to *Libitoides*, contrasting with it by having remarkably granulated coxae.

Key to the species of *Libitoides*

1. Body densely covered with coarse granules; spines of area III small and curved backwards like a rose thorn; scutal area IV unarmed *L. scabrissima* Roewer, 1912 comb. rest. (Mexico)
- Body finely granular; scutal area III with pair of strong spines tilted backwards
..... *L. ornata* (Say, 1821) (USA, Florida, Georgia)

- Body finely granular; scutal areas III and IV armed with very small erect acuminate tubercles 2
- 2. Retrolateral (“inner”) surface of femur IV with densely concentrated rows of granules 3
- Granulation of femur IV not especially concentrated on retrolateral surface
..... *L. modesta* (Banks, 1909) comb. nov., nom. rest. (Cuba)
- 3. Backbone and ribs present; chevron complete or nearly complete; body and appendages background almost always uniform brown; paired darker spots on scutal area III indistinct *L. albolineata* (Sørensen, 1884) (eastern USA)
- Backbone and ribs always lacking; chevron always dissociated; body mustard yellow with a pair of much darker spots on scutal area III
..... *L. sayi* (Simon, 1879) (USA, only in Arkansas, Kansas, Oklahoma and Texas)

Libitioidea albolineata (Sørensen, 1884)

Figs 14–16

Cosmetus albolineatus Sørensen, 1884: 592 [senior subjective synonym of *Libitioidea ornata* Roewer 1912 by Roewer (1912: 15), with inverted precedence].

Metacynorta denticus Walker, 1928: 158, fig. 23. **Syn. nov.**

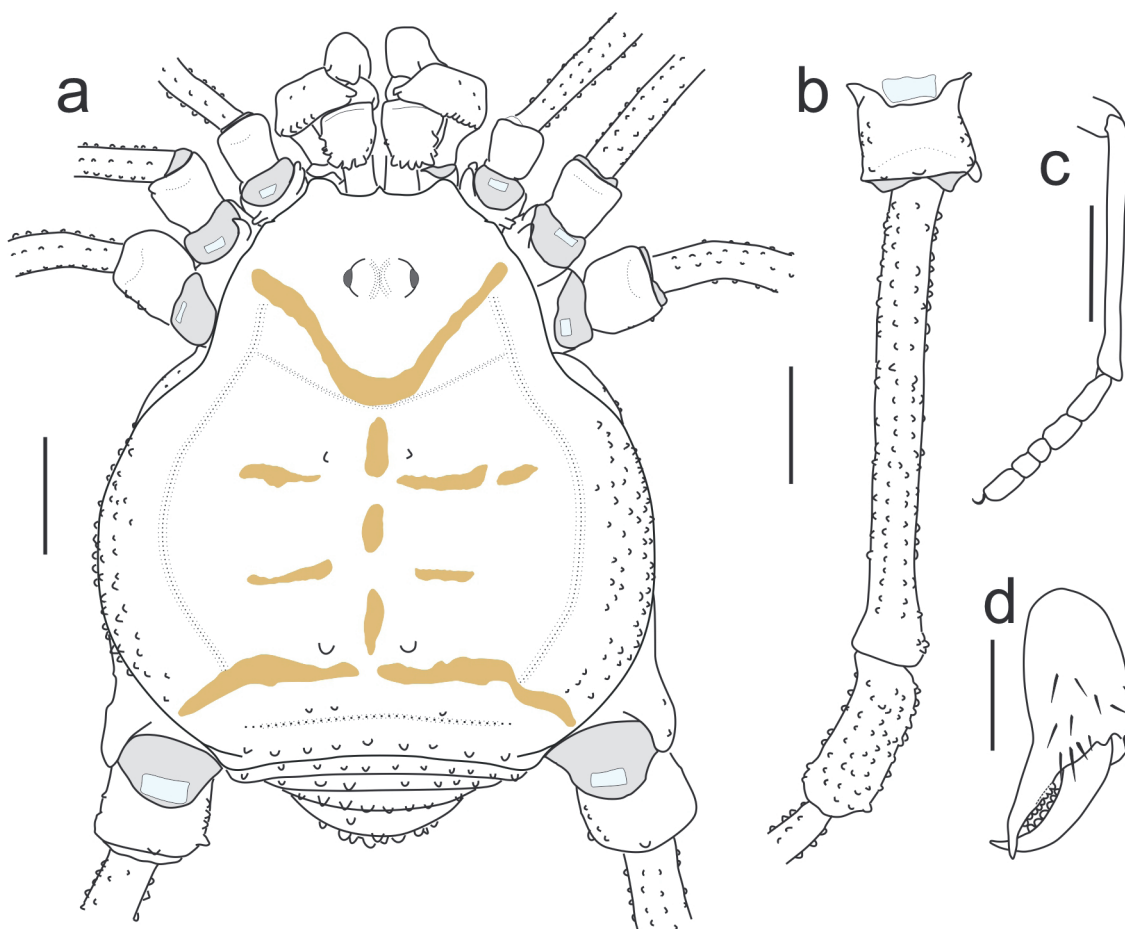


Fig. 14. *Libitioidea albolineata* (Sørensen, 1884), ♂ (USNMENT 01538062) from Palmyra, Virginia. **a.** Dorsal view of body. **b.** Left femur and trochanter IV, dorsal view. **c.** Left metatarsus and tarsomeres of leg I, lateral view. **d.** Left chelicera dorsal view. Scale bars = 1 mm.

Cynorta albolineata – Weed 1893: 295, pl. 6 figs 1–2.

Denticynorta dentica – Roewer 1947: 10.

Libitoides albolineatus – Moritz 1971: 190.

Vonones dentica – Cokendolpher & Jones 1991: 86.

Denticynorta denticus – Kury & Alonso-Zarazaga 2011: 50.

Libitoides albolineata – Medrano *et al.* 2021: 26, fig. 4H (nom. rest., comb. rest., mandatory inflection of epithet to match feminine gender).

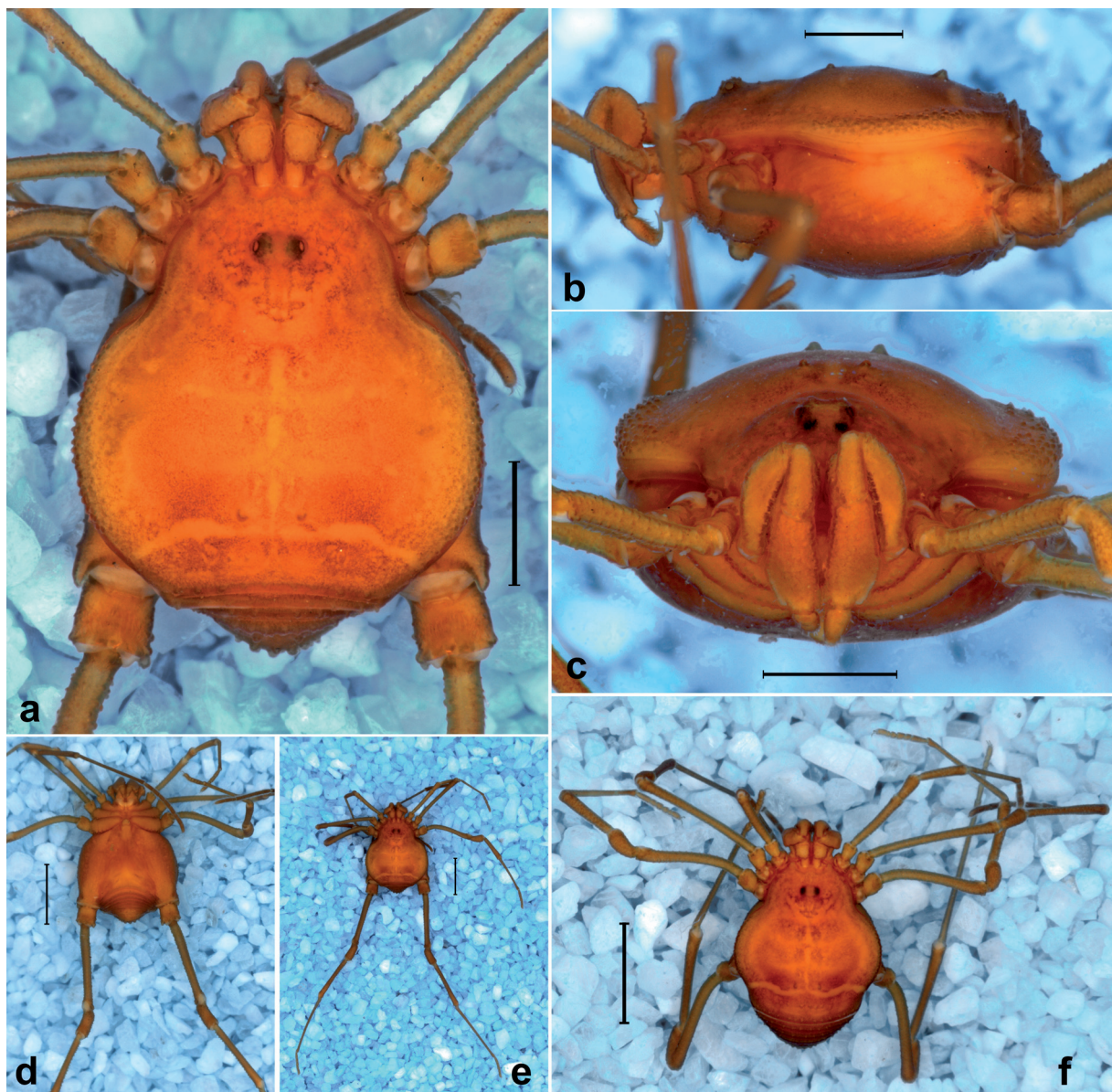


Fig. 15. *Libitoides albolineata* (Sørensen, 1884) (USNMENT 0153862) from Palmyra, Virginia. **a.** Male, habitus, dorsal view. **b.** Same, sinistrolateral view. **c.** Same, frontal view. **d.** Same, ventral view. **e.** Same, panoramic, dorsal view. **f.** Female, habitus, dorsal view (USNMENT 0153862). Scale bars: a–c = 1 mm; d–f = 2 mm.

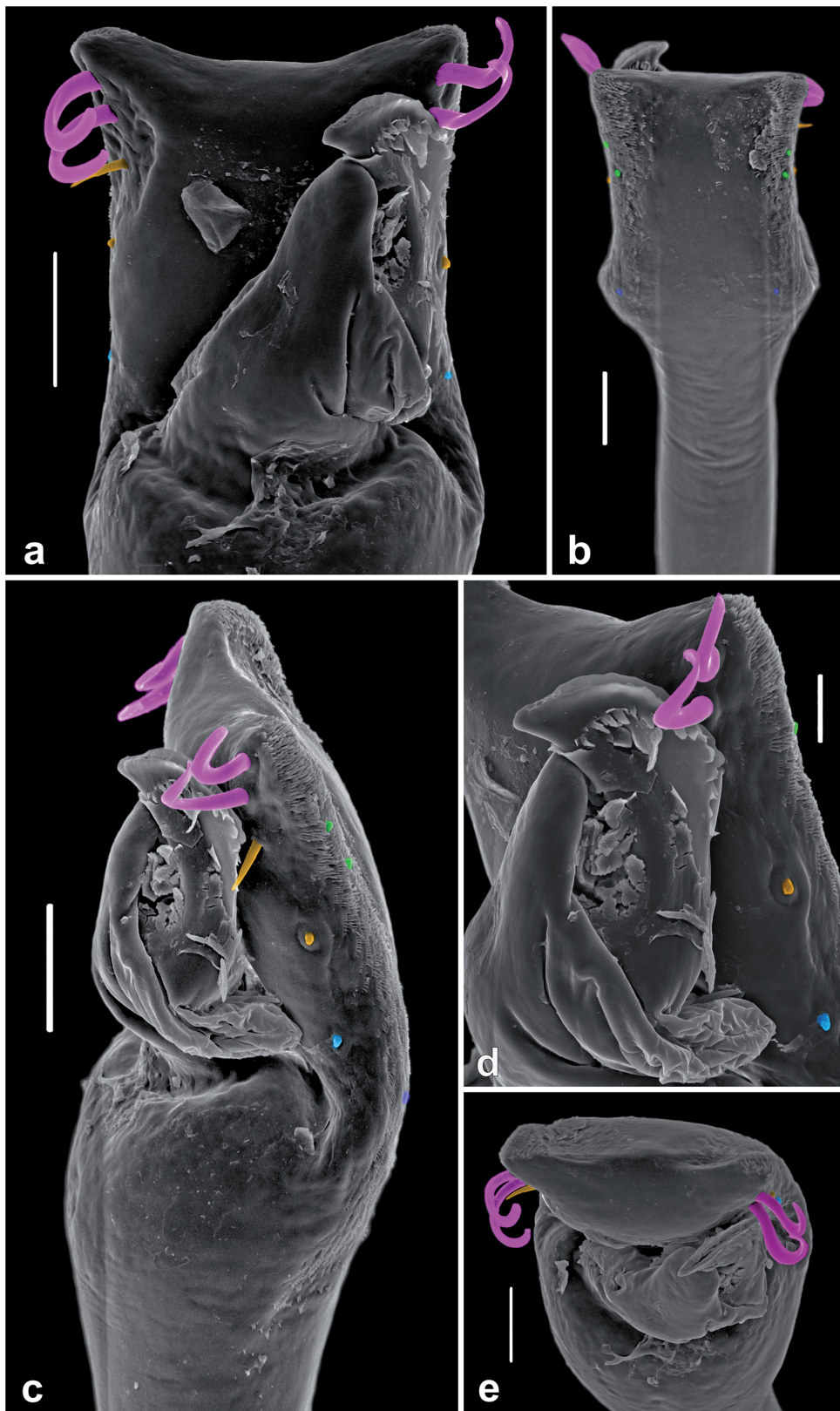


Fig. 16. *Libitoides albolineata* (Sørensen, 1884) (USNMENT 0153862) from Palmyra, Virginia, distal part of penis. **a.** Dorsal view. **b.** Ventral view. **c.** Dextralateral view. **d.** Detail of glans, dextralateral view. **e.** Apical view. Scale bars: a–c = 50 μ m; d = 20 μ m; e = 40 μ m.

Diagnosis

Libitioides albolineata differs from the other species of *Libitioides* by the following characters: short legs (femur IV shorter than or equal to DS length), small rounded tubercles in area III (instead of spines), abdomen dorsally round without coda and yellow spots of DS with backbone and ribs (frequently fragmented) and may have lateral clouds. General color of body and appendages uniform brown or rarely light yellowish brown.

Type data

Syntypes of *Cosmetus albolineatus*

USA • 1 ♂; Louisiana, New Orleans; Krøyer leg; ZMB 8393 (examined) • 1 ♂, 2 ♀♀; same collection data as for preceding; ZMUC (not examined).

Holotype of *Metacynorta denticus*

USA • ♀; Ohio, Clear Creek; whereabouts unknown (not examined).

Records

There are numerous records in the literature, mostly misidentified as *Libitioides sayi*.

Distribution (Figs 7–11)

The species occurs in the Gulf Coastal Plain, the Interior Plateaus and Appalachians. The distribution comprises USA states of Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia. WWF Terrestrial Ecoregions: Appalachian mixed mesophytic forests (NA0402), Appalachian/Blue Ridge forests (NA0403), Central U.S. hardwood forests (NA0404), Mississippi lowland forests (NA0409), Southeastern mixed forests (NA0413), Middle Atlantic coastal forests (NA0517), Piney wood forests (NA0523), Southeastern conifer forests (NA0529, only the westernmost part, state of Mississippi), Western Gulf coastal grasslands (NA0701) and Central forest–grasslands transition zone (NA0804).

Libitioides modesta (Banks, 1909) comb. nov., nom. rest.

Fig. 3

Vonones modestus Banks, 1909: 171 [senior subjective synonym of *Libitioides ornata* Roewer 1912 by Roewer (1912: 15), with inverted precedence].

Platycynorta secunda Roewer, 1947: 8, pl. 1 fig. 2. **Syn. nov.**

Diagnosis

Libitioides modesta is strongly similar to *L. albolineata*, only differing from it by the two paramedian granules in area IV of abdomen (a row of granules in *L. albolineata*).

Type data

Types of *Vonones modestus*

CUBA • Habana, Santiago de las Vegas; Baker leg.; USNM (not examined).

Holotype of *Platycynorta secunda*

CUBA • ♂; without further locality data; SMF RII 130/6a–b (examined by photo).

Paratype of *Platycynorta secunda*

CUBA • 1 ♀; without further locality data; SMF RII 130/6a–b (examined by photo).

Distribution (Fig. 13)

Only known from the type locality. WWF Terrestrial Ecoregion: Cuban dry forests (NT0213).

Libitioidea ornata (Say, 1821)

Figs 17–19

Gonyleptes ornatum Say, 1821: 68.

Cosmetus ornatus – Butler 1873: 114.

Cynorta ornata – Simon 1879: 200.

Metacynorta ornata – Roewer 1912: 24.

Vonones ornata – Goodnight 1958: 322.

“*Vernones ornata*” [incorrect subsequent spelling] – Corey & Taylor 1987: 166.

Vonones ornatus – Kury 2003: 85.

Libitioidea ornata – Medrano *et al.* 2021: 610.

Diagnosis

Libitioidea ornata differs from the other species of *Libitioidea* by the following characters: only moderately elongated legs (femur IV longer than DS length), high spines in area III slanted backwards (instead of rounded tubercles) and small coda. The yellow spots of DS with complete chevron and omega stripe, and backbone and ribs frequently fragmented. Lateral clouds are always present. General color of body and appendages uniformly brown.

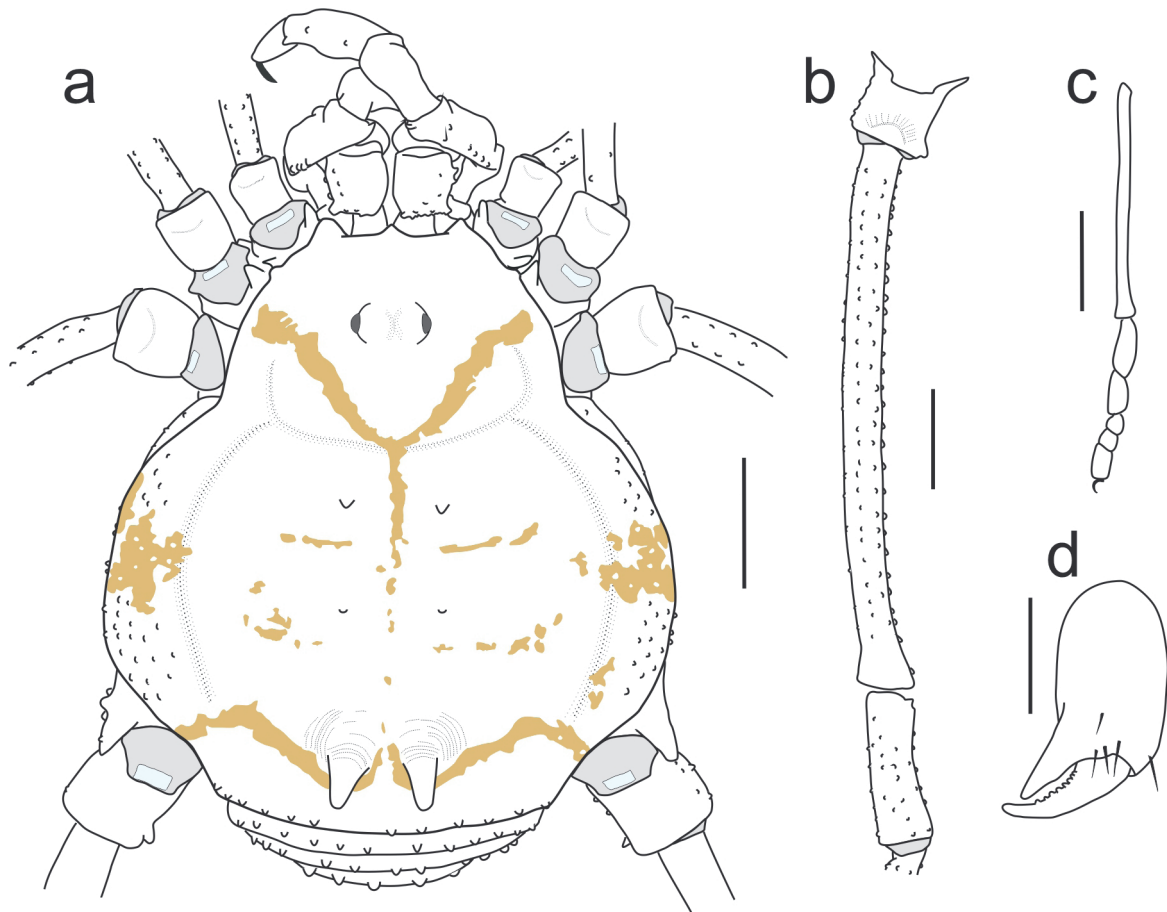


Fig. 17. *Libitioidea ornata* (Say, 1821), ♂ (USNMENT 01538061) from Hillsborough County, Florida. **a.** Dorsal view of body. **b.** Left femur and trochanter IV, dorsal view. **c.** Left metatarsus and tarsomeres of leg I, lateral view. **d.** left chelicera dorsal view. Scale bars = 1 mm.

Type data

Types of *Gonyleptes ornatum*

USA • Georgia, Cumberland Island and Florida, Eastern portion; Cabinet of the Academy of Natural Sciences of Philadelphia (not examined).

Records

USA, Florida, [Citrus County], Inverness (Weed 1893); [Dade County], Biscayne Bay; Lake Worth; Punta Gorda; Runnymede (Banks 1904). Orange County: University of Central Florida campus, 17 km E of Orlando (Corey & Taylor 1987).

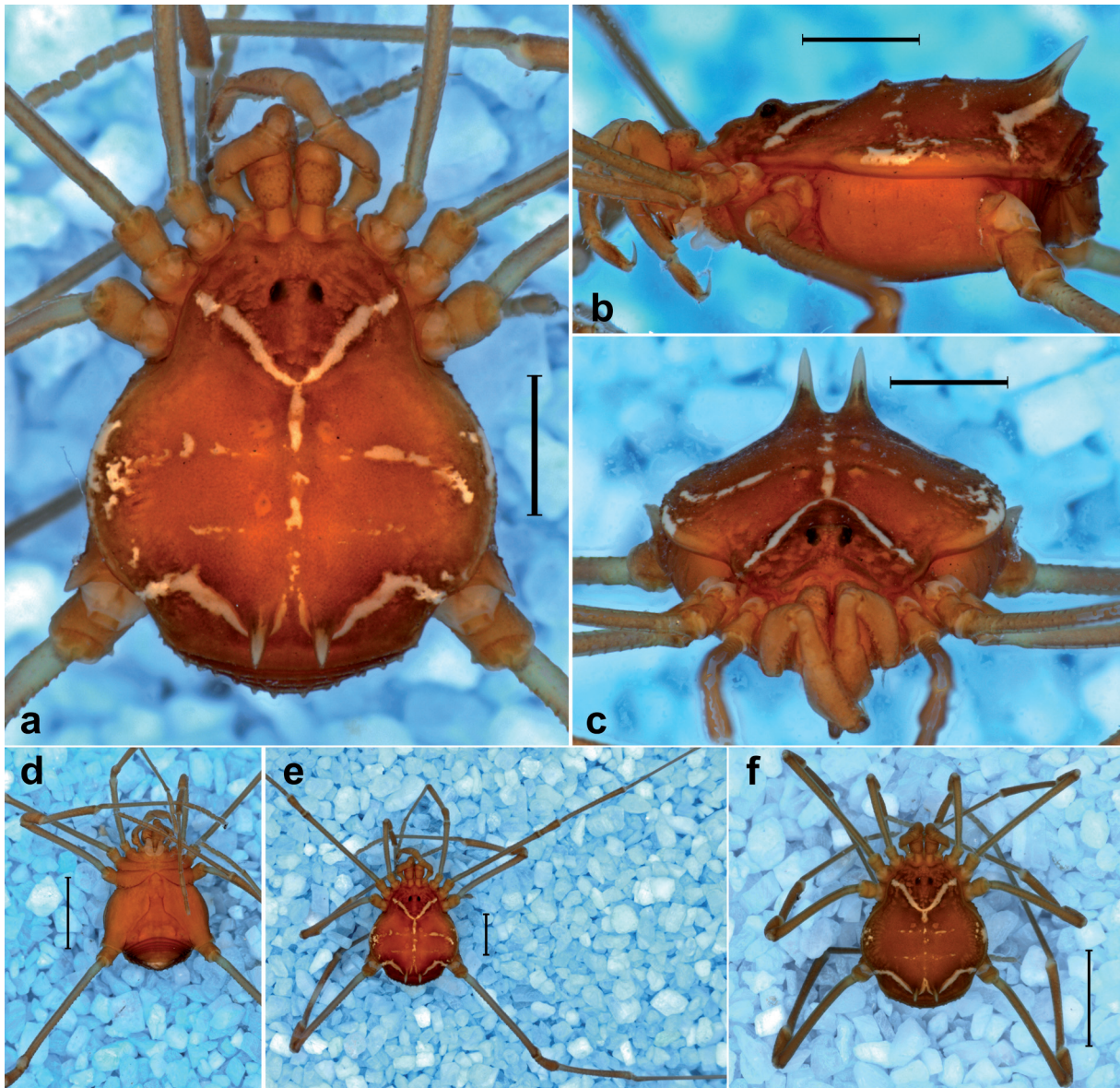


Fig. 18. *Libitioides ornata* (Say, 1821) (USNMENT 0153861) from Hillsborough, Florida. Habitus. **a.** Male, dorsal view. **b.** Sinistrolateral view. **c.** Frontal view. **d.** Ventral view. **e.** Panoramic, dorsal view. **f.** Female, dorsal view (USNMENT 0153861). Scale bars: a–c = 1 mm; d–f = 2 mm.

Incorrect records (misidentifications)

Louisiana, New Orleans. Oklahoma, University of Oklahoma Biological Station. Texas. The records from Illinois, Indiana, Louisiana and Ohio, Oklahoma and Texas (Wood 1868; Roewer 1912; Worsham 1962; Edgar 1966) are an incorrect interpretation of the confusing literature, and refer to other species of *Libitioides*.

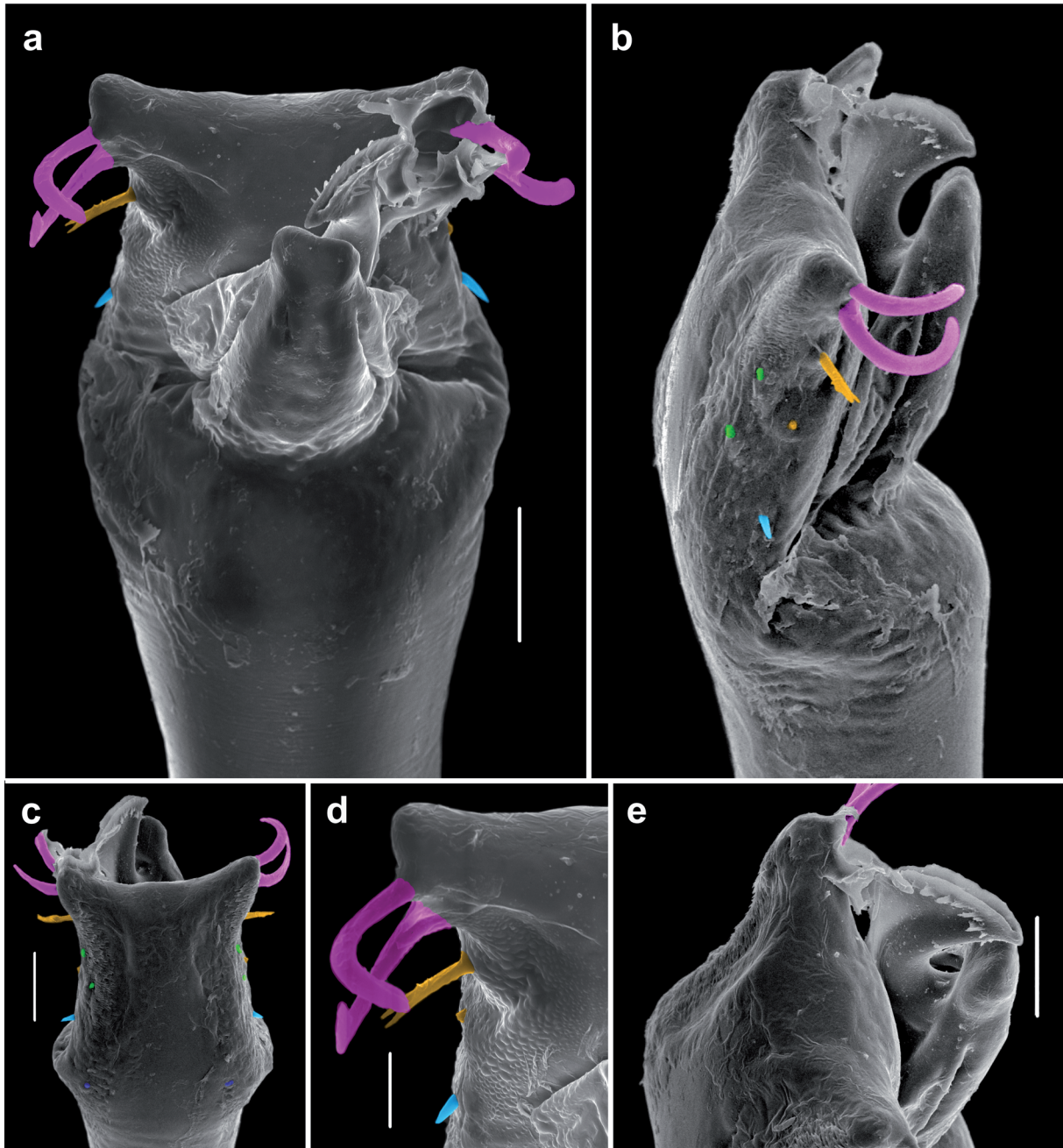


Fig. 19. *Libitioides ornata* (Say, 1821), ♂ (USNMENT 0153861) from Hillsborough, Florida, distal part of penis. **a.** Dorso-apical view. **b.** Sinistrolateral view. **c.** Ventral view. **d.** Detail of Fig. (a), macrosetae and lateral concavity of ventral plate. **e.** Detail of glans, sinistrolateral view. Scale bars: a–c = 50 μ m; d = 20 μ m; e = 40 μ m.

Comment on the combination *Vonones ornata*

Whenever this specific epithet is combined under *Vonones* as *Vonones ornata*, it is incorrect from the nomenclatural viewpoint, because *Vonones* being a masculine noun, the specific epithet should be inflected as *ornatus* (mandatory inflection of adjective to agree in gender with the neuter generic name; ICZN Code Art. 34.2).

Distribution

Species known from the USA Atlantic coastal plain, including the coast of the Gulf of Mexico. WWF Terrestrial Ecoregions: predominant occurrence in the Southeastern conifer forests (NA0529), but absent from the Everglades flooded grasslands (NT0904).

***Libitioides sayi* (Simon, 1879)**

Figs 20–22

Cynorta Sayi Simon, 1879: 200.

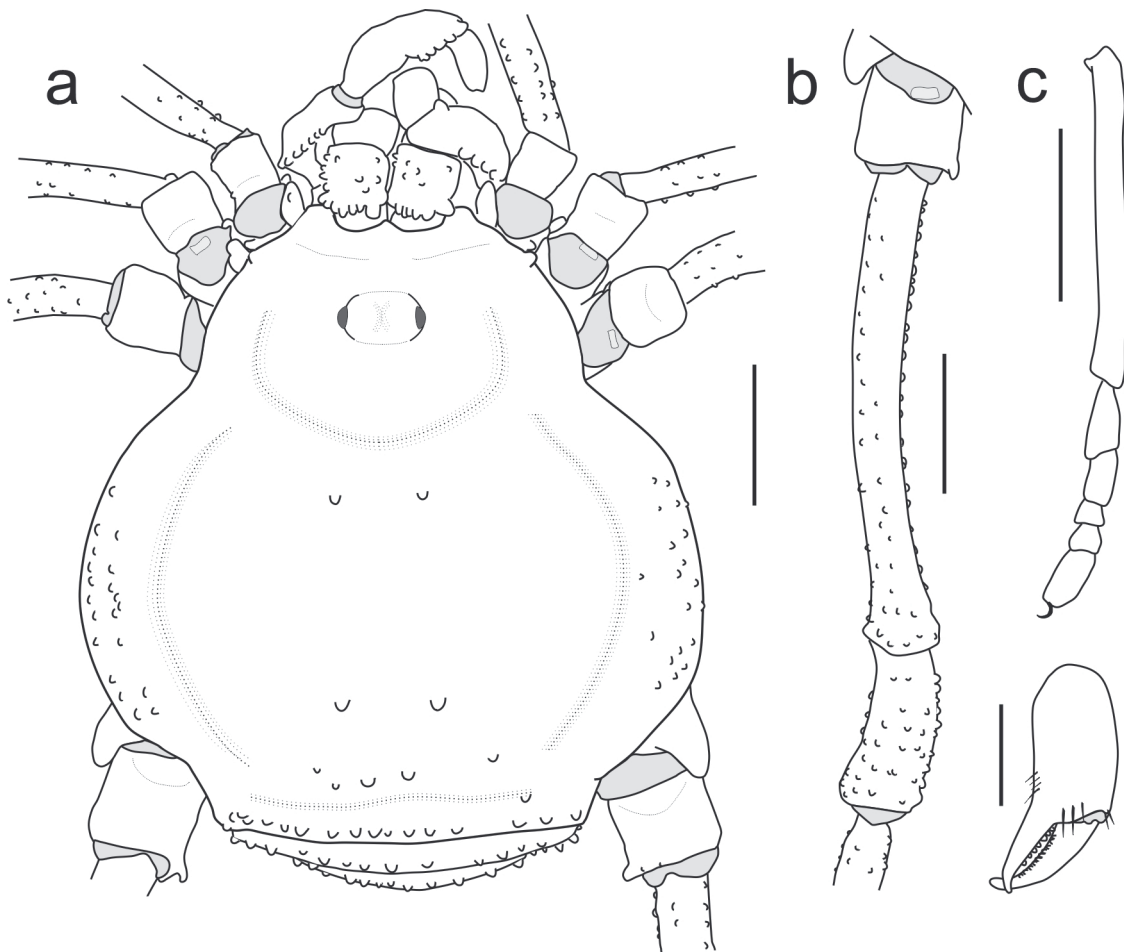


Fig. 20. *Libitioides sayi* (Simon, 1879), ♂ (MNRJ 58916) from Lake Kirby, Texas. **a.** Dorsal view of body. **b.** Left femur and trochanter IV, dorsal view. **c.** Left metatarsus and tarsomeres of leg I, lateral view. Scale bars = 1 mm.

Libitioides ornata Roewer, 1912: 15. ‡ Nomen made available by deliberate employment of Wood's misidentification (ICZN Arts 11.10 and 50.1), but originally mistakenly attributed to Wood, 1868.

Syn. nov.

Cynorta (Cynorta) depressa Sørensen in Henriksen, 1932: 386. **Syn. nov.**

Platycynorta transversalis Roewer, 1952: 42, fig. 23 [junior subjective synonym of *Cynorta sayi* Simon, 1879 by Cokendolpher & Jones (1991: 86)].

“*Gonyleptes ornatum*” – Wood 1868: 37. ‡ Non *Gonyleptes ornatus* Say 1821: misidentification, as noted by Cokendolpher & Peek (1991, vouchers destroyed).

Cynorta Sayii – Banks 1893: 150.

Cynorta sayi – Weed 1893: 294.

Cynorta sayii – Banks *et al.* 1932: 33.

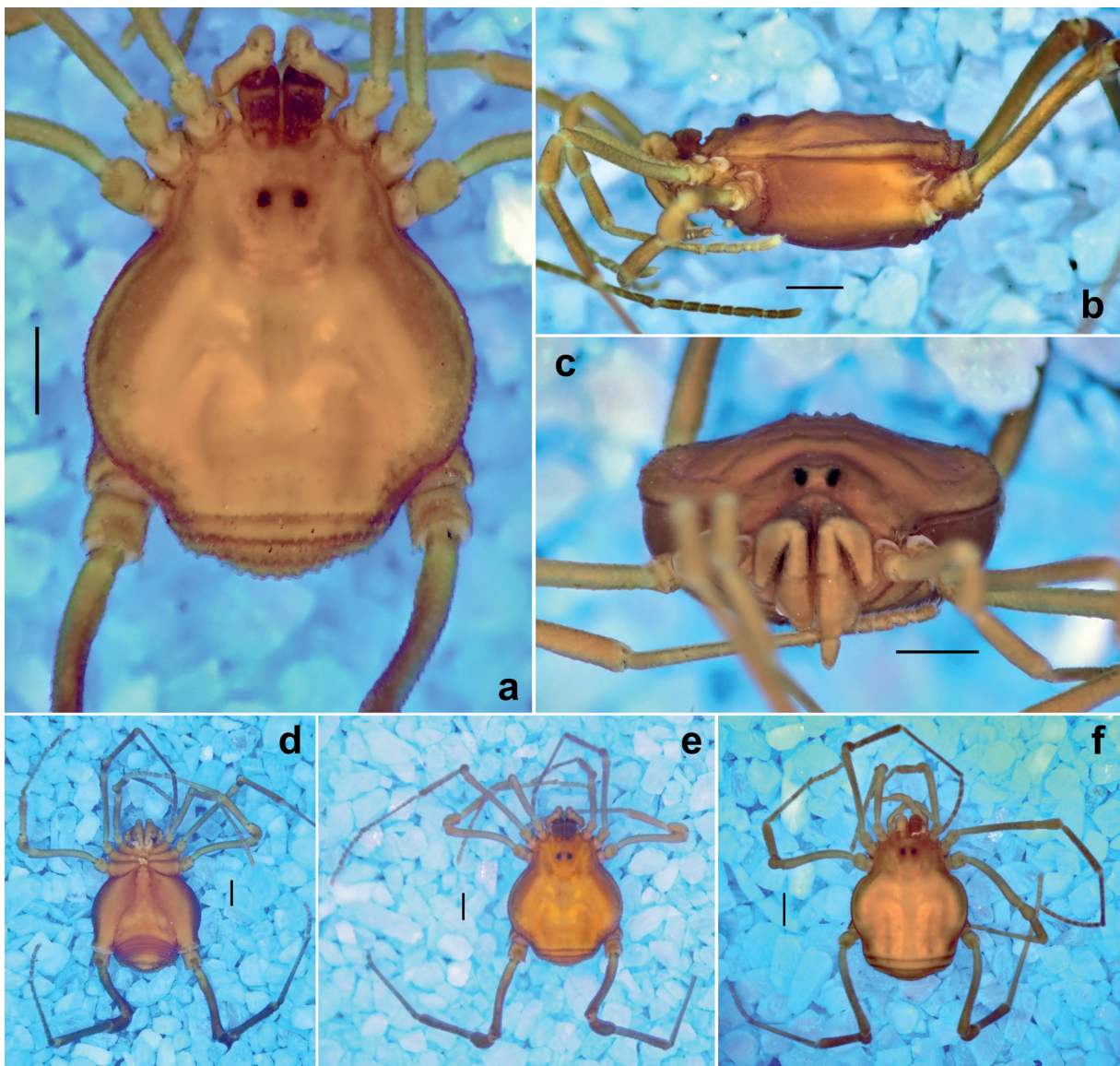


Fig. 21. *Libitioides sayi* (Simon, 1879), (MNRJ 58916) from Lake Kirby, Texas. Habitus. **a.** Male, dorsal view. **b.** Sinistrolateral view. **c.** Frontal view. **d.** Ventral view. **e.** Panoramic, dorsal view. **f.** Female, dorsal view (MNRJ 58916). Scale bars = 1 mm.

Cynorta (Cynorta) sayi – Sørensen in Henriksen 1932: 385.

Platycynorta depressa – Mello-Leitão 1933: 112.

Libitioides sayi – Mello-Leitão 1933: 112. — Medrano *et al.* 2021: 610 (comb. rest.).

Vonones sayi – Goodnight & Goodnight 1953a: 59.

Vonones ornata – Goodnight 1958: 322.

Diagnosis

Libitioides sayi differs from the other species of *Libitioides* by the following characters: short legs (femur IV shorter than or equal than DS length), small rounded tubercles in area III (instead of spines), small coda. Frequently without any spots in DS, chevron and omega stripe may be present (frequently fragmented). Ribs, backbone and lateral clouds never present. General color of body and appendages mustard yellow with a pair of much darker spots on scutal area III.

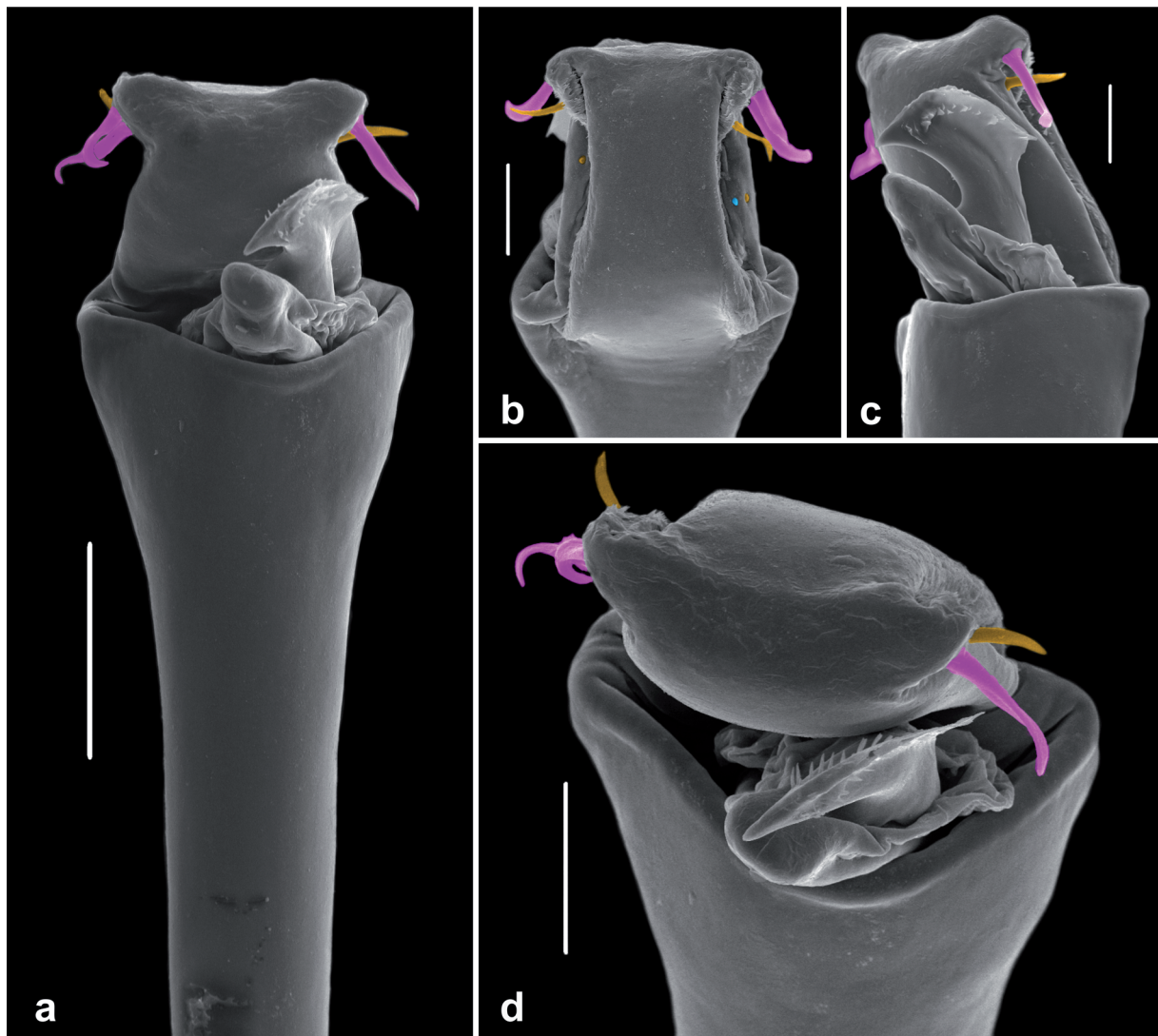


Fig. 22. *Libitioides sayi* (Simon, 1879), ♂ (MNRJ 58916) from Lake Kirby, Texas, distal part of penis. **a.** Panoramic dorsal view. **b.** Ventral view. **c.** Detail of glans, dextrolateral view. **d.** Apical view. Scale bars: a = 100 µm; b, d = 50 µm; c = 40 µm.

Type data

Types of *Cynorta sayi*

USA • Texas, without further locality data; whereabouts unknown (not examined).

Syntypes of *Cynorta depressa*

“CENTRAL AMERICA” • 3 ♂♂, 3 ♀♀; MTD • 1 ♂; ZMUC.

Holotype of *P. transversalis*

[USA] • ♂; Texas, Seagoville, near Dallas; SMF RII 9795 (examined).

Paratype of *P. transversalis*

[USA] • 1 ♀; same collection data as for holotype; SMF RII 9795 (examined).

Incorrect records (misidentifications)

CUBA, Santiago de Cuba, Santiago (Roewer 1912). USA, Alabama, Auburn (Banks 1900). Illinois, Southern portion (Weed 1893). Indiana, Cannelton; New Albany; Wyandotte (Banks 1907); “southern portion” (Goodnight 1958). Kansas (Banks 1893). Kentucky, Mammoth Cave (Roewer 1912). Louisiana, Southern portion; Morgan City; New Orleans. Mississippi, Agricultural College; Macomb. Oklahoma, Cleveland County; Comanche County; Grady County; Latimer County; Murray County (Roewer 1912; Banks *et al.* 1932). University of Oklahoma Biological Station; Sulfur: Platt National Park (Worsham 1962). Tennessee, Davidson County (Cokendolpher & Jones 1991). Texas, Brazos County; Harwood; Houston (Weed 1893); Jim Wells County: Alice (Dumitrescu 1976). From Florida into Texas, and from the Gulf states northward to southern Illinois, Indiana and Ohio (Goodnight & Goodnight 1953b). North Carolina (Roewer 1928). MEXICO, Nuevo León, 6 km SW of Bustamante; Redondo, 40 km S of Monterrey. Tamaulipas, 7 km NW of Gómez Farías; road cut near Gómez Farías; 4 km N of Joya de Salas (Goodnight & Goodnight 1973). There are two doubtful records of Sørensen (Henriksen 1932) from Texas and North Carolina.

Distribution (Figs 7–11)

Species occurring in the western part of the Central Lowlands, barely reaching the eastern part of the Great Plains. WWF Terrestrial Ecoregions: Piney Woods forests (NA0523), Western Gulf coastal grasslands (NA0701), Central forest/grasslands transition zone (NA0804), Central tall grasslands (NA0805, only in the extreme south in the state of Kansas), Edwards Plateau savanna (NA0806) and Texas blackland prairies (NA0814).

Libitoides scabrissima Roewer, 1912 comb. rest.

Libitoides scabrissima Roewer, 1912: 15.

Vonones scabrissimus – Kury 2003: 86.

Diagnosis

May be separated from its congeners by the coarsely granulated integument, area I with paramedian rounded granules, area III with slanted spines and unarmed area IV. Tibia and metatarsus with retrolateral row of small spines.

Type data

Syntypes

MEXICO • 3 ♂♂, 1 ♀; Puebla, Puebla; SMF RI 450 (examined).

Distribution

Only known from the type locality. WWF Terrestrial Ecoregion: Trans-Mexican Volcanic Belt pine-oak forests (NT0310).

Subfamily Metergininae Medrano, Kury & Mendes, 2021

Genus *Rhaucoides* Roewer, 1912

Rhaucoides Roewer, 1912: 25. Type-species by original designation: *Rhaucoides ornatus* Roewer, 1912.

Diagnosis

See Medrano *et al.* (2022: 206).

Rhaucoides riveti Roewer, 1914

Rhaucoides Riveti Roewer, 1914: 125, pl. 13 fig. 3.

Libitioides Riveti Roewer, 1914: 128, pl. 13 fig. 5. **Syn. nov.**

Type data

Holotype of *Rhaucoides riveti*

ECUADOR • ♂; Carchí, Tulcán; 3002 m alt.; 1901; Paul Rivet leg.; reported as in MNHN, but actually also in SMF.

Paratype of *Rhaucoides riveti*

ECUADOR • 1 ♂; same collection data as for holotype; SMF RI 477 (examined by photograph).

Syntypes of *Libitioides riveti*

ECUADOR • 1 ♂; [Carchí], El Pelado; 4151 m alt.; Jan. 1903; MNHN, lost? • 1 juvenile; same collection data as for preceding; Paul Rivet leg.; SMF RI 313, noted as ♀ on the label (examined by photograph).

Comments about the type material

Roewer (1914) studied the harvestmen collected by French ethnologist Paul Rivet (1876–1958) in two campaigns in the northern páramos of Ecuador (1901–1903). The material was officially split: one part was to be deposited in the MNHN, Paris and subsamples were taken to the Roewer Collection #1. As it happened, it seems that not all material was duly returned to Paris, but rather deposited in Roewer's collection, from where it ultimately ended in SMF, because it was not located by occasion of ABK's visit to Paris in 2017. Roewer mentioned only 1 male for *R. riveti*, but the type series (SMF RI 477) consists of two males. Maybe because of that indication, SMF curators called one of them “holotype” and the other “non-type”. As for *L. riveti*, the paper mentions “1 male, 1 juvenile”, of which, presumably the male would be in Paris. The juvenile is in SMF (SMF RI 313).

Remarks

Both external and genital morphology are conserved and well delimited in *Rhaucoides* members and *L. riveti* matches the genus diagnosis at least in external morphology. Decoloration is common in preserved opilions, and more common as in the ancient material studied by Roewer. Despite that, the juvenile syntype in SMF shows a pattern somewhat similar to *R. riveti*, a species described by Roewer with material collected by Rivet himself. Here, we propose the synonymy of *Libitioides riveti* with *Rhaucoides riveti* based on the morphological similarity and the geographic proximity (both type localities are in mountain tops 20 kilometers apart). Likewise, that decision avoids the creation of a secondary homonymy within *Rhaucoides* and the necessity of a replacement name.

Discussion

The combination of museum specimens and published photographs was essential for accurately identifying the different species of *Libitioides* and determine their distributions. By carefully selecting easily recognizable characters that could be evaluated from online photographs and mapping these characters individually, we were able to establish a combination of diagnostic characters for each species, particularly *L. sayi* and *L. albolineata*. This approach proved effective in accurately distinguishing these species. This method is likely only applicable to Cosmetidae due to the distinctive white markings on the dorsal scutum, which can be easily observed in photographs. It may not be effective for identifying other families of Laniatores.

We believe that American species of *Libitioides* are now adequately represented in our study, with neglected older names considered and synonymy clarified. Further investigation is needed for *L. scabrissima*, as it is poorly studied and has limited sampling. It is unlikely to also occur in the USA, specifically southern Texas, unless it is locally sympatric with the other two known species in that region. The American *Libitioides* serve as a prime example of a subject that could benefit from genetic analysis to better understand our findings, as the plastic phenotypic characters can obscure clear distinctions.

Libitioides ornata Roewer, 1912 vs *Cynorta sayi* Simon, 1879

Wood (1868) misidentified an as yet undescribed species as “*Gonyleptes ornatum*”, and this misidentification was already recognized by Simon (1879), who proposed a name for that species: “L’espèce rapportée par M.H. Wood au *Gonyleptes ornatus* Say, paraît en différer complètement et nous proposons de l’appeler *C. Sayi*.” Roewer (1912) corroborated Simon’s hypothesis that Wood’s material did not refer to *Gonyleptes ornatus* Say 1821, and correctly considered that it deserved a nomenclatural status of its own. However, Roewer proposed yet another new name – *Libitioides ornata* – keeping the same specific epithet used by Wood for a species in another genus (a procedure that he would adopt several times, often creating confusion, as shown in Kury 2020).

Both ICZN Art. 11.10 (Deliberate employment of misidentifications) and Art. 50.1 (Identity of authors) indicate that Roewer, by deliberately using Wood’s misidentification of *Gonyleptes ornatus* for the type species of the new nominal genus-group taxon *Libitioides* Roewer, 1912 denoted a new nominal species *Libitioides ornata* Roewer, 1912 (in spite of Roewer’s wrong assumption that Wood was to be the author). This nomen competes for synonymy where it is superseded by *Cynorta sayi* Simon, 1879.

The male holotype of *L. scabrissima* does not entirely match the general features of the remnant species of *Libitioides*, especially by the coarsely granular body, the coxae IV not parallel to the main body axis and the short, and the arched male femur IV.

The type locality of *Cynorta depressa*

In spite of the original data placing this species in Central America, we believe that it originated from a mislabeling. As demonstrated above, this specific Morph C possesses a narrow distribution in eastern Texas.

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