Conchita A. Pinzón Morales

Revisão sistemática do gênero *Eucynortula* Roewer, 1912 (Opiliones: Cosmetidae) e notas sistemáticas sobre algumas espécies relacionadas

Systematic review of the genus *Eucynortula* Roewer, 1912 (Opiliones: Cosmetidae) and systematic notes on some related species

São Paulo
2022

Conchita A. Pinzón Morales

Revisão sistemática do gênero *Eucynortula* Roewer, 1912 (Opiliones: Cosmetidae) e notas sistemáticas sobre algumas espécies relacionadas

Systematic review of the genus *Eucynortula* Roewer, 1912 (Opiliones: Cosmetidae) and systematic notes on some related species

Dissertação apresentada ao Instituto de Biociências da Universidade de São Paulo, para a obtenção de Título de Mestre em Ciências Biológicas, na Área de Zoologia.

Orientador: Ricardo Pinto-da-Rocha

São Paulo

2022

Ficha Catalográfica

Pinzón, Conchita
Systematic review of the genus *Eucynortula* Roewer, 1912 (Opiliones: Cosmetidae) and systematic notes on some related species
171

Dissertação (Mestrado) - Instituto de Biociências da Universidade de São Paulo. Departamento de Zoologia.

1. Cosmetidae 2. Morphology 3. Diversity I. Universidade de São Paulo. Instituto de Biociências. Departamento de Zoologia.

Comissão Julgadora:

_____ _____

Prof(a). Dr(a). Prof(a). Dr(a).

_____

Prof(a). Dr.(a). Ricardo Pinto da Rocha

Orientador(a)

Epígrafe

Siempre habrá nieve altanera
que vista el monte de armiño
y agua humilde que trabaje
en la presa del molino.

Y siempre habrá un sol también
un sol verdugo y amigo
que trueque en llanto la nieve
y en nube el agua de río.

León Felipe, *Revolución*

Acknowledgments

I am deeply grateful to Professor Ricardo Pinto da Rocha, who has been part of my formation since my early studies in Biology and for allowing me to be part of his lab at IB-USP. Furthermore, he was a great support to me during my master's studies that coincided with the period of social isolation caused by the Covid-19 pandemic.

To Brittany Damron for her kind disposition at every moment and her important contributions improving this work.

To Peter Jäger for his gentle assistance during my stay at SMF, and this institution for the financial support to my visit to the arachnological collection.

To Stuart Longhorn for sharing photographs of the type material of *E. albipunctata* and *E. bituberculata* from BMNH.

To Juliana Figueiredo, Daniel Castro, Marilia Pessoa and Jairo Moreno for their reception in the LAL team, their friendship, and multiple discussions and adventures during my stay in Brasil. Particularly I am in debt to Jairo Moreno for his comments to improve the final version of this work.

To my family and Hermes Cuadros for their unconditional support and trust.

I am greatful to my friends who were my family all the time that I spent far away from home: Cristian Guacaneme, Miguel Peña, Lina Vasquez, Andrés Rojas, Tania Churascari, Mario Rodriguez and Camilo Guerrero.

Finally, to Universidade de São Paulo and Instituto de Biociências for all the facilities provided to complete my master's studies and to CNPq for financial support to guarantee my well-being for two years in Brasil.

Index

1. Introduction

Opiliones belong to the class Arachnida and represent the third most diverse order among arachnids (Giribet & Kury, 2007). Currently, the order is divided into five suborders: the extinct Tetrophthalmi Garwood *et al*., 2014, and the remaining Cyphophthalmi Simon, 1879, Dyspnoi Hansen & Sørensen, 1904, Eupnoi Hansen & Sørensen, 1904 and Laniatores Thorell, 1876, extant today and widespread on all continents except Antarctica (Machado *et al*., 2007).

Laniatores is the most diverse suborder among Opiliones (Kury, 2013), with most of its diversity concentrated in two Neotropical families: Cosmetidae (> 700 spp) and Gonyleptidae (> 800 spp) (Benavides *et al*., 2020). The former is well represented from the south of North America to almost all of South America, including the Antilles (Kury & Pinto-da-Rocha, 2007), with a diversity peak in Central America, northern South America, and the Caribbean (Townsend *et al*., 2010; Damron *et al*., 2018).

Cosmetids can be morphologically recognized by the shape of the pedipalps, where the femur is laterally compressed and the tibia is dorso-ventrally flattened and spoon-like shaped covering chelicerae (Pinto-da-Rocha & Hara, 2011). Furthermore, pedipalps are not well armed with spines or long setae as other families of Laniatores sharing raptorial pedipalps (i.e., Cranaidae, Gonyleptidae, Nomoclastidae).

The family Cosmetidae has been divided into two subfamilies: Cosmetinae C. L. Koch, 1839 and Discosomaticinae Roewer, 1923. This division was traditionally based on the presence (Discosomaticinae) or absence (Cosmetinae) of pectination on the claws of leg IV. However, some authors have widely criticized these taxonomic arrangements (Ringuelet, 1959; Ferreira & Kury, 2010). Furthermore, in recent systematic analyses of some genera of cosmetids, it has been demonstrated that the pectination of claws

of leg IV has emerged several times within Cosmetidae and consequently, the primary homology hypothesis for Discosomaticinae has lost support (Coronato-Ribeiro & Pinto-da-Rocha, 2017; Medrano & Kury, 2018; Damron, 2020; Medrano *et al*., 2021).

The subfamily Discosomaticinae was the object of a recent phylogenetic analysis using morphological evidence (Medrano *et al*., 2021), which represents the first published analysis focused on a suprageneric taxon of Cosmetidae. The analysis rejected the monophyly of Discosomaticinae (*sensu* Roewer, 1923) and eight subfamilies were recognized, five new and three reestablished under a different configuration and diagnosis: Cynortinae Mello-Leitão, 1933; Cosmetinae C.L. Koch, 1839; Discosomaticinae Roewer, 1923; Ferkeriinae Medrano, Kury & Mendes, 2021; Flirteinae Medrano, Kury & Mendes, 2021; Metergininae Medrano, Kury & Mendes, 2021 and Taitoinae Medrano, Kury & Mendes, 2021. Discosomaticinae was divided into two tribes, Discosomaticini Roewer 1923 and Roquetteini Medrano, Kury & Mendes, 2021.

Also, Medrano *et al*. (2021) provided data on the geographic distribution of each subfamily and used this information to suggest a limited number of species included in large genera (i.e., *Paecilaema*, *Cosmetus*) which in the traditional taxonomic sense could not represent natural clades (Kury & Medrano, 2018; Medrano *et al*., 2021).

Medrano *et al*, (2021) brought light to the general suprageneric interpretation of Cosmetidae. Nevertheless, most of the genera analyzed by Medrano and collaborators remain poorly described and are often just known from old descriptions without any modern redescription. Furthermore, the suprageneric classification provided by Medrano *et al*. (2021) did not sort most cosmetid genera within the subfamilies proposed, instead just a few genera included in the analysis were classified. Therefore, it is necessary to examine the morphology of each cosmetid genus to give an accurate

taxonomic position, understand its diversity, and assess the new subfamilial classification under additional sources of evidence.

The taxonomy of Cosmetidae and other families of Laniatores have been complex and their phylogenetic relationships obscured due to the use of doubtful morphological characters in some taxonomic works (Benavides *et al*., 2020). One of the first classifications was proposed by Carl Friedrich Roewer and was called the "Roewerian system". It was based on an invariable combination of somatic characters such as the number of spines/tubercles on dorsal scutum, the number of tarsal segments, and coloration of dorsal scutum (i.e., Roewer, 1912; 1923). The main problem with the Roewerian system is that it leads to an increased number of species and monotypic genera. This is due to the inability to recognize intraspecific variation and in consequence, overestimates morphological differences (Pinto-da-Rocha & Yamaguti, 2013). Since strong intraspecific variation in tarsal segments has been recorded, Roewer's classification resulted in an artificial grouping that concealed evolutionary relationships.

In opposition to the Roewerian system, a new approach was proposed by Goodnight and Goodnight (i.e., 1953a) for use in the genera classification of Central America cosmetids. They widely discussed the superficiality of features commonly used in the Roewerian system (Goodnight & Goodnight, 1953b), and made a significant number of taxonomic changes in several species and genera, considering a wider range of intraspecific variation (Goodnight & Goodnight, 1953a).

Both approaches, from Roewer and Goodnight & Goodnight, expressed extremes in the interpretation of morphological variation, and lead to erected taxonomic entities that deserve major studies to identify their real boundaries (Kury, 2003).

More recently, a new resource of taxonomic information was proposed and widely expanded into opilionological research, this began with the exploration of genital morphology in the 1970s (Martens, 1976; 1986; 1988). Nowadays, penial morphology has great relevance in the description of taxa at genus and species level and homologies have been recently proposed for some suprafamilial clades (i.e., Gonyleptoidea in Kury & Villarreal, 2015; Kury, 2016)

Among Laniatores, Cosmetidae has recently received great taxonomic attention. The first attempt to review the whole family was carried out (Damron, 2020); the subfamily Discosomaticinae was reviewed in detail (Medrano et al., 2021) and some South American genera have been reviewed and new diagnoses proposed (i.e. *Cynorta* C. L. Koch, 1839 by Kury et al., 2007; *Flirtea* C. L. Koch, 1839 by Kury & García, 2016; *Metalibitia* Roewer, 1912 by Coronato-Ribeiro & Pinto-da-Rocha, 2017; *Rhaucus* (Simon, 1879) by García & Kury, 2017; *Eulibitia* Roewer, 1912 by Medrano & Kury, 2017; *Paecilaema* C. L. Koch, 1839 by Kury & Medrano, 2018; *Roquettea* Mello-Leitão, 1931 by Medrano & Kury, 2018; *Neocynorta* Roewer, 1915 by Medrano *et al*., 2019). These revisions allowed the recognition of new morphological characters, such as ornamentation of legs (Kury & Barros, 2014; Garcia & Kury, 2017), the shape of dorsal scutum (DS) (Kury & Medrano, 2016), color pattern on DS (Kury & Medrano, 2018; Medrano *et al*., 2021) and relevant information on genital morphology which has been studied in Cosmetidae. The inclusion of new morphological data provides major support in the recognition of monophyletic groups within the family and helps to better define genera and species, with further studies being able to clarify the internal relationships of several taxa.

Recent revisions of some Cosmetidae genera have highlighted that the use of the geographical distributions of genera and species, may allow the definition of taxonomic boundaries (Medrano & Kury, 2017; Garcia & Kury,

2018). Taking into account the high homoplasy of morphological characters found in recent phylogenetic analysis (Coronato-Ribeiro & Pinto-da-Rocha, 2017; Medrano & Kury, 2018; Damron, 2020). So, these distributional patterns, largely ignored before, can now be used to interpret the morphology, and to be used as a criterion for delimiting taxa, as phylogenetic studies have shown the results to be informative (Damron, 2020; Medrano *et al*., 2021).

The genus *Eucynortula*, for instance, has not been reviewed or even included in any cladistic hypothesis before this work. This genus includes species distributed from Mexico to Northern Brazil, occupying a considerably wide geographic range and containing species described using non-informative characters common in the classic systems of delimitation of species discussed above.

This work will review the genus *Eucynortula* based on morphological features including new informative characters proposed in recent works (Kury & Villareal, 2015; Coronato-Ribeiro & Pinto-da-Rocha, 2017; Medrano & Kury, 2017; Medrano & Kury, 2018; Damron, 2020 and Medrano *et al*., 2021) and will test its monophyly employing a cladistic analysis.

1.1. Systematic background of genus *Eucynortula* Roewer, 1912

The genus *Eucynortula* Roewer, 1912 was diagnosed by Roewer the following character combination: All areas of dorsal scutum unarmed, except area III with a medial pair of low but outstanding tubercles; males with cheliceral bulla well developed; Leg IV of males could be unarmed or armed with strong denticles and Tarsus I with 6 segments, III and IV always bearing more than 7 segments. Roewer (1912) transferred to the genus the following species: *Cynorta mexicana* Banks, 1898 (without type locality data, except for the title of the publication “Some Mexican phalangida”); *Cynorta*

albipunctata Pickard-Cambridge, 1905 (proposed as the type species of *Eucynortula* by Roewer) from Costa Rica; *Cynorta bituberculata* Pickard-Cambridge, 1905 from Guatemala, San Juan Chamelco, Petet, Cahabon (Pickard-Cambridge, 1905) and *Cynorta lata* Banks, 1909 from Santo Domingo, San Mateo, Costa Rica. In the same work, Roewer described *Eucynortula metatarsalis*, recognizing three subspecies: *E. metatarsalis metatarsalis* Roewer, 1912; *E. metatarsalis separata* Roewer, 1912 and *E. metatarsalis medialis* Roewer, 1912 from Mexico, Sierra de Nayarit, and Puebla; these subspecies were differentiated based on differences in the color pattern of dorsal scutum. Afterward, *Cynorta nannocornuta* Chamberlin (1925), was described from Barro Colorado Island, based on only females, Chamberlin (1925) suggested that the new species could belong to the genus *Flirtea* C. L. Koch, 1839 but decided not to transfer it due to the absence of males (Chamberlin, 1925). Shortly after it, Roewer (1925) described *Eucynortula ypsilon* Roewer, 1925 from Colombia, Darien "Punta di Sabana".

Subsequently, Goodnight & Goodnight (1942a) described *Eucynortula maculosa* Goodnight & Goodnight, 1942 whose holotype is a female and the male was not described but, established as a paratype in the same work; they identified this species as similar to *E. albipunctata* but exhibiting a different color pattern on the dorsal scutum.

In the same year, *Eucynortula dorsata* Goodnight & Goodnight, 1942 and *Eucynortula sexpunctata* Goodnight & Goodnight 1942 both from Barro Colorado Island, Canal Zone were described. Both species were differentiated from the remaining species of *Eucynortula* just by the color patterns on the dorsal scutum, and it was suggested to be a close relationship between *E. dorsata* and *E. ypsilon* solely based on their distinct color patterns. In addition, they described a male of *C. nannocornuta* (Goodnight & Goodnight, 1942b). Furthermore, Mello-Leitão (1943) described and

illustrated *Eucynortula puer* Mello-Leitão, 1943 from Ecuador, El Oro, Rio Colorado; Goodnight & Goodnight (1946) transferred *Eucynortula mexicana* (Banks, 1898) to *Poala* Goodnight & Goodnight, 1942 leaving the genus *Eucynortula* with 10 species.

Later, Goodnight & Goodnight (1947a) transferred *Cynorta nannocornuta* to *Eucynortula* without any justification and synonymized *E. dorsata* and *E. sexpunctata* under *Eucynortula nannocornuta* (Chamberlin, 1925). This new arrangement was supported by the examination of a large series of specimens that allowed them to infer that both species constitute extreme cases of intraspecific morphological variation. Also, the same authors described *Eucynortula multilineata* Goodnight & Goodnight, 1947 from Silkgrass, British, Honduras, based on a female; they related this species to *E. bituberculata*, but as usual in their previous works with other species, the only different feature they found was the color pattern (Goodnight & Goodnight, 1947a).

Afterward, Roewer (1947) described *Eucynortula pentapunctata* Roewer, 1947 from Manaus, Brazil; *E. rugipes* Roewer, 1947 from San José, Costa Rica; *E. auropicta* Roewer, 1947 from Costa Rica, Tilarán and *E. puncticulosa* Roewer, 1947 from Maracay, Venezuela; the latter two with a female holotype. Additionally, the species *Cynorta centralis* Sørensen in Henriksen, 1932 was transferred by Roewer (1947) to *Eucynortula* without justification. *Cynorta centralis* was described by Sørensen (in Henriksen, 1932 *opus postumum*) from Mexico as the type locality, without any further details. Originally the species was named by the original author as "*Cynorta mexicana"*, but the specific epithet was changed because it was preoccupied by Banks (1898).

After that, Caporiacco (1951) described *Eucynortula alboirrorata* from Cerro El Copey, Isla Margarita, Venezuela with only a female. Subsequently, Gonzalez-Sponga (1992) designated a male neotype for *E. alboirrorata* from

the same type locality, and in the same work, the author considered *E. puncticulosa* as a junior synonym of *Flirtea clypeata* (Sørensen, 1932).

A great number of synonyms were proposed by Goodnight & Goodnight (1953b), where 64 genera of Cosmetidae were synonymized under only three genera: *Cynorta* Koch, 1839, *Paecilaema* Koch, 1839 and *Vonones* Simon, 1879. Considering morphological variation, the authors stated "*it has been thought best to consider the mexican cosmetids as belonging in three genera which differ from one another in the number of tarsal segments in the first tarsus*" [italics added]. Nevertheless, the synonymic lists provided by them included genera with species not occurring in Mexico. This was the case for *Eucynortula*, which was considered a junior synonym of *Cynorta*, with just *E. metatarsalis* recorded from that country. Furthermore, the authors did not explain to support all the taxonomic changes proposed.

More recently, the genus *Eucynortula* was revalidated by Kury (2003) and all synonymies resulting from Goodnight & Goodnight (1953) were ignored and all genera revalidated, nevertheless, it was suggested by Kury (2003) that detailed studies are necessary to propose some nomenclature arrangements. Likewise, Kury (2003) synonymized the subspecies *E. metatarsalis metatarsalis*, *E. m. separata* and *E. m. medialis* considering differences in marks on the dorsal scutum highly variable to separate sympatric morphotypes.

On the other hand, Kury (2003) referred to *Eucynortula maculosa* as two different species as "*Eucynorta maculosa* (Goodnight & Goodnight, 1942) and *Eucynortula maculosa* Goodnight & Goodnight, 1942". Kury (2003) did not make a nomenclatural change for *Eucynortula maculosa*, which is the original species described by Goodnight and Goodnight (1942) and he quoted the same reference, page, and figure for both species, probably a mistake made by the author. In his recent catalog, *Eucynorta maculosa* is not considered as a valid species (Kury *et al*., 2021).

Nowadays, the genus *Eucynortula* includes 13 species distributed in Central America and South America.

---

2. Objectives

2.1. General objective

To propose a phylogenetic hypothesis on relationships between the species of the genus *Eucynortula* Roewer, 1912.

2.2. Specific objectives

1. To set the boundaries of the species of *Eucynortula* based on somatic and genital morphology, providing redescriptions, diagnoses, and illustrations.
2. To assess the monophyly of the genus *Eucynortula*.
3. To provide an identification key for the species of *Eucynortula*.
4. To establish the geographic distribution of its species.

3. Materials and Methods

3. 1. Examined material.

Were reviewed 56 species of Opiliones (115 specimens), Acronyms of repositories are given below (for reviewed and cited material).

AMNH: American Museum of Natural History. New York, U.S.A.

BMNH: The Natural History Museum, London.

FMNH: Field Museum of Natural History. Chicago, U.S.A.

GDSLV: Collection Godman & Salvin in BMNH.

IBSP: Arachnology Laboratory Instituto de Biociências, Universidade de São Paulo, São Paulo, Brasil.

ICN: Instituto de Ciencias Naturales de la Universidad Nacional de Colombia. Bogotá, Colombia.

MAGS: Private collection Manuel González Sponga. Caracas, Venezuela.

MBUCV: Museo de Biología. Facultad de Ciencias. Universidad de Caracas. Venezuela.

MCZ: Museum of Comparative Zoology, Harvard University. Cambridge, MA. U.S.A.

MNRJ: Museu Nacional, Universidad Federal de Rio de Janeiro, Rio de Janeiro, Brasil.

MZSP: Museu de Zoologia da Universidade de São Paulo, São Paulo, Brasil.

MZT: Museo Regionale di Scienze Naturali di Torino. Torino, Italy.

NHMW: Naturhistorisches Museum, Dritte Zoologische Abteilung. Wien (Vienna), Austria.

SMF: Naturmuseum Senkenberg, Frankfurt, Germany.

ZMG: Universität Göttingen. Institut für Zoologie und Anthropologie. Abteilung für Morphologie und Systematik und Zoologisches Museum. Göttingen, Germany.
ZMH: Zoologisches Institut und Zoologisches Museum, Universität Hamburg. Hamburg, Germany.

The examined material used in the analysis is represented by 11 genera of two families: Cosmetidae and Metasarcidae Kury, 1994 (See Table 1). The latter was included because it has been supported as the sister group of Cosmetidae (Kury & Villarreal, 2015; Pinto-da-Rocha *et al.,* 2014; Benavides *et al*., 2020). Species of Cosmetidae were chosen taking into account morphological similarities about diagnostic characters proposed by Roewer (1912) such as ornamentation of the dorsal scutum, armature of legs IV in males, and geographical criteria, including species occurring in the Central and North of South America, following the current distribution known for *Eucynortula*.
According to Table 1, was examined material of six valid species of *Eucynortula* and some material of *Eucynortula sexpunctata*, which is currently accepted as a junior subjective synonym of *E. nannocornuta*. Here it was included as an incipient terminal due to its external morphology is not consistent with the morphology of *E. nannocornuta* (See appendix 8 and 10 E-F).
On the other hand, just four of the six reviewed species of *Eucynortula* were included because two of them were only represented by a female and two immature specimens (*E. auropicta* and *E. rugipes,* respectively). In general, the material examined not included in the analysis corresponds to females, immature individuals, or not well-preserved males.

Table 1. List of material examined. [1.]Holotype examined; [2.] Paratype examined. [*]Species considered as a junior synonym of *Eucynortula nannocornuta* (Goodnight & Goodnight, 1947a; Kury, 2003; Kury *et al*., 2021).

Family	**Species**	**Code/ Repository**
Metasarcidae	*Chacoikeontus clavifemur* Roewer, 1921	IBUSP-OP-750
Cosmetidae	*Cynorta calcarapicalis* Roewer, 1912 [1.]	SMF 479
Cosmetidae	*Cynorta liturata* Roewer, 1927 [1.]	SMF 155
Cosmetidae	*Cynorta liturata* Roewer, 1927	ICN-AO-1388
Cosmetidae	*Cynorta punctatolineata* Roewer, 1917 [1.]	SMF 1310
Cosmetidae	*Cynortoperna albornata* Roewer, 1947 [1.]	SMF 2986
Cosmetidae	*Cynortula limitata* Roewer, 1927 [1.]	SMF 176
Cosmetidae	*Cynortula biprocurvata* Roewer, 1952 [1.]	SMF 9796
Cosmetidae	*Cynortula alejandra* Roewer, 1957 [1.]	SMF 11420
Cosmetidae	*Cynortula longipes* (Pickard-Cambridge, 1904)	SMF 2994
Cosmetidae	*Cynortula punctata* Roewer, 1947 [1.2.]	SMF 1519
Cosmetidae	*Cynortula quadrimaculata* Roewer, 1912 [1.]	SMF 423
Cosmetidae	*Cynortula stellata* Roewer, 1912 [1.2.]	SMF 465
Cosmetidae	*Cynortula undulata* Roewer, 1947 [1.2.]	SMF 1502
Cosmetidae	*Eucynorta quadripustulata* (Simon, 1879)	SMF 547
Cosmetidae	*Eucynortella spectabilis* Roewer, 1912 [1.]	SMF 453
Cosmetidae	*Eucynortula albipunctata* (Pickard-Cambridge, 1904)	SMF RI 425/32 SMF 1531/32
Cosmetidae	*Eucynortula auropicta* Roewer, 1947 [1.]	SMF RII/7372-235
Cosmetidae	*Eucynortula pentapunctata* Roewer, 1947 [1,2.]	SMF RII/5860/202 SMF RII/5861
Cosmetidae	*Eucynortula metatarsalis* Roewer, 1912 [1,2]	SMF RI/432/32 SMF RI/430/32 SMF RI/436/32

Cosmetidae	*Eucynortula ypsilon* Roewer, 1925 [2.]	SMF RII/109/69-32
Cosmetidae	*Eucynortula sexpunctata* Goodnight & Goodnight, 1942 [2. *]	RII/9038-254-32
Cosmetidae	*Eucynortula rugipes* Roewer, 1947 [1,2.]	SMF 1532/32
Cosmetidae	*Eulibitia scalaris* (Sørensen in Henriksen, 1932)	MNRJ-17948
Cosmetidae	*Metacynorta gracilipes* Pickard-Cambridge, 1904	IBUSP-OP-2583
Cosmetidae	*Metalibitia brasiliensis* Soares & Soares, 1949	IBUSP-OP-749
Cosmetidae	*Metalibitia paraguayensis* (Sørensen, 1884)	MCZ-132484
Cosmetidae	*Metalibitia rosascostai* Capocasale, 1966	IBUSP-OP-390
Cosmetidae	*Neocynorta venezuelensis* (Roewer, 1915) [1.2.]	SMF 1080
Cosmetidae	*Taito osmari* Kury & Barros, 2014	MZSP-58308
Cosmetidae	*Taito curupira* Pinzón et al., 2021 [1.]	MZSP-58149
Cosmetidae	*Taito mayoruna* Pinzón et al., 2021 [1.]	IBSP-10718
Cosmetidae	*Taito mayoruna* Pinzón et al., 2021 [2.]	MZSP-76423

3.2. Taxonomy

Descriptions of species were carried out based on material examined, some of which were type material (See Table 1). All descriptions were based on males; relevant features of females were described when material was available.

The terminology used in the description of the external morphology follows Kury & Barros (2014) for “groin warts” and Kury & Medrano (2016) for “Mid bulge” and “Coda” and outline shape of DS. The color patterns described here used terms as “backbone”, “chevron” and “Omega stripe” proposed by Kury & Medrano (2018).

Some terms widely used for describing the morphology of Opiliones are detailed below to provide a strict meaning about each one.

Tubercles: Were considered as prominent elevations of tegument that could be short or long and may present different shapes at their tips (i. e., blunt or acute).

Spines: On dorsal scutum are referred as "spiniform tubercles", normally longer and conical.

Granules: Following DaSilva & Gnaspini (2009), "short elevation (height = diameter) usually present in large numbers in the same structure covering it rather homogeneously". Herein the term is used to denote tegument texture as well.

Apophysis: Following DaSilva & Gnaspini (2009), "irregularly shaped structure, generally larger than those above, which occurs only at coxa, trochanter, and apex of the femur of the appendages" (See Fig.3A and Char. 51)

Projection: Denote a prolongation of any structure, sometimes longitudinal, used herein in a different way than apophysis (see figure 6 K and Char. 73).

The tarsal formula is given from leg I to IV, values in parenthesis indicate the number of segments of distitarsus, when it was not possible to know the number of tarsal segments it was expressed with a question mark.

Relative positions of external structures were described following Acosta *et al*. (2007). Codes and names for color were described using the standard names of the 267 Color Centroids of the NBS/IBCC Color System following Kury & Orrico (2006).

Genital morphology was described following Kury & Villarreal (2015) for nomenclature of macrosetae and Medrano & Kury (2016) was followed for the reinterpretation of macrosetae D1. Microsetae descriptions follow Kury (2016). Nevertheless, this information was only provided for those species whose material was available for SEM.

Illustrations of the external morphology were carried out using a stereomicroscope with a camera lucida on a Leica MZ APO and digitalized using the software Inkscape version 0.91 (www.inkscape.org). Male genitalia, when available for SEM, were prepared following Pinto-da-Rocha (1997) and micrographs were taken with a Zeiss DSM940 electron microscope. For type material, genital morphology was illustrated with a Camera lucida attached to a microscope Zeiss Axioskop 2 plus and digitalized subsequently by the same means as external morphology. All measures are given in millimeters (mm).

Maps showing the distribution of species were elaborated with the software ArcGis version 10.5. Geographical coordinates were estimated following the reference of the literature, which in most cases does not include major details about the localities.

Abbreviations: Cx = coxa; CW = carapace width; CL = carapace length; DS = dorsal scutum; DSW = dorsal scutal width; Fe = femur; DSL = dorsal scutal length; Mt = metatarsus; MS = macrosetae; ms = microsetae; Pa = patella; VP = ventral plate; Ta = tarsus; TF = tarsal formula; Ti = tibia, and Tr = trochanter.

3.3. Phylogenetic analysis

The phylogenetic analysis was based on a matrix of 94 morphological characters for 30 terminals (Table 1), based only on adult males. It includes 26 genital characters and 68 somatic characters. All characters were considered unordered and were codified using reductive coding (64 characters) or composite coding (30 characters). Reductive coding was mostly represented to better show the independence of characters (Strong & Lipscomb, 1999). Nevertheless, multistate characters were included when

reductive codification implied loss of information about the state of characters.

The matrix was constructed using the software Mesquite version 3.61 (Madison & Madison, 2019), and analyzed with TNT version 1.5 (Goloboff *et al*., 2000), Heuristic searches by traditional search with the algorithm TBR (Tree Bisection and Reconnection) were carried out. The following parameters were used thus: 10.000 trees in memory, 200 repls. and 100 trees saved per replication for all searches conducted.

The most parsimonious trees were found assuming equal weighting (EW), defined as a prior value given for characters before any analysis is done (Goloboff, 1993) this approach considers all characters equally informative in a given phylogeny.

Search of the fittest tree was performed using implied weighting (IW) which was defined as a concave function of homoplasy, where each character is weighted using the following equation:

$$f = k\,(e + k)$$

where, f is a worth of *fitness* which reflects the concordance between the characters and tree; e is the number of extra steps of character and k is the constant of concavity which could take any value from 1 to infinite (Goloboff, 1993). There are not any criteria to select a K value, due that it was used the script setk.run written by Salvador Arias which calculates the best K value considering the data set (Goloboff et al., 2008). The application of this script resulted in a K value of 4.765625.

Both approaches (EW and IW) were carried out to discuss the resolution of relationships when considering characters highly homoplastic as less informative.

Consistency Index and Retention Index were estimated for each character (ci and ri) and all trees (CI and RI). Bremer support was calculated for the EW

tree, this measure of branch support is understood as the extra steps needed to lose a branch from the most parsimonious tree (Bremer, 1994).

Finally, optimization of characters was carried out with the software Winclada 1.61 (Nixon, 1999) under criteria of accelerated transformation (ACCTRAN) of characters, it was preferred due to it assumes the rise of character early on the phylogeny with reversals on top of branches, this has been considered preferable because it preserves the primary homology hypothesis (Kitching *et al*., 1998), the optimization of characters was performed on the tree obtained under IW.

4. Results

4.1. List of Characters

The examination of the morphology of terminals resulted in the following list of characters. Being 26 from the penis, four from the chelicerae, 15 from the pedipalps, 15 from the legs, 29 from the dorsum, and five from the venter. The list of characters is composed of 56 characters from the literature and 38 new characters.

PENIS

0. **Penis, general shape of VP** (Damron, 2020: Char, 65). (ci: 0.25; ri: 0.25; steps: 12)

0. Rectangular, Lateral sides longer than the apical margin (Fig. 8 E, F).

1. Square, lateral sides equal length to distal margin (Fig. 8 A, B)

2. Trapezoidal, lateral margins converging basally or distally (Fig. 20 I, K).

1. Distal margin of VP (Damron 2020: Char. 64). Modified. (ci: 0.37; ri: 0.37; steps: 8)

0. Curved, concave (Fig. 8 A, B, E, F, I, J)

1. Cleft (20-50% of VP length)

2. Straight (Fig. 23 A, B)

3. Convex

2. Penis, VP, latero-distal corners, width (Medrano *et al*., 2021: Char. 113). (ci: 0.12; ri: 0.3; steps: 8)

0. inflated, wider than rest of the VP (Fig. A, B)

1. As wide as the rest of VP (Fig. 8 E, F)

3. VP, length It was considered the truncus width for comparison (Kury & Villarreal 2015: Char. 46. Modified). (ci: 0.2; ri: 0.63; steps: 5)

0. Long, longer than apical width of truncus (Fig. 20 I, K)

1. Short, shorter or equal than apical width of truncus (Fig. 8 A, B, Fig. 20 A, B)

4. MS C, number (Damron 2020: Char. 72) Modified. (ci: 0.5; ri: 0; steps: 2)

0. Three pairs

1. Two pairs (Figs. 8; 20; 23; 27)

5. MS C, shape (Medrano & Kury 2018: Char. 43) Modified. (ci: 1; ri: 1; steps: 1)

0. Straight

1. Curved (Figs. 8; 20)

6. MS C, Shape (ci:1; ri:1; steps: 1)

0. Cylindrical

1. Spatulated (Figs. 8; 20; 27)

7. MS D, number (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 52) Modified. (ci: 0.12; ri: 0; steps: 8)

0. One pair (Fig. 20 I-L)

1. Two pairs (Figs. 9; 11; 13)

8. MS D1, size (Medrano & Kury 2018: Char. 45) Modified. (ci: 0.3; ri: 0.3; steps: 3)

0. Short (Fig. 20 I)

1. Long (Fig. 8 A, B)

9. MS D2, size (Medrano & Kury 2018: Char. 47) Modified. (ci: 0.25; ri: 0; steps: 4)

0. Shorter than D1 (Figs. 8 A, E, I)

1. Longer than D1

10. MS A, number (Medrano & Kury 2018: Char. 39 and Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 53) Modified. (ci: 0.25; ri: 025; steps: 4)

0. One pair (Fig. 27 A, F, I)

1. Two pairs (Figs. 8, 20, 23)

11. MS A1, size (Medrano & Kury 2018: Char. 40 and Damron 2020: Char. 67) Modified. (ci: 0.14; ri: 0.25; steps: 7)

0. Long (Fig. 8 A, E)

1. Short (Fig. 8 I)

12. MS A2, size (ci: 0.2; ri: 0.33; steps: 10)

0. Short (it would be shorter than A1) (Fig. 23 A-D)

1. Length comparable to A1 (Fig. 8 I, J)

2. Longer than A1 (Fig. 27 A)

13. MS A, most apical pair position (Damron, 2020: Char. 69) (ci: 0.33; ri: 0.71; steps: 3)

0. Basal on VP (Fig. 8 A, B)

1. At mid-length of VP (Fig. 20 I)

14. MS E, number (Coronato-Ribeiro & Pinto-da-Rocha, 2017: Char. 50) Modified. (ci: 0.43; ri: 0.43; steps: 7)

0. Absent (Fig. 8 B, F, J)

1. Three pairs

2. Two pairs (Fig. 27 J)

3. Only one pair

15. MS D2, position (ci: 0.2; ri: 0.5; steps: 5)

0. Located on the basal half of VP (Fig. 8 C, D)

1. Located on the distal half of VP (Fig.20 I)

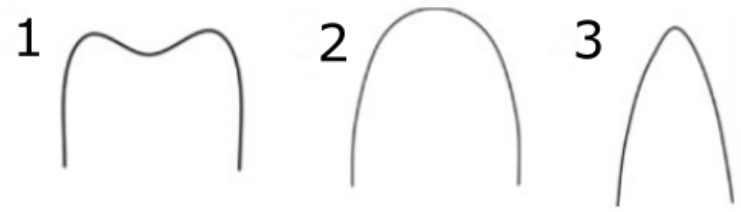
16. Glans, dorsal process, shape (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 61 and Damron, 2020: Char. 91) (ci: 0.33; ri: 0.39; steps: 12)

0. Absent

1. Bilobed

2. Rounded (Fig. 8 A, E, I)

3. Subtriangular (Fig. 16 A)



17. Glans, length (Coronato-Ribeiro & Pinto-da-Rocha, 2017: Char 58) (ci: 0.12; ri: 0; steps: 8)

0. Short, it does not exceed the distal margin of VP (Figs. 8 E)

1. Long, it exceeds the distal margin of VP (Figs. 8 I)

18. VP, position of glans on the VP (Damron, 2020: Char. 88) (ci: 0.33; ri: 0.5; steps: 3)

0. Attached at basal region (Fig. 8, 20, 23, 27)

1. Attached at the middle portion

19. Stylus, length (ci: 0.14; ri: 0.4; steps: 7)

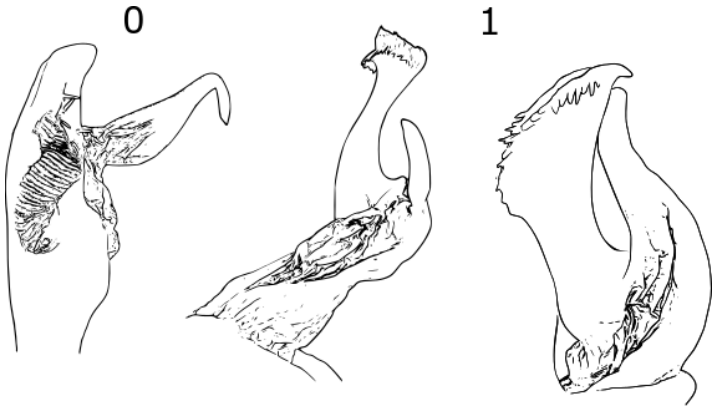
0 Long, exceeds the distal margin of VP (Fig. 20 A)

1 Short, does not exceed the distal margin of the VP (Fig. 23)

20. Penis, stylus, Apex shape (Damron 2020: Char. 94) Modified. (ci: 1; ri: 1; steps: 1)

0. Cylindrical, no modification around the seminal opening

1. Wattle present (Figs. 8, 20, 23, 27)



21. Wattle, Disposition of stylar barbs in dorsal part (Medrano *et al*., 2021: Char. 130) (ci: 0.5; ri: 0; steps: 2)

0. Not reaching the dorsal margin of the stylus (fig. 23 A-D)

1. Reaching the dorsal margin of the stylus (fig. 8 D)

22. Wattle, Disposition of stylar barbs in ventral part (Medrano *et al*., 2021: Char. 129) (ci: 1; ri: 1; steps: 1)

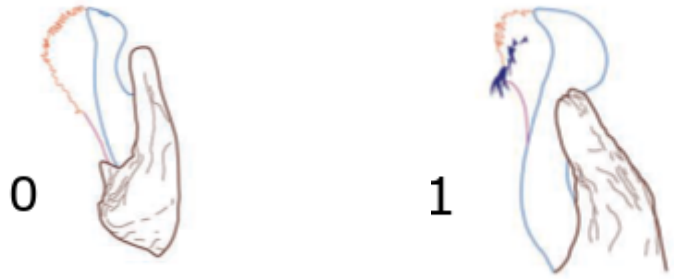
0. Not reaching the ventral margin of the stylus (fig. 8 M)

1. Reaching the ventral margin of the stylus (fig. 23 C)

23. Wattle, ventral extension on stylus (Medrano & Kury, 2018: Char. 63, Fig. 5 state 0: H and I; state 1: G and state 2: A and B) Modified. (ci: 0.25; ri: 0.4; steps: 4)

0. Going to the base of the stylus (Fig. 23 C)

1. From the middle to the tip of the stylus, not extended toward the base of the stylus (Fig. 8 D)



24. Truncus, apical width (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 46) Modified. (ci: 0.12; ri: 0.41; steps: 8)

0. Laterally, slightly thickened, do not exceed the width of distal margin of VP (Figs. 8 A)

1. Laterally, strongly thickened, exceed the width of distal margin of VP (Figs. 8 E)

25. VP, lateral sacs (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 57) Modified. (ci: 1; ri: 1; steps: 1)

0. Present

1. absent (Figs. 8, 20, 23, 27)

DORSAL SCUTUM

26. DS, anterior margin of the prosoma, width (Medrano *et al.*, 2021: Char. 6.) (ci: 0.22; ri: 0.3; steps: 9)

0. Narrow, three times maximum abdomen width (fig. 24 A; 25 A)

1. Wide, approx. 2.5 times maximum abdomen width (fig. 3 A; 5 A; 21 A)

2. Very wide, less than two times maximum abdomen width

27. Lateral projections of anterior margin of Dorsal scutum (Damron 2020: Char. 4 and 5 and Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 2) Modified. (ci: 0.38; ri: 0.5; steps: 8)

0. Absent

1. Subtriangular (Figs. 3 A; 5 A)

2. Sub-square (Figs. 24 A)

3. Bifids or multicuspid (Fig. 17 A; 18 A)

28. Dorsal scutum, shape (ci: 0.3; ri:0.4; steps: 13)

0. Epsilon

1. Alpha

2. Beta (Fig. 24 A)

3. Gamma (25 A)

4. Lambda (Fig. 3 A; 5 A; 6 A; 7 A)

29. Ozophore, projection (ci: 0.14; ri: 0; steps: 7)

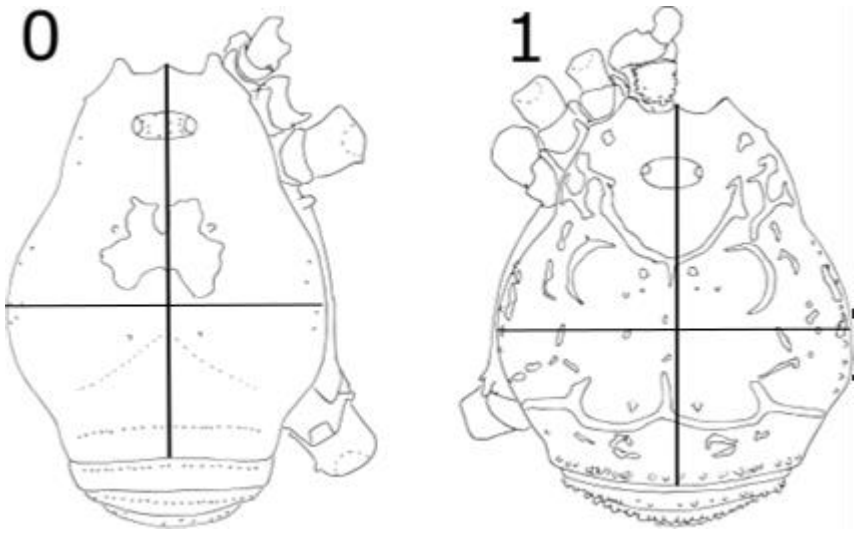
0. Projected laterally or dorsally

1. Not projected

30. Dorsal scutum, length (Medrano & Kury 2017: Char. 1). Modified. (ci: 0.17; ri: 0.37; steps: 6)

0. Elongated, width comprises until 80% of the length of DS.

1. Not elongated, width reaching more than 80% of the length of DS.



31. Posterior margin, shape (ci:0.16; ri: 0.23; steps: 12)

0. Slightly concave (Fig 17 A)

1. Straight (Fig. 24 A)

2. Convex (Fig. 21 A)

32. Mid bulge, projection (ci: 0.2; ri: 0.33; steps: 5)

0. Well projected laterally, width comparable to the length of dorsal scutum (fig. 18 A)

1. Slightly projected, width minor than the length of dorsal scutum (fig. 17 A)

33. Lateral margin of dorsal scutum, ornamentation (ci: 0.154; ri: 0.15; steps: 13)

0. With granules on all its length

1. With granules mostly on mid bulge (Fig. 3 A; 6 A; 7 A)

2. Without granules (Fig. 5 A)

34. Tegument of dorsal scutum (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 10) Modified. (ci: 0.10; ri: 0.31; steps: 10)

0. Granulated

1. Smooth (Fig. 19 A)

35. Ocularium, medial depression (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 5) Modified. (ci: 1; ri: 1; steps: 1)

0. Well marked, deep

1. Slithgly marked

36. Ocularium, interocular distance (Medrano & Kury 2018: Char. 4) Modified. (ci: 0.12; ri: 0.46; steps: 8)

0. Wide ocularium, occupying 30% or more of prosoma width (fig. 7 A)

1. Narrow ocularium, occupying less than 30% of prosoma width (Fig. 3 A)

37. Ocularium, coverage (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 6) (ci: 0.2; ri: 0; steps: 5)

0. With granules or tubercles (Fig. 7 A)

1. Smooth (Fig. 17 A; 19 A)

38. Dorsal scutum, Ornamentation of area I (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 9) Modified. (ci: 0.18; ri: 0.44; steps: 11)

0. Armed with a pair of paramedian moderated tubercles (Fig. 24 A)

1. Armed with a pair of minute tubercles (Fig. 3 A; 5 A; 6 A)

2. Unarmed (Fig. 19 A)

39. Dorsal scutum, ornamentation of area II (ci:1; ri: 1; steps: 1)

0. Armed with tubercles or protuberances

1. Unarmed (Fig. 3 A)

40. Dorsal scutum, ornamentation of area III (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 12) Modified. (ci: 0.27; ri: 0.27; steps: 11)

0. With a pair of large conical tubercles (fig. 7 A)

1. With a pair of outstanding blunt tubercles (fig. 6 A)

2. With a pair of low blunt tubercles (Fig. 3 A)

3. Unarmed

41. Dorsal scutum, Ornamentation of area IV (Damron, 2020: Char. 16) (ci: 1; ri: 1; steps: 1)

0. Armed with tubercles or protuberances

1. Unarmed

42. Dorsal scutum, posterior margin (Damron 2020: Char. 16, 20 and Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 14) Modified. (ci: 0.33; ri: 0.6; steps: 3)

0. With a row of tubercles or granules (Figs. 6 A)

1. Smooth (Fig. 19 A)

43. Dorsal scutum, posterior margin (ci: 1 ri: 1; steps: 1)

0. Uncolored

1. With colored tubercles or rounded patches

2. With a pale transverse line

44. Dorsal scutum, grooves (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 7 and Medrano & Kury 2018: Char. 9) Modified. (ci: 0.16; ri: 0.37; steps: 6)

0. Distinct, well-marked (Fig. 18 A)

1. Not distinct (Fig. 19 A)

45. Free tergites, Ornamentation (ci: 0.2; ri: 0.38; steps: 10)

0. Without a row of tubercles each (fig. 10 A)

1. With a row of moderate tubercles each (figs. 3 A)

2. With a row of minute tubercles each (fig. 24 A)

46. Free tergite I-III, yellow coloration (Medrano *et al*., 2021: Char. 61) Modified. (ci: 1; ri: 1; steps: 1)

0. Without yellow granules or colored patches

1. Paramedian granules colored or colored patches (3 A; 5 A; 6 A; 7 A)

47. Anal plate, coverage (ci: 0.3; ri: 0,22; steps: 10)

0. Slightly granulated (Fig. 17 A)

1. With outstanding tubercles on the whole surface (Fig. 18 B)

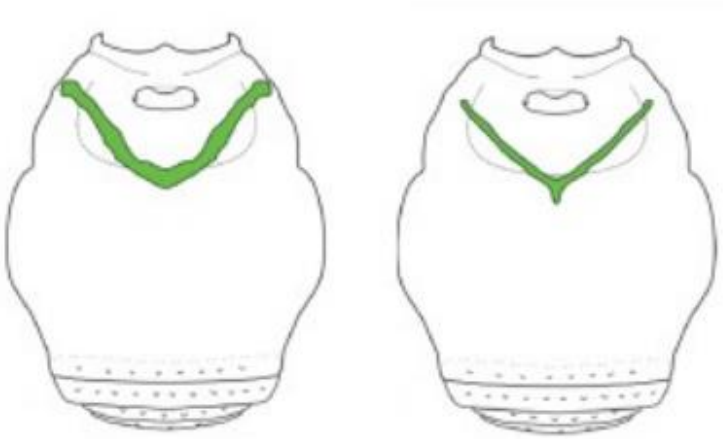
2. Smooth (Fig. 19 A)

3. With an apical medial projection

48. Color, Dorsal pattern with a V mark on cephalic groove Kury & (Medrano 2018: Fig. 8 A and B.) (ci: 0.2; ri: 0.69; steps: 5)

0. Absent

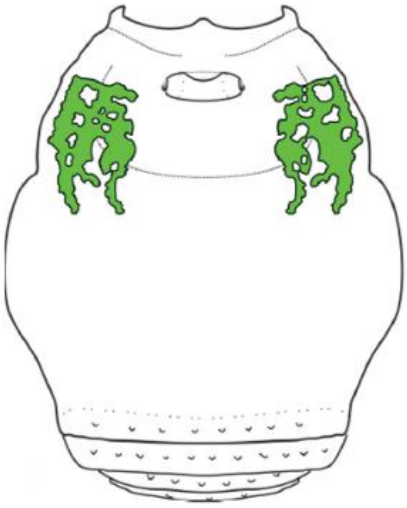
1. Present



49. Color, dorsal pattern with two lateral patches at the laterals of the cephalic groove (Kury & Medrano 2018. Fig. 8 F). (ci: 0.33; ri: 0.77; steps: 3)

0. Absent

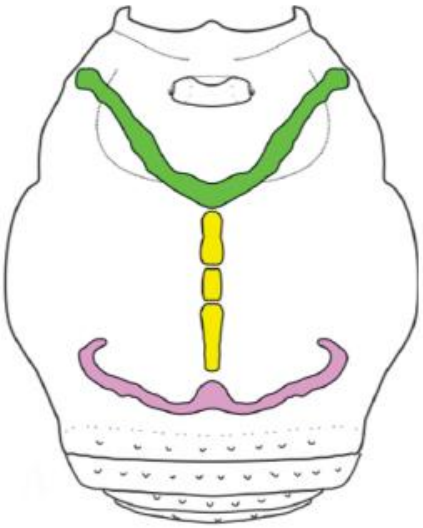
1. Present



50. Color, dorsal pattern, medial line of DS colored (Kury & Medrano 2018. Fig. 7A Yellow mark.) (ci: 0.14; ri: 0.33; steps: 7)

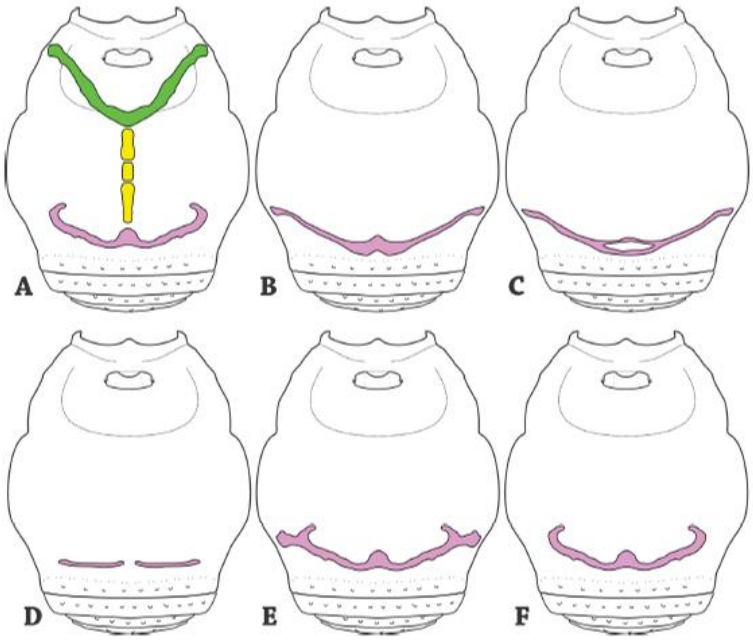
0. Absent

1. Present



51. Color, dorsal pattern, abdominal groove between areas III and IV colored (Kury & Medrano 2018. Fig 7. Pink mark.) (ci:0.14; ri: 0.53; steps: 7)

0. Absent
1. Present

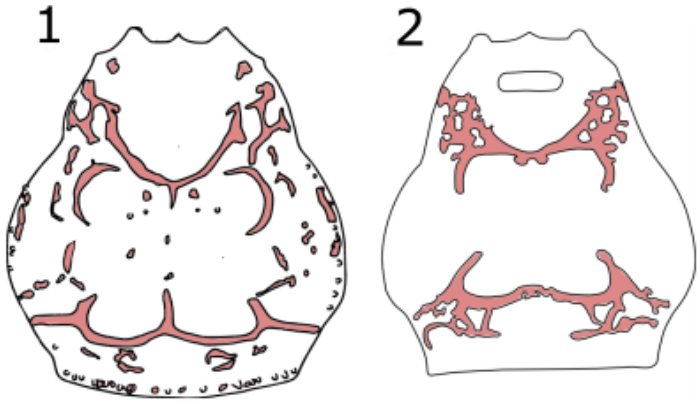


52. Color, dorsal pattern. Areas I, II, and III delimited laterally by white/pale yellow lines (ci: 0.28; ri: 0.44; steps: 7)

0. Absent

1. Present

2. Just areas I and III



53. Dorsal scutum with a white patch forming a typical-easel (ci: 0.5; ri:0.8; steps: 2)

0. absent

1. present (Fig. 24 A)

54. Dorsal scutum with a white patch forming a ladder mask (ci: 0.33; ri: 0; steps: 3)

0. absent

1. present

LEGS

55. Legs, Coxa IV, *clavi inguines* (Medrano & Kury 2018: Char.28.) (ci: 0.2; ri: 0.63; steps: 5)

0. Present (fig. 18 A; 21 A; 24 A)

1. Absent (figs. 3 A; 5 A; 6 A; 7 A; 17 A)

56. Leg IV, Coxa, the outline of the lateral border in dorsal view (Medrano *et al*., 2021: Char. 85.) (ci: 0.28; ri: 0; steps: 7)

0. Convex (fig. 3 A)

1. Concave

2. Convex proximally and concave distally

57. Leg IV, Coxa, length, proportion to DS in dorsal view (Medrano *et al*., 2021: Char. 84.) (ci: 0.25; ri: 0.33; steps: 8)

0. Short 0.3 x DS length (fig. 26 A)

1. Medium 0.5 x DS length (fig. 7 A)

2. Long 0.8 x DS length (fig. 25 A)

58. Leg IV, Coxa, visibility in dorsal view (Medrano *et al*., 2021: Char. 81.) (ci: 0.4; ri: 0.4; steps: 5)

0. Entirely visible

1. Partially covered by DS (Scutum outline touches or surpasses the Cx outline) (fig. 6)

2. Entirely covered by DS (only posterior margin apparent) (fig. 26 A)

59. Leg IV, Coxa, basal articulation, thickening (Medrano *et al*., 2021: Char. 80.) (ci: 0.16; ri: 0.44; steps: 6)

0. Without thickening (fig. 5 A)

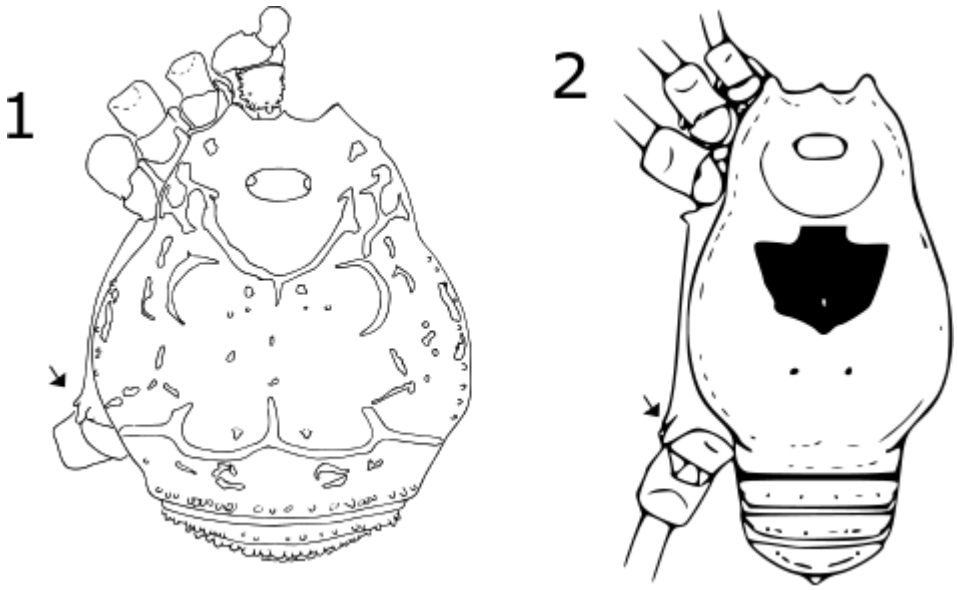
1. Basal thickening (fig. 3 A)

60. Legs, Dorso apical apophysis of coxa IV (Kury & Barros 2014, Fig. 25 A; Medrano & Kury 2018: Char. 27 and Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 26) Modified. (ci: 0.28; ri: 0.61; steps: 7)

0. Absent

1. Short

2. Long



61. Legs, Coxae IV coverage (Medrano & Kury 2018: Char. 33) Modified. (ci: 0.2; ri: 0.69; steps: 5)

0. Granulated (Fig. 18 A)

1. Smooth (Fig. 3 A; 5 A)

62. Legs. Trochanter IV. Ornamentation (Damron, 2020: Char. 48) Modified. (ci: 0.25; ri: 0.14; steps: 8)

0. With one or more retrolateral apical tubercles (fig. 17 A)

1. With retrolateral tubercles, basal and apical (fig. 24 A; 25 A)

2. Unarmed (fig. 19 A)

63. Legs. Femur IV. Shape (Damron, 2020: Char. 52) Modified. (ci: 0.28; ri: 0.58; steps: 7)

0. Prolaterally curved (in lateral view)

1. Straight (in dorsal view) (Figs. 19 G, H)

2. Dorsally curved (in prolateral view)

64. Legs, Femur IV. Length. (Medrano & Kury 2018: Char. 32) Modified. (ci: 0.11; ri: 0.27; steps: 9)

0. Long, exceeding the dorsal scutum length (Fig. 6 H)

1. Short, length comparable or minor than dorsal scutum length (Fig 3 E, F)

65. Legs, Femur IV. Ornamentation in males (ci: 0.25; ri: 0.4; steps: 8)

0. Unarmed (without conspicuous ornamentation) (Fig. 6 H)

1. Armed longitudinally with large spines or tubercles (Fig. 3 E, F; 24 B-D)

2. Armed with strong spines and tubercles restricted to the distal portion of the femur (fig. 7 D; 25 G, H; 26 B)

66. Legs, Femur IV. Apex of femur swollen (Damron, 2020: Char. 55) Modified. (ci: 0.25; ri: 0.50; steps: 4)

0. Absent

1. Present (Fig. 19 G, H)

67. Legs. Femur IV tegument coverage (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 40) Modified. (ci: 0.22; ri: 0.36; steps: 9)

0. With outstanding blunt tubercles (Fig. 3 E, F)

1. Granulated (Fig. 6 I)

2. Smooth (Fig. 10 G, H)

68. Legs, Tibia IV. Males with dimorphic ornamentation (ci: 0.5; ri: 0.0.75; steps: 2)

0. Absent

1. Present (Fig. 3 G-I; 19 G, H)

69. Legs. Basitarsus I of males (ci: 0.17; ri: 0; steps: 6)

0. Swollen (Fig. 21 J, K)

1. Not swollen

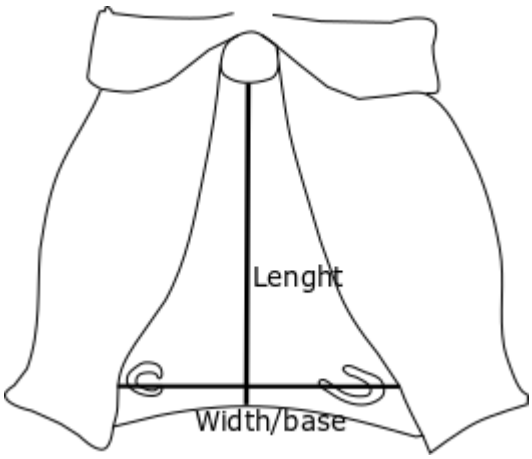
VENTER

70. Venter, Dimensions of stigmatic area (ci: 0.22; ri: 0.13; steps: 9)

0. Short, longitudinally shorter than the transversal base

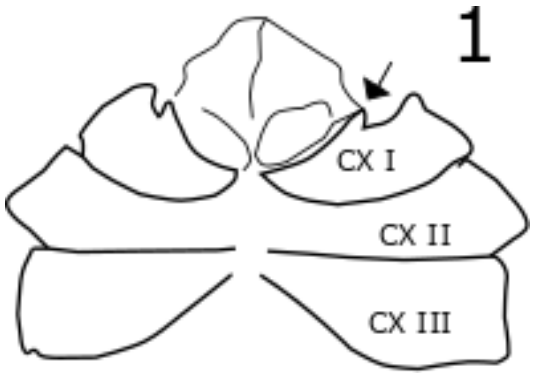
1. Equal, length transversal and longitudinal comparable

2. Long, longitudinally longer than the base



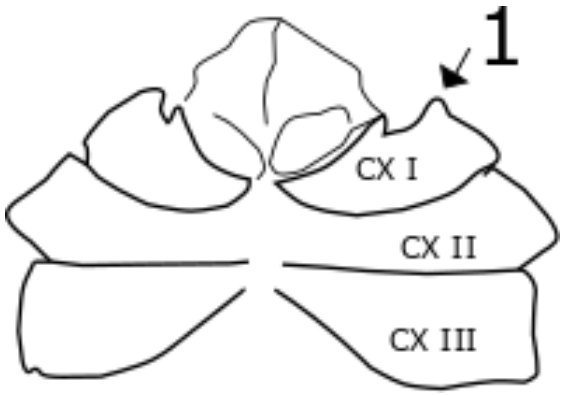
71. Venter, Coxa I, medial anterior projection (ci: 0.2; ri: 0.33; steps: 5)

0. Absent
1. Present



72. Venter, Coxa I, apical anterior projection (ci: 0.12; ri: 0.3; steps: 8)

0. Absent
1. Present

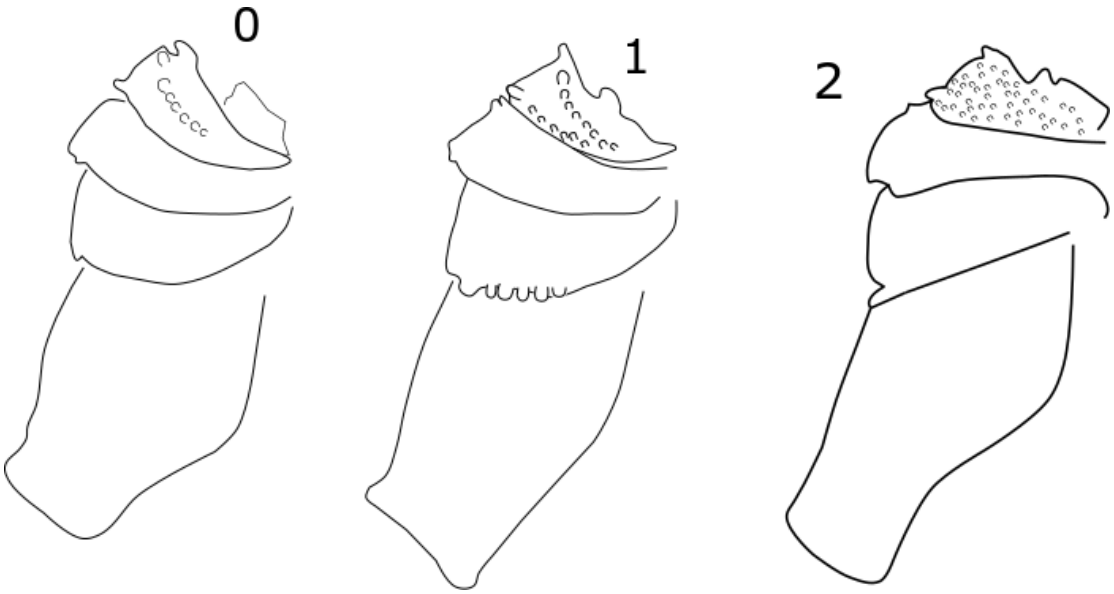


73. Venter. Row(s) of longitudinal tubercles of Coxa I (ci: 0.2; ri: 0.33; steps: 10)

0. Only one row of tubercles (medial, anterior, or posterior)

1. Two rows of tubercles

2. Absent. Tubercles covering the surface not ordered



74. Venter, Sternites with a row of tubercles or granules (ci: 0.14; ri: 0.25; steps: 7)

0. Present

1. Absent

PEDIPALPS

75. Pedipalps, Femur shape (ci: 1; ri: 1; steps: 1)

0. Cylindrical

1. Flattened laterally

76. Pedipalps, Fe. Ventral margin shape (ci: 0.14; ri: 0.45; steps: 7)

0. Sub-straight (Fig. 21 E, G)

1. Curved (Fig. 19 E, F)

77. Pedipalp. Fe. Ventral margin ornamentation (ci: 0.5; ri: 0.89; steps: 2)

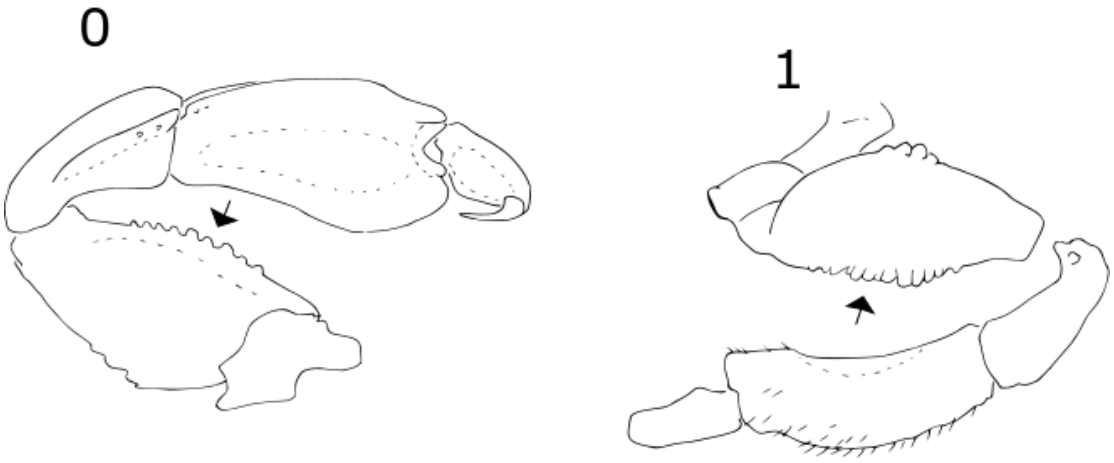
0. With longitudinal tubercles occupying the most portion of margin of femur

1. With longitudinal tubercles forming a row occupying the medial region of the margin of the femur

78. Pedipalps, Tubercles on ventral margin of Femur (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 21.) Modified. (ci: 0.25; ri: 0; steps: 4)

0. Considerably separated/ differentiable each, the base of each tubercle independent

1. Very close, the base of each tubercle is not independent

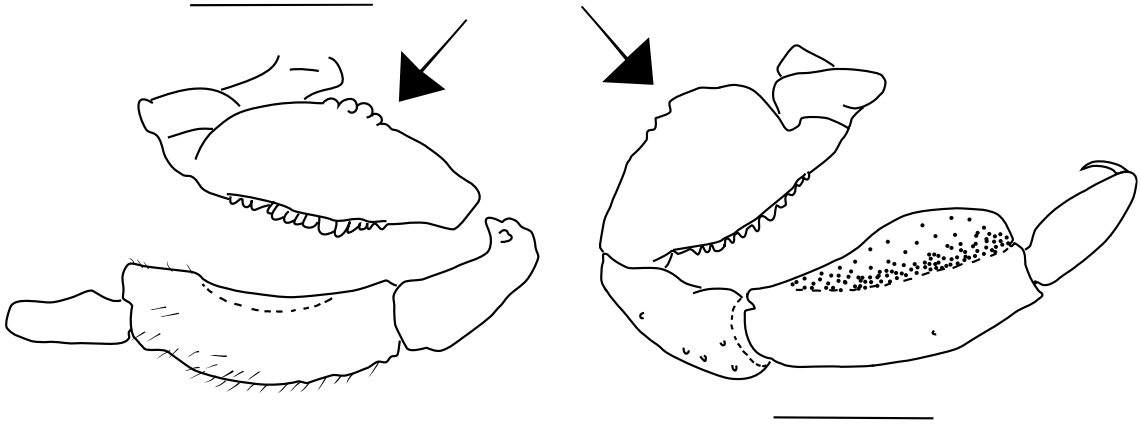


79. Pedipalps. ornamentation on dorsal margin of femur (ci: 0.29; ri: 0.28; steps: 7)

0. Unarmed

1. With tubercles

2. Tubercles not well marked

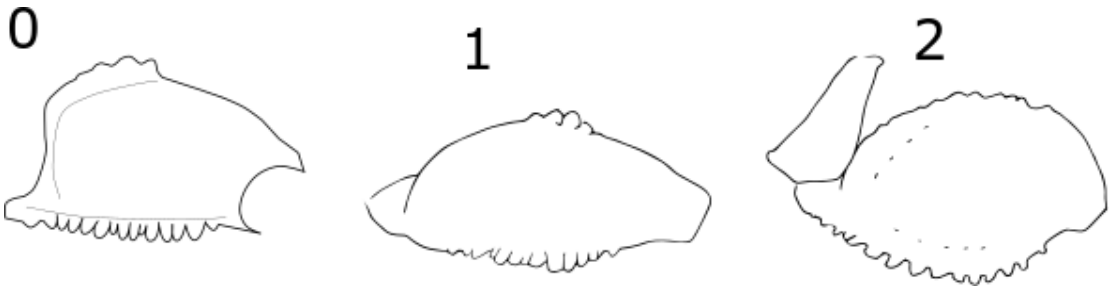


80. Pedipalps. Dorsal margin of femur, extension of tubercles or sinuous portion (ci: 0.15; ri: 0.21; steps: 13)

0. On a laminar anteromedial projection

1. Only on the medial portion

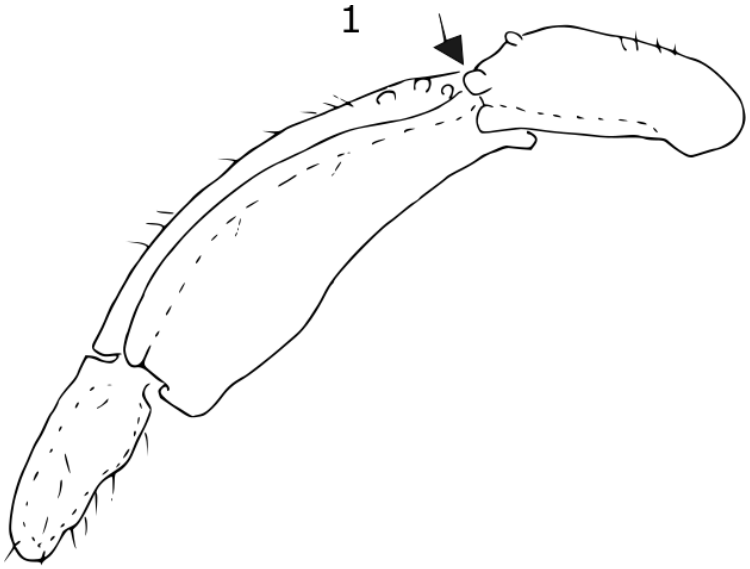
2. Since basal portion until medial, or slightly extended, but do not reach the distal portion



81. Pedipalps. Patella. Mesal apical tubercle (ci: 0.2; ri: 0.42; steps: 5)

0. Absent

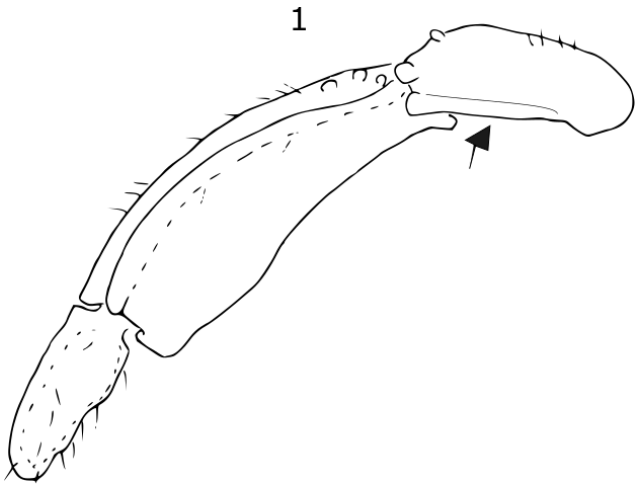
1. Present



82. Pedipalps. Patella, mesal longitudinal laminar projection (ci: 0.14; ri: 0.33; steps: 7)

0. Absent

1. Present



83. Pedipalp, Tibiae. Lamination (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 22.) Modified. (ci: 0.5; ri: 0; steps: 2)

0. Not laminated

1. Laminated

84. Pedipalp, Tibiae, type of lamination (ci:0.16; ri: 0.58; steps: 6)

0. Moderately laminated (Fig. 19 B)

1. Strongly laminated (Fig. 21 F, G)

85. Pedipalps. Ti. Mesal ditch (Kury & Barros, 2014) (ci: 1; ri: 1; steps: 1)

0. Absent (Figs. 3 C; 6 E; 7 C)

1. Present (Figs. 17 H; 18 E; 19 C)

86. Pedipalps, Ti. Length (ci: 0.25; ri: 0.57; steps: 4)

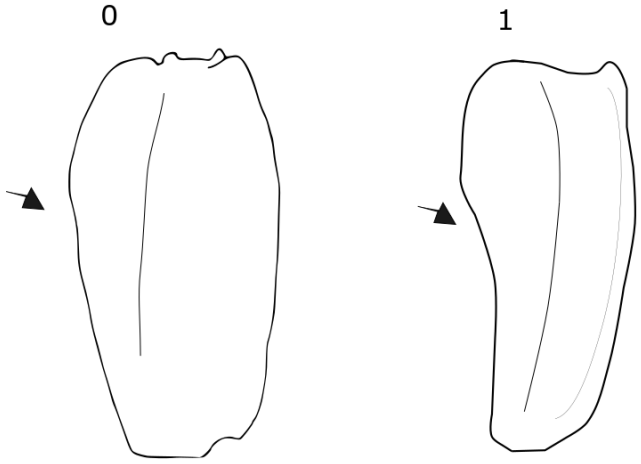
0. Short, length minor or comparable than femur length

1. Long, exceeds the length of the femur (Fig. 19 D)

87. Pedipalps, Tibiae, ectal projection Medio-distally (ci: 0.1; ri: 0.31; steps: 10)

0. Absent, does not exist a marked differential of ectal projection

1. Present, Medio-distally marked outstanding ectal projection



88. Pedipalps. Tarsus, shape (Medrano & Kury 2018: Char. 24.) Modified. (ci: 0.25; ri: 0.62; steps: 4)

0. Sub-triangular, basally wider (Fig. 19 B)

1. Cylindrical, basally as wide as distally, or comparable, ventrally does not flatten (Figs. 3 C; 7 B, C)

89. Pedipalps. Claw, length (ci: 0.1; ri: 0.25; steps: 10)

0. Long, equal, or longer than the half-length of tarsus (Fig. 3 C, D)

1. Short, does not exceed the half-length of tarsus (Fig. 7 B, C)

CHELICERAE

90. Chelicerae. Second segment hypertelic in males (Coronato-Ribeiro & Pinto-da-Rocha 2017: Char. 19) Modified. (ci: 0.17; ri: 0.58; steps: 6)

0. Absent (Figs. 18 A)

1. Present (Figs. 9 A; 21 D)

91. Chelicerae. Movable finger, longitudinal row of teeth (ci: 0.11; ri: 0.2; steps: 9)

0. Present

1. Absent

92. Chelicerae, fixed finger, dentition (ci: 0.2; ri: 0.27; steps: 10)

0. With medial teeth higher than basal and distal teeth

1. With a row of same size teeth

2. Without teeth

93. Chelicerae, Basal segment, marginal tubercles (Damron 2020: Char.31 and 32.) Modified. (ci: 1; ri: 1; steps: 1)

0. Absent

1. Present

4.2. Phylogenetic Analysis

The analysis of the matrix (appendix 11) yields the twelve most parsimonious trees (560 steps) under EW (CI= 0.24 and RI= 0.43), a strict consensus was constructed to summarize the hypotheses (Fig.1).

The EW results (Fig. 1) show the monophyly of Cosmetidae (Clade A), and a monophyletic well-supported clade formed by *Metalibitia*-Ferkeriinae (BS=2) being the sister group of a great clade containing all other cosmetids (clade C) with BS=3. The relationship found herein, about *Metalibitia*, differs from the finding of Medrano *et al*., (2021) where subfamily Ferkeriinae (herein represented by *Metalibitia*) was grouped inside a big

clade containing *Achantolibitia* Mello-Leitão, 1928, *Libitioides* Roewer, 1912 and Taitoinae.

Within clade C, *Metacynorta gracilipes* was recovered as the sister species of a clade containing the remaining cosmetids sampled (clade D; BS= 2). Clade D constitutes a polytomy including *Cynortoperna albornata, Eucynortula sexpunctata, E. ypsilon, E. metatarsalis, E. albipunctata, Eulibitia scalaris, Eulibitia maculata, Neocynorta venezuelensis, Cynortula undulata, C. punctata, C. longipes, C. limitata, C. punctatolineata, Cynorta calcarapicalis,* clade E (BS= 3), F (BS= 3) and G (BS= 1).

Clade E shows *Eucynortula pentapunctata* plus *Cynortula quadrimaculata* being recovered in all trees as well as clade F, joining *Eucynorta quadripustulata* and *Cynorta liturata*, herein considered *Eucynorta*. Clade G, on the other hand, was recovered with low support, and its internal relationships for most species were unresolved. A clade within clade G was recovered with good support (BS= 4) suggesting a relationship between *Taito mayoruna*, *Eucynortella spectabilis,* and *Taito curupira*. This big clade containing species of *Eucynortella*, *Taito,* and *Cynortula* was herein considered Taitoinae (See discussion section below).

Under EW it was not possible to sort the most of species included in the analysis, it was due to the high quantity of homoplastic characters found in Cosmetidae. However, some clades were recovered with certain stability within most parsimonious trees, thus, 1). A monophyletic *Eulibitia* was recovered in 2/12 most parsimonious trees; 2). A clade configurated by *E. ypsilon* plus *E. sexpunctata* was found in 8/12 trees; 3). A clade containing *Eulibitia* spp, *Cynortula alejandra*, *C. biprocurvata*, *C. stellata*, *E. spectabilis* and *Taito* spp. was recovered in 7/12 trees, this clade is herein considered Taitoinae, and the genus *Eulibitia* is included in the subfamily Taitoinae (see discussion and taxonomic section); 4). A clade grouping *E. metatarsalis*, *E. pentapunctata*, *C. quadrimaculata*, *C. punctatolineata*, *C.*

longipes, *C. albornata,* and *E. albipunctata* was found in 8/12 trees, relationships within this clade varied about the position of *E. albipunctata* which was located as sister species of *C. longipes*, *C. albornata* and *C. punctatolineata* (2/12 trees) and as the sister of the same set of species plus the clade of *E. pentapunctata* and *C. quadrimaculata* (8/12 trees) (fig. 2).

Aplication of IW resulted in an optimal K value found with the script setk.run (K= 4.765625; fit: 40.49875; CI= 0.232; RI= 0.413. See Fig.2).

The results given by IW (Fig. 2) showed Cosmetidae monophyletic (Clade A), as well as Ferkeriinae, represented herein by *Metalibitia* (Clade B), which was recovered as the sister group of a clade containing the remaining cosmetid terminals (clade C). At the base of clade C, *M. gracilipes* and *C. punctata* were presented in isolated branches being the first one the sister species of a clade containing *C. punctata* plus clade E (clade D).

Clade E was subdivided into two clades (F and G), clade F containing *E. ypsilon* and *E. sexpunctata*. On the other hand, clade G was divided into two smaller clades (H and I). Clade H grouping clades J and K, where clade J recovered *N. venezuelensis* as sister species of clade M containing *E. quadripustulata* and *C. liturata*, herein considered *Eucynorta* (see below for further discussion); clade K grouped *E. metatarsalis* as sister species of clade N, which showed *E. pentapunctata* and *C. quadrimaculata* as the sister group of clade P presenting *C. punctatolineata*, *C. longipes*, *E. albipunctata,* and *C. albornata*, herein considered *Eucynortula*.

The last big clade I, showed *C. calcarapicalis* as the sister group of clade L. The last one is divided into two smaller clades, the smaller one recovered *C. undulata* and *C. limitata* being the sister group of clade Q. This last clade is herein considered Taitoinae (recovered under EW as well) and grouped a paraphyletic *Eulibitia* and *Taito* spp, *E. spectabilis*, *C. alejandra*, *C. biprocurvata,* and *C. stellata*.

Both analyses, EW and IW, coincide with a monophyletic Cosmetidae, as well as Ferkeriinae, herein represented by *Metalibitia*, being the sister group of the remaining cosmetids included. This relationship does not agree with the proposal of Medrano *et al*., (2021).

Nevertheless, the internal relationships of the clade C differ under IW and EW (see fig. 2).

The presence of polytomies under EW was restricted to consensus (fig. 1), all trees obtained under EW consistently recovered the clades presented in the consensus, the polytomies found in the consensus are related to the relative position of clades into the trees. Both, consensus (fig. 1) and IW hypothesis (fig. 2), recovered consistently the clades formed by *E. pentapunctata* plus *C. quadrimaculata*; *E. quadripustulata* plus *C. liturata* and the clades G, in EW, and R, in IW, which includes species of *Taito*, *Cynortula*, *Eucynortella* and *Eulibitia* (under IW) were herein considered clade of *Taitoinae*.

Finally, *Eucynortula* (*sensu* Roewer 1912) was found paraphyletic and a new classification of *Eucynortula* was herein obtained, including its new assignation within the subfamily Cynortinae Mello-Leitão, 1933 by present armature of scutum variable, being area III always armed with paramedian tubercles; chelicerae sexually dimorphic, with hand moderately swollen and basichelicerite thicker in males; femur IV of male distally thickened and/or armed with teeth on more than one surface; penial MS A1 reduced (in some species of *Eucynortula*) (Medrano *et al.,* 2021). Under the present classification, the genera *Cynortula* and *Cynortoperna* were considered junior synonyms of *Eucynortula*. Further discussion about relationships and taxonomic changes implications is presented considering the results under IW.

The choice of IW (K= 4.765625) as working hypothesis for classification purposes, was made due to it was observed a great amount of homoplasy

among the morphological characters used. Following Goloboff *et al*., (2008) characters must be weighted differentially to give major worth to those which present the less homoplasy and to improve the resolution of tree.

4.3. Taxonomy

Given the paraphyly of *Eucynortula* a new classification, a re-description of type species, and a new diagnosis are given. Some taxonomic changes are proposed based on material examined, the assessment of photographs of museum specimens, and literature for species currently classified under *Eucynortula* (when possible). Taxonomic changes for other species and genera of Cosmetidae are proposed based on the phylogenetic relationships herein presented and examined material.

Family Cosmetidae C. L. Koch, 1839

Subfamily Cynortinae Mello-Leitão, 1933 New assignment

Genus *Eucynortula* Roewer, 1912

Cynorta [part]: Banks, 1898: 181; Pickard-Cambridge, 1904: 556; Banks, 1909: 225.

Eucynortula Roewer, 1912: 58; 1923: 332; 1925: 5; Mello-Leitão, 1926: 333; Roewer, 1927c: 586; 1933: 287; Mello-Leitão, 1933c: 106; 1935b: 113; 1943a: 6; Caporiacco, 1951: 15; González-Sponga, 1992: 193; Kury, 2003: 59; Townsend *et al.,* 2010: 3, 13, 17, 19; Kury *et al.*, 2021 (type species *Cynorta albipunctata* Pickard-Cambridge, 1904, by original designation).

Cynorta [part]: Goodnight & Goodnight, 1953b: 37.

Cynortoperna Roewer, 1947: 16; Goodnight & Goodnight, 1953b: 24; Kury, 2003: 51,254; Townsend *et al*., 2010: 3, 12; Kury *et al.,* 2021 (Type species *Cynortoperna albornata* Roewer, 1947, by original designation and by monotypy). **New synonym**

Cynortula Roewer, 1912: 45; Pickard-Cambridge, 1904: 557 Roewer, 1923: 322; 1925: 5; 1927c: 575; Mello-Leitão, 1926: 333; 1932: 57, 441; Roewer, 1933: 284; Mello-Leitão, 1933: 106; 1935b: 113; 1940: 98; Caporiacco, 1951: 13; Roewer, 1956b: 443; 1957: 83; González-Sponga, 1992: 180 Kury, 2003: 51; Townsend *et al.,* 2010: 3, 12*;* Kury *et al*., 2021; Medrano *et al*., 2021:29, 30, 42 (type species *Cynorta longipes* Pickard-Cambridge, 1904, by original designation). **New synonym**

Cynortetta Roewer, 1947: 8; González-Sponga, 1992: 176; Kury, 2003: 50; Kury *et al*., 2021 (Type species *Cynortetta rugosa* Roewer, 1947 by original designation and by monotypy). **New synonym.**

Diagnosis: Outline of DS λ-shaped with some attenuation of the second constriction that could be interpreted as γ-shaped (in *E. albipunctata*, *E. albornata* **comb. nov.**, *E. analis* **comb. nov.**, *E. longipes* **comb. nov.**, *E. pictipes* **comb. nov.,** *E. punctatolineata* **comb. nov.** and *E. rugosa* **comb. nov.**) or β-shaped (in *E. albipustulata* **comb. nov.**, *E. annulata* **comb. nov.**, *E. areolata* **comb.nov.**, *E. leucopyga* **comb. nov.** and *E. punctitergum* **comb. nov.**). Narrow or wide ocularium. Areas I and III of DS with a pair of tubercles each, being on the area I reduced and blunt, and on area III more conspicuous blunt (in *E. albipunctata*, *E. albornata* **comb. nov.**, *E. longipes* **comb. nov.** and *E. rugosa* **comb. nov.**) or conical and acute (in the remaining species). Posterior margin of DS and free tergites with a row of granules colored each. Color pattern with a *chevron* mark, the reticulated pattern on each side of prosoma; areas I-III laterally marked with pale blots as well as groove between areas III and IV (omega stripe); a reticulated pattern could be present on lateral longitudinal sides from the reticulated pattern of prosoma until the *omega stripe*; some blots could appear on area IV. Free tergites I-III and posterior margin of DS with a row of paramedial granules colored. *Clavi inguines* absent, dorsal apophysis of Cx IV present, short or

long. Dimorphic characters on Fe and/or Ti IV. Chelicerae are strongly inflated in males; some species could present monomorphic chelicerae. Pedipalps with the dorsal margin of Fe sinuous, without tubercles. Penis: Dorsal process of glans subtriangular, VP Subrectangular or square, two pairs of MS C, curved and spatulated; two pairs D, being D1 always attached next to MS-C and D2 could be attached next to D1 or the apical pair of A1 or at the middle portion of VP. Two pairs of MS A comparable in size and close to each other. Stylus with stylar barbs on the apex of wattle.

Systematic remarks: Cynortinae was diagnosed by having the shape of DS β-type (α-type in *Holovonones* and *Vonones*), species of *Eucynortula* as herein proposed present body shape β-type (with slightly marked constrictions of DS); γ -type (with first constriction well marked and second one attenuated, with a not well-marked coda); and λ-type (with first constriction well marked and second one slightly marked presenting a short coda). When species included in Cynortinae by Medrano *et al*., 2021 are reviewed, it is possible to note that the body shape of DS designated for some species is not in agreement with descriptions provided by Kury *et al*. (2007) and Kury & Medrano (2016). This occurs with *Metagryne* Roewer, 1912 which presents the first constriction of DS well marked and the second one not marked. This pattern corresponds to a γ-type (Medrano & Kury, 2026) and instead is treated as a β-type (See below for further discussion about DS shape).

Other morphological characters described among Cynortinae are found in *Eucynortula* and allowed to fit it as belonging to this subfamily. Thus, the armature of areas of DS, being areas I and III armed with paramedian tubercles, stouter or outstanding on area III when compared with those on area I; the hand of chelicerae moderately swollen in some species, basichelicerite thicker in males (as in *E. albipunctata*); Femur IV of male

with ventral rows of denticles or with more conspicuous ornamentation distally and MS A1 reduced (present in *E. albipunctata*).

Species included (13 spp): type species *Eucynortula albipunctata* (Pickard-Cambridge, 1904), *Eucynortula alboirrorata* Caporiacco, 1951, *Eucynortula albornata* (Roewer, 1947) c**omb. nov**., *Eucynortula longipes* (Pickard-Cambridge, 1904) **comb. nov.**, *Eucynortula punctatolineata* (Roewer, 1917) **comb.nov**., *Eucynortula albipustulata* (Roewer, 1912) **comb. nov.**, *Eucynortula analis* (Roewer, 1928) **comb. nov.**, *Eucynortula annulata* (Roewer, 1947) **comb. nov.**, *Eucynortula areolata* (Roewer, 1947) **comb. nov.**, *Eucynortula leucopyga* (Roewer, 1947) **comb. nov.,** *Eucynortula pictipes* (Banks, 1909) **comb. nov.**, *Eucynortula punctitergum* (Roewer, 1947) **comb. nov.** and *Eucynortula rugosa* (Roewer, 1947) **comb. nov.**

Identification key for identification to *Eucynotula* species

Note: The species *E. alboirrorata* was not included in this key due to lack of available photographs or specimens.

1.a. Area III of dorsal scutum with a pair of blunt tubercles (fig. 6 A) … 2

b. Area III of DS with a pair of spiniform tubercles (fig. 7 A) …… 4

2.a. Fe IV strongly long in males …….…. *E. longipes* **comb. nov.** (fig. 6).

b. Fe IV moderately exceed or not, the length of DS in males (fig. 3 E) ….……..……. 3

3.a. Tegument on areas I-III darkened laterally, Fe IV not exceeding the length of DS (Appendix 1 figs. A, G, I)…….……. *E. albipunctata*

b. Tegument on areas I-III equally colored, Fe IV exceeding the length of DS (Appendix 2)……. *E. albornata* **comb. nov.**

4.a. Fe IV with robust ventro-distal tubercles denticle-shaped (fig. 7 D) ……..... *E. punctatolineata* **comb. nov.**

b. Fe IV without robust ventro-distal tubercles denticle-shaped……... 5

5.a. Wide ocularium, occupying more than 30% of prosoma width (fig. 7 A) ...…….…… 6

b. Narrow ocularium, occupying less than 30% of prosoma width (fig. 3 A) ……...……... 7

6.a. Spiniforms tubercles on area III elongated and directed backward, Fe IV straight and long (fig.13 C, B)…….... *E. leucopyga* **comb. nov.**

b. Spiniforms tubercles on area III moderate, short; Fe IV short, not exceeding the length of DS (fig. 12)……. *E. areolata* **comb. nov.**

7.a. Legs I-IV with basal portion of Fe and Ti pale, the rest dark (fig. 14) ……. *E. pictipes* **comb. nov.**

b. Legs I-IV equally colored……..….... 8

8.a. Fe IV short, minor o equal length of DS…….… 9

b. Fe IV long, exceeding the length of DS ……...….... 11

9.a. Fe IV curved, basally or distally (fig. 10) ……..…….... 10

b. Fe IV substraight (fig. 11)…… *E. annulata* **comb. nov.**

10.a. Paired tubercles on area I outstanding in lateral view (fig. 16)….……... *E. rugosa* **comb. nov.**

b. Paired tubercles on the area I moderate, slightly outstanding in lateral view (fig. 10)…… *E. analis* **comb. nov.**

11.a. Fe IV without greater tubercles on the ventral surface (fig. 9) ……..……..... *E. albipustulata* **comb. nov.**

b. Fe IV with greater tubercles on the ventral surface (fig. 15) ……..……... *E. punctitergum* **comb.nov.**

Eucynortula albipunctata Pickard-Cambridge, 1905

Cynorta albipunctata Pickard-Cambridge, 1905; 556, pl. 52, figs 9, 9a-b; Banks, 1909a: 225.

Eucynortula albipunctata: Roewer, 1912b: 59; 1923: 333, fig 375; 1927c: 587; 1933: 287; Roach *et al*., 1980: 512; Kury, 2003: 59; Townsend *et al*., 2010: 3, 17; Kury *et al*., 2021.

Cynortula cingulata Roewer, 1933: 284, fig 8; Kury, 2003: 51; Townsend *et al.,* 2010: 4, 11, 13, 17, 25; Kury *et al.*, 2021. **New Synonym.**

Cynortula brevipes Roewer, 1947: 14, pl. 4, fig 34; Kury, 2003: 51. Townsend *et al*., 2010: 3, 17; Kury *et al.,* 2021. **New synonym.**

Type material: *Eucynortula albipunctata*: GDSLV-3547; ♂ Holotype and 2♀ Paratype. Costa Rica (photographs examined); SMF RI/425-32, 1♂ and 5♀. Costa Rica (examined); SMF RII/1531-32, 1♂ and 1♀. Costa Rica, San Isidro (examined). See appendix 1.

Diagnosis: *E. albipunctata* could be differentiated from the remaining species of *Eucynortula*, except for *E. albornata* **comb. nov.** by present blunt and reduced tubercles on area III (Fig. 3 A); Fe and Ti IV with greater tubercles in males, particularly on the ventral surface (Fig. 3 E-I). It is different from *E. albornata* **comb. nov.** by the shape of Fe IV which is shorter than the DS and curved in *E. albipunctata* and by present darkened lateral sides of areas I-III.

Description SMF RI/425-32 (♂)

Measurements: LDS: 4.2; WDS: 3.6; LC: 1.7; WC: 2.7; LFeIV: 3.9

Color in ethanol: Dorsum: background Deep Orange Yellow (69); Dorsal marks of color pattern Brilliant Yellow (83); pedipalps and chelicerae Deep Orange (51); legs Moderate Greenish Yellow (102).

Dorsum: (fig. 3 A and 4 A-F) First constriction of DS well marked, the second constriction attenuated, mid bulge moderately expanded (DS shape λ). Blunt and subtriangular lateral supra-cheliceral projections. Cephalic and abdominal grooves are slightly marked. Area I with medial minute tubercles, III with a pair of blunt medial low tubercles. Area IV with some low

tubercles. Posterior margin and free tergites with a row of tubercles each. Lateral margin of DS with a row of small tubercles mostly disposed on the mid bulge.

Venter: Anal plate with outstanding blunt tubercles covering its surface. Ventral free sternites with a row of small tubercles each. Cx I with an anterior longitudinal row of blunt tubercles.

Chelicerae: Monomorphic, basal segment with outstanding marginal tubercles mostly on ectal and basal margins.

Pedipalps: (fig. 3 B-D) Dorsal margin of Fe with a projection from basal to medial section. Ventral margin with a longitudinal row of tubercles. Ti strongly curved, ectally well laminated. Ta sub-cylindrical and small marginal setae, strong claw.

Legs: (fig. 3 E-I) Cx IV without groin warts, with dorsal apical rounded apophysis bi-cuspid. Legs I-IV with minute tubercles forming rows. Fe and Ti IV with greater tubercles in a row, those ventral on Ti outstanding, dorsally smaller. Me IV with ventral tubercles, basally more evident. TF: 6(3): 11:7:8.

Penis: (fig. 8 A-D) VP short, lateral margins concave, at distal portion slightly enlarged laterally, distal margin slightly curved (concave). Two pairs of MS C, curved and flattened. Two pairs of MS D, cylindrical, straight, and long, D1 longer than D2. Two pairs of MS A, cylindrical and straight. Two ventral pairs of MS E and a most basal pair B. Dorsal process of glans rounded, glans do not exceed the distal margin of VP. Stylus exceeding the distal margin of the VP, wattle short, ventrally moderately extended with some stylar barbs grouped at the apex. Microsetae seems to be distributed on the corner fields of VP. Nevertheless, SEM micrographs are not enough clear to elucidate kind and how much the microsetae expands toward the VP.

Dimorphism: Males with Ti and Fe of leg IV armed with longitudinal rows of tubercles outstanding, females present low tubercles (see table 3 for size variation).

Table 3. Body and Fe IV size variation in *Eucynortula albipunctata*. Abbreviations: CL= carapace length, CW= carapace width, DSL= dorsal scutum lenght, DSW= dorsal scutum width, Fe= Femur length, n= number of specimens measured.

	Males n = 2			**Females n = 4**		
	Max	Min	Mean	Max	Min	Mean
CL	2.0	1.7	1.85	2.0	1.7	1.8
CW	3.2	2.6	2.9	3.5	2.9	3.13
DSL	5.0	4.1	4.55	5.2	4.7	4.93
DSW	4.5	3.8	4.15	4.8	4.1	4.43
Fe IV	4.8	3.9	4.35	4.6	3.8	4.23

Eucynortula alboirrorata Caporiacco, 1951

Eucynortula alboirrorata Caporiacco, 1951: 15, figs 7a-b; González-Sponga, 1992: 194, figs 232-237; Kury, 2003: 59; Kury *et al*., 2021.

Type material: MBUCV 460, ♀ holotype, lost. Venezuela, Nueva Esparta. Parque Nacional Cerro Copey, Isla de Margarita. MAGS-938a, ♂ Neotype and 2♀. Same locality as holotype (not examined).

Taxonomic remarks: *E. alboirrorata* was described based on an adult female. Its holotype is lost and a male neotype was designated by Gonzalez-Sponga, (1992). He provided a new description, including a drawing of the male genitalia and external structures (i.e., pedipalps, chelicera, dorsum, and distal

segments of leg I), but without enough details. González-Sponga, included the description of dimorphic characters which are consistent with diagnostic armature occurring in *Eucynortula* (Fe IV with ventral outstanding tubercles). Furthermore, in the MS drawing it is possible to recognize two pairs of MS C, two pairs of MS D, being D2 attached bassaly, closer to the pair of MS A; MS A1 and A2 comparable in size, as observed in other species of *Eucynortula* (*E. punctatolineata* **comb. nov.** and *E. longipes* **comb. nov.**). Further examination of male genitalia and other somatic characters may provide more information on the morphology of *E. alboirrorata*.

Eucynortula albornata **(Roewer, 1947) New combination**

Cynortoperna albornata Roewer, 1947: 16, pl. 5, fig. 41; Townsend *et al*., 2010: 16, 25; Kury *et al*., 2021.

Type material: *Cynortoperna albornata*: SMF-RII/2986-32, ♂ Holotype. Costa Rica, Tilarán (examined). See appendix 2.

Diagnosis: *E. albornata* **comb. nov.** is differentiated from the remaining species of *Eucynortula*, except from *E. albipunctata* by having a pair of blunt and small tubercles on area III (Fig. 5 A), Fe and Ti IV ornamented with outstanding longitudinal tubercles ventrally attached. The main difference found between *E. albornata* **comb. nov.** and *E. albipunctata* is the shape and length of Fe IV, which is substraight and longer than DS in *E. albornata* **comb. nov.** and curved and shorter than DS in *E. albipunctata*.

Description SMF RII/2986-32 (♂)

Measurements: LDS: 4.7; WDS: 3.5; LC: 2 WC: 3; LFeIV: 5.6.

Color in ethanol: Dorsum: Background of dorsal scutum Strong Yellow (84); dorsal marks of color pattern Pale Greenish Yellow (104). Legs, pedipalps and chelicerae Light Greenish Yellow (101).

Dorsum (fig. 5 A): Dorsal scutum with the first constriction well marked, second constriction subtly marked, curved (DS shape λ). Sub-triangular lateral supra-cheliceral projections. Ozophore projected laterally. Grooves of DS and cephalic marked by the white marks on DS. Narrow ocularium, medial depression slightly marked. Area I with a pair of minute tubercles; III with a pair of medial low blunt tubercles larger than those on area I; areas II and IV unarmed. Posterior margin and free tergites with a row of tubercles each.

Venter: Cx I with an anterior longitudinal row of blunt tubercles; II with an apical tubercle; III with a marginal anterior and posterior row of tubercles that do not reach the medial portion.

Chelicerae: Basal segment with marginal tubercles larger at the basal border. Monomorphic.

Pedipalps (fig. 5 B): Fe ventral border with a row of tubercles, dorsally with a keel anteromedial. Pa with a laminar mesal projection and two mesal-dorsal apical projections. Ti laminated, ectally projected mostly since medial portion to distal limit, mesally projected on all its length, apically projected with a terminal seta; mesal and ectal border of Ti with small setae. Tarsus elongated, sub-cylindrical with setae on all ventral margins. Strong claw.

Legs: Cx I-II anterodorsal projected anteriorly; III with a small -anterodorsal tubercle; IV with a dorso-apical apophysis, tegument on Cx IV granulated. Fe I and II straight, III and IV slightly curved. Tro I-IV with a small retrolateral apical projection. Tegument of podomeres granulated. Basitarsus I swollen. Fe and Ti IV with two ventral, dorsal, and lateral rows of tubercles each, ventral ones larger. TF: 6(3):12:7:8.

Penis: Not examined.

Dimorphism: No female examined. Nevertheless, swollen basitarsus I is a common dimorphic character in Cosmetidae.

Taxonomic remarks: Type material of *Cynortoperna albornata* is partially destroyed, it means, the penis could not be examined and not compared. Nevertheless, the transference herein proposed is based on the strong concordance found with regard to external morphology which was shown with the phylogenetic analysis. As is shown in Figure 5 and appendix 2, it could be easily appreciable that the outline of dorsal scutum is λ-shaped as all species. Shape of pedipalps, specifically Ti and Fe, and the same type of ornamentation of Ti and Fe of leg IV in males are common features shared by this species and *E. albipunctata*. External morphology allows supporting the assignation of *E. albornata* **comb. nov.** as another species of *Eucynortula* despite the lack of genital morphology.

***Eucynortula longipes* (Pickard-Cambridge, 1904) New Combination**

Cynorta longipes Pickard-Cambridge, 1904: 557, pl. 52, figs 13, 13a; Banks, 1909a: 226.

Cynortula longipes: Roewer, 1912b: 46; 1923: 323, fig 358; 1927c: 575; Mello-Leitão, 1932: 58; Roewer, 1933: 284; Townsend *et al*., 2010: 3, 17; Kury *et al*., 2021.

Cynortula torquata Roewer, 1947: 15, pl. 4, fig 32 **New synonym**

Type material: GDSLV, Holotype. Costa Rica (not examined); SMF 2994, 2♀ and 2♂. Costa Rica, San Isidro, Cartago, Tablazo (examined).

Diagnosis: *E. longipes* **comb. nov.** differs from the remaining species of *Eucynortula* by presenting the Fe IV strongly elongated in males (Fig. 6 H), and by presenting the second segment of chelicerae slightly inflated in males.

Description SMF 2994 (♂)

Measurements: LDS: 4.8; WDS: 4.2; LC: 1.9; WC: 3.2; LFIV: 11.5

Color in ethanol: Dorsum background Vivid Orange (48); Dorsal marks Pale Greenish Yellow (104); legs and pedipalps Strong Greenish Yellow (99); Chelicerae Strong Yellow (84).

Dorsum (fig. 6 A-D): First constriction of dorsal scutum well marked, second slightly marked, curved. Anterior margin of dorsal scutum with two lateral sub-triangular projections. Ozophore laterally projected. Mid bulge with minute tubercles on the margin. Posterior margin and free tergite with a row of small tubercles each. Cephalic and abdominal grooves well marked. Wide ocularium, medial depression well marked and covered with minute granules. Area I with a pair of minute blunt tubercles. Area III with a larger pair of blunt tubercles.

Venter: Cx I with an apical projection dorsally directed, with an anterior row of small tubercles; II with a distal-anterior tubercle; III with 1-3 antero-distal tubercles and a posterior row of 5-6 tubercles increasing size distally. Free sternites with a row of small tubercles each.

Chelicerae: basal segment with minute tubercles on its surface, with marginal tubercles, larger on ectal and basal margins. Second segment slightly inflated.

Pedipalps (fig. 6 E-F): Tro with an apical-ventral tubercle with a terminal seta. Fe dorsally with a keel from basal to medial portion, undulated on terminal portion, with two small tubercles. Ventrally with small tubercles covering the medial portion only. Pa with two projections, the dorsal one smaller. Ti extended on mesal side, distal apically anteriorly projected; ectal side laminated from medial to the distal portion, with an apical seta. Ta mesally slightly projected, subcylindrical elongated, ventrally not flattened. Strong claw with marginal setae.

Legs (fig. 6 G): Long and slender, granulated. Fe I-IV strongly elongated and straight. Cx I with dorso-apical terminal projections (anterior and posterior). Cx II just with an anterior projection. Cx IV with a small dorso-apical

apophysis. Basitarsus I with basal segments swollen. Mt IV slightly longer than the femur. TF: 6(3):10:7:8.

Penis (fig. 8 I-M): VP short, distal margin concave, laterally elongated. Lateral margins concave at medial portion. Truncus apically thickened, comparable to distal margin of VP. Two pairs of MS C flattened and curved; two pairs of MS D, D1 near to pair C, D2 at medial portion of VP, closer to A1 and shorter than D1. Two pairs A, A1 slightly longer than A2. Two ventral pairs of MS E, located between D1 and D2. Dorsal process of glans rounded. Stylus exceeding the distal margin of VP, with a short wattle not very extended ventrally, with some stylar barbs.

Dimorphism: Basitarsus I and second segment of chelicerae inflated. Fe IV of the female is considerably shorter than the male (fig. 6 G-H)

Taxonomic remarks: Roewer (1912) described the genera *Eucynortula* and *Cynortula* in the same work. The diagnosis proposed for both genera only differs by the ornamentation of area I of dorsal scutum, being unarmed in *Eucynortula* and with a pair of paramedian tubercles in *Cynortula*. After reviewing the material of type species of both genera it was possible to observe minute tubercles on area I of *E. albipunctata*. Since diagnosis of Roewer does not allow to separate morphologically both genera. The analysis herein performed presented both species inside the same clade, suggesting both as part of the same natural group. Considering the results herein presented *Cynortula* is now considered a junior synonym of *Eucynortula* as a consequence of transfer *C. longipes* to *Eucynortula*. However, it is important to state that under the current sense of *Cynortula* (*sensu* Roewer) the genus is paraphyletic and further examination of its species could be done to elucidate their taxonomic identity.

Cynortula torquata is considered a junior synonym of *E. longipes* **comb. nov.** due to they share the same ornamentation, color pattern of DS, shape of DS and a Fe IV strongly elongated in males without any ornamentation.

Table 4. Body and Fe IV size variation in Eucynortula *longipes*. Abbreviations: CL= carapace length, CW= carapace width, DSL= dorsal scutum length, DSW= dorsal scutum width, Fe= Femur length, n= number of specimens measured.

	Males n= 2			**Females n= 2**		
	Max	Min	Mean	Max	Min	Mean
CL	1.9	1.8	1.85	1.8	1.6	1.7
CW	3.3	3.0	3.15	3.3	3.1	3.2
DSL	4.7	4.6	4,65	5.1	4.5	4.8
DSW	4.3	4.1	4.2	4.8	4.3	4.55
Fe IV	11.4	9.4	10.4	6.8	6.3	6.55

***Eucynortula punctatolineata* (Roewer, 1917) New combination**

Cynorta punctatolineata Roewer, 1917: 95, fig 3; 1923: 319, fig 352; 1927c: 558; Mello-Leitão, 1932: 72; González- Sponga, 1992: 24, 425; Kury, 2003:47; Kury *et al*., 2021.

Type material: SMF RI 1310 ♂ holotype. Venezuela. Zulia. Between Maracaibo and Sierra de la Perija (examined).

Diagnosis: *E. punctatolineata* **comb. nov.** could be differentiated from the remaining species of *Eucynortula* by the conical and acute tubercles on area III of DS (Fig. 7 A); ornamentation of Fe IV with two ventral distal rows of denticles and Ti with outstanding ventral tubercles in males (Fig. 7 D).

Description SMF 1310 (♂)

Measurements: LDS: 4.8; WDS: 4.6; LC: 1.6; WC: 2.9; LFIV: 5.6

Color in ethanol: Dorsum background Light Olive Brown (112); Dorsal marks Pale Greenish Yellow (104); legs and pedipalps Brilliant Yellow Green (195); Chelicerae Light Olive Brown (112).

Dorsum (fig. 7 A): Outline of DS λ-shaped with first constriction well marked, short coda. Anterior margin of DS with sub-triangular lateral projections. Narrow ocularium, with medial depression, slightly marked. Mid bulge with small granules on lateral margin. Grooves of scutum marked by the color pattern. Area I with a pair of paramedian low blunt tubercles. Area III with a pair of spiniform tubercles directed backward. Posterior margin and free tergites with a row of small colored tubercles.

Venter: Tegument granulated. Cx I with a medial longitudinal row of tubercles, anal plate with moderate-sized tubercles. Sternites with a row of small tubercles each.

Chelicerae: With marginal tubercles, those of major size on basal and ectal margin. Second segment slightly outstanding.

Pedipalps (fig. 7 B, D): Tro with a ventral medial tubercle. Ventral margin of Fe sub-straight, with a longitudinal row of tubercles, close to each other, but differentiable at the base, almost reaching the distal portion. Dorsal margin with a sinuous keel from the basal portion to the medial portion, just two outstanding rounded tubercles at the distal portion of the keel. Pa mesally with a longitudinal projection not well laminated. Ti with moderately laminated, ectal anterior margin straight; ectal margin with small setae on all its length. Ta sub-cylindrical, long, with some setae on its dorsal surface. Short claw.

Legs (fig. 7 D): Legs I-IV granulated. Cx IV with groin warts, and dorsal apical apophysis long and acute. Fe IV straight, with two ventral rows of denticles restricted to the distal portion. Ti with outstanding ventral blunt tubercles forming two rows. Mt IV with pale ringed marks. Basitarsus I inflated. TF: 6:12:8:9.

Penis (fig. 8 E-H): VP sub-rectangular, distal margin concave. Apex of truncus thickened. Glans and stylus short, not surpassing the distal margin of the VP. Dorsal process of glans rounded, wattle of stylus with stylar barbs

on the apex. Two pairs of MS C curved and spatulated. Two pairs of MS D, D1 longer and sub-straight closer to pair C2; D2 smaller than D1, located at the middle portion of VP. Two pairs of MS A, closer to one another and comparable in size.

Dimorphism: Leg IV with dimorphic ornamentation on Fe and Ti; Basitarsus I inflated and second segment of chelicerae slightly inflated. Despite a female was not reviewed dimorphic characters herein described are common features of cosmetid males.

Taxonomic remarks: The genus *Cynorta* has been found paraphyletic by Damron (2020). This genus composition has been largely considered as dubious due to it encompasses a high number of species with a strong and varied morphology. Recently, Kury *et al*., (2007) redescribed the type species of *Cynorta*, *C. conspersa* (Perty, 1833), and a new diagnosis including genital morphology was given. Under that new description, the species herein transferred to *Eucynortula* does not corresponds to *Cynorta*, mainly by the shape of VP and number of MS C (three pairs in *Cynorta*). On the other hand, the result of the present analysis allowed to fit *Cynorta punctatolineata* within *Eucynortula* by sharing diagnostic characters described above.

The following species were not included in the phylogenetic analysis because only photographs were examined and the state of some morphological characters were not observed. Nevertheless, they were transferred to *Eucynortula* by presenting the diagnostic characters and a distribution pattern that allows supporting them belonging to this genus. Diagnoses are given to provide some morphologic information for each one. However, some limitations might be noted due to the use of photographs for examination.

Eucynortula albipustulata (Roewer, 1912) New combination

Eucynorta albipustulata Roewer, 1912b: 56, 1923: 331, fig 373; 1927c: 581; Mello-Leitão, 1932: 63; Roewer, 1933: 285; Weidner, 1959: 122; Kury, 2003: 56; Townsend *et al*., 2010: 3, 5, 20, 25; Kury *et al*., 2021.

Type material: SMF RI 452, 2 ♂, 2 ♀ syntypes, Costa Rica, Cartago (Photographs examined); ZMH, syntype, Costa Rica, San José (Photographs examined, see fig. 9).

Diagnosis: This species could be differentiated from the remaining species of the genus by the following combination of characters: Fe IV long and straight (Fig. 9) (short and curved in *E. rugosa* **comb. nov**. and *E. analis* **comb. nov**.); uniform coloration of Fe and Ti IV (not uniform in *E. pictipes* **comb. nov**.); Narrow ocularium (wider in *E. areolate* **comb. nov.**); area III armed with acute low tubercles (bigger in *E. leucopyga* **comb. nov**.; blunt in *E. albipunctata*, *E. longipes* **comb. nov**. and *E. albornata* **comb. nov**.); Fe IV without outstanding ornamentation (present in *E. punctatolineata* **comb. nov.**); second segment of chelicerae strongly inflated (moderate in the remaining species); color pattern could present well marked reticulated patch on each side of prosoma and abdomen covered by dots (dots on abdomen are restricted to rows of small granules, when present, on areas of DS in the remaining species); omega stripe on groove between area III and IV not reaching the lateral sides of area III (reaching in the remaining species).

Taxonomic remarks: Type material examined (by photographs) shows strong variation with regard to the attenuation of pattern of color on DS. Diagnostic characters of *Eucynortula* were identified and on that basis is supported this transference. It is possible that under a major revision this species could be considered synonym of another Costar Rican species, *E. punctitergum* **comb. nov.,** due to they share strong similarities. It was only possible to

identify a disctinct color pattern and the extent of enlarged chelicerae in both species, which could be due to intraspecific variation.

Eucynortula analis (Roewer, 1927) New Combination

Eucynorta analis Roewer, 1927c: 585, fig 27; Mello-Leitão, 1932: 64; Goodnight & Goodnight, 1942c: 12; 1942d: 8; Kury, 2003: 56; Townsend *et al*., 2010: 19, 25; Kury *et al*., 2021.

Type material: SMF RII 753/87, ♀ Holotype. Costa Rica, San José. (Photographs examined, see fig. 10).

Diagnosis: This species could be differentiated from the remaining *Eucynortula* by the following combination of characters: Area III of scutum with short spiniform tubercles (Fig. 10) (blunt tubercles in *E. albornata* **comb. nov**., *E. albipunctata*, *E. longipes* **comb. nov**.), shorter than acute tubercles present in *E. leucopyga* **comb. nov**. and *E. punctatolineata* **comb. nov**.; curved and short Fe IV (straight in *E. annulata* **comb. nov**., *E. areolata* **comb. nov.**, *E. albipustulata* **comb. nov**. and *E. punctitergum* **comb.nov.**); Fe and Ti IV without any disctinct coloration (Fe and Ti I-IV pale at base and darker at distal portion in *E. pictipes* **comb. nov.**); narrow ocularium (wider in *E. rugosa* **comb. nov.**).

Taxonomic remarks: Photographs examined belongs to the female holotype. Examination of male will bring insights about the sexual dimorphism of leg IV. The decision to transfer this species to *Eucynortula* is supported by the diagnostic external features given above.

Eucynortula annulata (Roewer, 1947) New Combination

Cynorta annulata Roewer, 1947: 19, pl. 7, fig 58; Kury, 2003: 41.

Type material: SMF RII 1530/28, ♂ holotype (photographs examined, see fig. 11); 1511/68, 1 ♀ paratype, Costa Rica, San José.

Diagnosis: This species could be differentiated by the following combination of characters: Area III of DS with a pair of acute low spines (bigger in *E. leucopyga* **comb. nov.** and blunt in *E. albipunctata*, *E. albornata* **comb. nov**. and *E. longipes* **comb. nov.**); Fe and Ti without outstanding ornamentation (strongly armated in *E. punctatolineata* **comb. nov**.); short and straight Fe IV (curved in *E. pictipes* **comb.nov**.; *E. rugosa* **comb. nov.** and *E. analis* **comb. nov**.; long and straight in *E. areolata* **comb. nov**., *E. punctitergum* **comb.nov.** and *E. albipustulata* **comb. nov.**) (Fig. 11).

Taxonomic remarks: This species presents all external characters described in the diagnosis of the genus given above, except by the colored granules on free tergites, which can be considered as a variable feature that could be shared or not by all individuals and species. On the other hand, *E. annulata* **comb. nov.** seems to be highly similar to *E. areolata* **comb. nov**., the only different feature is the length of Fe IV being longer in *E. areolate* **comb. nov**. exceeding the DS length. Since, further revision of type material to support any taxonomic change on both species is needed.

Eucynortula areolata (Roewer, 1947) New Combination

Eucynorta areolata Roewer, 1947: 16, pl. 4, fig 36; Kury, 2003:56; Townsend *et al*., 2010: 3, 20, 25, 26; Kury *et al*., 2021.

Type material: SMF RII 1525/113a-b, ♂ holotype, 2 ♀ paratypes, Guatemala, Quetzaltenango (Photographs examined, see fig. 12).

Diagnosis: This species could be differentiated from other species of the genus by the following combination of characters: Fe IV sub-straight and long (short and curved in *E. pictipes* **comb. nov**., *E. rugosa* **comb. nov.** and *E. analis* **comb.nov.**; long and straight in *E. annulata* **comb. nov.**); area III

of dorsal scutum with a pair of acute and low tubercles (larger acute tubercles present in *E. leucopyga* **comb. nov**.; blunt tubercles in *E. albipunctata*, *E. albornata* **comb. nov.** and *E. longipes* **comb. nov.**); wide ocularium; Fe IV without outstanding ventral ornamentation (outstanding tubercles on distal portion in *E. punctitergum* **comb. nov**. and long denticles in *E. punctatolineata* **comb. nov.**); abdominal areas without colored granules (present in *E. albipustulata* **comb. nov.**) (Fig. 12).

Taxonomic remarks: This species presents external diagnostic characters described for *Eucynortula*. Its position as a valid species could be re-evaluated after further examination of type material. This species is strongly similar to *E. annulata* **comb. nov.** Nevertheless, they differ on interocular distance and length of Fe IV which were characters herein considered informative at the species level. Due that, they were considered different species until further information allows to support any other interpretation (i.e., genital morphology).

Eucynortula leucopyga (Roewer, 1947) New Combination

Cynorta leucopyga Roewer, 1947: 18, pl. 6, fig 52; Kury, 2003: 46; Townsend *et al*., 2010: 3, 18; Kury *et al*., 2021.

Type material: SMF RII 2992/123, ♂ holotype, Costa Rica. Limón. Waldeck Farm. (Photographs examined, see fig. 13).

Diagnosis: This species could be differentiated from the remaining by present the following combination of characters: Fe sub-straight and long (short and curve in *E. pictipes* **comb. nov.**, *E. rugosa* **comb. nov.**, *E. analis* **comb. nov.**); tubercles on area I moderately outstanding; dorso-apical apophysis of coxa IV short (Fig. 13). The main diagnostic character of this species is the shape and length of acute spiniform tubercles on area III which are directed backwards, absent or shorter in the remaining species, except in

E. punctatolineata **comb. nov.**; Fe IV not armed (armed with strong distal denticles in *E. punctatolineata* **comb. nov.**).

Eucynortula pictipes (Banks, 1909) New combination

Cynorta pictipes Banks, 1909a: 226.

Eucynorta pictipes: Roewer, 1912b: 56; 1923: 329; 1927c: 582, 586; 1933: 285; Mello-Leitão, 1932: 63; Kury, 2003:57; Townsend *et al*., 2010: 3, 19; Kury *et al*., 2021.

Type material: MCZ, ♂ holotype (photographs examined); SMF RI, paratype (photographs examined, see fig. 14), Costa Rica, Cartago, Turrialba.

Diagnosis: *E. pictipes* **comb. nov.** could be differentiated from the remaining species by the following combination of characters: Fe IV curved and short (straight in *E. annulata* **comb. nov.**, *E. areolata* **comb.nov.**, *E. leucopyga* **comb. nov.**, *E. punctitergum* **comb. nov.** and *E. albipustulata* **comb. nov.**); a pair of low and conical acute tubercles on area III; legs I-IV with a disctinctive coloration being basal portions of Fe and Ti pale (Fig. 14).

Eucynortula punctiterga (Roewer, 1947) New Combination

Cynorta punctitergum Roewer, 1947: 19, pl. 7, fig 55; Kury, 2003: 47; Townsend *et al*., 2010: 3, 18, 25; Kury *et al*., 2021.

Cynorta punctiterga: Kury *et al*., 2021.

Type material: SMF RII 1528/27a-b, ♂ holotype, 4 ♂ 2 ♀ paratypes. Costa Rica, San José, San José (photographs examined, see fig. 15).

Diagnosis: This species could be recognized by the following combination of characters: Legs straight and long (short and curved in *E. pictipes* **comb.**

nov., *E. rugosa* **comb. nov.**, *E. analis* **comb. nov.** and straight and short in *E. annulata* **comb. nov.**); Fe with ventral rows of outstanding tubercles (unarmed in *E. areolata* **comb. nov.**, *E. leucopyga* **comb. nov.**, *E. albipustulata* **comb. nov.** and *E. longipes* **comb. nov.**, strongly armed in *E. punctatolineata* **comb. nov.**); tubercles on area III low and acute (blunt in *E. albipunctata*, *E. albornata* **comb. nov.** and *E. longipes* **comb. nov.**).

Eucynortula rugosa (Roewer, 1947) New Combination

Cynortetta rugosa Roewer, 1947: 8, pl. 4, fig 31; González- Sponga, 1992: 176, figs 207-212; Kury, 2003: 50; Kury *et al*., 2021.

Type material: SMF RII 1475/ 91a-b, ♀ holotype, 1 ♀ paratype. Venezuela, Merida. (Photographs examined, see fig. 16).

Diagnosis: *E. rugosa* **comb. nov.** could be differentiated from remaining species by the following characters combination: Short and curved Fe IV (straight and long in *C. annulata* **comb.nov**., *E. areolata* **comb. nov**., *E. leucopyga* **comb. nov.**, *E. punctitergum* **comb. nov.**, *E. albipustulata* **comb. nov.** and *E. longipes* **comb. nov.**); low and slightly acute tubercles on area III (low and blunt in *E. albipunctata*, *E. longipes* **comb. nov**. and *E. albornata* **comb. nov.** and bigger and directed backwards in *E. punctitergum* **comb. nov.** and *E. punctatolineata* **comb. nov.**); legs uniformely colored (distinct in *E. pictipes* **comb. nov.**); wide ocularium (narrower in *E. analis* **comb.nov.**).

Taxonomic remarks: Photographs examined belong to a female (Fig. 16), major examination of males is needed to better determine diagnostic characters for this species. For now, it is considered a species of *Eucynortula* by its general external morphology which shows the diagnostic characters of this genus.

Additional note on *Eucynortula*: Some species of *Eucynortula* were included in the analysis and resulted not related with the type species, *E. albipunctata*. Those species were not included into another genus due to our poor knowledge of Cosmetidae.

Species described under the genus *Eucynortula,* not included in the analysis, were excluded due to the absence of diagnostic characters of *Eucynortula* proposed here and, instead, were transferred to another genus, when possible, or considered placed *Incertae sedis*.

The synonymy of *Cynortula* under *Eucynortula* increases the number of species herein considered *Incertae sedis*. The most species of *Cynortula* were herein considered *Incertae sedis* due to it was impossible to determine their taxonomic position with the limited information assessed.

Species *Incertae sedis*

"Eucynortula" auropicta* Roewer, 1947 *Incertae sedis

Eucynortula auropicta Roewer, 1947: 12, pl. 3, fig 25; Kury, 2003: 59; Townsend *et al*., 2010: 20; Kury *et al*., 2021.

Type material: SMF RII 7372/235, ♀ Holotype. Costa Rica. Tilarán (examined). See appendix 5.

Taxonomic remarks: *E. auropicta* was described based on a single female, it became ambiguous to fit this species in any cosmetid genus. This was due to a lack of information on sexually dimorphic characters and male genital morphology, which are considered decisive to identify species of Cosmetidae. External morphology observed could be considered strongly homoplastic and consequently doubtful to give a generic position.

"Eucynortula" bituberculata* (Pickard-Cambridge, 1904) *Incertae sedis

Cynorta bituberculata Pickard-Cambridge, 1904: 557, pl. 52, figs 12, 12a. *Eucynortula bituberculata*: Roewer, 1912b: 59; 1923: 333, fig 376; 1927c: 586; Goodnight & Goodnight, 1947b: 36; Kury, 2003: 59; Townsend *et al*., 2010: 19; Kury *et al*., 2021.

Type material: GDSLV 3558, Holotype and Paratype. Guatemala. Cahabon; Petén; San Juan Chamelco (Photographs examined). See appendix 6.

Taxonomic remarks: Pickard-Cambridge (1905) described *E. bituberculata* recognizing strong similarities with *Cynorta annulipes* Pickard-Cambridge, 1904 (now valid as *Eucynortella annulipes*), the principal differences he recognized were the male dimorphic characters on leg IV, being unarmed in *E. bituberculata* and *C. annulipes* with ventro-apical denticles on Fe IV, and a pair of tubercles on free tergite III in *E. bituberculata*. Diagnostic characters described for the species here referred could be considered ambiguous (i.e., wide ocularium, tarsal formula and coloration of dorsal scutum). After observation of photographs of type material (see appendix 7), it was not evident any ornamentation of free tergites, but I consider dimorphic ornamentation of legs IV enough to support both as different species within the same geographic range. Under the evidence assessed in the present revision, it was not possible to accommodate the species *E. bituberculata* into another genus. It is imperative the examination of genital morphology to provide a confident classification.

"Eucynortula" lata (Banks, 1909) *Incertae sedis*

Cynorta lata Banks, 1909a: 226.

Eucynortula lata: Roewer, 1912b: 59; 1923: 334; 1927c: 587; Friebe & Adis, 1983: 103; Adis, 1992: 40; Kury, 2003: 59; Townsend *et al*., 2010: 19; Kury *et al*., 2021.

Type material: MCZ 14751. Costa Rica. Santo Domingo; San Mateo. (Photographs examined, see appendix 7).

Taxonomic remarks: External morphology of *E. lata* did not allow to fit it in any genus, it presents a common combination of characters widely found in Cosmetidae, examination of genital morphology will provide more reliable conclusions.

"Eucynortula" maculosa* Goodnight & Goodnight, 1942 *Incertae sedis

Eucynortula maculosa Goodnight & Goodnight, 1942a: 8, fig 8; Kury, 2003: 59; Kury *et al*., 2021.

Eucynorta maculosa; Kury 2003: 57, 297.

Type material: AMNH, ♀ holotype, paratype. Mexico, Veracruz.

Taxonomic remarks: E. maculosa was described based on a female. Its male remains undescribed. The lacking of information on genital morphology makes it ambiguous to give any generic identity.

The original description of *E. maculosa* is based on general characters of the dorsal scutum and pedipalps. Whereas, greater attention was paid to the color pattern of the tegument. Consequently, I considered the current description highly incomplete.

Kury & Cokendolpher (2000) listed *Eucynorta maculosa* (Goodnight & Goodnight, 1942) from Mexico. Afterward, Kury (2003) referred on his catalogue the species "*Eucynorta maculosa* (Goodnight & Goodnight, 1942)" and provided the synonymic list showing the transference of *Eucynortula maculosa* to *Eucynorta*. However, in that same catalogue Kury (2003) listed the species *Eucynortula maculosa* with the same type material

and same reference of Goodnight and Goodnight (1942) cited for *Eucynorta maculosa* as a valid name.

It seems that the transference of this species was made by Kury and Cokendolpher (2000) without any explanation, and was omitted in Kury (2003), probably due to a lapsus. Recently, Kury *et al*. (2021) just quoted the species *Eucynortula maculosa* and the name *Eucynorta maculosa* was not cited. Consequently, the current valid name is *Eucynortula maculosa* Goodnight & Goodnight, 1942.

"Eucynortula" metatarsalis Roewer, 1912 *Incertae sedis*

Eucynortula metatarsalis metatarsalis Roewer, 1912b: 59, fig 10; 1923: 334, figs 377, 378a; 1927c: 587; Kury, 2003: 59.

Eucynortula metatarsalis separata Roewer, 1912b: 59; 1923: 334, fig 378b; 1927c: 586; Kury, 2003: 59.

Eucynortula metatarsalis medialis Roewer, 1912b: 59; 1923: 334, fig 378c; 1927c: 587; Kury, 2003: 59.

Eucynortula metatarsalis: Henriksen, in Sørensen, 1932: 397; Kury & Cokendolpher, 2000: 154; Kury, 2003: 59; Kury *et al*., 2021.

Type material: MNHN, Holotype. Mexico, Nayarit, Sierra de Nayarit (not examined). SMF RI/432-32, 3♀ and 3♂ Paratypes; SMF RI/480-32, 2♂ Paratypes; SMF RI/436-32, 1♂; 1♀ Paratypes. Mexico, Nayarit (examined). See appendix 3.

Description SMF RI 432-32 (♂)

Color in ethanol: Dorsum background, pedipalps and chelicerae Vivid Orange Yellow (66); dorsal marks on scutum Pale Greenish Yellow (104); Legs Moderate Greenish Yellow (102).

Dorsum (fig. 17 A-G): First and second constriction of dorsal scutum well marked, mid bulge laterally projected (DS shape λ), with marginal minute

tubercles. Anterior margin with lateral supra-cheliceral projections trilobed slightly curved dorsally. Ocularium narrow. Cephalic groove and abdominal grooves not well marked. Area I with a pair of minute tubercles, II unarmed, III with a pair of small blunt tubercles, IV with a transverse row of minute tubercles. Posterior margin and free tergites with a row of 8-9 blunt minute tubercles each.

Venter: Stigmatic area projected, sutures dividing coxae, and stigmatic area not well marked. Cx I with a projection medial anterior and distal and with a row of tubercles.

Chelicerae: Basal segment with marginal tubercles, basally with two tubercles bigger than the remaining and distally on the meso-apical region with a triangular projection. The second segment of chelicerae slightly inflated.

Pedipalps (fig. 17 K-L): Fe with a dorsal keel covering from the basal portion to medial; ventrally a longitudinal row of tubercles. Pa with a mesal laminar projection. Ti ectally projected, with a projection anteriorly directed. Ta sub-cylindrical, strong claw.

Legs (fig. 17 H-J): I-IV equally thickened, covered with small granules forming rows. Cx IV with a small dorso-apical apophysis. Tro I-IV with retrolateral apical projections greater on III and IV. Fe III and IV curved, I slightly curved, II straight. Mt IV with a retrolateral basal blunt projection followed by a row of small tubercles appearing toward the distal portion. TF: 6(3):8:7:7

Penis (fig. 20 A-D): Distal margin of VP concave, slightly laterally projected. Lateral margins of VP curved (concave). Two pairs of MS C curved and flattened; two pairs of MS D, Straight and cylindrical, MS-D1 longer than D2; two pairs of MS A straight and cylindrical, A1 longer than A2; One pair of ventral basal MS B. Glans long, exceeding the longitude of distal margin of the VP; dorsal process of glans rounded. Stylus longer,

surpassing the distal margin of VP, wattle extended ventrally (smooth portion) almost reaching the base of stylus, apically with some stylar barbs. *Dimorphism*: Males with Me armed with a retolateral basal projection. Chelicerae slightly swollen. Females with ventral sutures between coxae and stigmatic areas visible (see table 4 for size variation).

Table 4. Body and Fe IV size variation in "*Eucynortula" metatarsalis*. Abbreviations: CL= carapace length, CW= carapace width, DSL= dorsal scutum lenght, DSW= dorsal scutum width, Fe= Femur length, n= number of specimens measured.

	Males n = 3			Females n = 3		
	Max	Min	Mean	Max	Min	Mean
CL	2.3	1.8	2.1	2.0	2.0	2.0
CW	3.6	2.8	3.26	3.4	3.0	3.2
DSL	6.5	5.2	6.0	6.2	6.0	6.06
DSW	5.7	4.6	5.26	5.5	5.4	5.46
Fe IV	6.5	4.6	5.73	5.1	4.9	5.0

"Eucynortula" nannocornuta* (Chamberlin, 1925) *Incertae sedis

Cynorta nannocornuta Chamberlin, 1925: 242; Roewer, 1927c: 571; Mello-Leitão, 1932: 72.

Cynorta nannacornuta (misspelling): Goodnight & Goodnight, 1942d: 6, fig 16; 1953b: 44; Roach *et al*., 1980: 512.

Eucynortula nannocornuta: Goodnight & Goodnight, 1947a: 6; Kury, 2003: 60; Townsend *et al*., 2010: 3, 17, 25; Kury *et al*., 2021.

Eucynortula dorsata Goodnight & Goodnight, 1942d: 8, fig 19; 1947a.

Eucynortula sexpunctata Goodnight & Goodnight, 1942d: 9, fig 21; 1947a.

Type material: MCZ 1341, ♂ Holotype. PANAMA. Canal Zone. Barro Colorado Island. (Photographs examined, see appendix 8).

Taxonomic remarks: External characters observed in photographs of *E. nannocornuta* did not allow us to establish a clear identity. It was evident that the species present common characters found among Cosmetidae (i.e., color pattern V-shaped, middle line and groove between III and IV areas marked, shape of DS) and it is necessary a detailed examination of the genital morphology to support any conclusion.

The only informative character that I observed, was the thickened ventral distal Fe IV. This character was also observed in other Centro American species as is showed and discussed below (see *Eucynortula ypsilon*).

"Eucynortula" pentapunctata Roewer, 1947 *Incertae sedis*

Eucynortula pentapunctata Roewer, 1947: 12, pl. 3, fig 23; Kury, 2003: 60; Kury *et al*., 2021.

Type material: SMF-RII/5861, ♂ Holotype. Brazil, Amazonas, Manaus. (examined). SMF RII/5860/202, 1♀ Paratype. Brazil, Amazonas, Manaus (examined). See appendix 4.

Description SMF RII/5861 (♂):

Measurements: LDS: 3.1; WDS: 2.9; LC: 1.3; WC: 2; LFIV: 2.7

Color in ethanol: Dorsum: background Deep Orange Yellow (69); dorsal marks of color pattern Light Yellow (86); legs, pedipalps and chelicerae Moderate Greenish Yellow (102).

Dorsum (fig. 18 A): First and second constriction of dorsal scutum well marked, mid bulge widely expanded. Anterior margin with lateral projections bicuspid. Narrow ocularium. Cephalic groove slightly visible, marked by a white mark V-shaped. Abdominal grooves slightly marked,

medial line dividing areas marked by a white patch. Lateral margins with conspicuous tubercles mostly at the mid bulge. Areas I, II and IV unarmed, area III with a medial pair of low tubercles. Free tergites with a row of outstanding tubercles each.

Venter: Cx I with an apical posterior and two anterior apical tubercles. An anterior and posterior row of tubercles that join at the basal portion. Cx II projected and distally thickened. III with two anterior tubercles and four posteriors. IV with a tubercular projection apical-posterior. Margin of stigmatic area with a double transverse row of tubercles on the proximities of Cx IV. Free sternites with a row of low tubercles each. Anal plate with tubercles disposed erratically.

Chelicerae: Basal segment with a marginal row of tubercles mostly since the medial part toward the basal portion; ectal border dorsally laminated and projected. Second segment monomorphic.

Pedipalps (fig. 18 C-D): Fe dorsally with tubercles longitudinally not reaching the distal portion; ventrally with a longitudinal row of small tubercles well differentiated in the base. Pa with a meso-apical tubercle; Ti with a dorsal apical tubercle; Ta not flattened ventrally, but rounded, subtriangular in dorsal view.

Legs: I-IV long and slender, Cx I-II with dorso-anterior and posterior projections each (Cx III just with anterior projection); Cx IV strongly granulated, groin warts present, formed by a transverse row of five tubercles, dorso-apical apophysis of Cx IV long. Tr I-IV with a retrolateral distal tubercle. Fe I-IV straight, tegument of all leg covered by small tubercles, forming longitudinal rows. Ta I with basal segments swollen and enlarged.

Penis (fig. 20 E-H): Truncus thickened at the distal portion, wider than distal portion of VP. Distal margin of VP concave, lateral margins curved (concave). Two pairs of MS C flattened and slightly curved; one pair of MS D, cylindrical and long; two pairs of MS A, both small, size comparable; a

ventral basal pair B. Glans exceeding the distal margin of VP; dorsal process of glans rounded. Long stylus, exceeding the distal margin of VP, wattle short, ventrally moderately projected, not reaching the medial portion of stylus.

Sexual dimorphism: Tubercles on Cx IV smaller than in males. Basitarsus I not swollen.

Taxonomic remarks: This species was recovered forming a clade with *C. quadrimaculata* ***incertae sedis***, constituting the sister clade of *Eucynortula*. All characters supporting this clade are ambiguous synapomorphies. Revision of material allows identifying both species as highly different with regard to somatic features (i.e., size of DS, general shape of body, length of legs IV, pattern of color, ornamentation of DS). This may be interpreted as a clade which stability could not be maintained under a major sampling of terminals. Nevertheless, considering the sources herein studied it was not possible to define which genera they belong. The original description of *E. pentapuntata* is based on a set of characters usually used by Roewer (see Roewer, 1947). After revision of the type material, it was possible to provide a new description and to determine that this species do not belong to *Eucynortula*.

"*Eucynortula" puer* Mello-Leitão, 1947 *Incertae sedis*

Eucynortula puer Mello-Leitão, 1943a: 6, fig 3; Kury, 2003: 60; Kury *et al*., 2021.

Type material: MNRJ 5387, ♂ Holotype, lost. Ecuador. El Oro. Río Colorado (not examined).

Taxonomic remarks: Type material of *E. puer* was destroyed during the fire of the MNRJ in September of 2018 at the Museu Nacional de Rio de Janeiro. No more specimens are known for this species and unfortunately the

description provided by Mello-Leitão (1947) is mostly focused in described the color pattern. Whereas, other morphological characters were not described. Given this, it is not possible to find a generic identity for the species and further studies are required.

"Eucynortula" rugipes Roewer, 1925 *Incertae sedis*

Eucynortula rugipes Roewer, 1947: 12, pl. 3, fig 21; Kury, 2003: 60; Townsend *et al*., 2010: 3, 20; Kury *et al*., 2021.

Type material: SMF RII 1532/118, ♂ Holotype, 1♂ Paratype. Costa Rica, San José (examined). See appendix 9.

Description SMF RII 1532 (♂)

Measurements: LDS: 5.6; WDS: 4.5; LC: 2.3; WC: 3.6; LFIV: 6.1

Color in ethanol: Dorsum background Vivid Orange (247); dorsal marks of color pattern Light Yellow (244); chelicera and pedipalps Strong Yellow (217); legs Brilliant Orange Yellow (255).

Dorsum: Outline of DS λ-shaped, first constriction well marked, short coda. Anterior margin with three projections, lateral rounded and medial one subtriangular. Ocularium unarmed, medial depression slightly marked. Cephalic groove not well marked, visible by the color pattern, scutum grooves slightly visible. Areas I, II and III unarmed, just area III with a medial pair of acute low tubercles. Posterior margin and free tergites I-III with a row of low tubercles. Lateral margin of DS with a row of minute tubercles.

Venter: Cx I with a medial longitudinal row of tubercles. Tro IV with a retrolateral basal apophysis visible in ventral view.

Chelicerae: Basal segment with marginal tubercles larger in size on ectal margin. Second segment inflated.

Pedipalps: Dorsal margin of Fe with small tubercles not reaching the distal portion. Ventral margin of Fe with a longitudinal row of tubercles denticle-

shaped from the basal portion to distal. Pa mesally projected, sinuous. Ti strongly flattened, forming an apical curve, with tubercles with terminal setae on ectal margin. Ta elongated, cylindrical, strong claw.

Legs: I-IV with some granules forming longitudinal rows. Fe III and IV curved, I-II sub-straight. Cx IV with apophysis dorso-apical short. Fe IV with largest tubercles. Basitarsus I inflated.

Penis: No penis examined.

Dimorphism: Basitarsus and second segment of chelicerae inflated are common features of dimorphism in Cosmetidae, no female was examined.

Taxonomic remarks: Type material of *E. rugi*pes correspond to a subadult male and an adult male. The first one was corroborated as a immature individual due to it presents pulvillus and body considerably soft. The other individual does not present pulvillus but the body is equally soft and destroyed. No penis was found in both individuals. Due the lack of a well-preserved male adult, this species was not included in the analysis and both the genital morphology and external morphology are not conclusive to give it a generic identity. It is necessary further evaluation of new additional material.

"Eucynortula" sexpunctata Goodnight & Goodnight, 1942 Revalidated

Incertae sedis

Eucynortula sexpunctata Goodnight & Goodnight, 1942d: 9, fig 21; Goodnight & Goodnight, 1947:7: (Syn. *Eucynortula nannocornuta* (Chamberlin, 1925)); Kury, 2003: 60.

Type material: AMNH, ♂ holotype (not examined), ♀ paratype, SMF RII/9038-254-32, 4♀ Paratypes, Panama, Old Panama City. (Examined) See appendix 10 E-F.

Taxonomic remarks: I believe that the previous synonymy of *Eucynortula sexpunctata* under *E. nannocornuta* proposed by Goodnight & Goodnight

(1947) was not supported, they considered both species as "extremes of variation of a single species". Examination of photographs of *E. nannocornuta* reveals strong differences in shape and ornamentation of DS and pattern of color. It was not found any morphologic character to support that synonymy, consequently, *E. sexpunctata* is **revalidated,** and having in consideration the similar shape of general structure of genitalia between *E. ypsilon* and *E. sexpunctata* and somatic characters, it is possible to state a putative relationship between both species, as was shown by the analysis performed. A set of Centro American species sharing a common distal thickened of Fe IV (see below) could be considered as a natural group under major analysis.

"Eucynortula" ypsilon Roewer, 1925 *Incertae sedis*

Eucynortula ypsilon Roewer, 1925: 5, pl. 5, figs 3a-b; 1927c: 587, fig 28; Kury, 2003: 60; Kury *et al*., 2021.

Type material: MZT, ♂ Holotype. (Not examined); SMF RII 109/69-32, 1♂ Paratype. Colombia. Chocó. Darien. Punta di Sabana (Examined). See appendix 10 A-D.

Description SMF RII 109/69-32 (1♂)

Measurements: LDS: 4.4; WDS: 4; LC: 1.7; WC: 3; LFeIV: 5.5

Color in ethanol: Dorsum background Dark Orange Yellow (72); dorsal marks of color pattern Pale Greenish Yellow (104); chelicera and pedipalps Dark Orange Yellow (72); legs Grayish Greenish Yellow (105).

Dorsum (fig. 19 A): First constriction of DS well-marked, second constriction attenuated coda slightly marked. Mid bulge moderately expanded laterally. Anterior margin with triangular lateral projections. Cephalic groove well marked by the color pattern V-shaped, middle line of abdominal areas marked by the color pattern. Abdominal grooves not well

marked. Ocularium with medial depression well marked. Areas I, II and IV unarmed, III with a pair of low blunt tubercles. Posterior and lateral margin with some minute tubercles, free tergites with a row of minute tubercles each. *Venter*: Cx I with a row of tubercles, II, III and IV covered by small tubercles with minute terminal setae. Free sternites with a row of minute tubercles each. Anal plate covered by minute granules.

Chelicerae: Basal segment with marginal tubercles, two larger on mesal apical portion. Second segment swollen.

Pedipalps (fig. 19 B-E): Fe almost oval, strongly curved. Dorsally with a laminar projection ondulated, extended from basal to medial portion. Ventral margin with a longitudinal row of tubercles denticle-shaped. Pa with a mesal laminar projection, with two distal projections. Ti elongated, ectal apical border with two terminal setae; mesal border with an anterior projection. Ta subtriangular. Strong claw.

Legs (fig. 19 G-H): All legs covered by granules. Basitarsus I inflated. Cx IV with dorso apical small blunt apophysis, groin warts present formed by a cluster of small tubercles. Tro III and IV with a retrolateral apical tubercle. Fe I and II straight, III and IV sub-straight. Fe IV ventral apically thickened. TF: 6(3):15:8:9.

Penis (fig. 20 I-L): Distal margin of VP concave, elongated laterally, lateral margins sub-straight. Truncus apically not thickened. Two pairs of MS C, curved and flattened. Two pairs of MS D, cylindrical and sub-straight. Two pairs of MS A, A2 almost as long as A1, one pair of MS B, ventral basally attached. Glans exceeding the distal margin of VP, irregular-shaped, dorsal process rounded. Stylus longer than VP, short wattle, not reaching the medial portion of stylus.

Dimorphism: Males examined present basitarsus I and second segment of chelicerae inflated; ventro-distal portion of Fe IV ventrally thickened (fig 10 G-H).

Taxonomic remarks: Even after examination of the type material it was not possible to propose a generic identity for *E. ypsilon*. However, it is possible to state that the genital morphology is strongly similar to *Cynorta discreta* Chamberlin, 1925. They share a general shape of VP, same pattern of MS, being two pairs of C, D and A, D2 being shorter than D1 and A2 comparable in size to A1 and a truncus slightly thickened at apex, not exceeding the wide of distal margin of VP. These characters suggest a possible relationship between them. Still, I decided do not to transfer *E. ypsilon* to *Cynorta* considering that it does not fit within the diagnosis proposed by Kury *et al*. (2007) where was stated that type species of *Cynorta* has a sub-squared VP, with parallel lateral borders and a pattern of MS with more than two pairs C. Furthermore, currently *Cynorta* is composed by a great number of species, with a high morphologic and distributional disparity, that doubtfully it belongs to that genus.

On the other hand, after comparing some external characters with species sharing an occurrence range (Panamá and north of South America) it was possible to note that a distal ventral thickened Fe IV is common in *Eucynorta venosa* Roewer, 1927, *Cynorta dariensis* Roewer, 1925, *Eucynorta reimoseri* Roewer, 1914 and *Eucynortula nannocornuta* (Chamberlin, 1925) ***incertae sedis.*** This feature could be considered as a putative synapomorphy for a taxonomic group that deserves major attention.

The following species belonging to *Cynortula* were considered ***Incertae sedis*** because they do not present diagnostic characters of *Eucynortula*, herein considered senior synonymous of *Cynortula*. Neither under the information assessed in the present work was possible to fit them within other genera of Cosmetidae. Further studies on these species are needed to elucidate their taxonomic identity.

"Cynortula" alejandra (Roewer, 1957) *Incertae sedis*

Cynortula alejandra Roewer, 1957: 86, fig 21; Kury, 2003: 51; Kury & Barros, 2014: 5, 39; Kury, *et al*., 2021.

Type material: SMF-11420, ♂ Holotype. Perú. Ucayali. Río San Alejandro, tributary of Aguaytia (examined).

"Cynortula" biprocurvata (Roewer, 1952) *Incertae sedis*

Cynortula biprocurvata Roewer, 1952: 43, fig 22; Kury, 2003: 51; Kury, *et al*., 2021.

Type material: SMF RII 9796/269, (♂ holotype, 1♀ paratype, examined). Peru. Cajamarca. Santa Rosa, Rio Chinchipe.

"Cynortula" figurata Roewer, 1957 *Incertae sedis*

Cynortula figurata Roewer, 1957: 84, fig 19; Kury, 2003: 51; Kury, *et al*., 2021.

Type material: SMF RII 11407/282, ♂ holotype (not examined). Peru. Ucayali. Pucallpa, at Río Ucayali.

"Cynortula" garna Goodnight & Goodnight, 1942 *Incertae sedis*

Cynortula garna Goodnight & Goodnight, 1942c: 11, fig 13; Kury, 2003: 51; Kury, *et al*., 2021.

Type material: AMNH, ♀ holotype. ♀ paratypes (not examined). Bahamas. Andros Island.

"Cynortula" granulata Roewer, 1912 *Incertae sedis*

Cynortula granulata Roewer, 1912: 46; 1923: 323, fig 359; 1927: 575; Mello-Leitão, 1932: 58; Goodnight & Goodnight, 1947b: 5, fig 6; Henriksen, in Sørensen, 1932: 400; Kury, 2003: 51; Kury, *et al*., 2021.

Type material: SMF RI 478, ♀ holotype (examined). Trinidad and Tobago. Trinidad. Blue Bassin.

"Cynortula" guttistriata Roewer, 1947 *Incertae sedis*

Cynortula guttistriata Roewer, 1947: 14, pl. 4, fig 33; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: SMF RII 8595/238, ♀ holotype (photographs examined). Bolivia.

"Cynortula" ignacia Roewer, 1957 *Incertae sedis*

Cynortula ignacia Roewer, 1957: 83, fig 17; Kury, 2003:52; Kury, *et al*., 2021.

Type material: SMF RII 11398/281, ♀ holotype (not examined). Peru. Cajamarca. Río Chinchipe, near San Ignacio.

"Cynortula" koelpelii Roewer, 1912 *Incertae sedis*

Cynortula koelpelii Roewer, 1912b: 47, pl. 1, fig 4; 1923: 324, fig 360; 1927c: 575; Mello-Leitão, 1932: 58; 1933c: 110; Kury, 2003: 52; Townsend *et al*., 2010: 3, 17; Kury, *et al*., 2021.

Type material: NHMW, 1 ♂ 1 ♀ (not examined) Nicaragua, Granada SMF RI 466, 1 ♂ syntypes (examined) Costa Rica, Cartago.

Note: Label of *C. koelpelii* at SMF denote a male individual, but after revision I conclude it is actually a female.

"Cynortula" limitata Roewer, 1927 *Incertae sedis*

Cynortula limitata Roewer, 1927c: 578, fig 22; Mello-Leitão, 1932: 58; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: SMF RII 176/84, ♂ holotype (examined). Ecuador. Pichincha.

"Cynortula" modesta (Sørensen, 1932) *Incertae sedis*

Cynorta (*Cynorta*) *modesta* Sørensen, 1932: 399

Cynortula modesta: Mello-Leitão, 1933c: 110; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: ZMG, 2 ♀ syntypes (not examined). Trinidad and Tobago. Trinidad. Port of Spain.

"Cynortula" pectinipes Roewer, 1947 *Incertae sedis*

Cynortula pectinipes Roewer, 1947: 15, pl. 5, fig 40; Kury, 2003: 52; Kury *et al*., 2021.

Type material: SMF RII 9019/246, ♂ holotype, 4♂ paratypes. Ecuador, Loja, Loja (Photographs examined).

"Cynortula" pedalis (Banks, 1909) *Incertae sedis*

Cynorta pedalis Banks, 1909a: 227; Kury, 2003: 52.

Eucynortella pedalis: Roewer, 1912b: 53; 1923: 327; 1927c: 579; Mello-Leitão, 1932: 54. Cynortula pedalis: Goodnight & Goodnight, 1947a: 4, fig 20; Townsend *et al*., 2010: 3, 17; Kury, *et al*., 2021.

Type material: MCZ 14790, ♂ holotype (photographs examined). Costa Rica, San José, San Isidro.

"Cynortula" peruviana Roewer, 1952 *Incertae sedis*

Cynortula peruviana Roewer, 1952: 43, fig 13; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: SMF RII 9800/273, ♀ holotype (not examined). Peru, San Martín, Puerto Huicte, near Uchiza, Rio Huallaga.

"Cynortula" pizai H. Soares, 1945 *Incertae sedis*

Cynortula pizai H. Soares, 1945b: 212, fig 1; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: MZUSP, OS 2900, ♀ holotype (not examined). Brazil, São paulo, Guaíra: Mouth of Sapucaí.

"Cynortula" punctata Roewer, 1947 *Incertae sedis*

Cynortula punctata Roewer, 1947: 14, pl. 3, fig 27; Kury, 2003: 52; Townsend *et al*., 2010: 17; Kury, *et al*., 2021.

Type material: SMF RII 1519/102a-b, ♂ holotype, 1 ♀ paratype (examined). Guatemala, Quezaltenango.

"Cynortula" quadrimaculata Roewer, 1912 *Incertae sedis*

Cynortula quadrimaculata Roewer, 1912b: 48; 1923: 324, fig 361; 1927c: 575; Mello-Leitão, 1932: 58; Kury & Coken- dolpher, 2000: 154; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: SMF RI 423, ♂ holotype (examined). Mexico, Puebla, Puebla.

"Cynortula" robusta Roewer, 1947 *Incertae sedis*

Cynortula robusta Roewer, 1947: 15, pl. 5, fig 39; Kury, 2003: 52; Townsend *et al*., 2010: 3, 17; Kury *et al*., 2021.

Type material: SMF RII 2996/127a-b, ♂ holotype, 1 ♀ paratype (photographs examined). Costa Rica. Cartago. Irazú.

"Cynortula" santarosa Roewer, 1957 *Incertae sedis*

Cynortula santarosa Roewer, 1957: 86, fig 20; Kury, 2003: 52; Kury, *et al*., 2021.

Type material: SMF RII 11395/279, ♂ holotype (not examined). Peru, Cajamarca, Santa Rosa, at Río Chinchipe.

"Cynortula" stellatata (Roewer, 1912) *Incertae sedis*

Cynortula stellata Roewer, 1912b: 40, figs 9, pl. 1 fig 5; 1923: 325, figs 362-363; 1925: 5; 1927c: 576; Mello-Leitão, 1932: 58, fig 24; Weidner, 1959: 121; Kury, 2003: 52. Kury & Barros, 2014: 5; Damron, 2020; Kury, *et al*., 2021.

Type material: SMF 465, 3♂ and 1♀ (♂ Holotype and paratypes, examined). Ecuador. Guayas. Guayaquil; Ecuador. Chimborazo. Riobamba.

"Cynortula" striata Roewer, 1912 *Incertae sedis*

Cynortula striata Roewer, 1912b: 51; 1923: 325, fig 364; 1927c: 575; Mello-Leitão, 1932: 58; Kury, 2003: 52; Kury, *et al*., 2021.

Cynorta striata: Goodnight & Goodnight, 1953b: 37; H. Soares, 1970b: 324.

Type material: SMF RI 426, ♂ holotype (examined). French Guyana, Cayenne.

Note: Label of holotype refers to a male, after examination I concluded that it is actually a female.

"Cynortula" undulata Roewer, 1947 *Incertae sedis*

Cynortula undulata Roewer, 1947: 14, pl. 3, fig 26; Kury, 2003:53; Kury, *et al*., 2021.

Type material: SMF RII 1502/95a-b, ♂ holotype, 1 ♀ paratype (examined). Trinidad and Tobago. Trinidad.

"Cynortula" wheeleri Roewer, 1931 *Incertae sedis*

Cynortula wheeleri Roewer, 1931a: 249, fig 3; Hadði, 1935: 68; Kury & Cokendolpher, 2000: 154; Kury, 2003:53; Kury, *et al*., 2021.

Type material: Type depository unknown. Mexico, Veracruz. Mirador.

"Cynortula" zaca Goodnight & Goodnight, 1942 *Incertae sedis*

Cynortula zaca Goodnight & Goodnight, 1942c: 11, fig 24; Kury, 2003:53; Townsend et al., 2010: 17; Kury, *et al*., 2021.

Type material: AMNH ♂ holotype, ♀ paratype (not examined). Costa Rica, Port Parke, Elena Bay.

Eucynorta Roewer, 1912

Cynorta (part): Simon, 1879: 196; Pickard-Cambridge, 1904: 556; Banks, 1909: 225.

Eucynorta Roewer, 1912b: 54; 1923: 328; Mello-Leitão, 1923c: 111; 1926: 333; Roewer, 1927c: 580; 1933: 285; Mello-Leitão, 1932: 63; 1933c: 106; Kästner, 1937: 389; Roewer, 1954: 67; Kury, 2003: 58; Townsend *et al*., 2010: 3, 13; Damron *et al*., 2018; Kury, *et al*., 2021 (type species *Cynorta quadripustulata* Simon, 1879, by original designation).

Cynorta (part): Goodnight & Goodnight, 1953b: 37.

Eucynortula [part]: Goodnight & Goodnight, 1947b: 34, fig 17; 1977: 153, fig 18; Kury, 2003: 60, 61; Proud & Townsend, 2019: 234, 235, 237, 239, 241.

Eucynorta quadripustulata (Simon, 1879)

Cynorta quadripustulata Simon, 1879a: 196

Eucynorta quadripustulata: Roewer, 1912b: 55; 1923: 328; 1927c: 581; Mello-Leitão, 1932: 64. Kury, 2003: 57; Townsend *et al*., 2010: 3, 19, 25; Kury, *et al*., 2021.

Cynorta (*Prasia*) *quadripustulata*: Sørensen, 1932: 385.

Cynorta liturata: Roewer, 1927c: 565, fig 13, Mello-Leitão, 1932: 71; González-Sponga, 1992: 23, 427. Kury, 2003: 46; Kury, *et al*., 2021. **New synonym.**

Type material: MNHN, ♂ Holotype, Colombia (not examined).

Examined material: SMF 547; 2♂ and 3♀, Colombia, Darien. *Cynorta liturata* SMF 155; ♂ Holotype, Venezuela, Zulia, Maracaibo. ICN-AO-1388; 1389 1♂. Colombia, Bolivar, San Cristobal, Estacion Piscicola. ICN-AO-1380 1♂ and 2♀, Colombia, Bolivar, Turbaco, Jardín Botánico "Guillermo Piñeres"; ICN-AO-1141 1♀, Colombia, Bolivar, San Juan Nepomuceno, Santuario de Fauna y Flora Los Colorados, Sendero el Yayal. ICN-AO-1457 1♀, Colombia, Bolivar, San Jacinto, Vereda La Flecha. ICN-AO-999 2♀, Colombia, Cundinamarca, Bogotá, Club Campestre.

Description SMF 547 ♂

Measurements: LDS: 5.1; LC: 4.2; LC: 2.0; WC: 3.6; LFIV: 5.5

Color in ethanol: Dorsum, background Strong Orange Yellow (68); color pattern Brilliant Greenish Yellow (98). Legs, Brilliant Orange Yellow (67). Chelicerae and pedipalps Strong Yellowish Brown (74).

Dorsum (fig. 21 A and 22 A-J): First constriction of dorsal scutum well marked, second constriction of scutum curved, short coda. Low ocularium, medial depression well marked. Anterior margin with rounded lateral projections. Cephalic and abdominal grooves not well marked. Area I with a pair of minute tubercles, area III with a pair of long spines. Posterior margin and free tergites with a row of low blunt tubercles each. Tegument in general smooth.

Venter: Gnatocoxa apically-anteriorly projected. Cx I with a longitudinal anterior row of tubercles; II with a basal-anterior tubercle. Anal plate with tubercles on its surface.

Chelicerae (fig. 21 D): Basal segment with small and scarce marginal tubercles. Second segment strongly inflated. Fixer finger without teeth, mobile finger with a tooth located at basal portion.

Pedipalps (fig. 21 E-G): Dorsal margin of Fe with a keel covering from the basal to medial portion, at the middle with irregular projections. Ventral

margin with tubercles denticle-shaped, well differentiated at the base on the whole longitude. Tro with a ventral-apical tubercle and a superior small tubercle. Pa ventrally not flattened. Ti ectally flattened with a distal anterior projection, in general oval. Ta subtriangular, not flattened ventrally, with small marginal setae.

Legs (fig. 21 H and K): Basitarsus of leg I inflated, Fe I-IV sub-straight, III and IV with a small distal retrolateral tubercle. Cx IV with a small tricuspid dorso-apical apophysis. Groin warts reduced.

Penis (fig. 23 A-D): Elongated VP, distal margin straight, distally projected laterally; lateral margins sub-straight just slightly convex; dorso-apically projected. Two pairs of MS C, C1 dorsally attached, C2 ventralmost, both slightly spatulated and curved; two pairs of cylindrical and straight MS D, D1 longer, D2 vary reduced and basal, closer to pair A. A1 longer than A2, cylindrical and a moderately curved. Two pairs of MS E, ventrally attached E1 between C2 and D1 and E2 between D1 and D2. One basal-ventral pair of minute MS B. Short glans, not exceeding the distal margin of VP, subtriangular, dorsal process of glans in lateral view slightly flattened, subtriangular. Stylus with a long wattle, well extended ventrally reaching the base of stylus, stylar barbs covering from the distal to medial part of wattle, apically with an anterior projection visible in lateral view. Microsetae type T1 and T4 covering lateral fields of VP, T1 covering the basal portion of midfield.

Dimorphism: Males with strong dimorphism on second segment of chelicerae (alpha males) (fig. 21 D). There are males with slightly inflated chelicerae (beta males) (fig. 21 B) almost comparable with not enlarged female chelicerae (fig. 21 C). Basitarsus I inflated in males.

Taxonomic remarks: The synonymy herein proposed is based on the strong similarities found in the genital morphology, both species share a VP constrained at distal portion, a similar MS C1 dorsally attached and emerging

toward distal margin of VP, and an equal number, position and size of MS (A-E). Furthermore, external morphology also supports that they are the same species showing extremes of attenuation of color pattern (see fig. 15). Both species have been recorded in the same range of distribution in north of South America and Panamá.

As it was discussed by Damron *et al*. (2018) original characters of *E. quadripustulata* (type species of *Eucynorta*) described by Roewer (1912) were not specific at species level, and a clarification of their facilities to identify species of *Eucynorta*. They stated that Roewer's original description mentioned chelicerae normally built and posteriorly, Simon (1879), who provided an emended description, stated inflated male chelicerae. According to the revision of a large series of specimens of *E. quadripustulata,* I believe that the discrepancy could be due to the isolated revision of major (alfa) and minor (beta) males (Solano-Brenes *et al*., 2018), which are herein illustrated and compared with female chelicerae (fig. 21B-D).

Eucynorta multilineata (Goodnight & Goodnight, 1947) New combination

Eucynortula multilineata Goodnight & Goodnight, 1947b: 34, fig 17; Kury, 2003: 60, 61; Townsend *et al*., 2010: 3, 19; Proud & Townsend, 2019: 234, 235, 237, 239, 241, figs 1C-D, 5A-D; Kury, *et al*., 2021.

Cynorta multilineata: Goodnight & Goodnight, 1977: 153, fig 18.

Type material: FMNH, ♀ holotype. Belize, Silkgrass. (Not examined).

Taxonomic remarks: Type material of *Eucynortula multilineata* was not examined, instead some micrographs of genital morphology published by Proud & Townsend (2019) were studied to give it a generic identity. According to the re-description given for *E. quadripustulata* (type species),

it is possible to conclude that there are some genital characters shared by both species such as: 1) number of MS C, D and A, being D2 reduced and attached closer to A1 at middle portion of VP. This same pattern was observed in *Eucynorta rooneyi* Damron *et al*., 2018 recently described. 2). Shape of VP which is long and sub-rectangular. 3) Wattle well extended ventrally reaching the base of stylus and with stylar barbs occupying almost the middle of the longitude of stylus.

With regard to the external morphology, the photographs in dorsal and lateral view provided by Proud & Townsend (2019) allows to conclude that ornamentation of *E. multilineata* **comb. nov.** fits with description of type species of the genus with areas I and III with medial tubercles.

Subfamily Taitoinae Medrano, Kury & Mendes, 2021

Eulibitia Roewer, 1912 New assignment

Eulibitia Roewer, 1912: 16 (type species: *Eulibitia maculata* Roewer, 1912, by original designation).

Libitia (*Messa*) Sørensen in Henriksen, 1932: 412 junior homonym of *Messa* Leach, 1817 (Hymenoptera): Medrano & Kury, 2017:5.

Messa Mello-Leitão, 1933: 107, 112; Medrano & Kury, 2017:5 (type species: *Libitia* (*Messa*) *scalaris* Sørensen, 1932, by original designation).

Paramessa Mello-Leitão, 1933: 109; Medrano & Kury, 2017:5 (type species: *Libitia* (*Messa*) *castanea* Sørensen, 1932, by original designation)

Brachylibitia Mello-Leitão, 1941: 166; Medrano & Kury, 2016; Medrano & Kury, 2017:5; Medrano *et al.,* 2019: 2 (type species: *Brachylibitia ectroxantha* Mello-Leitão, 1941, by original designation).

Platymessa Mello-Leitão, 1941: 167; Medrano & Kury, 2017:5 (type species: *Platymessa h-inscripta* Mello-Leitão, 1941, by original designation).

Messatana Strand, 1942: 398; Medrano & Kury, 2017:5 (replacement name for *Messa* Mello-Leitão, 1933).

Eulibitia: Roewer 1914: 127; 1923: 298; 1928: 547; Mello- Leitão 1926: 331; 1932: 56; 1933: 106; Kury 2003: 60; Pinto-da-Rocha & Hara 2011: 10. Medrano & Kury 2016: 52; Medrano & Kury, 2017:5; Medrano *et al.,* 2019: 2.

Messa: Mello-Leitão 1935: 114; Kury & Alonso-Zarazaga 2011: 50. *Platimessa* (incorrect original spelling): Mello-Leitão 1941: 167.

Platymessa: Roewer 1963: 52; Kury 2003: 81; Medrano & Kury 2016: 54.

Brachylibitia: Kury 2003: 38; Medrano et al., 2019: 2.

Messatana: Kury 2003: 67; Kury & Alonso-Zarazaga 2011: 50.

Paramessa: Kury 2003: 80.

Taxonomic remarks: *Eulibitia* is herein included within the subfamily Taitoinae on the basis of the results obtained in the phylogenetic analysis performed which allowed to identify the following diagnostic features proposed by Medrano *et al*. (2021): DS β-type (see discussion below about shape of DS in *Eulibitia*), flat in lateral view; elongated coda, and a transverse stripe on area V that could be dissociated; coxa IV elongated; Fe IV median sized, sometimes curved. Armature present on Fe IV with a retrolateral row of equally spaced tubercles; with distal armature sometimes present.

5. Discussion

The genus *Eucynortula* has never been reviewed and this is the first attempt to elucidate the relationships of a Centro American genus of Cosmetidae on the basis of a phylogenetic approach.

5.1. The genus *Eucynortula*

Roewer (1912) diagnosed the genus based on his extended system; he stated that species of *Eucynortula* presented areas I, II, IV, V and free tergites unarmed. In the same work, he erected the genus *Cynortula*, whose unique different diagnostic character was the presence of a pair of blunt tubercles on area I.

After revision of material of *Eucynortula*, it was found that type species, *E. albipunctata*, presents a minute pair of tubercles on area I, as well as *E. metatarsalis*, and *E. bituberculata* described and transferred, respectively, in the same work. Under Roewer's weak diagnoses, the assignment of species to both genera is strongly dubious.

Until the present analysis, just the species "*E. nannocornuta*" was included in a phylogenetic analysis using molecular and morphological data (Damron, 2020). The examination of the same material reviewed by Damron (2020) yields to conclude that the specimens correspond to *Eucynortula sexpunctata* revalidated herein, which at that moment was under the synonymy of *E. nannocornuta*. In that phylogenetic analysis, the species was recovered closely related to species of *Cynorta*, *Paecilaema* and *Paracynorta*. Nonetheless, under the present analysis, both species, *E. nannocornuta* and *E. sexpunctata* were not considered to belong to the genus *Eucynortula*. Consequently, the position and relationships showed for "*E. nannocornuta*" in the result of Damron (2020) should be interpreted as a taxon of uncertain classification.

The phylogenetic analysis herein performed found a monophyletic *Eucynortula*, composed by the species *E. albipunctata*, *E. albornata* **comb. nov.,** *E. longipes* **comb. nov.** and *E. punctatolineata* **comb. nov.**

The monophyly of the genus is supported by the non-homoplastic synapomorphies (see appendix 12): posterior margin and free tergites I-III with a row of colored granules (chars. 43 and 46) and by the following homoplastic synapomorphies: MS D2 attached at basal half of VP (char. 15); anterior margin of DS with sub-triangular lateral projections (char: 27); abdominal areas I-III laterally delimited by white/pale yellow lines (char: 52); Fe IV long, exceeding the length of DS (char: 64); Ti IV of male with dimorphic ornamentation (char: 68); ventral margin of Fe of pedipalp curved (char: 76) and fixed finger of chelicerae with medial teeth higher than distal and basal teeth.

Revision of photographs of another Centro American species allowed to fit them within the diagnosis proposed here. Since, the proposal of *Eucynortula* includes 13 species, four above mentioned plus *E. albipustulata* **comb.nov.**, *E. alboirrorata*, *E. analis* **comb. nov.**, *E. annulata* **comb. nov.**, *E. areolata* **comb. nov.**, *E. leucopyga* **comb. nov.**, *E. pictipes* **comb. nov.**, *E. punctitergum* **comb.nov.** and *E. rugosa* **comb. nov.**

Revision of photographs from types was enough to identify diagnostic characters described for *Eucynortula*, nevertheless, it was common to limit the species by the length and shape of Fe IV and by a combination of external characters as the width of ocularium, armature on leg IV (when possible), differences on color pattern (in *E. albipustulata* **comb.nov.**, *E. albornata* **comb. nov.,** *E. analis* **comb. nov.**, *E. annulata* **comb. nov.**, *E. areolata* **comb. nov.**, *E. leucopyga* **comb. nov.**, *E. pictipes* **comb. nov.**, *E. punctitergum* **comb. nov.** and *E. rugosa* **comb. nov**). Even so, general external morphology is strongly similar and further examination of more material could suggest some different interpretation of those species;

particularly by examination of genital morphology. Furthermore, it is important to state that meristic characters should not be considered as diagnostic, mainly when a unique specimen is reviewed and it is unknown the variation of sizes among several individuals (Gnaspini, 1999).

Another species previously considered as *Eucynortula* were here excluded. The majority of them were considered *Incertae sedis* (*E. auropicta*, *E. bituberculata*, *E. lata*, *E. maculosa*, *E. metatarsalis*, *E. nannocornuta*, *E. pentapunctata*, *E. puer*, *E. rugipes*, *E. sexpunctata*, *E. ypsilon*), as was discussed before in each case, and only *E. multilineata* was transferred to *Eucynorta* based on its genital and external morphology (see above for more detailed discussion).

5.2. Internal relationships of *Eucynortula* and morphological implications on Cosmetidae

The phylogenetic analysis showed *E. punctatolineata* **comb.nov.** as the sister species of a clade containing the remaining *Eucynortula* recovered under IW and in two of the most parsimonious trees under EW. This clade was supported by sharing VP of penis square (char: 15); dorsal process of glans sub-triangular (char: 16); wide anterior margin of DS (char: 26) and granulated tegument of DS (char: 34), see appendix 12.

E. longipes **comb. nov.**, as well, was found to be the sister species of a clade composed by *E. albipunctata* and *E. albornata* **comb. nov.**, recovered only under IW. It was supported on the following homoplastic synapomorphies (see appendix 12): MS A2 short (char: 12); MS D2 located at distal half of VP (char: 15); stylar barbs not reaching the ventral margin of stylus (char: 22); Fe IV prolaterally curved (char: 63); patella of pedipalp with mesal apical tubercle (char: 81); mobile finger of chelicerae with a longitudinal row of teeth (char: 91); fixed finger of chelicerae with a row of same size teeth (char: 92).

The last clade showed a closer relationship between *E. albipunctata* and *E. albornata* **comb. nov.** should be considered with less support than it seems. Since three out of seven characters supporting this clade correspond to genital morphology, which was not reviewed in *E. albornata* **comb. nov.**

Eucynortula was supported by a few non-homoplastic synapomorphies (chars. 43 and 46), reflecting that at least, most characters herein used are highly homoplastic and the general morphology of both outgroup and ingroup is strongly conservative.

Previous analyses found a high extend of homoplasy among characters used to describe genera and species of Cosmetidae (Coronato-Ribeiro & Pinto-da-Rocha, 2015, Medrano & Kury, 2018, Damron, 2020, Medrano *et al*., 2021). Unfortunately, until today, just the genera *Metalibitia* and *Roquettea* have been reviewed under a cladistic framework (Coronato-Ribeiro & Pinto-da-Rocha, 2015; Medrano & Kury, 2018) and more recently the subfamily Discosomaticinae (Medrano *et al*., 2021). Revisions of *Metalibitia* and *Roquettea*, agree with a set of terminals that have been strongly contrasting with regard to its morphology, it means, outgroup and ingroup presenting extremes of a morphocline, in some characters, improving the result considering that the clear differentiation brings to light to a better resolution of the outgroup and, consequently of the ingroup (Maddison *et al*., 1984).

Contrary to those analyses, the present revision of *Eucynortula* was based on a set of terminals with a less contrasting morphology. The selection of the outgroup was more conservative and other Centro American genera never reviewed (nor taxonomically or under a phylogenetic framework) were included. The resultant implications of this outgroup selection were a set of terminals with a high similar morphology, which reflects the degree of morphologic conservatism of Centro American fauna of Cosmetids.

In general, Cosmetidae presents a highly homoplastic morphology; as was said before, the most robust analysis carried out including molecular and

morphologic data and a set of 136 terminals (Damron, 2020) conclude that particularly characters commonly used to determine genera and species (i.e., outline of dorsal scutum, color pattern, ornamentation of DS areas) have evolved more than once into the multiple genera of Cosmetidae.

Recently, it was discussed about the extent of information provided by the size of ocularium, called interocular distance (IOD), it was stated that this measure of the width of ocularium seems to be not highly variable within genera (i.e., *Rhaucus* and *Metalibitia*) (Medrano *et al*., 2021). Additionally, it was noted that variation observed on different species within the same genera is related to a wide range of distribution and probably, it could reflect groups of species (i.e., Brazilian species of *Cosmetus* Perty, 1833 with a narrow ocularium and broad in Panamanians and Venezuelan species of *Cosmetus*) (Coronato-Ribeiro & Pinto-da-Rocha, 2015; Medrano *et al*., 2021). In spite of *Cosmetus* has not been the object of any phylogenetic analysis, its monophyly could be accepted by a set of putative morphologic synapomorphies that has been recognized until today and seem to be constant among its species (Coronato-Ribeiro & Pinto-da-Rocha, 2015).

Considering the results herein presented, variation of ocularium could be found among species of *Eucynortula*; probably variation of this character could not be directly related with a wide distributional pattern, instead, narrow or wide ocularium could be states showing interspecific variation within a genus.

Species included in the present analysis are not widely distributed (see figs. 24, 25 and 26). It was found that a great set of species restricted to Central America presents different extents of size of ocularium (i.e., wider in *E. leucopyga* **comb. nov.** and narrower in remaining species occurring in Costa Rica. See figs. 29-31).

Recently, Medrano *et al*. (2021) found a high degree of resolution for clades proposed as subfamilies. Characters related to the color pattern were

included (29 of 130) using a detailed codification for disposition of patches of pale color on DS, Cx IV, free tergites and ocularium. The results showed that under this detailed approach it is possible to find phylogenetic signal.

Previous analyses including color characters as Damron (2020) shows a contradictory result, being supported that pattern of color is not informative enough due to common patterns on the dorsum of cosmetids have evolved several times within the family. This result could be attributed to the extent of detail provided by the way of codification of characters.

Pattern of color within *Eucynortula* supports the finding of high phylogenetic signal provided by that character since all unambiguous characters supporting this clade were related to colored granules on free tergites and posterior margin. Furthermore, it was recognized as a diagnostic character the lateral reticulated pattern which is extended from prosoma to area III-IV in all species of *Eucynortula* herein proposed.

Shape of dorsal scutum has been proposed as informative in descriptions and taxonomic reviews of some genera (*i.e.*, *Eulibitia* β-type by Medrano & Kury, 2017; *Libitia* α-type by Medrano *et al*., 2020; *Rhaucus* α-type by García & Kury, 2017; *Taito* β-elongated type by Kury & Barros, 2014).

Kury *et al*., (2007) recognized four types of dorsal scutum: α-type, β-type, γ-type, and δ-type and suggested this feature as informative for diagnosing genera. Kury & Medrano (2016) provided terminology to describe the shape of DS in Opiliones Laniatores, they increased the number of shapes possible within the suborder describing the variation found among the extent of constriction of lateral margin on prosoma-abdomen and mid bulge-coda. Furthermore, they included some possible variations found in shape and prolongation of mid bulge and coda. However, all shapes recognized today for describing the shape of dorsal scutum remain unreliable to establishing synapomorphies. Instead, it has been found that different shapes of DS have evolved several times within Cosmetidae (Damron, 2020). Furthermore, it

has been described intraspecific sexual variation with regard to the shape of dorsal scutum (Pinto-da-Rocha & Hara, 2011; Kury & Barros, 2014; Rodriguez *et al*., 2014).

Recent works have increased the number of DS shapes in Cosmetidae (*i.e*., Medrano & Kury, 2017). The diagnosis of *Eulibitia* given by Medrano & Kury (2017) described and illustrated a shape with well-marked constrictions I and II which was called β-shaped. This β shape described in *Eulibitia* is in disagreement with the previous description given by Kury & Medrano (2016) which presents lateral constrictions of DS very attenuated. Townsend *et al*., (2010) stated that exists some difficulty to determine the shape of DS in Centro American species of Cosmetidae after examination of a set of more than 70 species. The present revision agrees with Townsend *et al*., (2010) considering that it is possible to find several shapes of DS inside the same genus (*i.e*., *Eucynortula*, with β- shape; λ-shape and γ-shape) and some intraspecific variation on attenuation of the second constriction could be found and interpreted as two different shapes γ-shaped and λ-shaped (see Fig.4).

With regard to this finding, it is possible to state that outline shape of DS is not a reliable character to propose synapomorphies or as a diagnostic character at the genus level. On the other hand, it is possible that different shapes proposed by Kury & Medrano (2016) overestimated the variation within the same shape of DS and, as currently used, result not informative.

The homoplastic morphology of Cosmetidae has been consistently accepted based on both major analyses including the larger set of terminals (Damron, 2020; Medrano *et al.*, 2021). However, it does not mean that morphology is not informative at any level within the family, instead, it was discussed about the interpretation of morphology which must be given under a geographic and distributional scenario (Damron, 2020; Medrano *et al.*, 2021; Medrano *et al*., 2021).

The current distribution of *Eucynortula* spp. presented here (figs. 24-26), includes species from Guatemala to Venezuela. The disjunct distributional pattern could be due to a lack of known species occurring in intermediate areas (i.e., northern Colombia). Further examination and/or sampling of areas unknown could increase the number of species of *Eucynortula* and improve the understanding of its distributional patterns.

5.3. Phylogenetic relationships within species of Cosmetidae included in the analysis

The analysis performed included a small sample of Cosmetidae as terminals (29 spp of >700 spp described), this represents a constraint with regard to the resolution reached for the outgroups.

The most of species herein included were not assigned to any subfamily because the morphology does not fit with the diagnostic characters proposed by Medrano *et al*., (2021). Probably the limits of those suprageneric groups need to be reviewed under further information or new subfamilies should be proposed in order to better understand the diversity of Cosmetidae.

As have been found before, Ferkeriinae, represented by *Metalibitia*, was recovered as the sister group of the remaining Cosmetidae (Coronato-Ribeiro & Pinto-da-Rocha, 2015; Medrano & Kury, 2018; Damron, 2020). This result differs from Medrano *et al*., (2021) where Ferkeriinae was recovered as the sister group of *Libitioides* plus Taitoiinae.

The clade C, configurated by non-Ferkeriinae cosmetids presented to *Metacynorta gracilipes* and *C. punctata* as sister species of the remaining Cosmetidae.

The clade F, containing *E. ypsilon Incertae sedis* plus *E. sexpunctata Incertae sedis* suggests a relation between both species. Herein, those species were considered as *Incertae sedis* due to it was not possible to define its genus identity. Both species are strongly similar, but they were maintained

as independent species due to a great number of autapomorphies present in both, principally, a set of genital characters (i.e., shape of VP, shape at the base of VP, shape of truncus) are strong evidence to support the species distinction.

E. metatarsalis Incertae sedis, *E. pentapunctata Incertae sedis* and *C. quadrimaculata Incertae sedis* were found as the most related species to *Eucynortula*. These species present a wide distribution, being *E. metatarsalis Incertae sedis* and *C. quadrimaculata Incertae sedis* species from Mexico and *E. pentapunctata Incertae sedis* from Brazil.

It was recovered the type species of *Eucynorta*, *E. quadripustulata,* as sister of *C. liturata*. The former was considered senior synonym for the second one by the examination of genital and external morphology which was found equal. This clade was recovered as the sister group of *N. venezuelensis* suggesting some relationship between both genera from North of Colombia and Venezuela, respectively.

Cynorta calcarapicalis appeared as the most related species from the remaining *Eulibitia* spp, *Taito* spp, *C. undulata* and *C. limitata*. This species was not grouped within the clade of Cynortinae, herein represented by *Eucynortula*. This result suggests that probably *C. calcarapicalis* do not belong to *Cynorta* and further studies are necessary with the inclusion of *C. conspersa* which could bring light about this issue.

Eulibitia was found paraphyletic, in opposition to the finding of Medrano *et al*., (2021), where it was recovered as monophyletic being represented by *E. scalaris* and *E. h-inscriptum* (Mello-Leitão, 1941). *Eulibitia* was related to a big clade containing *Acantholibitia*, Ferkeriinae, *Libitioides* and Taitoinae (Medrano *et al*., 2021). However, this genus was not assigned to any subfamily until the present revision (See taxonomy section for further morphologic discussion).

A monophyletic clade containing species of "*Cynortula"* plus terminals of *Taito* and *E. spectabilis* was supported by a non-ambiguous synapomorphy (char. 53). This clade reflects a morphologic relationship between those terminals within Taitoinae, which share relevant features proposed as diagnostic for *Taito* (*i.e*., outline of DS β-elongated, anal plate with a blunt medial projection). This finding is in agreement with the recent proposal of the subfamily Taitoinae Medrano *et al.* (2021) which grouping both genera plus *Acritas* Sørensen, 1932, *Chusgonobius* Roewer, 1952, *Cynortopyga* Roewer, 1947, *Vononana* Roewer, 1927, *Vononoides* Roewer, 1912, *Chinchipea* Roewer, 1952, *Chirinobius* Roewer, 1952, *Cynortoplus* Roewer, 1925 and *Pygocynorta* Roewer, 1925, and *Eulibitia* herein assigned to this subfamily, all sharing a common elongated shape of DS (Medrano *et al*., 2021).

However, the analysis performed by Medrano *et al*., (2021) did not include the type species of *Eucynortella* (*E. spectabilis*). Instead, the subfamily assignment of *Eucynortella* was based on the occurrence of a unique species, *E. cryptogamma,* which was considered as probably not belonging to *Eucynortella*, without further explanations about it. Thus, the result herein obtained supports *Eucynortella* within Taitoinae and extends the current distribution of Taitoinae to the Guyana shield.

In spite of the great quantity of morphological evidence supporting a possible designation of *C. alejandra*, *C. biprocurvata*, and *C. stellata* as belonging to *Taito* (i. e., shape of VP, pattern of size and disposition of MS on VP, DS shape and pattern of color), none taxonomic change was proposed because of the result of the cladistic analysis implies the interpretation of clade R as a single genus, yielding to consider *Eucynortella* as a senior synonym of *Taito*. Nevertheless, the character of color pattern, proposed as a diagnostic feature of *Taito*, has shown to be consistent among its species, and it is not

present in *E. spectabilis* which has a pair of pale longitudinal stripes from prosoma to area III.

Consequently, the species of *Cynortula* were considered as *Incertae sedis*, and *Taito* and *Eucynortella* maintained as independent genera until a cladistic analysis including the type species of *Taito*, *T. spaceinvaders*, be carried out.

---

6. Conclusions

1. *Eucynortula* is a monophyletic clade supported on two non-homoplastic synapomorphies, including thirteen species from Guatemala, Costa Rica and Venezuela.
2. Morphology of *Eucynortula*, as was proposed in the present work, is highly homogeneous among its species in characters such as color patterns, body shape, armature of DS and dimorphic ornamentation of Fe IV of males.
3. Subfamilies of Cosmetidae as currently proposed do not allow to fit several Centro American and South American genera, consequently, morphologic features supporting those groups must be reviewed and/or new subfamilies should be proposed under further information.

Resumo

O gênero *Eucynortula* Roewer, 1912 é revisado pela primeira vez com base na morfologia externa e da genitália masculina. Um enfoque conservativo foi utilizado para selecionar o grupo externo, considerando a correspondência morfológica e geográfica. A analise foi baseada numa matriz de 94 caracteres e 30 terminais pertencentes a duas famílias, Metasarcidae (uma espécie) e Cosmetidae (29 especies, 10 gêneros). Os resultados mostraram *Eucynortula* parafiletico, sendo excluídas todas as espécies do gênero do clado, exceto a espécie tipo, *E. albipunctata*. Três gêneros foram sinonimizados com *Eucynortula*: *Cynortula* Roewer, 1912; *Cynortoperna* Roewer, 1947 and *Cynortetta* Roewer, 1947. As seguintes espécies foram transferidas para *Eucynortula* com base na diagnose proposta no presente trabalho: *E. albornata* **comb. nov**., *E. annulata* **comb. nov.**, *E. albipustulata* **comb. nov.**, *E. analis* **comb. nov.** e *E. areolata* **comb. nov**., *E. leucopyga* **comb. nov.**, E. *longipes* **comb. nov**., *E. punctatolineata* **comb. nov**., *E. punctitergum* **comb. nov.**; *E. pictipes* **comb. nov.** e *E. rugosa* **comb. nov.** As espécies *Cynortula cingulata* e *Cynortula brevipes* foram consideradas sinônimos júnior de *E. albipunctata*. A espécie *Eucynortula alboirrorata* foi mantida dentro do gênero por apresentar os caracteres diagnósticos. As demais especies do gênero, *E. auropicta*, *E. metatarsalis, E. pentapunctata*, *E. bituberculata*, *E. lata*, *E. maculata*, *E. nannocornuta*, *E. puer*, *E. rugipes* e *E. ypsilon*, que não apresentaram os caracteres diagnósticos propostos, foram considerados *Incertae sedis* devido a que a evidencia revisada não permitiu estabelecer a sua identidade genérica. Alem disso, a espécie *Eucynortula sexpunctata*, atualmente valida como sinônimo júnior de *E. nannocornuta*, foi revalidada e considerada ***Incertae sedis***. As

espécies de *Cynortula* cuja identidade não foi resolvida, foram consideradas ***Incertae sedis***.

A espécie tipo de *Eucynorta*, *E. quadrimaculata* foi descrita e nova informação inédita sobre caracteres dimórficos foi incluída com o fim de aumentar o conhecimento sobre sua variação morfológica. *Cynorta liturata* foi encontrada sinônimo júnior de *E. quadripustulata* e *Eucynortula multilineata* foi transferida para *Eucynorta* com base na morfologia externa e dos genitais.

Finalmente, é proposta uma nova classificação para o gênero *Eucynortula* representado por treze espécies distribuídas em Norte de America do Sul e Central e é considerado como pertencente a subfamília Cynortinae.

Abstract

The genus *Eucynortula* Roewer, 1912 is reviewed for the first time based on a set of morphological characters considering external and genital morphology of males. A conservative approach was employed to select the outgroup, considering geographic and morphologic correspondence. The analysis was based on a matrix of 94 characters and 30 terminals from two families, Metasarcidae (one species) and Cosmetidae (29 species in 10 genera). Results showed a paraphyletic *Eucynortula* by the exclusion of all terminals of *Eucynortula* from the clade except the type species, *E. albipunctata*. Three genera were herein proposed as junior synonyms of *Eucynortula*: *Cynortula* Roewer, 1912; *Cynortoperna* Roewer, 1947 and *Cynortetta* Roewer, 1947. In addition, the following species were transferred to *Eucynortula* based on the diagnosis herein proposed: *E. albornata* **comb. nov**., *E. annulata* **comb. nov.**, *E. albipustulata* **comb. nov.**, *E. analis* **comb. nov.** e *E. areolata* **comb. nov**., *E. leucopyga* **comb. nov.**, E. *longipes* **comb. nov**., *E. punctatolineata* **comb. nov**., *E. punctitergum* **comb. nov.**; *E. pictipes* **comb. nov.** e *E. rugosa* **comb. nov.** The species *Cynortula cingulata* and *Cynortula brevipes* were considered junior synonyms of *E. albipunctata*. The species *E. alboirrorata* previously valid as *Eucynortula* presents the diagnostic characters, thus it was maintained. The remaining species of *Eucynortula*, *E. auropicta*, *E. metatarsalis, E. pentapunctata*, *E. bituberculata*, *E. lata*, *E. maculata*, *E. nannocornuta*, *E. puer*, *E. rugipes* and *E. ypsilon,* which do not present diagnostic characters of the genus were considered ***Incertae sedis*** because of evidence reviewed was inconclusive to determine their generic identity. Furthermore, the species *Eucynortula sexpunctata,* currently valid as a junior synonym of *E. nannocornuta*, was revalidated and considered ***Incertae sedis.*** The species of *Cynortula* whose identity was not clarified were considered ***Incertae sedis***.

The type species of *Eucynorta*, *E. quadrimaculata* was described and new information about dimorphic characters was given in order to expand the knowledge about its morphology and variation. *Cynorta liturata* was considered a junior synonym of *E. quadripustulata* and *Eucynortula multilineata* was transferred to *Eucynorta* based on genital and external morphology.

Finally, a new classification is proposed for the genus *Eucynortula* being represented by 13 species distributed in North of South America and Central America and is considered as belonging to the subfamily Cynortinae.

References

Acosta LE, Pérez-González, A. & A. L. Tourinho (2007) Methods for taxonomic study. In: Pinto-da- Rocha R, Machado G, Giribet G (Eds) Harvestmen: The Biology of Opiliones. Harvard University Press, Cambridge, Massachusetts, 494–510.

Banks, N. (1898) Some Mexican Phalangida. J. New York Entomol. Soc. 6(3):181-182.

Banks, N. (1909). Arachnida from Costa Rica. Proc. Acad. Nat. Sci. Philadelphia, 61(2): 194-234.

Benavides, L. R., Pinto-da-Rocha, R. & G. Giribet (2021) The phylogeny and Evolution of the Flashiest of the Armored Harvestmen (Arachnida: Opiliones). Syst. Biol. 70(4):645–659.

Bremer, K. (1994) Branch support and tree stability. Cladistics 10: 295–304.

Caporiacco, L. (1951) Studi sugli Aracnidi del Venezuela racolti dalla sezione di Biologia (Universitá Centrale del Venezuela). I parte: Scorpiones, Solifuga, Opiliones e Chernetes. Acta Biol. Venez., 1(1): 1-46.

Chamberlin, R. V. (1925) Diagnoses of new American Arachni- da. Bull. Mus. Comp. Zool. Harvard Coll., 67(4): 211-248.

Coronato-Ribeiro A. & R. Pinto-da-Rocha (2017) Taxonomic revision and cladistic analysis of the genus *Metalibitia* Roewer, 1912 (Opiliones, Cosmetidae, Cosmetinae). Zootaxa 4291: 201–242.

Damron, B. (2020) Phylogenetics and morphology evolution of the family Cosmetidae Koch, 1839 (Arachnida: Opiliones): the curious case of Cosmetidae. Unpublished D. Phil. Thesis, Instituto de Biociências, Universidade de São Paulo.

Damron, B., Pinto-da-Rocha, R. & S. J. Longhorn (2018) Description of a new species of *Eucynorta* (Opiliones, Cosmetidae) from Cortés, Honduras. Zootaxa 4450 (1): 125–134.

DaSilva, M. B. & P. Gnaspini (2009) A systematic revision of Goniosomatinae (Arachnida: Opiliones: Gonyleptidae), with a cladistic analysis and biogeographical notes. Invertebr. Syst., 23, 530–624.

Ferreira, C. P. & A. B. Kury (2010) A review of *Roquettea*, with description of three new Brazilian species and notes on *Gryne* (Opiliones, Cosmetidae, Discosomaticinae). Zool. Sci. 27: 697–708.

Friedrich, S. & T. Lehmann (2020). *Taito adrik*, a new harvestman species from the Area de Conservación Privada Panguana, Peruvian Amazonia (Opiliones: Laniatores: Cosmetidae). Zootaxa 4729: 105–115.

García A.F. & A. B. Kury (2017). Taxonomic revision of the Andean harvestman genus *Rhaucus* Simon, 1879 (Arachnida, Opiliones, Cosmetidae). Zootaxa 4338: 401–440.

Garwood, R. J, Sharma, P.P., Dunlop J. A. & G. Giribet (2014). A Paleozoic stem group to mite harvestmen revealed through integration of phylogenetics and development. Curr. Biol. 24: 1017– 1023.

Giribet, G. & A. B. Kury (2007) Chapter 3. Phylogeny and Biogeography. In: Pinto-da-Rocha, R., Machado, G. & Giribet, G. (Eds.), Harvestmen: the biology of the Opiliones. x + 597 pages. Harvard University Press, Cambridge and London, pp. 62–87.

Gnaspini, P. (1999). The use of morphometric characteristics for the recognition of species among Goniosomatinae harvestmen (Arachnida, Opiliones, Gonyleptidae). J. Arachnol. 27:129-134.

Goloboff, P. A. (1993). Estimating character weights during tree search. Cladistics 9: 83–91.

Goloboff, P., J. Farris & K. Nixon (2003) TNT: Tree Analysis Using New Technology. Program and Documentation, available at http//www.lillo.org.ar/phylogeny/tnt/

Goloboff, P., Farris, J. & K. Nixon (2008). TNT, a free program for phylogenetic analysis. Cladistics 24:774-786.

Goloboff, P. A., Carpenter, J. M., Arias, J. S. & D. R. Mirande (2008). Weighting against homoplasy improves phylogenetic analysis of morphological data sets. Cladistics 24, 1e16.

González-Sponga, M. A. (1992) Aracnidos de Venezuela. Opiliones Laniatores II. Familia Cosmetidae. Acad. Cienc. Fisicas, Matematicas y Naturales. 432 pp. Caracas.

Goodnight, J. C. & M. L. Goodnight (1942a) New and little known Phalangida from Mexico. Am. Mus. Novit., 1163: 1- 16.

Goodnight, J. C. & M. L. Goodnight (1942b) Phalangids from Central America and the West Indies. Am. Mus. Novit., 1184: 1-23.

Goodnight, J. C. & M. L. Goodnight (1942c) Phalangids from Central America and the West Indies. Am. Mus. Novit., 1184: 1-23.

Goodnight, J. C. & M. L. Goodnight (1942d) Phalangida from Barro Colorado Island, Canal Zone. Am. Mus. Novit., 1198: 1-18.

Goodnight, Clarence J. & Marie L. Goodnight (1946) Additional studies of the phalangid fauna of Mexico. 1. Am. Mus. Novit., New York, 1310: 1-17.

Goodnight, J. C. & M. L. Goodnight (1947a) Studies on the phalangid fauna of Central America. Am. Mus. Novit., 1340: 1-21.

Goodnight, J. C. & M. L. Goodnight (1947b) Studies of the phalangid fauna of Trinidad. Am. Mus. Novit., 1351: 1-13.

Goodnight, J. C. & M. L. Goodnight (1953a) Taxonomic recognition of variation in Opiliones. Syst. Zool., 2(4): 173-179.

Goodnight, J. C. & M. L. Goodnight (1953b) The opilionid fauna of Chiapas, Mexico, and adjacent areas. Am. Mus. Novit., 1610: 1-81.

Goodnight, J. C. & M. L. Goodnight (1977) Laniatores of the Yucatán Peninsula and Belize (British Honduras). Assoc. Mex. Cave St. Bull., 6: 139-166.

Hadði, J. (1935) Ein eigentumlicher neuer Hölen-Opilionid aus Nord-Amerika, Cladonychium corii g.n. sp. n. Biol. Gener., 11: 49-72.

Kästner, A. (1937) Chelicerata. 7. Ordnung der Arachnida: Opiliones Sundeval = Weberknechte. Pp. 300-393. In: W. Kukenthal & T. Krumbach, editors, Handbuch der Zoologie. Vol. 3, no. 2. Walter de Gruyter & Co., Berlin & Leipzig.

Kitching, I., Williams, D., Forey, P.L. & C. J. Humphries (1998). Cladistics: The Theory and Practice of Parsimony Analysis. Oxford University Press, Oxford.

Kury A. B. (2003) Annotated catalogue of the Laniatores of the New World (Arachnida, Opiliones). Rev Iber Aracnol, vol esp mon 1: 5–337.

Kury, A. B. (2013) Order Opiliones Sundevall, 1833. In: Zhang, Z.-Q. (Ed.) Animal Biodiversity: An Outline of Higher-level Classification and Survey of Taxonomic Richness (Addenda 2013). Zootaxa, 3703(1), 27–33.

Kury, A. B. (2016) A classification of the penial microsetae of Gonyleptoidea (Opiliones: Laniatores). Zootaxa 4179: 144–150.

Kury, A. B & J. C. Cokendolpher (2000) Opiliones. In: Llorente B., J. E., E. González S. & N. Papavero (eds.). Biodiversidad, Taxonomía y Biogeografía de Artópodos de México: Hacia una Síntesis de su conocimiento. Volumen II. pp. 137-157.

Kury, A. B. & V. G.D. Orrico (2006) A new species of *Lacronia* Strand, 1942 from the highlands of Rio de Janeiro (Opiliones, Gonyleptidae, Pachylinae). Rev Iber Aracnol, 13, 147–153.

Kury, A. B. & R. Pinto-da-Rocha (2007) Cosmetidae Koch, 1839. In: Pinto-da-Rocha, R., Machado, G. & Giribet, G. (Eds.), Harvestmen: the biology of the Opiliones. x + 597 pages. Harvard University Press, Cambridge and London, pp. 182–185.

Kury, A. B., Villarreal, O. & C. S. Costa (2007) Redescription of the type species of *Cynorta* Koch, 1839 (Arachnida, Opiliones, Cosmetidae). J. Arachnol. 35: 325–333.

Kury, A. B. & C. M. Barros (2014). A new genus and eight new species of Amazonian cosmetines (Opiliones, Laniatores, Cosmetidae). Zool. Stud. 53: 1–46.

Kury, A. B. & O. Villarreal (2015) The prickly blade mapped: establishing homologies and a chaetotaxy for macrosetae of penis ventral plate in Gonyleptoidea (Arachnida, Opiliones, Laniatores). Zool. J. Linn. Soc. 174 (1), 1–46.

Kury, A.B. & A. F. García (2016) On the identity of *Flirtea* C. L. Koch, 1839 (Arachnida, Opiliones, Cosmetidae). Zootaxa 4093: 231–247.

Kury A.B. & M. Medrano (2016) Review of terminology for the outline of dorsal scutum in Laniatores (Arachnida, Opiliones). Zootaxa 4097: 130–134.

Kury, A. B. & M. Medrano (2018) A whiter shade of pale: anchoring the name *Paecilaema* C. L. Koch, 1839 onto a neotype (Opiliones, Cosmetidae). Zootaxa 4521: 191–219.

Kury, A. B, Mendes, A. C, Cardoso, L, Kury, M.S., de Granado, A. A. & G. Giribet (2021) World catalogue of Opiliones. WCO-Lite v.2.3.0. Available at: https://wcolite. com/.

Machado, G., Pinto-da-Rocha, R. & G. Giribet (2007) What are harvestmen? In: Harvestmen: The Biology of Opiliones (Ed. by R. Pinto-da-Rocha, G. Machado & G. Giribet), pp. 1–13. Massachusetts: Harvard University Press.

Maddison, W. P.; Donoghue, M. J. & D. R. Maddison (1984) Outgroup analysis and parsimony. Syst. Zool., 33(1): 83-103.

Maddison, W. P. & D. R. Maddison (2021) Mesquite: a modular system for evolutionary analysis. Version 3.70 http://www.mesquiteproject.org

Martens J. (1976) Genitalmorphologie, System und Phylogenie der Weberknechte (Arachnida: Opiliones). Ent. Germanica 3: 51–68.

Martens J. (1986) Die Grossgliederung der Opiliones und die Evolution der Ordnung (Arachnida). In: Barrientos JA, ed. Actas del X Congreso Internacional de Aracnologia (Jaca, Spain, September 1986). Vol. 1, x + 428 pp. Barcelona: Juvenil, 289– 310.

Martens J. (1988) Fissiphalliidae, a new family of South American laniatorean harvestmen (Arachnida: Opiliones). Z. Zool. Syst. Evolutionsforsch., 26: 114– 127.

Medrano M. & A. B. Kury (2018) Relationships and cladistic analysis of *Roquettea* with description of two new species and notes about evolution of stylus in Cosmetidae (Opiliones, Grassatores). Invert. Syst. 32: 1206–1233.

Medrano M., Ázara, L. N. & A. B. Kury (2019) Rediscovery of *Eulibitia ectroxantha* (Mello-Leitão, 1941) and synonymy of *Sphalerocynorta* Mello-Leitão, 1933 (Opiliones: Cosmetidae). C. R. Biologies 342, 345–350.

Medrano, M., Kury, A. B. & A. Cruz Mendes (2021) Morphology-based cladistics splinters the century-old dichotomy of the pied harvestmen (Arachnida: Gonyleptoidea: Cosmetidae). Zool. J. Linn. Soc., 2021, XX, 1–88.

Medrano M, Kury AB & L. Martinez (2021) A fresh look at Cosmetus Perty, 1833 (Opiliones: Cosmetidae), with new synonymies and description of two new species from Colombia. Zootaxa. 5004 (3): 430–446.

Medrano M. & A. B. Kury (2017) Taxonomic revision of the Andean genus *Eulibitia* Roewer, 1912 (Arachnida, Opiliones, Cosmetidae), with the description of five new species. Europ. J. Taxon. 357: 1–55.

Medrano M, Villarreal O. & A. B. Kury (2019) Review of *Neocynorta* Roewer, 1915 with two new generic synonymies (Opiliones, Gonyleptoidea, Cosmetidae). J. Nat. Hist.53: 677–704.

Medrano M. & A. B. Kury (2016) Characterization of *Platymessa* with redescription of the type species and a new generic synonymy (Arachnida, Opiliones, Cosmetidae). Zootaxa 4085: 52–62.

Medrano M, Ázara L. N. & A. B. Kury (2020) The short-legged Andean cosmetids revisited: the genus *Libitia* Simon, 1879 with description of two new species (Opiliones, Cosmetidae). Europ. J. Taxon.634: 1–25.

Mello-Leitão, C. F. de (1926). Notas sobre Opiliones Laniatores sulamericanos. Revta Mus. paul., 14: 327-383.

Mello-Leitão, C. F. de (1932) Opiliões do Brasil. Revta Mus. paul., 17(2): 1-505.

Mello-Leitão, C. F. de (1933) Notas sobre os opiliões do Brasil descritos na obra póstuma de Sörensen: "Descriptiones Laniatorum". Bolm. Mus. nac. Rio de J., 9(2): 99-114.

Mello-Leitão, C. F. de (1935) Algumas notas sobre os Laniato- res. Archos Mus. nac. Rio de J., 36(4): 87-116.

Mello-Leitão, C. F. de (1943) Arácnidos recogidos en el Ecuador y en el Perú por la señora H. E. Frizell Don. Comun. zool. Mus. Hist. nat. Montevideo, 5(1): 1-8.

Nixon, K. C. (1999) Winclada (BETA) ver. 0.9.9. Available at http://www.cladistics.com

Pickard-Cambridge, F. O. (1905) Order Opiliones [2nd part]. In: Godman F.D, Salvin O, eds. Biologia Centrali-Americana. Vol. 2. Arachnida. Araneidea and Opiliones. London: Porter/ Dulau & Co., 561–610, pls 53, 54.

Pinto-da-Rocha, R. (1997) Systematic review of the Neotropical family Stygnidae (Opiliones, Laniatores, Gonyleptoidea). Arq Zool S Paulo 33: 163–342.

Pinto-da-Rocha, R. & M. R. Hara (2011) Redescription of *Platygyndes* Roewer, 1943, a false Gonyleptidae, (Arachnida, Opiliones, Cosmetidae). ZooKeys 143: 1–12.

Pinto-da-Rocha, R. & H. Yamaguti (2013) *Paecilaema batman*, a new species of Brazilian troglophilous harvestman that exhibits a remarkable color patches variation. Zoologia, 30, 441–446.

Pinto-da-Rocha, R., Bragagnolo, C., Marques, F. P. L. & M. Antunes Junior (2014) Phylogeny of harvestmen Family Gonyleptidae inferred from a multilocus approach (Arachnida: Opiliones). Cladistics, 30: 519–539.

Proud, D. N. & V. R. Townsend Jr. (2019) Unusual penis morphology among cosmetid harvestmen (Arachnida: Opiliones) from Mesoamerica. Zoomorphology 138:233–247.

Ringuelet, R. A. (1959). Los aracnidos argentinos del orden Opiliones. Revta. Mus. argent. Cienc. natur., 5(2): 125-439

Roach, B., T. Eisner & J. Meinwald (1980) Defensive substances of opilionids. J. Chem. Ecol., 6(2): 511-516.

Rodriguez, A. L., Townsend Jr, V.R., Johnson, M. B. & T. B. White (2014) Interspecific variation in the microanatomy of cosmetid harvestmen (Arachnida, Opiliones, Laniatores). J. of Morph., 275, 1386–1405.

Roewer, C. F. (1912) Die Familie der Cosmetiden Opiliones-Laniatores. Archiv für Naturgeschichte, 78 (10), 1–122.

Roewer, C. F. (1917) 52 neue Opilioniden. Arch. Naturgesch., 82A (2): 90-158.

Roewer C. F. (1923) Die Weberknechte der Erde. Systematische Bearbeitung der bisher bekannten Opiliones. Jena: Gustav Fischer.

Roewer, C. F. (1925) Opilioniden aus Süd-Amerika. Boll. Mus. Zool. Anat. Comp. Torino, NS, 34(40): 1-34.

Roewer, C. F. (1927) Weitere Weberknechte II. (2. Ergänzung der Weberknechte der Erde, 1923). Abh. Nat. ver. Bremen, 26(3): 527-632.

Roewer, C. F. (1931) Drei neue Cosmetiden aus Mexiko. Zool. Anz., 95(9-10): 247-250.

Roewer, C. F. (1933) Ergebnisse der Österreichischen biologischen Costa-Rica-Expedition 1930. IV. Teil. Opilioniden. Ann. naturh. Mus. Wien, 46: 276-295, 16 figs.

Roewer, C. F. (1952) Neotropische Arachnida Arthrogastra zumeist aus Peru. Senckenbergiana, 33(1-3): 37-58.

Roewer, C. F. (1947) Diagnosen neuer Gattungen und Arten der Opiliones - Laniatores. Weitere Weberknechte XII. Cosmetidae. Senckenbergiana, 28(1-3): 1-58.

Roewer, C. F. (1952) Neotropische Arachnida Arthrogastra zumeist aus Peru. Senckenbergiana, 33(1-3): 37-58.

Roewer, C. F. (1954) Spinnentiere aus El Salvador, I. (Arachnoi- dea: Pedipalpi, Solifuga, Opiliones-Laniatores). Senckenberg. biol., 35: 57-73, 10 figs.

Roewer, C. F. (1956) Arachnida arthrogastra aus Peru II. Senckenberg. biol., 37(5-6): 429-445.

Roewer, C. F. (1957) Arachnida arthrogastra aus Peru III. Senc- kenberg. biol., 38(1/2): 67-94.

Simon, E. (1879) Essai d'une classification des Opiliones Mecos- tethi. Remarques synonymiques et descriptions d'espèces nouvelles. Ann. Soc. Ent. Belgique, 22: 183-241.

Soares, B. A. M. (1944) Notas sobre opiliões da coleção do Museu Nacional do Rio de Janeiro. Papéis Avulsos Dep. Zool. Est. S. Paulo, 6(15): 163-180.

Soares, B. A. M. (1945) Opiliões da coleção do Museu Nacional do Rio de Janeiro. Archos Zool. Est. S. Paulo 4(9): 341- 394.

Soares, B. A. M. (1946) Opiliões do Departamento de Zoologia. Revisão dos opiliões existentes atualmente no Departamento de Zoologia da

Secretaria da Agricultura do Estado de São Paulo. Archos Zool. Est. S. Paulo, 4(13): 485-534.

Soares, H. E. M. (1945) Contribuição ao estudo dos opiliões da coleção "Otto Schubart". Papéis Depto Zool. Est. S. Paulo, 5(23): 209-219.

Soares, H. E. M. (1970) Novas espécies de opiliões da Região Amazônica (Opiliones, Cosmetidae, Gonyleptidae, Phalangiidae, Stygnidae). Revta. bras. Biol., 30(3): 323-338.

Sørensen, W. (1932) Descriptiones Laniatorum (Arachnidorum Opilionum Subordinis). (Opus posthumum recognovit et edidit Kai L. Henriksen). Kongl. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd. (= Mem Acad. roy. Sci. Let. Danemark), København, ser. 9, 3(4): 197-422.

Strong, E. E. & D. Lipscomb (1999) Character Coding and Inapplicable data. Cladistics 15, 363–371.

Townsend Junior, V., Viquez, C., Vanzandt, P. & D. Proud. (2010) Key to the species of Cosmetidae (Arachnida, Opiliones) of Central America, with notes on penis morphology and sexual dimorphisms. Zootaxa, 2414, 1–26.

Weidner, H. (1959) Die entomologischen Sammlungen des Zoologischen Staatsinstitut und Zoologischen Museum Hamburg. I. Teil. Pararthropoda und Chelicerata I. Mitt. Hamburg. Zool. Mus. Inst., 57: 89-142.

Figures

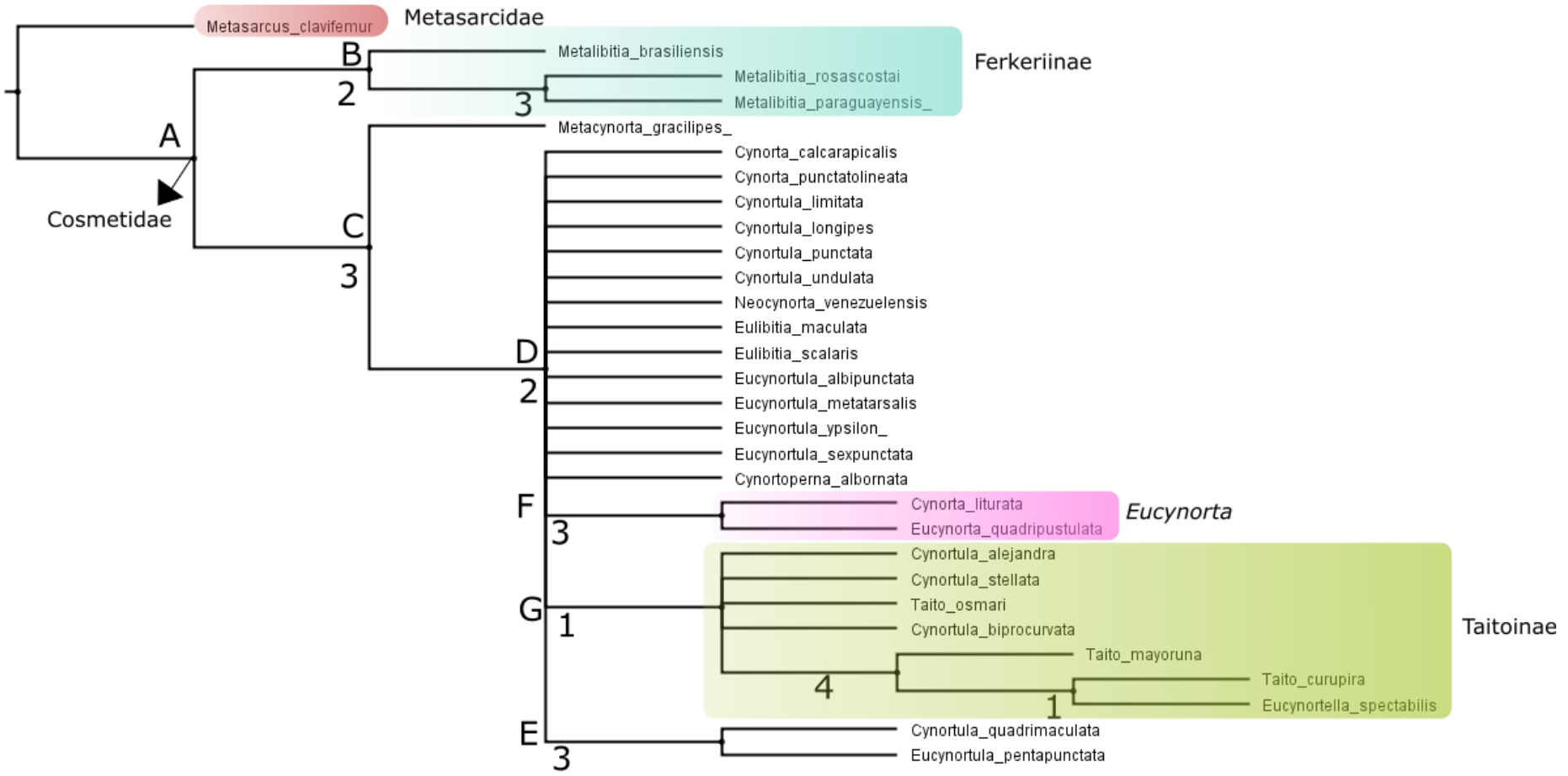

Metasarcus_clavifemur
Metasarcidae
B
2
Metalibitia_brasiliensis
Metalibitia_rosascostai
3
Metalibitia_paraguayensis_
Ferkeriinae
A
Cosmetidae
C
3
Metacynorta_gracilipes_
Cynorta_calcarapicalis
Cynorta_punctatolineata
Cynortula_limitata
Cynortula_longipes
Cynortula_punctata
Cynortula_undulata
Neocynorta_venezuelensis
Eulibitia_maculata
D
Eulibitia_scalaris
2
Eucynortula_albipunctata
Eucynortula_metatarsalis
Eucynortula_ypsilon_
Eucynortula_sexpunctata
Cynortoperna_albornata
F
3
Cynorta_liturata
Eucynorta_quadripustulata
Eucynorta
G
1
Cynortula_alejandra
Cynortula_stellata
Taito_osmari
Cynortula_biprocurvata
Taito_mayoruna
4
Taito_curupira
1
Eucynortella_spectabilis
Taitoinae
E
3
Cynortula_quadrimaculata
Eucynortula_pentapunctata

Figure 1. Phylogenetic hypothesis for *Eucynortula*. Strict consensus built from twelve equally parsimonious trees constructed with equal weighting (EW) (L= 560 steps). Numbers below branches represent Bremer support values (BS). Letters next to each node naming clades. Colored squares showing groups recovered as herein interpreted.

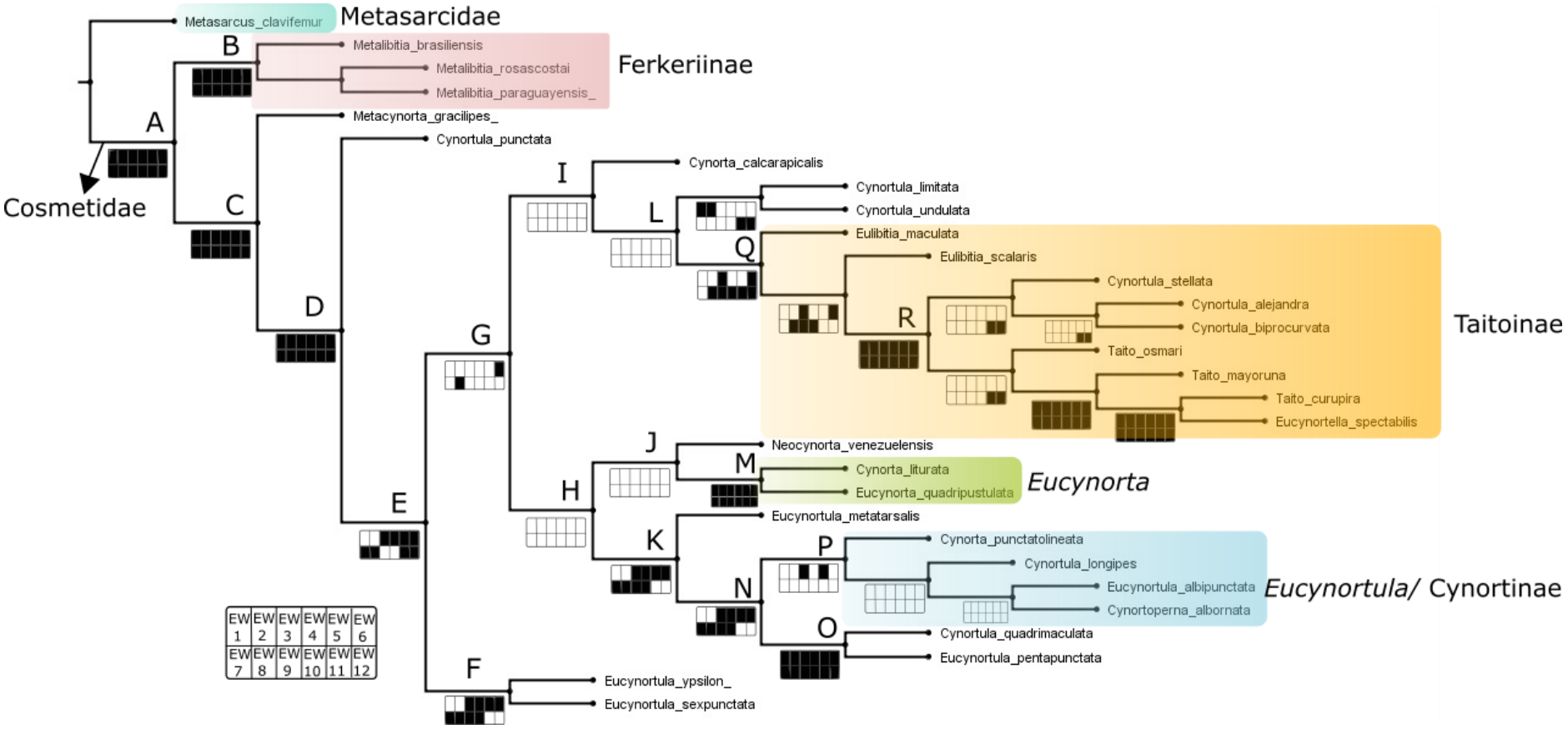


Figure 2. Phylogenetic hypothesis for *Eucynortula.* Tree built under Implied weighting (IW) (K= 4.765625; fit:40.49875). Boxes showing the subfamilies recovered. Pink: *Metalibitia*; Yellow: *Taito*, *Eulibitia* and *Eucynortella*; Green: *Eucynorta*;

Blue: *Eucynortula*. Letters above each node naming clades. Navajo rugs showing clades recovered in the 12 most parsimonious trees obtained under EW.

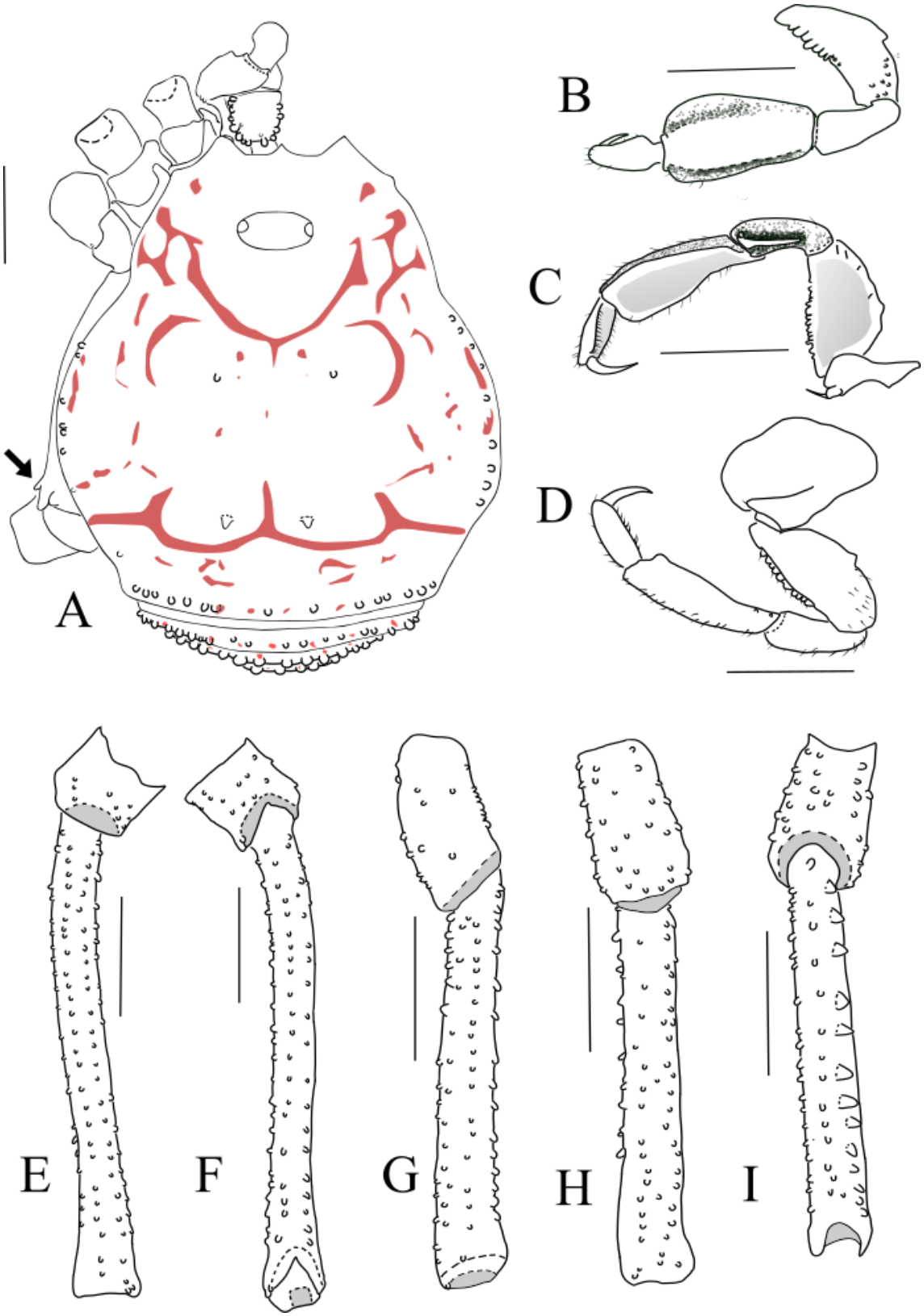


Figure 3. *Eucynortula albipunctata*. **A-I**: male (SMF-RI 425/32), A. Habitus, dorsal view; **B-D**: Right pedipalp, B. Dorsal view, C. Mesal view, D. Ectal view; **E-F**: Fe IV. E. Dorsal view. F. Ventral view; **G-I**: Tibia IV,

G. Retrolateral view, H. Dorsal view, I. Ventral view. Arrow showing the dorso-apical apophysis of Cx IV. Scale bars: 1mm.

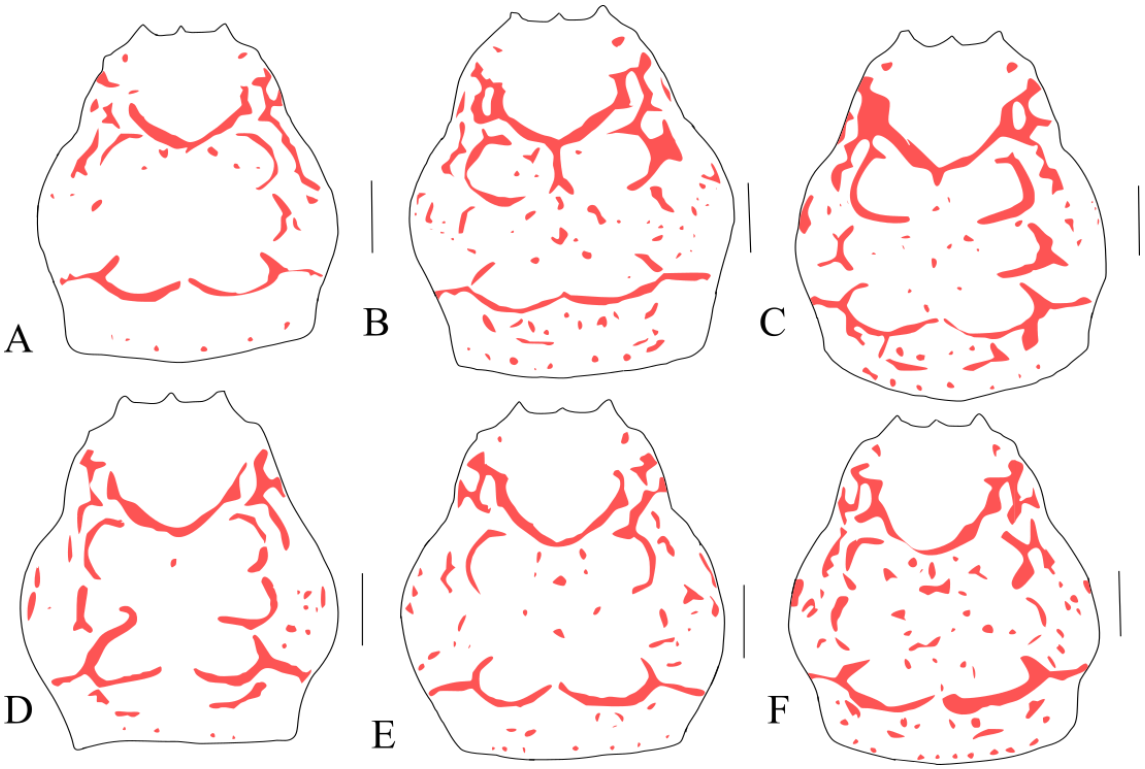


Figure 4. *Eucynortula albipunctata* (SMF-RI 425/32), **A-F.** Dorsal scutum, Variation of dorsal pattern of color. Scale bars: 1mm.

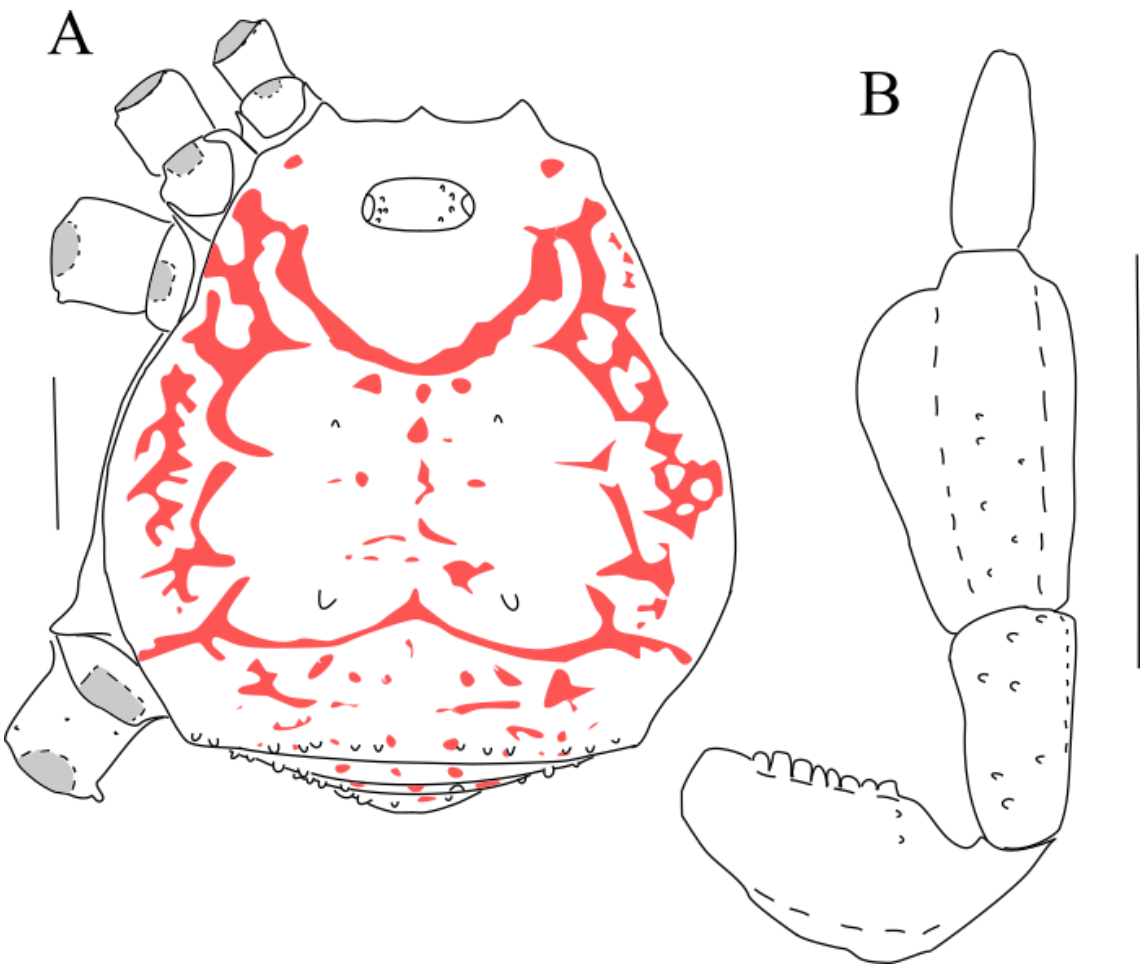


Figure 5. *Eucynortula albornata* **comb. nov**., **A-B**: Male holotype (SMF-RII/2986-32), A. Habitus, dorsal view, B. Left pedipalp, dorsal view. Scale bars: 1mm.

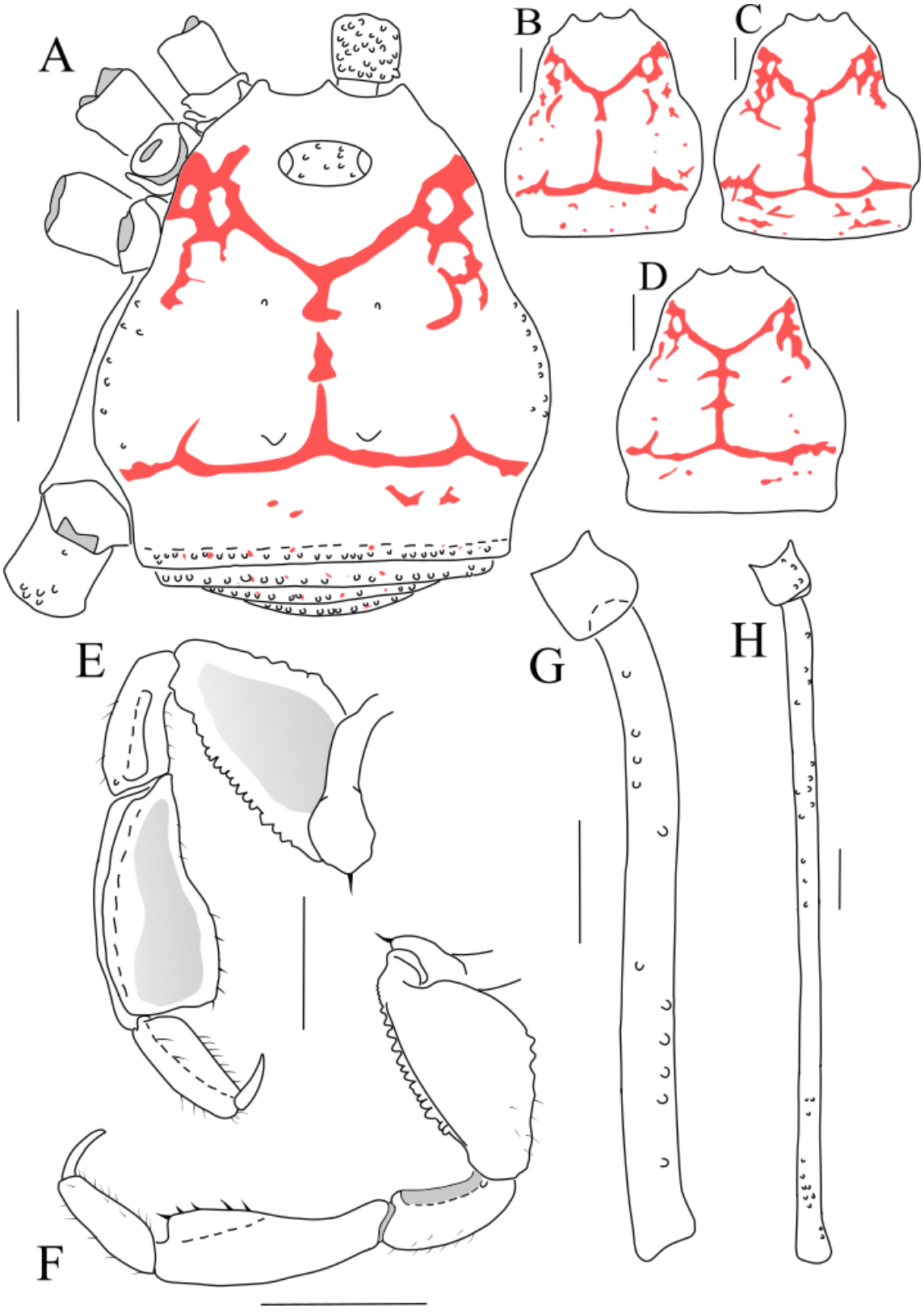


Figure 6. *Eucynortula longipes* **comb. nov.**, **A-H**: (SMF-2994), A. Male, habitus in dorsal view; **B-D**: Dorsal scutum, variation of color pattern; **E-F**: Male right pedipalp, E. Mesal view, F. Ectal view; **G-H**: Right leg IV, G.

Female, trochanter and femur, H. Male trochanter and femur. Scale bars: 1mm.

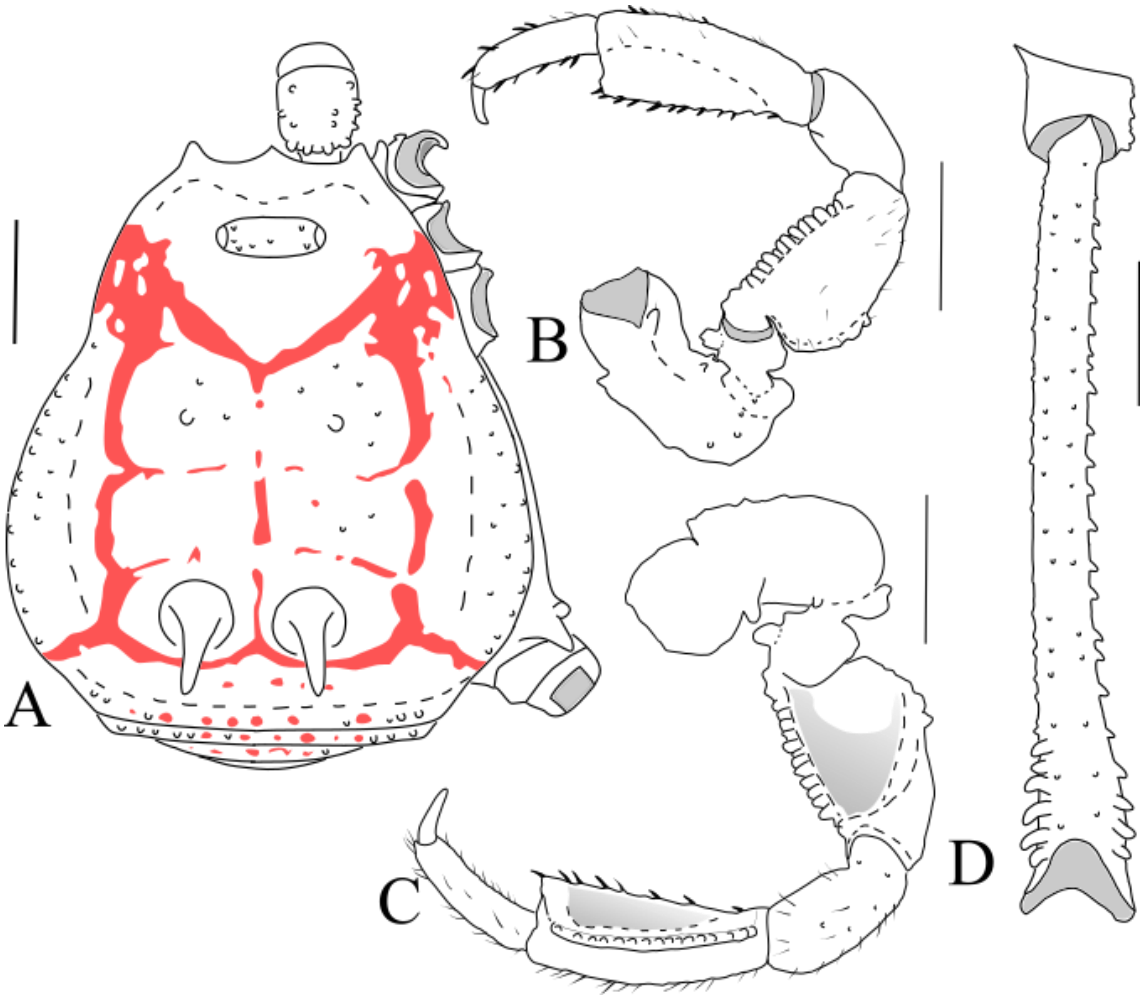


Figure 7. *Eucynortula punctatolineata* **comb. nov**., **A-D**: Male holotype (SMF-RII/1310). A. Habitus, dorsal view, B. Left pedipalp, ectal view, C. Same, mesal view, D. Leg IV, Tro and Fe in ventral view. Scale bars: 1mm.

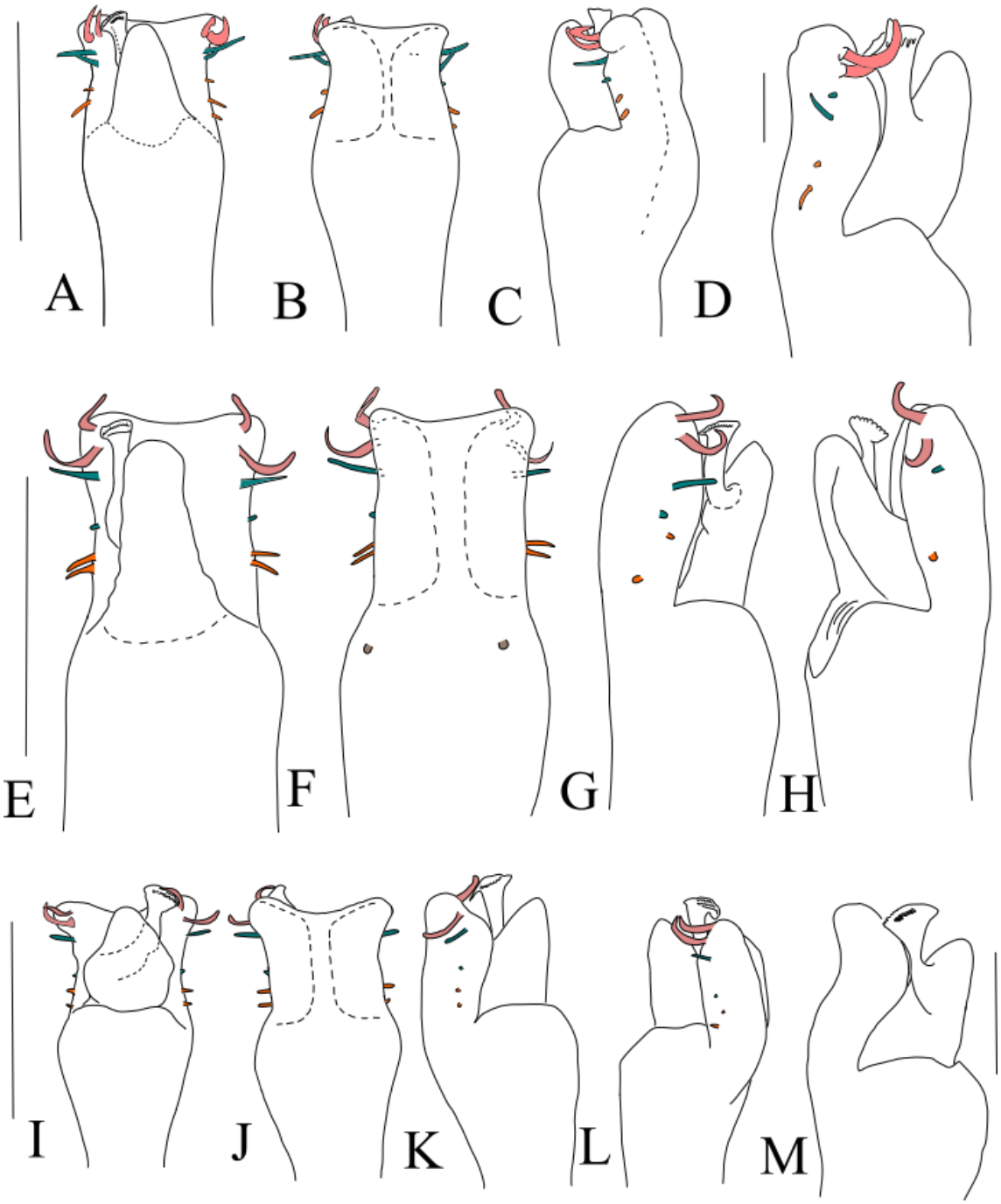


Figure 8. Penis of *Eucynortula* spp. **A-D**: *Eucynortula albipunctata* (SMF-RI 425/32), A. Dorsal view, B. ventral view, C-D. Lateral view; **E-H**: *Eucynortula punctatolineata* **comb. nov.** (SMF-1310), E. Dorsal view, F. Ventral view, G. Lateral view, H. Lateral view. **I-L**: *Eucynortula longipes* **comb. nov.** (SMF-2994), I. Dorsal view, J. Ventral view, K-M. Lateral view. Scale bars: 0.05mm.

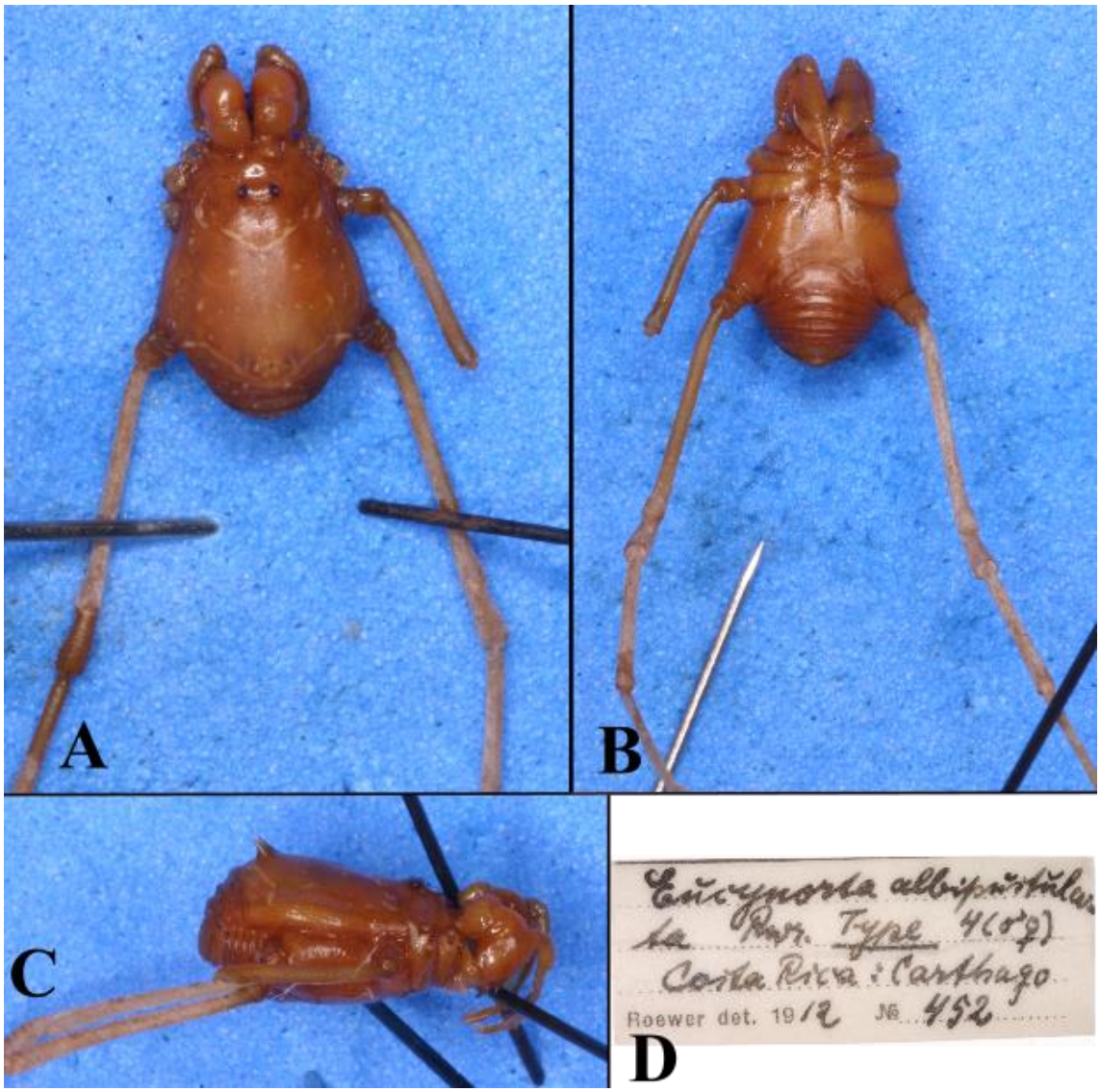


Figure 9. *Eucynortula albipustulata* **comb. nov**., **A-C:** Male holotype (SMF-452), A. Dorsal view, B. Ventral view, C. Lateral view; **D**. Label of material at SMF collection. Photos A-D by: Ricardo Pinto-da-Rocha.

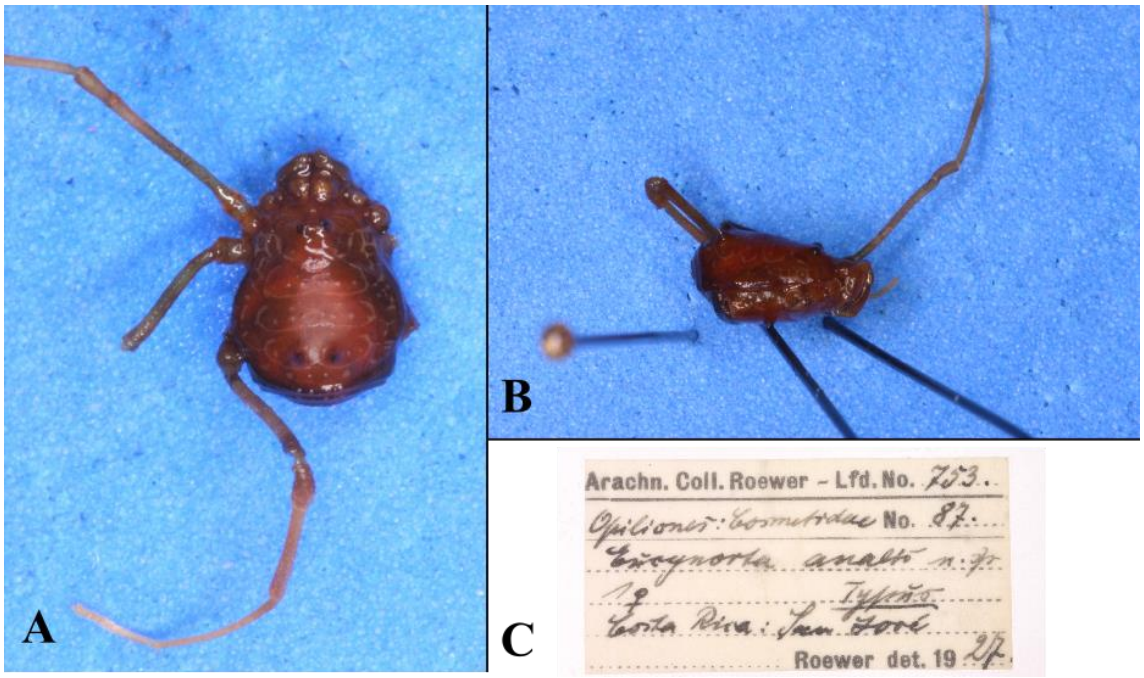


Figure 10. *Eucynortula analis* **comb. nov**., **A-B:** Female holotype (SMF-753), A. Dorsal view, B. Lateral view; **C.** Label of material at SMF collection. Photos A-C by: Ricardo Pinto-da-Rocha.

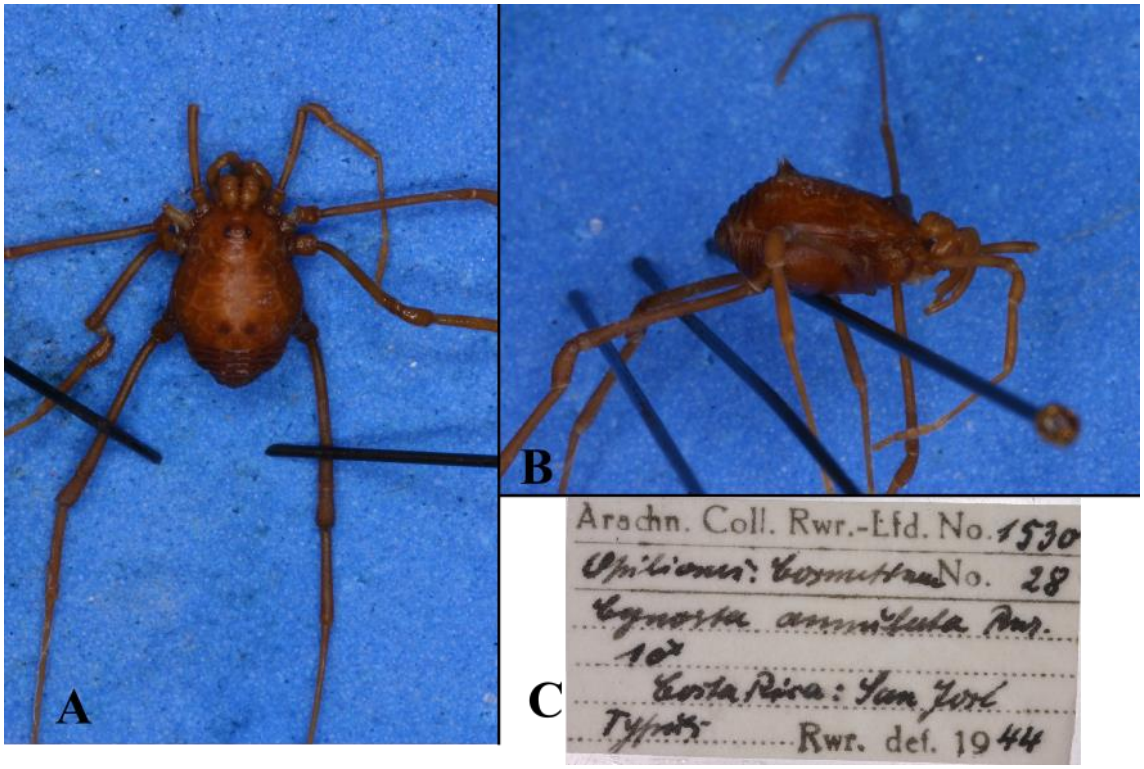


Figure 11. *Eucynortula annulata* **comb. nov**. **A-B:** Male holotype (SMF-1530), A. Dorsal view, B. Lateral view; **C.** Label of material at SMF collection. Photos A-C by: Ricardo Pinto-da-Rocha.

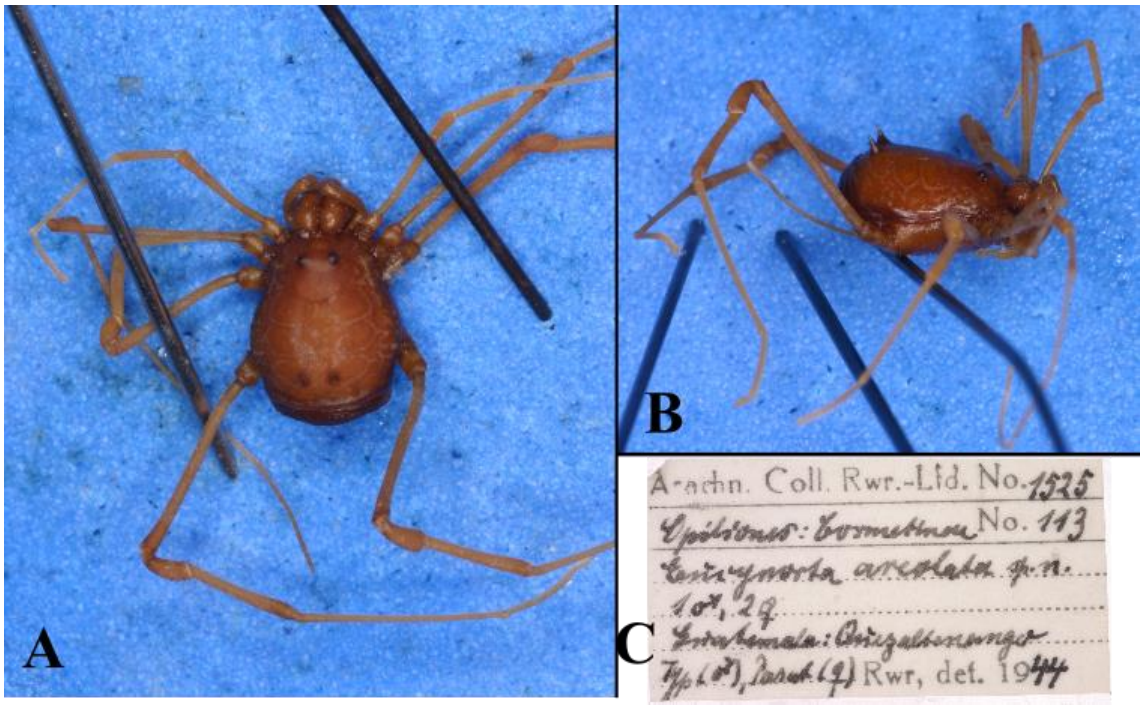


Figure 12. *Eucynortula areolata* **comb. nov**. **A-B:** Male holotype (SMF-1525), A. Dorsal view, B. Lateral view; **C.** Label of material at SMF collection. Photos A-C by: Ricardo Pinto-da-Rocha.

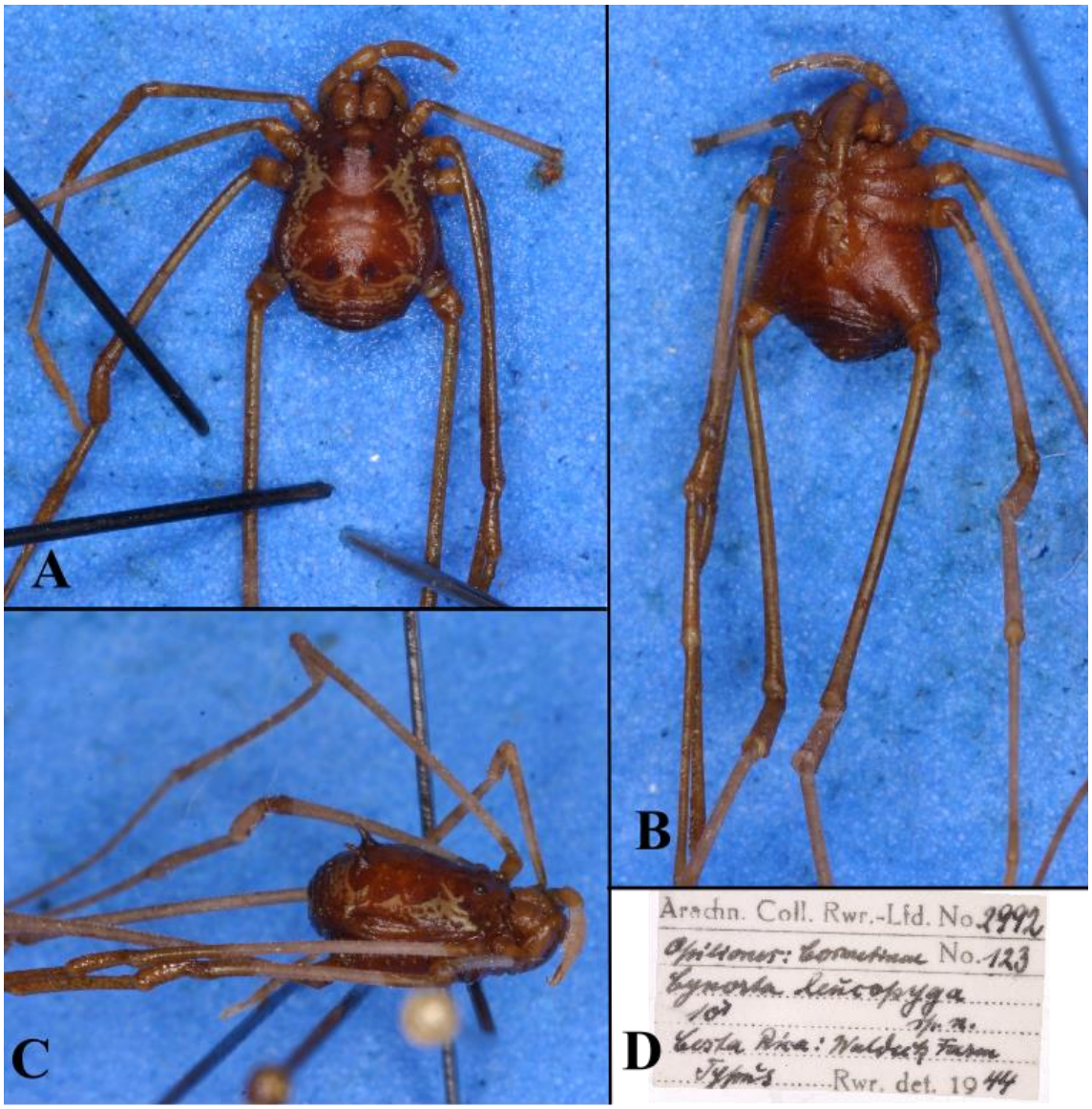


Figure 13. *Eucynortula leucopyga* **comb. nov**. **A-C:** Male holotype (SMF-2992), A. Dorsal view, B. Ventral view; C. Lateral view; **D.** Label of material at SMF collection. Photos A-D by: Ricardo Pinto-da-Rocha.

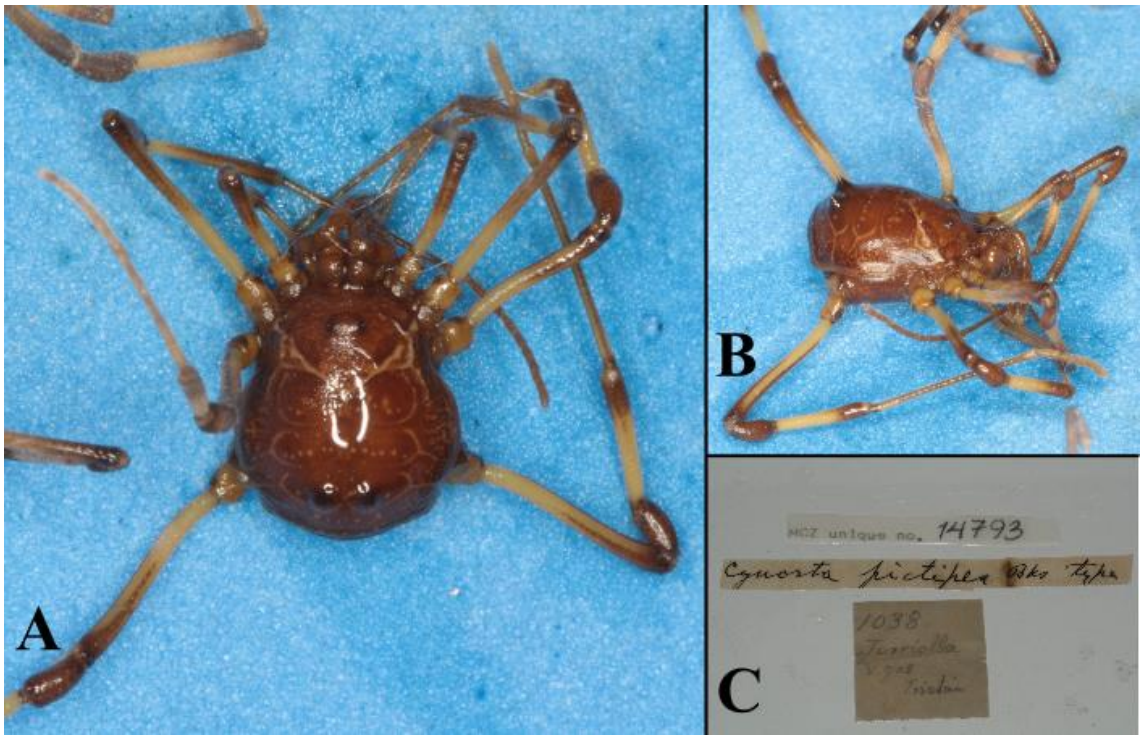


Figure 14. *Eucynortula pictipes* **comb. nov**. **A-B:** Male holotype (MCZ-14793), A. Dorsal view, B. Lateral view; **C.** Label of material at MCZ collection. Photos A-C by: Ricardo Pinto-da-Rocha.

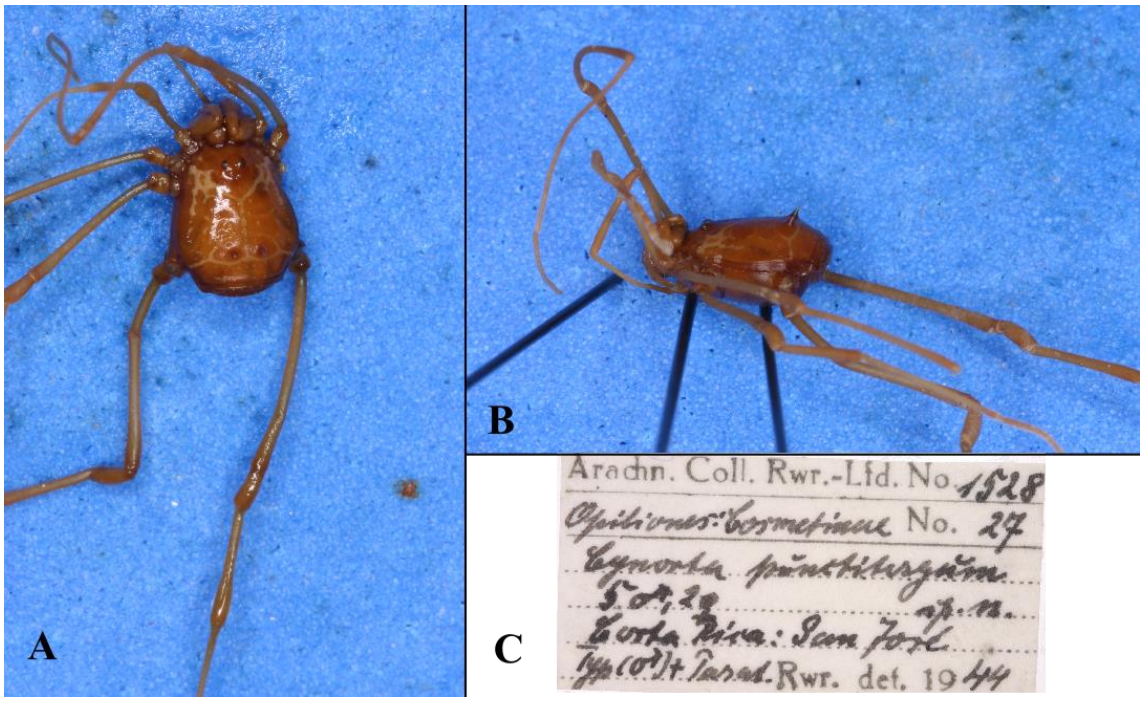


Figure 15. *Eucynortula punctiterga* **comb. nov**. **A-B:** Male holotype (SMF-1528), A. Dorsal view, B. Lateral view; **C.** Label of material at SMF collection. Photos A-C by: Ricardo Pinto-da-Rocha.

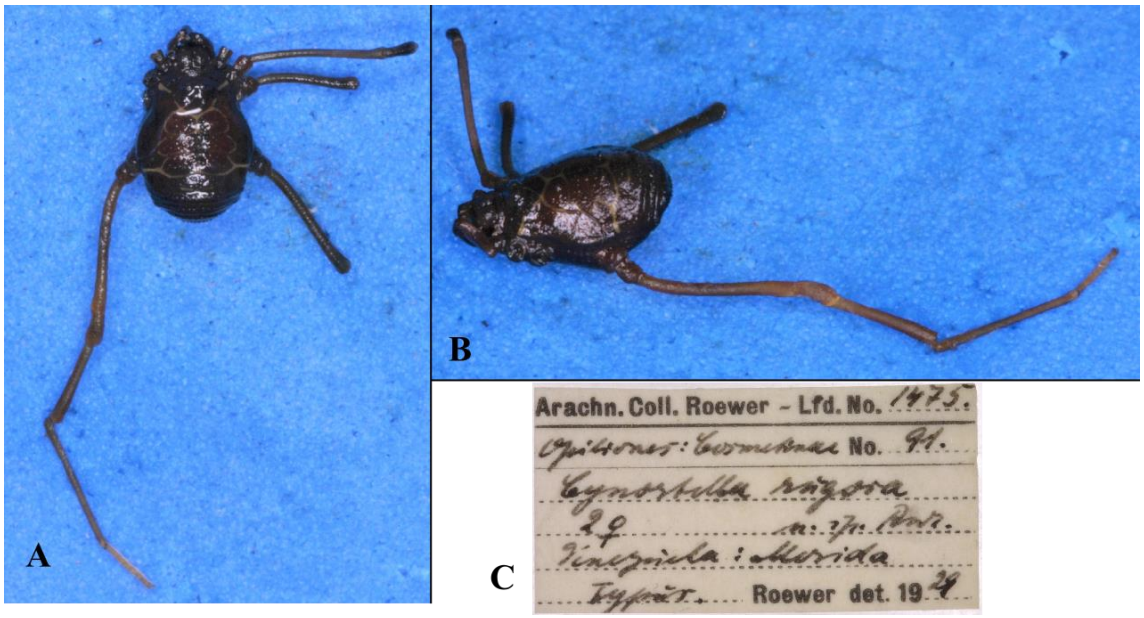


Figure 16. *Eucynortula rugosa* **comb. nov**. **A-B:** Female holotype (SMF-1475), A. Dorsal view, B. Lateral view; **C.** Label of material at SMF collection. Photos A-C by: Ricardo Pinto-da-Rocha.

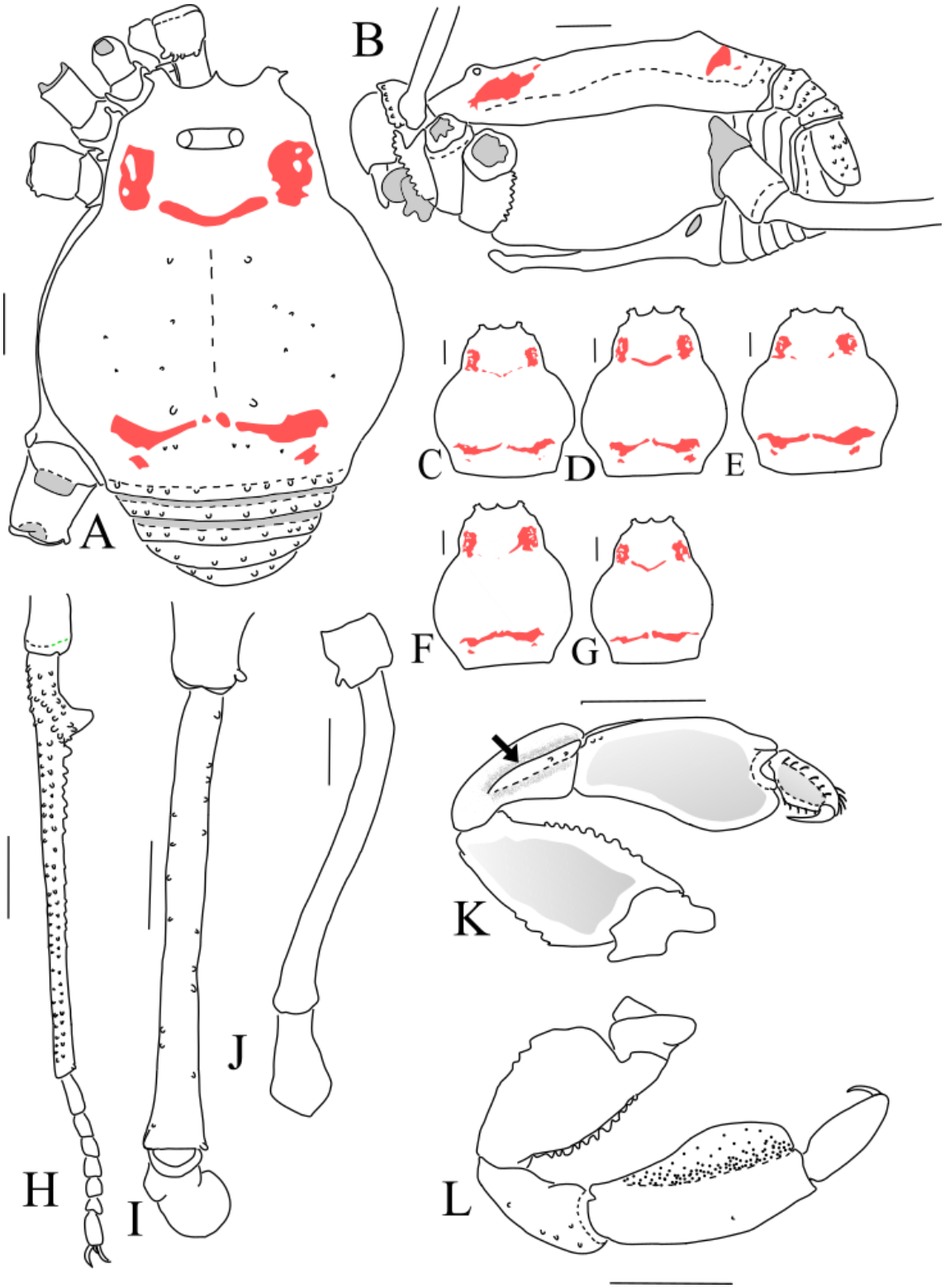


Figure 17. *Eucynortula metatarsalis Incertae sedis*, **A-L**: Paratypes (SMF-RI 432/32), **A-B**. Male paratype, habitus A. Dorsal view, B. Lateral view; **C-G**. Dorsal scutum, variation of pattern of color; **H-I**: Male, left leg IV, H. Metatarsus, dorsal view, I. Fe IV, dorsal view; **J**. Male Fe III, dorsal view;

K-L: Male, right pedipalp, K. Mesal view, L. Ectal view. Arrow showing the mesal projection of patella. Scale bars: 1mm.

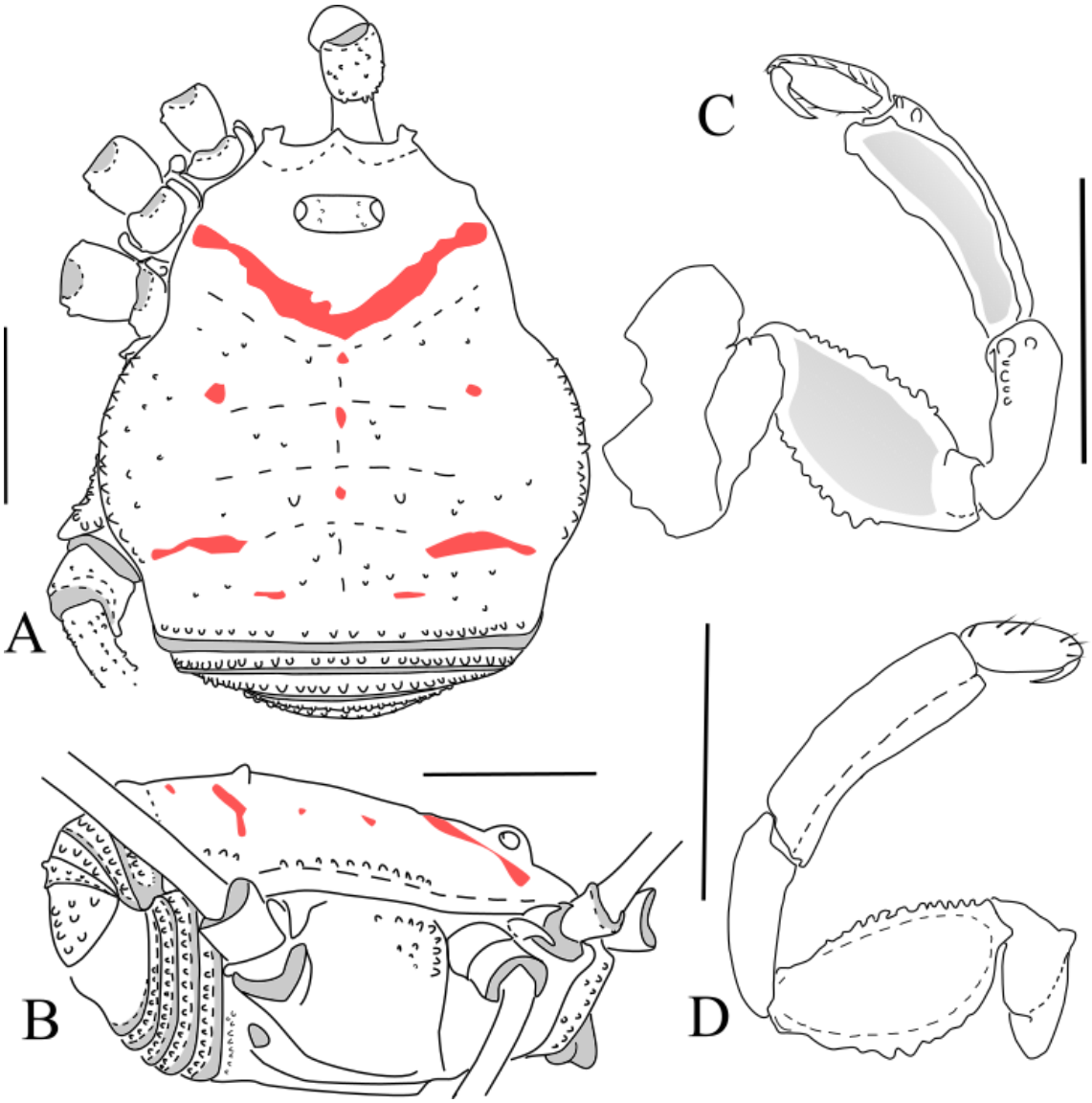


Figure 18. *Eucynortula pentapunctata Incertae sedis* **A-D**: Male holotype (SMF-RII/5861), **A-B**. Habitus, A. Dorsal view, B. Lateral view; **C-D**. Right pedipalp, C. Mesal view, D. Ectal view. Scale bars: 1mm.

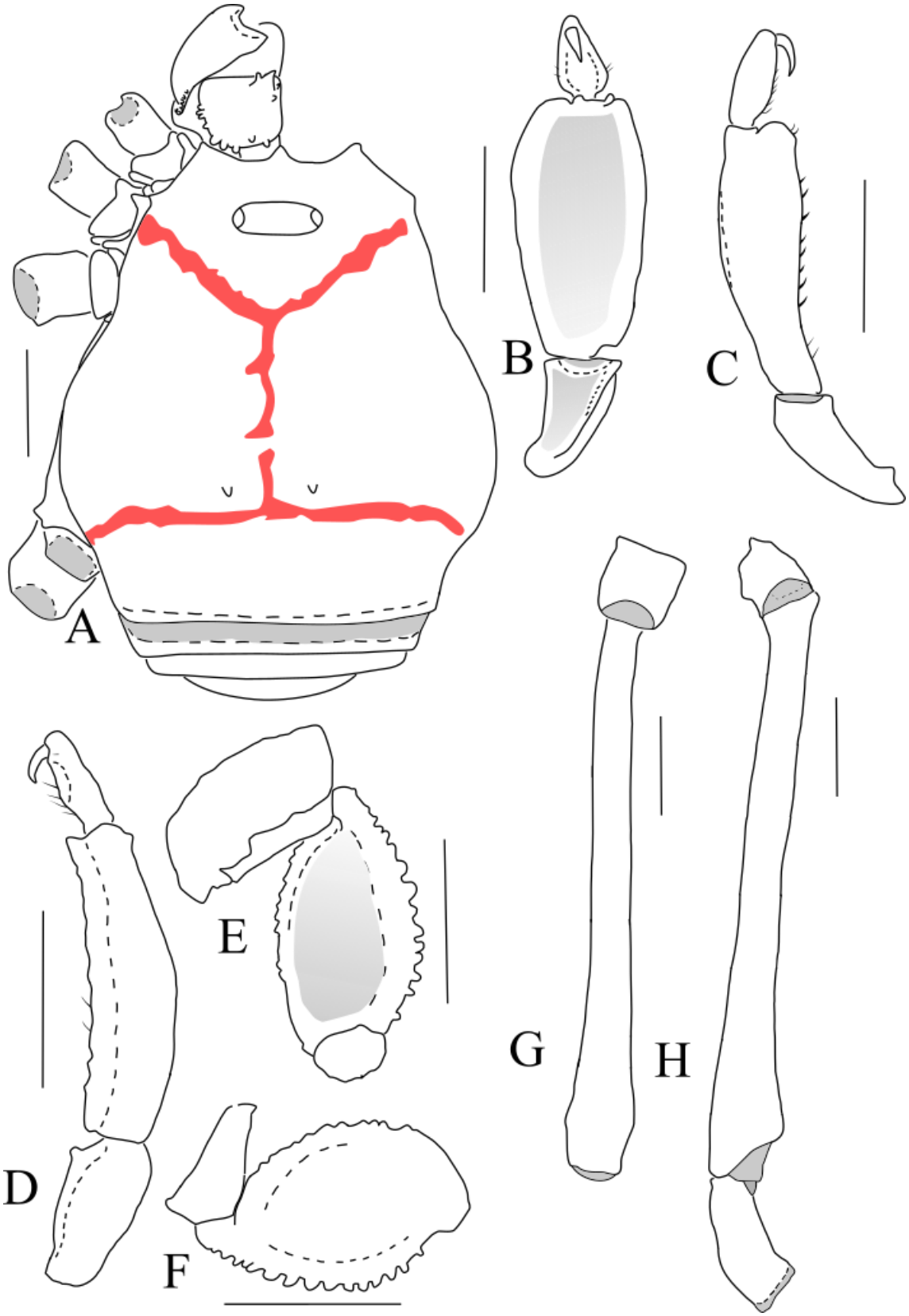


Figure 19. *Eucynortula ypsilon Incertae sedis*, **A-H**: Male paratype (SMF RII 109/69-32), A. Habitus, dorsal view; **B-F**: Right pedipalp, B. Patela, tibia and tarsus in ventral view, C. Same, ectal view, D. Same, mesal view. E.

Trochanter and femur, mesal view, F. Same, ectal view; **G-H**: Left leg IV, G. Trochanter and femur, dorsal view, H. Trochanter, femur and patella, retrolateral view. Scale bars: 1mm.

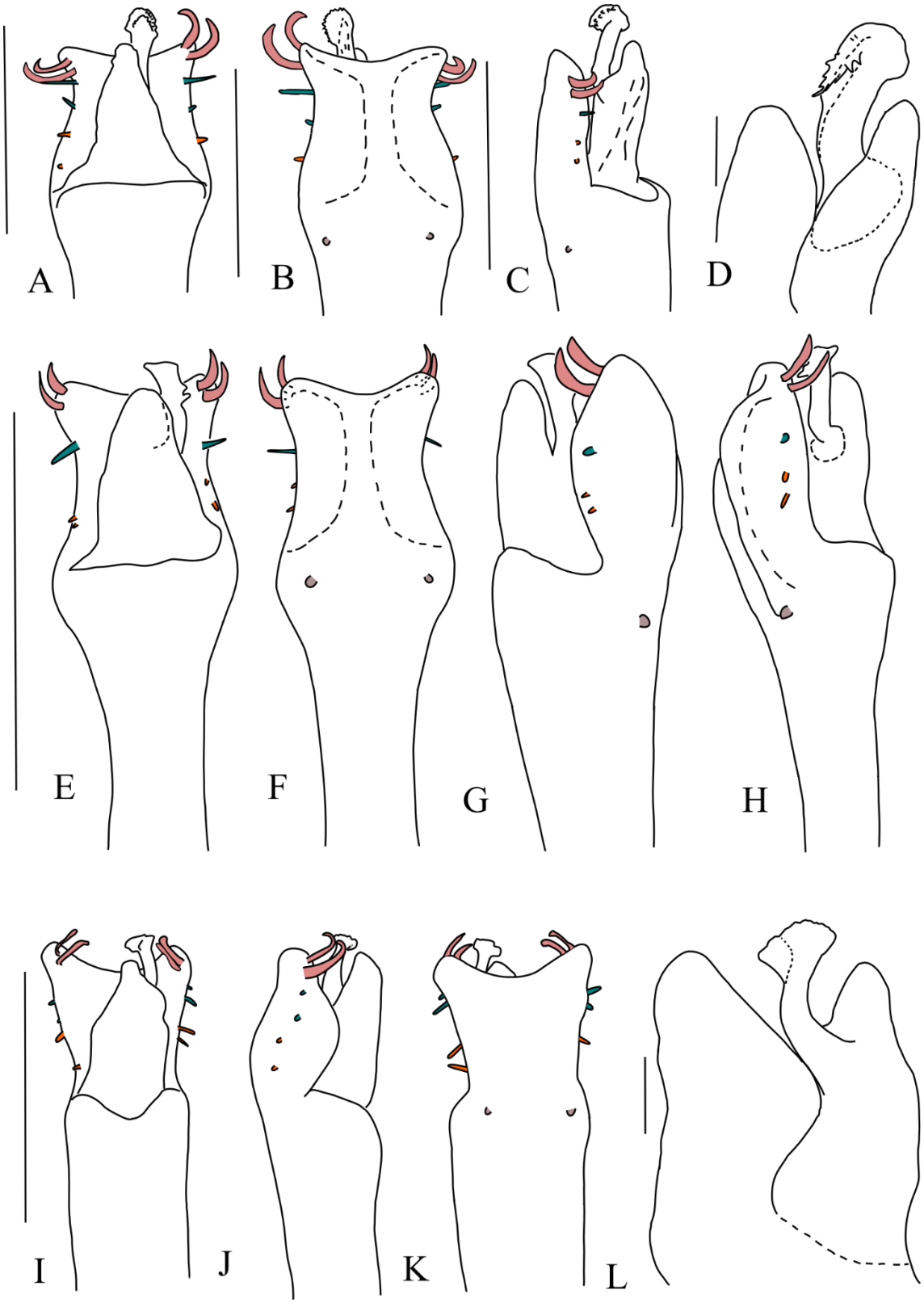


Figure 20. Penis of *Eucynortula* spp. Incertae sedis. **A-D**. *E. metatarsalis Incertae sedis* (SMF-RI 432/32), A. Dorsal view, B. Ventral view, C. Lateral view, D. Lateral view, detail of wattle; **E-H.** *E. pentapunctata Incertae sedis* (SMF-RII/5861), E. Dorsal view, F. Ventral view, G-H. Lateral view; **I-L.** *E. ypsilon Incertae sedis* (SMF RII 109/69-32), I. Dorsal view, J. Lateral view, K. Ventral view, L. Lateral view, detail of wattle. Scale bars: 0,05.

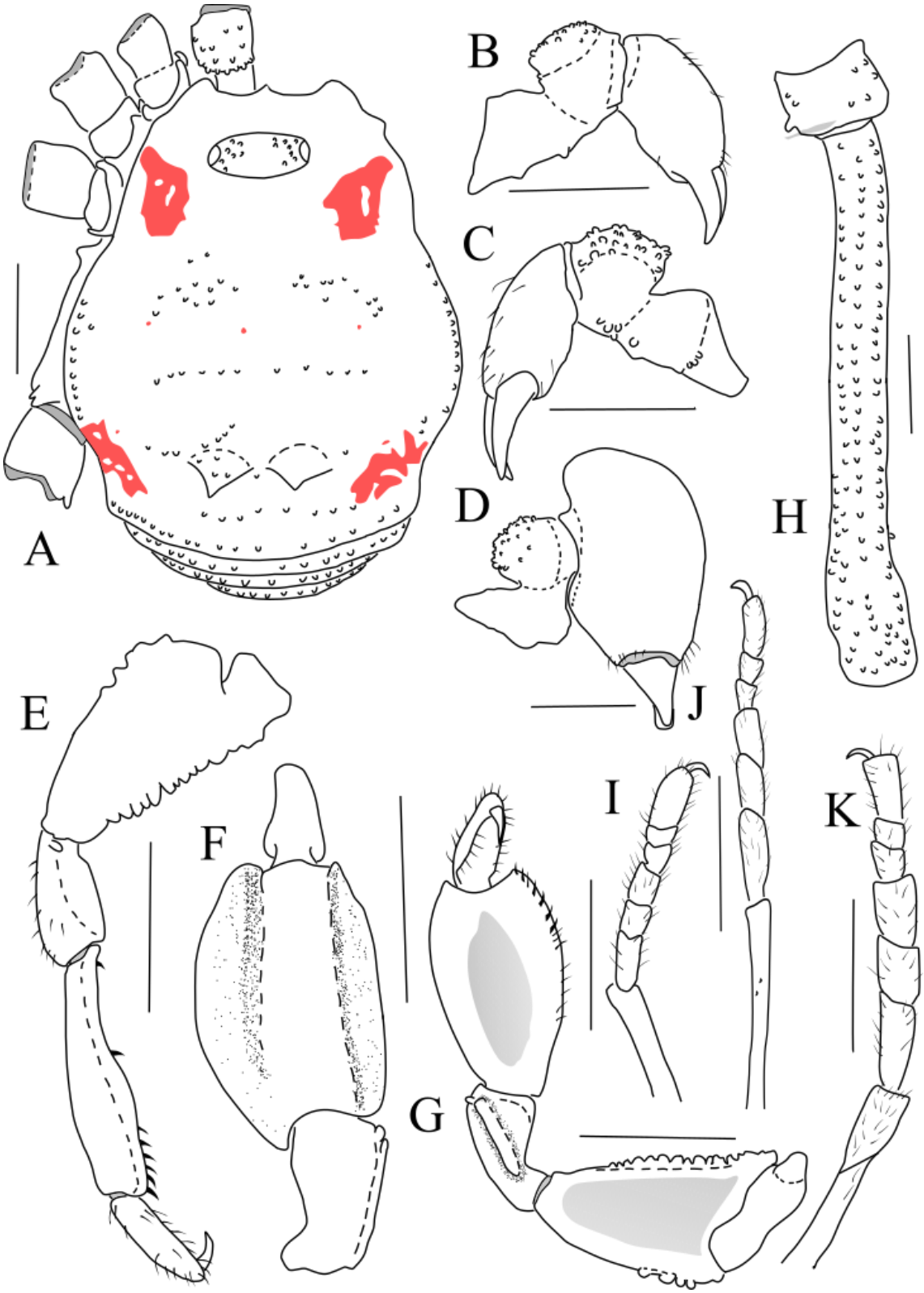


Figure 21. *Eucynorta quadripustulata*, **A-H**: (SMF 547), A. Male α, Habitus dorsal, B. Male β, right chelicera, mesal view, C. Female, left chelicera, mesal view, D. Male α, right chelicera, ectal view; **E-G**: Male, left pedipalp. E. Ectal view, F. Patella, femur and tarsus, dorsal view, G. Mesal view, H.

Male, trochanter and femur IV, dorsal view; **I-K:** Distal segments of leg I, I. Female, tarsus (ICN-AO-1389), J. Male β, tarsus (ICN-AO-1389), K. Male α, tarsus (ICN-AO-1388). Scale bars: 1mm.

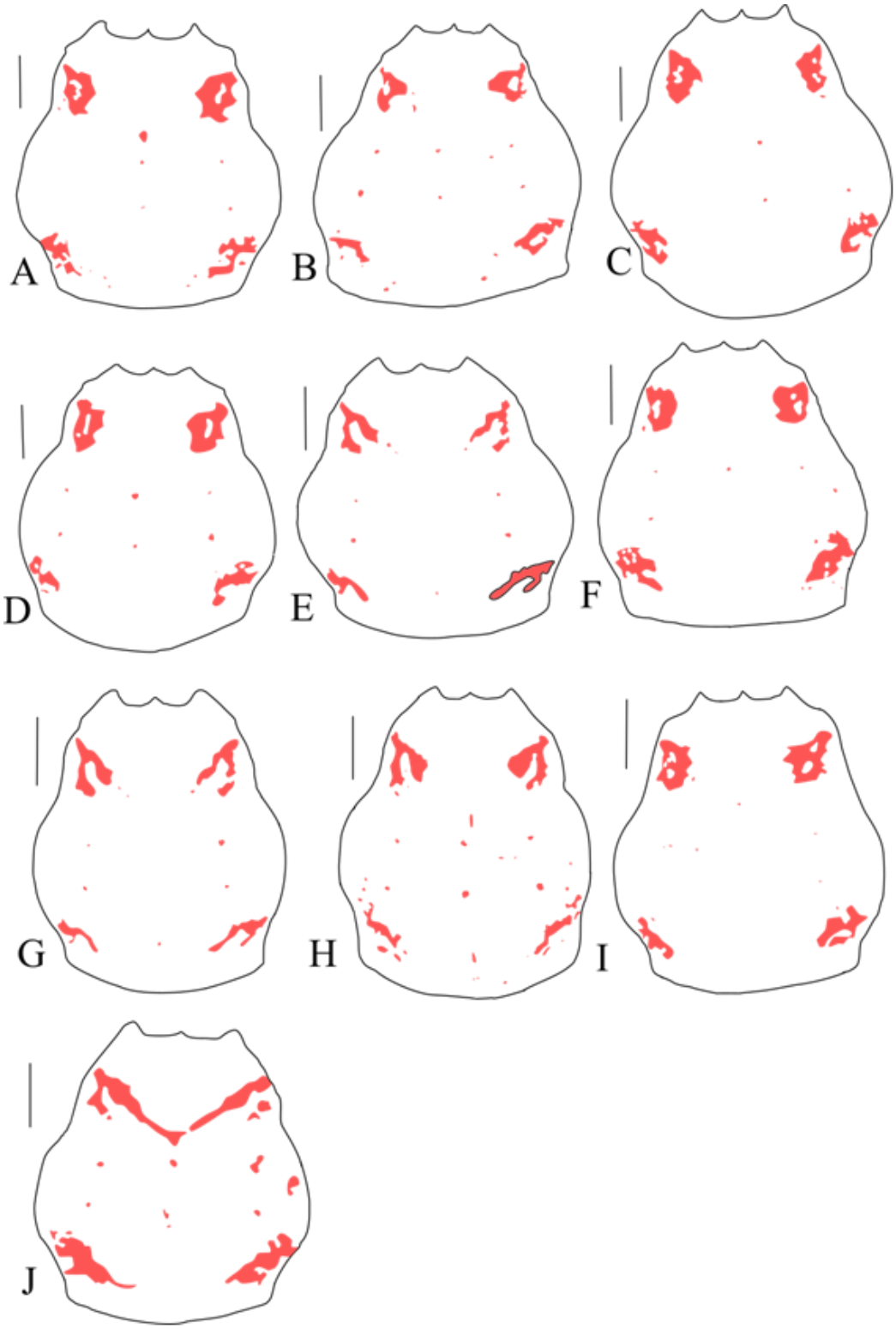


Figure 22. *Eucynorta quadripustulata*. **A-J:** Dorsal scutum, Variation of color pattern. Scale bars: 1mm.

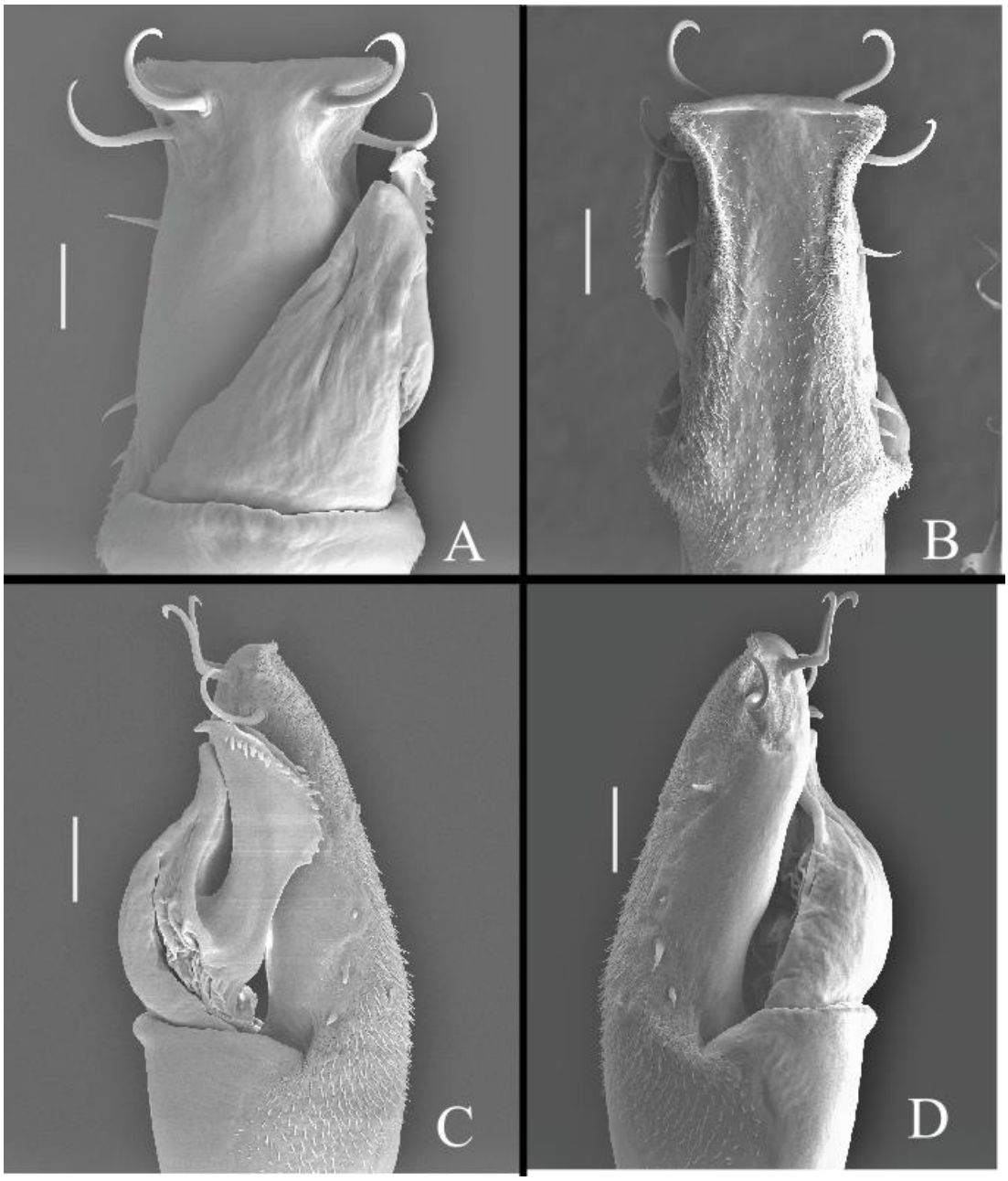


Figure 23. Penis of *Eucynorta quadripustulata* (ICN-AO-1388), A. Dorsal view, B. Ventral view, C-D. Lateral view. Scale bars: 0.05mm.

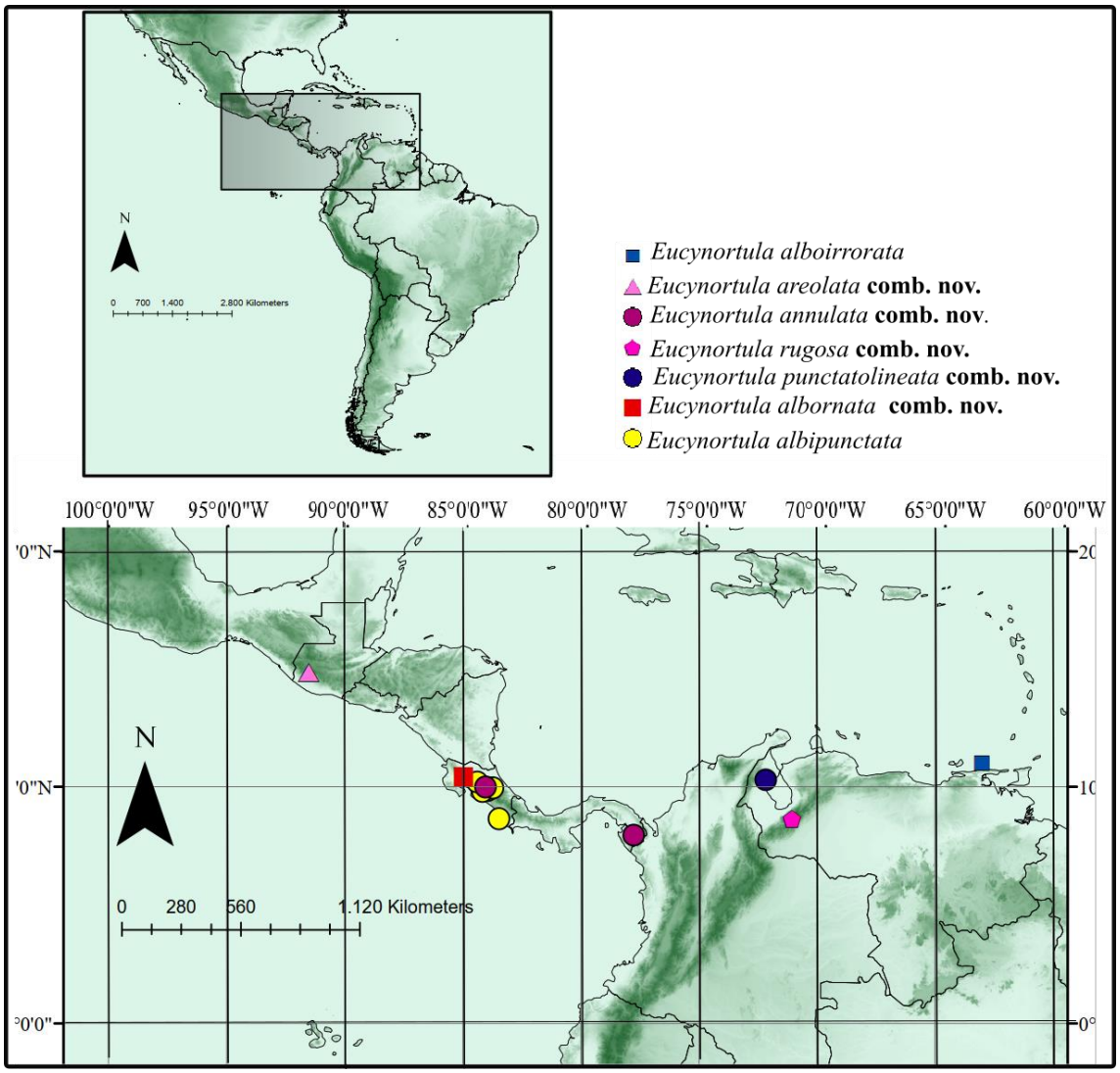


Figure 24. Distribution records of *Eucynortula* spp. Inset: location of the sector represented.

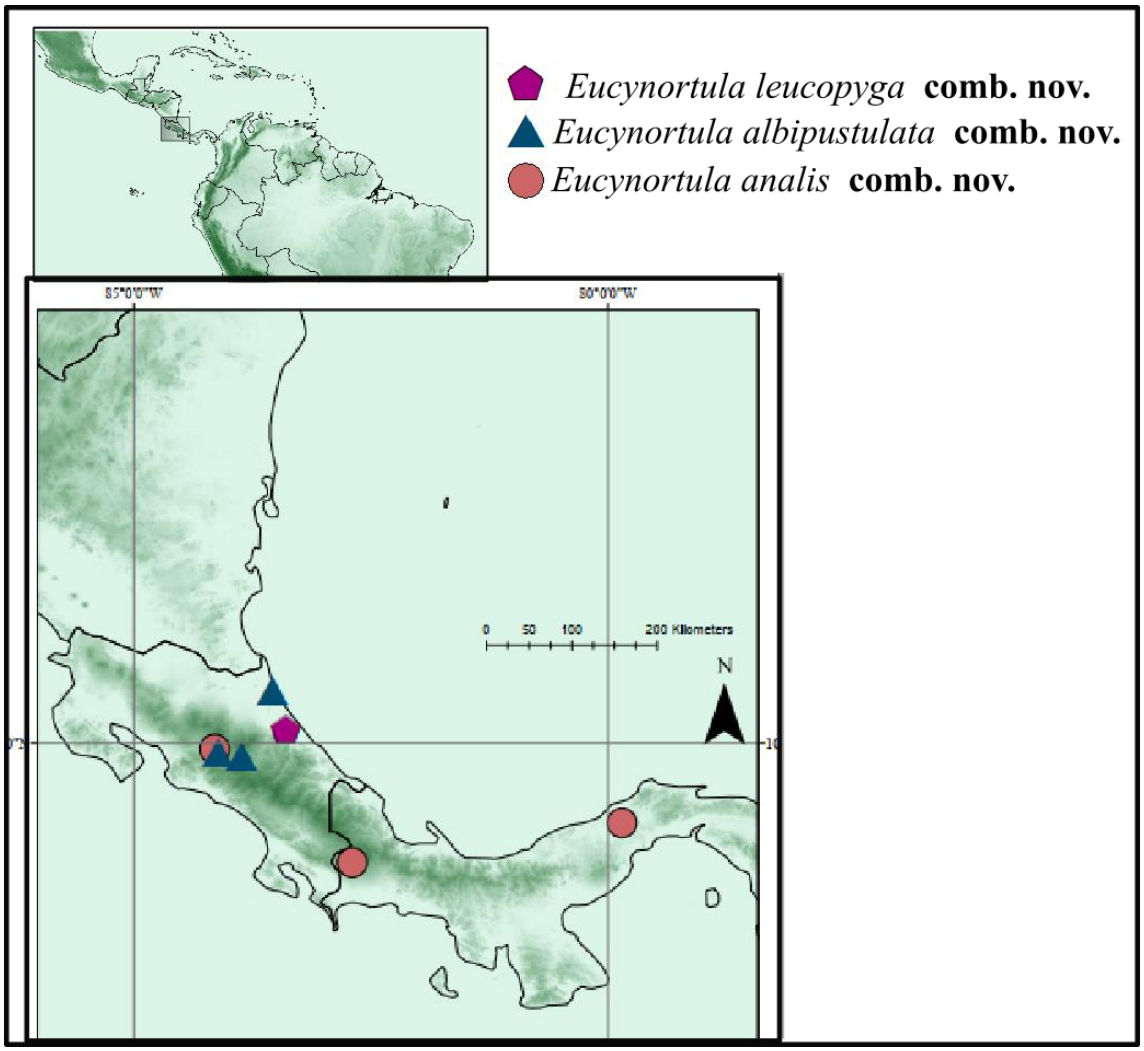


Figure 25. Distribution records of *Eucynortula* spp. Inset: location of the sector represented.

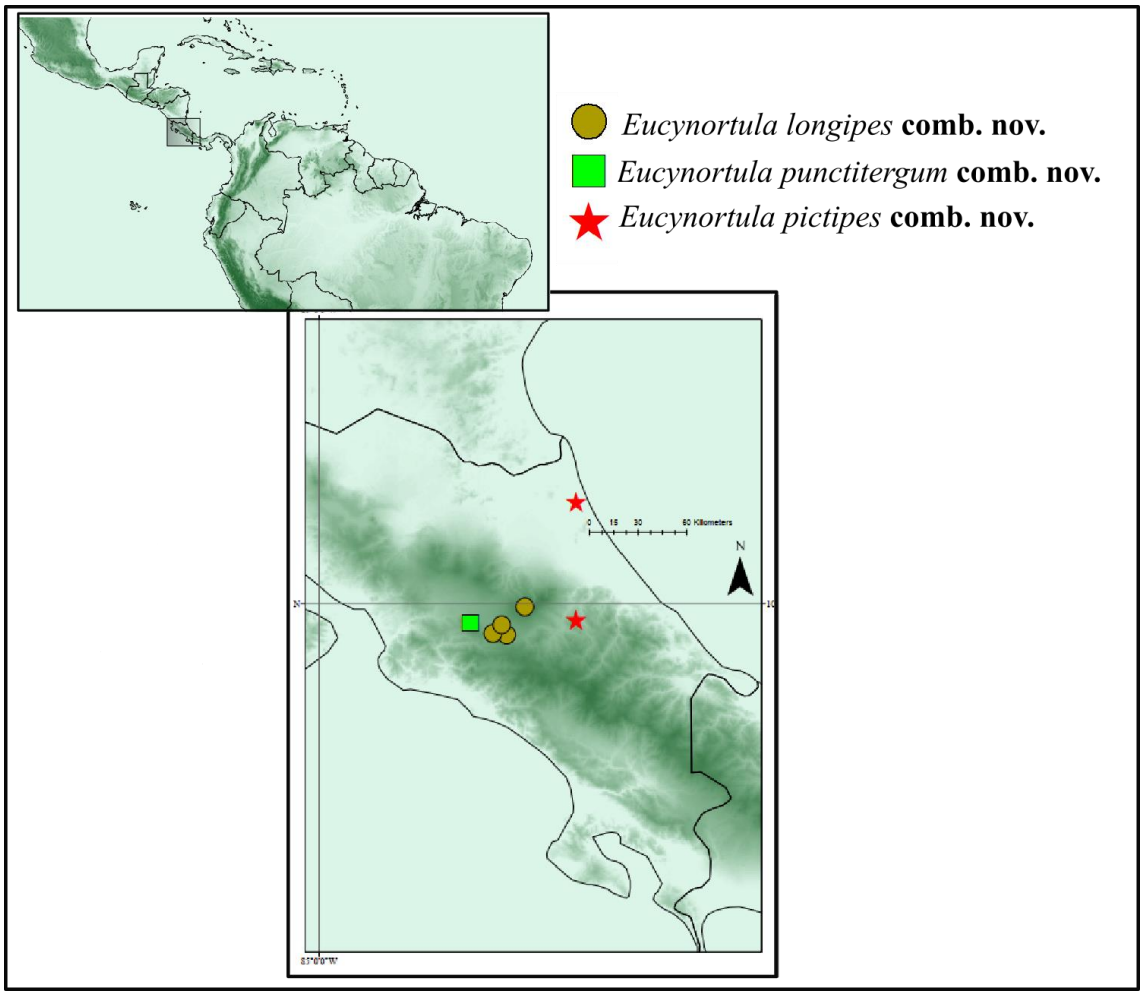
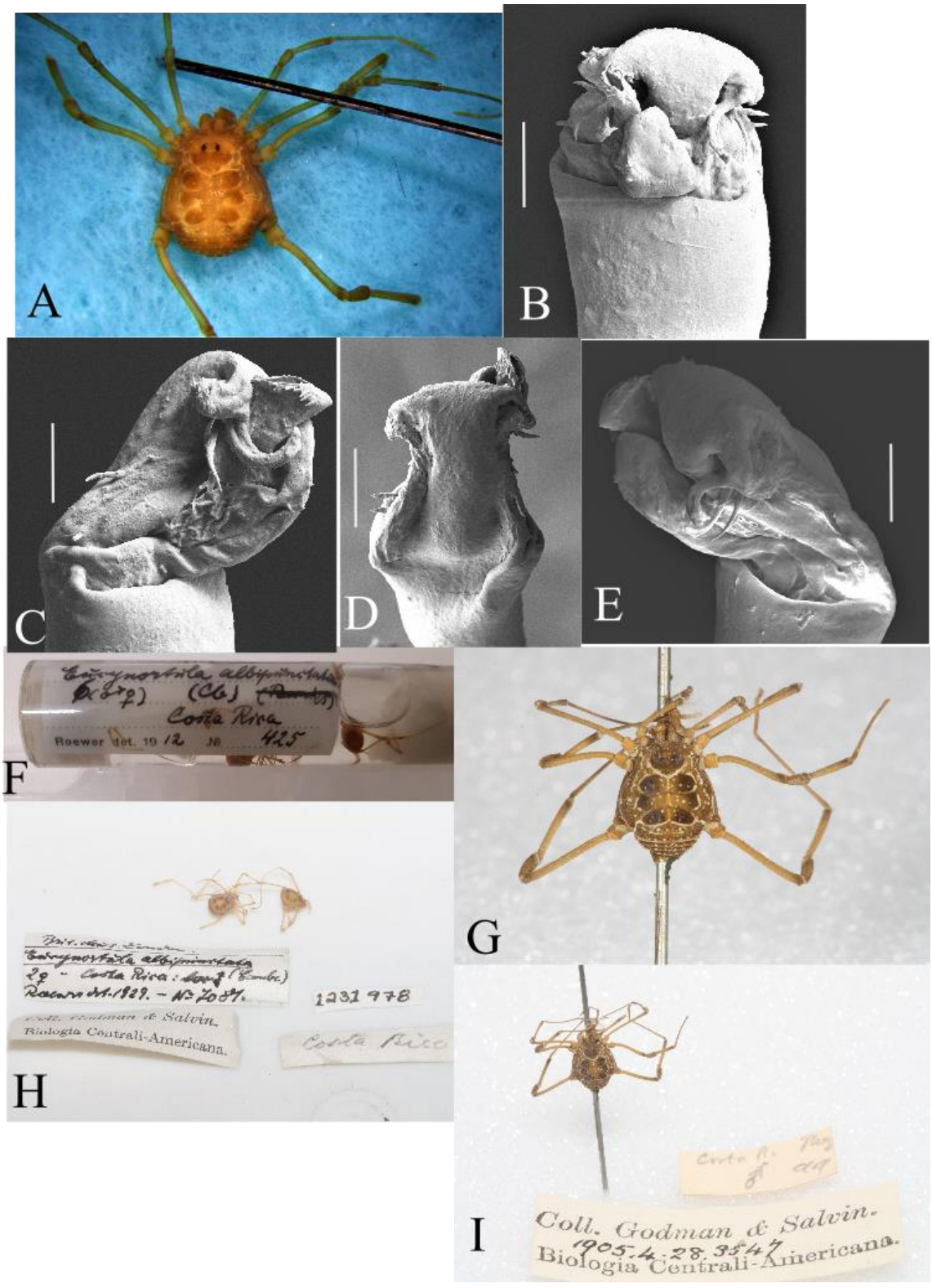


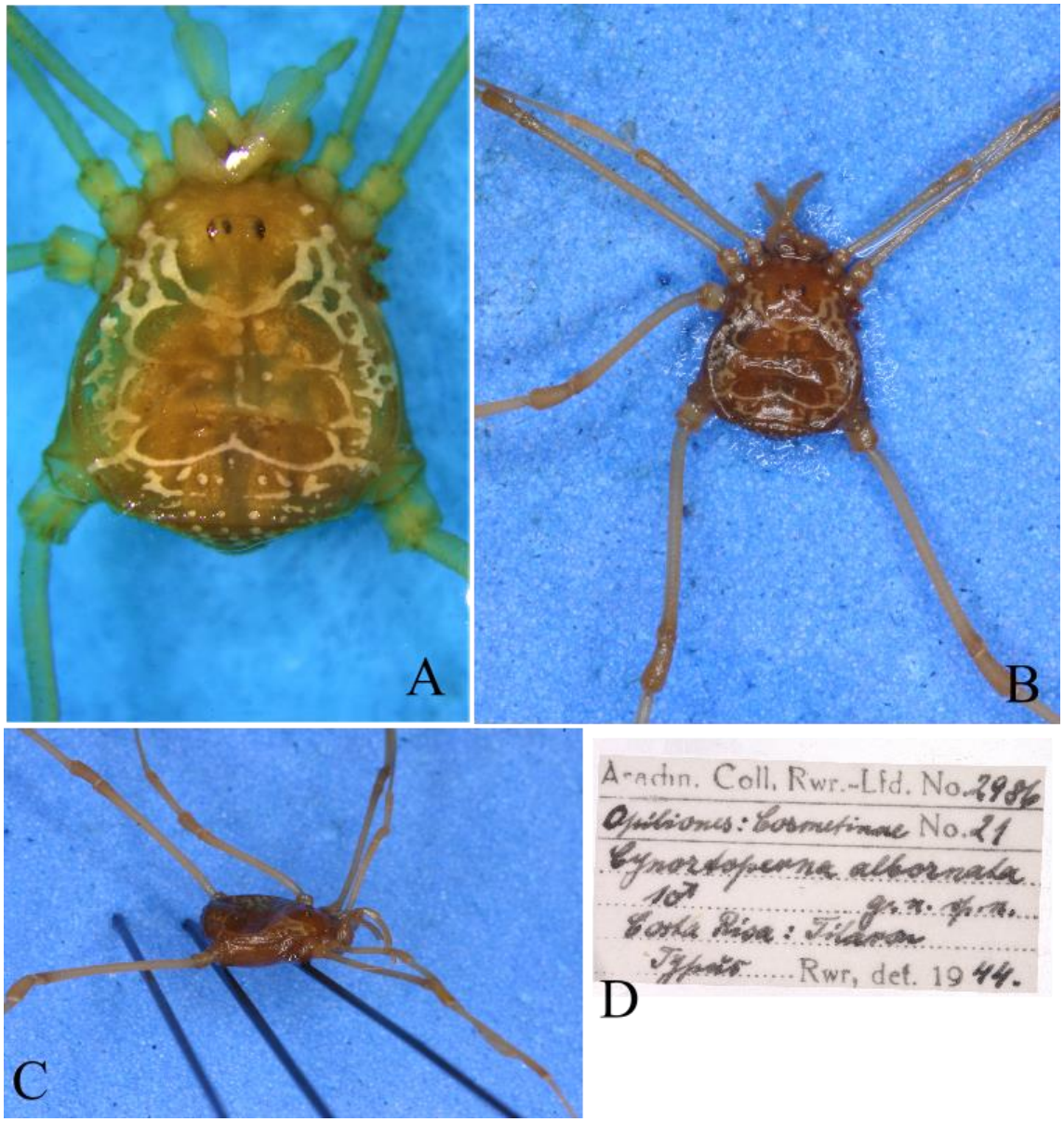
Figure 26. Distribution records of *Eucynortula* spp. Inset: location of the sector represented.

Appendices

Appendix 1. *Eucynortula albipunctata*. **A-F**: SMF-425, A. Male, habitus dorsal; **B-E**: Penis, B. Dorsal view, C, Lateral view, D. Ventral view, E. Lateral apical view; F. Label of SMF corresponding to examined material; **G-I**: Types GDSLV-3547 in BMNH, G. Male, dry collection, H. Two females and label, wet collection, I. Male and label, dry collection. Scale bars. 0.05mm. Photos G-I by Stuart Longhorn.

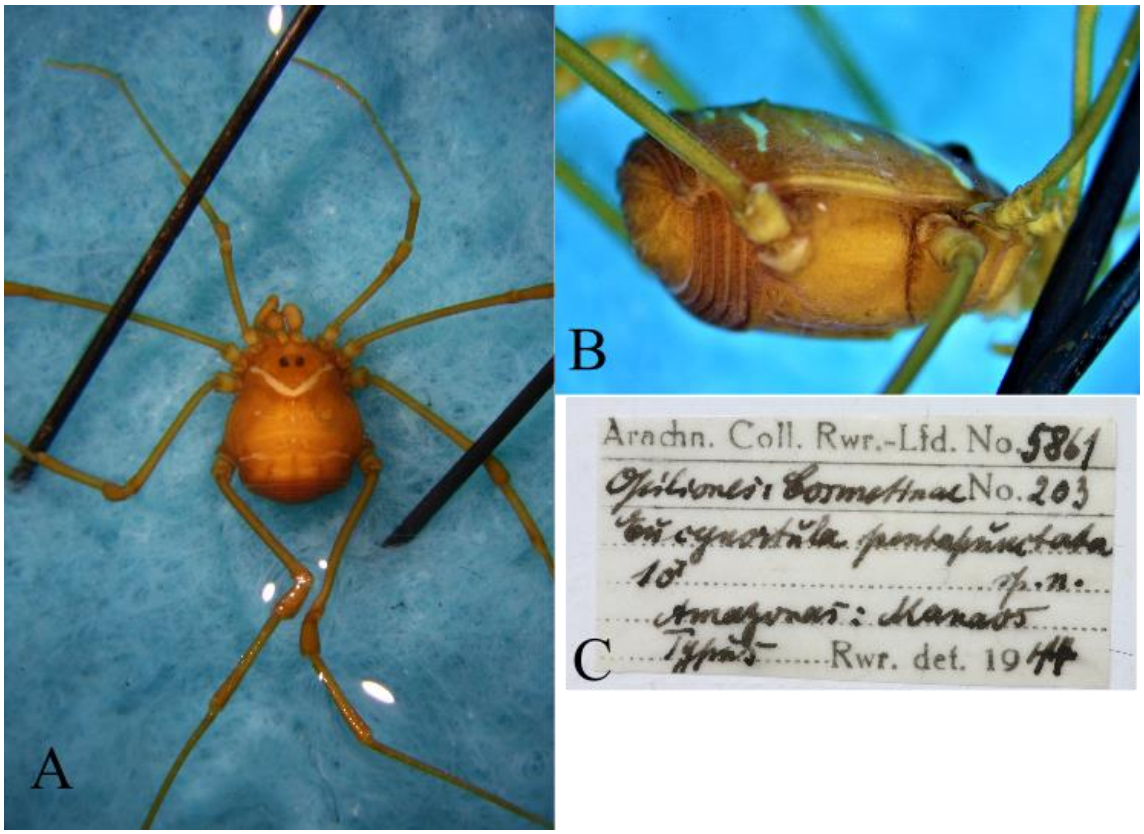

A
B
C
D
E
Costa Rica
Roewer det. 19 12 № 425
F
G
Coll. Godman & Salvin.
Biologia Centrali-Americana.
Costa Rica
H
Coll. Godman & Salvin.
1905.4.28.3547
Biologia Centrali-Americana.
I

Appendix 2. *Eucynortula albornata* **comb. nov. A-D:** Holotype (SMF RII/2986-32), A-C. Habitus, A-B. Dorsal view, C. Lateral view; D. SMF label. Photos B-D by Ricardo Pinto-da-Rocha.



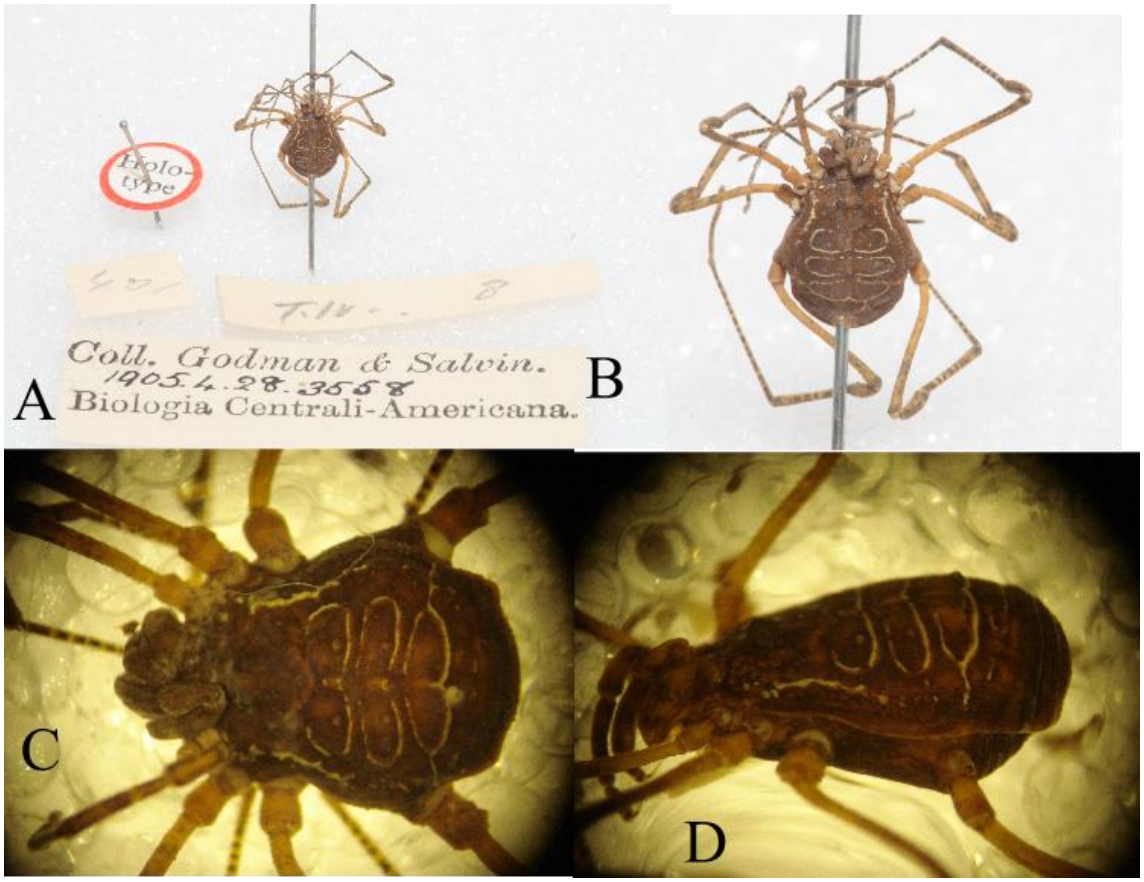
Appendix 3. *Eucynortula metatarsalis Incertae sedis*, **A-C**: Male holotype, SMF-432, A. Habitus, dorsal view, B. ventral view, C. Metatarsus IV, retrolateral view; **D.** Labels of type examined material from SMF.

Appendix 4. *Eucynortula pentapunctata Incertae sedis* A-B: Male, holotype (SMF RII/5861), A. Habitus, dorsal view, B. Same, lateral view; C. Label of type examined material deposited at SMF. Photo C. By Ricardo Pinto-da-Rocha.

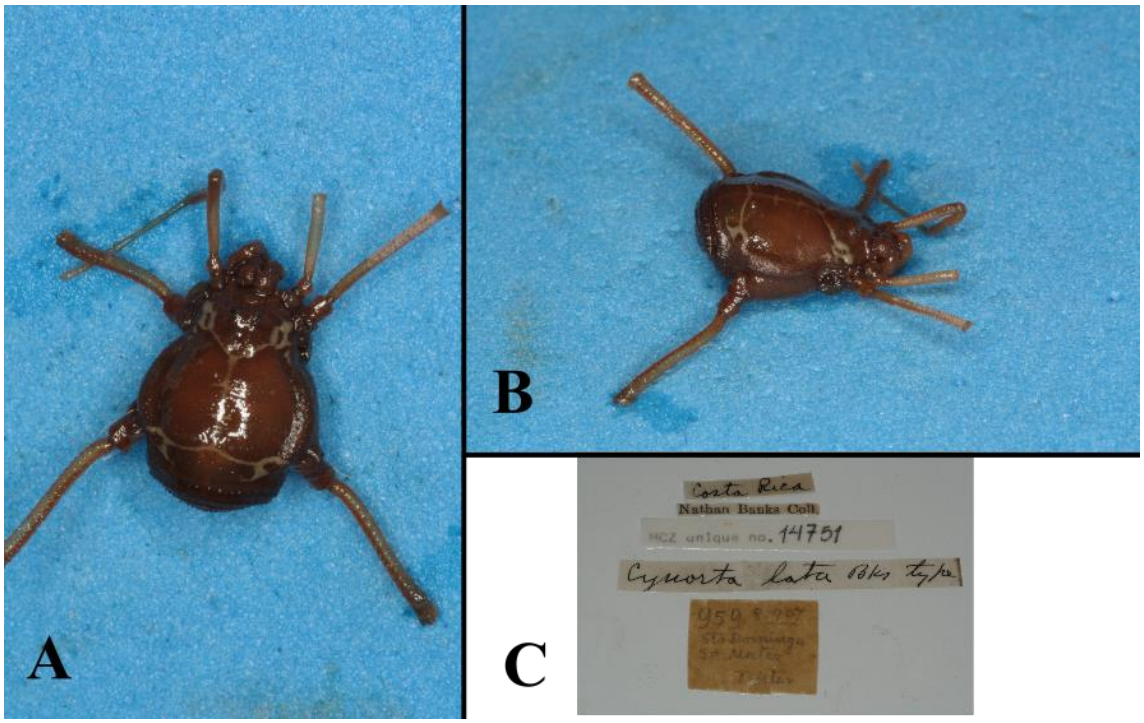


Appendix 5. *Eucynortula auropicta Incertae sedis*, **A-D:** Type female (SMF RII 7372/235), **A-C**: Habitus, A. Dorsal view, B. Ventral view, C. Lateral view; **D.** Label of type examined material deposited at SMF. Photo D. by Ricardo Pinto-da-Rocha.

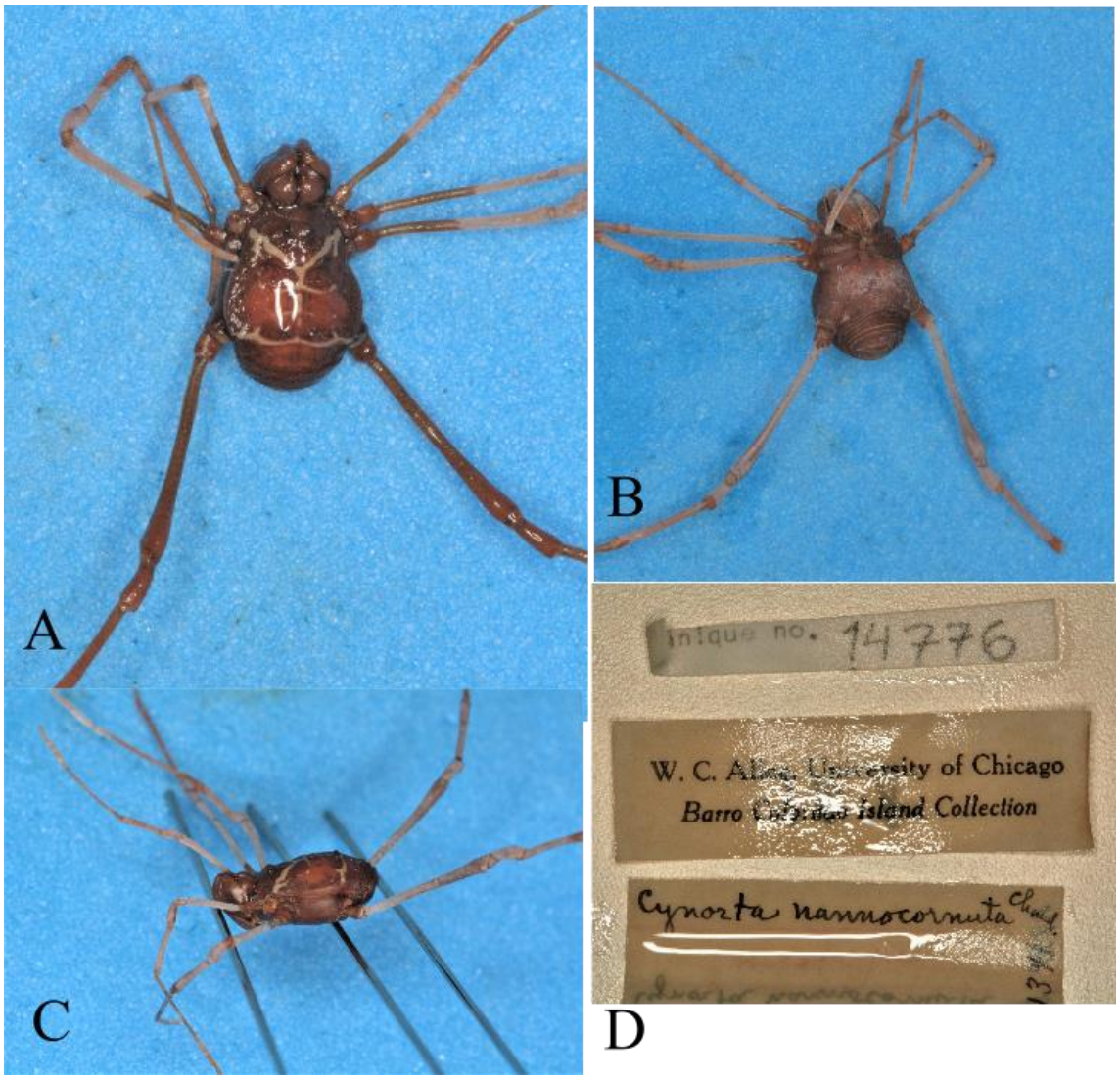
Appendix 6. *Eucynortula bituberculata Incertae sedis*. **A-D**: GDSLV-3558 in BMNH. **A-B**: Dry collection, male holotype. A. Dorsal view and label. B. Same, more detail; **C-D:** Habitus, male, wet collection, C. Dorsal view, D. Lateral view. Photos by Stuart Longhorn.



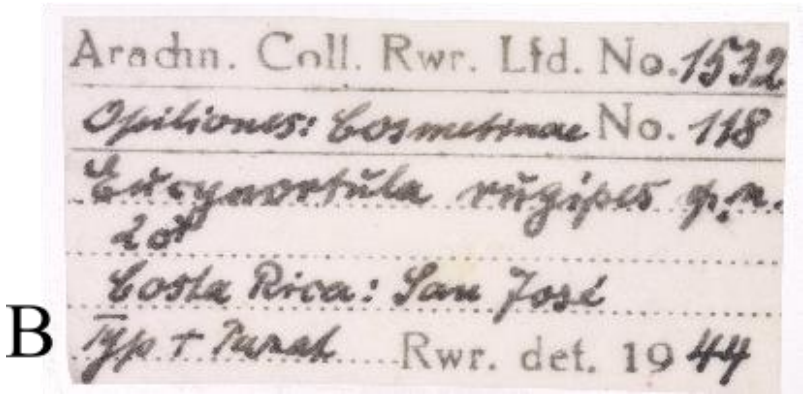
Appendix 7. *Eucynortula lata Incertae sedis*, **A-B:**Habitus, male holotype (MCZ 14751), A. Dorsal view, B. Lateral view, **C.** Label of type material deposited at MCZ. Photos by Ricardo Pinto-da-Rocha.



Appendix 8. *Eucynortula nannocornuta Incertae sedis*, **A-C:**Habitus, male holotype (MCZ 1341), A. Dorsal view, B. Ventral view, C. Lateral view. **D.** Label of type material deposited at MCZ. Photos by Ricardo Pinto-da-Rocha.

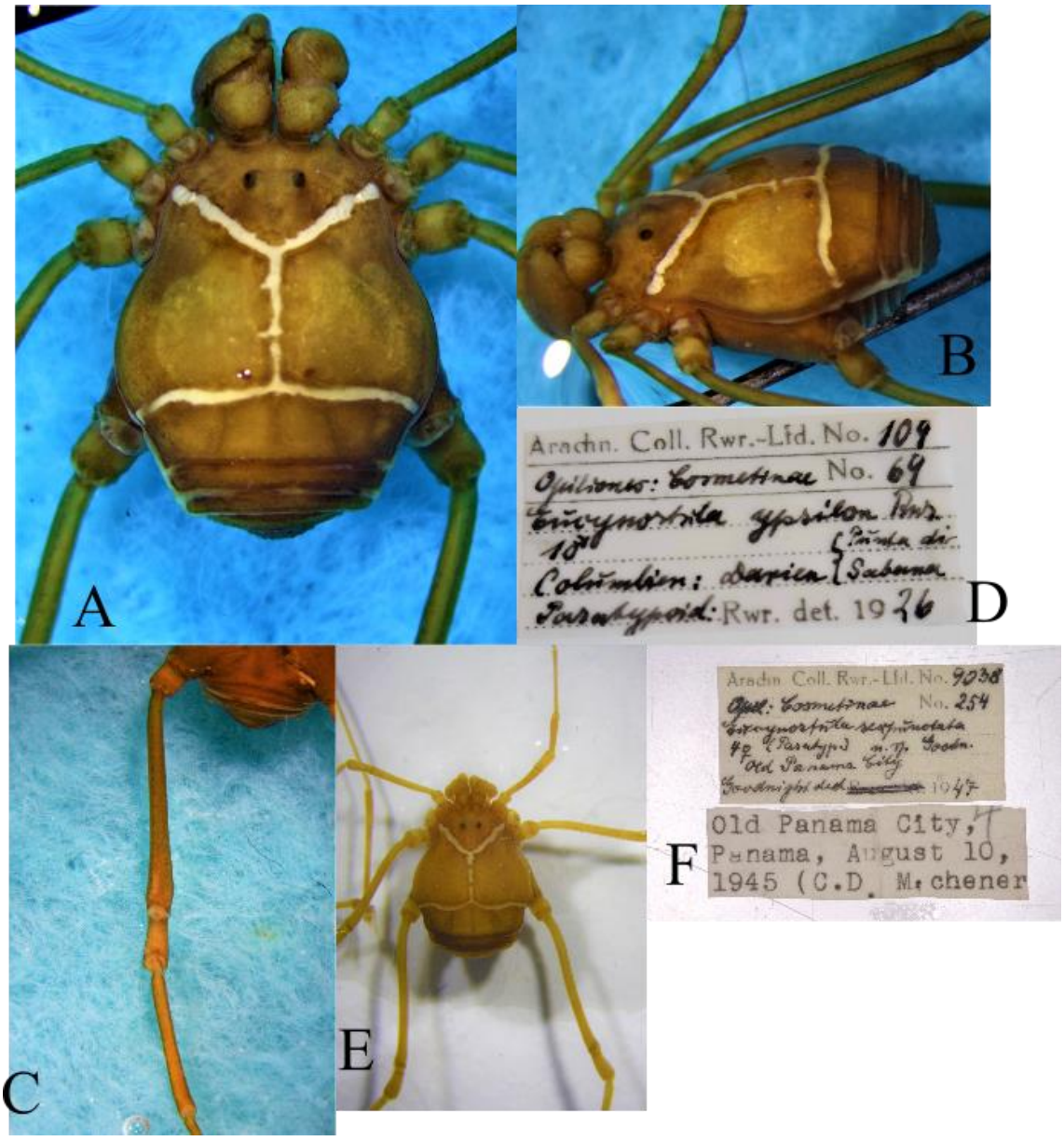


Appendix 9. *Eucynortula rugipes Incertae sedis*, **A.** Male holotype (SMF RII 1532/118), dorsal view, **B.** Label of type examined material deposited at SMF. Photo B. by Ricardo Pinto-da-Rocha.



Appendix 10. *Eucynortula ypsilon Incertae sedis*, **A-D**: Male paratype (SMF RII 109/69-32), **A-B**. Habitus, A. Dorsal view, B. Lateral view. **C**. Leg IV, trochanter-tibia, ventral view, **D**. Label of type examined material deposited at SMF; **E-F**: Female paratype, *Eucynortula sexpunctata*

(RII/9038-254-32), E. Habitus, dorsal view, F. Label of type examined material deposited at SMF. Photo F. by Ricardo Pinto-da-Rocha.



Appendix 11. Data matrix (95 characters, 30 taxa) used in the cladistic analysis of *Eucynortula*. (Continued next page).

Metasarcus_clavifemur	000000000?10003140001011002000101000000000000200000000010101000000000000000000?000?000001011
Metalibitia_rosascostai	21101001O?11011?01100???00133001010110001000110100000001022120101010002110010002101100O??10121
Metalibitia_brasiliensis	21101001 1?00?11?00100???00133011011110203000020200000001021120001011000101010002001110010100O1
*Metalibitia_paraguayensis_*	21101000?01?11?00100???00133012000110002000100100000001212?2000101001111201000?0110001010011
Cynorta_calcarapicalis	000011111?10002?400010101111101211010011010001001011000101112101120101211001100221111101011121
Cynorta_liturata	020011101110002030111010112120021101000101001100111100000011100110010101000100011101100000102O
Cynorta_punctatolineata	001111101010102020011111110130110101000101101110111111011011020010101100110110012000110101101O1
Cynortula_limitata	320011111?1020??200110110122012121101112100110010011000111011210002O??????111121111O1?00?1??1
Cynortula_alejandra	201111101011203030001011110120001011010131021202000001000211211102011011010111111111010101100 1
Cynortula_longipes	100111101011103031001011011140111111101121010110111120010210100100010001000100021001100110110 1
Cynortula_punctata	220111101?10112130101??111114012121101112110100200000001011011001002000101110002?1111001100??1
Cynortula_quadrimaculata	000101101010102110001??11102111110011011210011010100000101201001100001210101?0012?0000?0110111
Cynortula_stellata	200111101110102131001??10102301011110121210211010000010002112100120000211111110221110101001101
Cynortula_undulata	201011101010102040011??10112211102011011210011001001100101101121100001011201010201110101011??1
Neocynorta_venezuelensis	001011101010103040011011011141110211001111000200110120010110202101000001110100011?111001101101
Eulibitia_maculata	021011101110202140011110011140121111002131020201100110110111110011000???10101022111010000000 1
Eulibitia_scalaris	200011101010012 1?000101001014012100100112112010000001000011110001100000111111102001111010001O1
Taito_osmari	201111101?00?021200010110112200111010021211210000000010012112120020101011?011101111010101012 1
Eucynorta_quadripustulata	230011101010100040011010112110121101002101001100010000000011100100110001000100012111100011102 1
Eucynortula_albipunctata	100111101010002131001001111140111111101121010111110110010111110010011001100110020101101110001 1
Eucynortula_pentapunctata	000111111?1110??21001?111103401111011021210012011011000011212001100000011111100221011011001 2 1

Eucynortula_metatarsalis	10011110101000?14100101111034102111100112100110011110001011111011002002110011002100110011010 11
*Eucynortula_ypsilon_*	21001110011011?131001??10111101112111021210012001011000121201101001100001111100221111010011121
Eucynortula_sexpunctata	21001110101121313001101001011011121100212100100010110??10010112110110001110110020111001101 1001
Taito_curupira	200011101?112?2?2001101101012001111110011112100200010100021121020101002010110102110101100000001
Taito_mayoruna	20011111100 0?0002001101111122101121111213112100300000100011121011201001000111102010101000100 01
*Metacynorta_gracilipes_*	10101111101101213100101101?2400111011011200?00?00111100 1????20001101?000010100021111100000?021
Cynortula_biprocurvata	101111111?11202?30001??1111141120211002131021100000021101111 2?2112011001 10?1000111111 10000????
Eucynortella_spectabilis	020011101000?0?030011??1111140021001102131121000000020001211212000010010001101122111011 0000??1
Cynortoperna_albornata	??????????????????????????1131121211101121011110111100010120100000111000100100020?1110100?????

Appendix 12. Phylogenetic hypothesis constructed under IW (K= 4.7656) presenting the optimization of characters. Black circles on the branches represent non-ambiguous synapomorphies; white circles show ambiguous synapomorphies. Numbers below each circle represent the character state; numbers above each circle show the number of each character.