

## Notes on *Santobius* from Vanuatu and Fiji and the Status of the Eastern Melanesian *Ibalonius* (Arachnida: Opiliones: Podoctidae)

Adriano B. Kury<sup>1,\*</sup> and Glauco Machado<sup>2</sup>

<sup>1</sup>Departamento de Invertebrados, Museu Nacional, UFRJ, Quinta da Boa Vista, São Cristóvão, 20.940-040, Rio de Janeiro, RJ, Brazil

<sup>2</sup>Departamento de Ecologia, Instituto de Biociências, Rua do Matão, trav. 14, nº 321, 05.508-900, São Paulo, SP, Brazil

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**Adriano B. Kury and Glauco Machado (2009)** Notes on *Santobius* from Vanuatu and Fiji and the status of the eastern Melanesian *Ibalonius* (Arachnida: Opiliones: Podoctidae). *Zoological Studies* 48(4): 524-538. A group of the Podoctidae, formed by 4 Melanesian species is newly recognized. The generic name *Santobius* Roewer, 1949, hitherto monotypic, is available and should be given to this group, which is entirely re-diagnosed. *Mesocerotula* Roewer, 1949 and *Ibantila* Šilhavý, 1969 are herein considered new junior subjective synonyms of *Santobius*. *Mesoceras annulipes* Sørensen, 1886, currently in *Ibalonius*, is removed to *Santobius*. Consequently, the generic name based on this species, *Mesoceras*, invalid due to homonymy with a genus of Mollusca, is transferred from the synonymy of *Ibalonius* to *Santobius*. A key is given to the 4 species of *Santobius*. Comments are made on descriptions of *S. annulipes* and *S. spinitarsus*. Some new morphological terms are defined for the taxonomy of the Podoctidae. <http://zoolstud.sinica.edu.tw/Journals/48.4/524.pdf>

**Key words:** Laniatores, Mollusca, Diptera, Homonymy, Cuba.

The Podoctidae is a small family of Laniatores (Arachnida, Opiliones) with 58 genera and 120 species distributed in Australasia, SE Asia, India, Sri Lanka, the Seychelles, Madagascar, and continental Africa (Kury 2007). They are absent from New Zealand and Tasmania. A single species is known from Cuba, probably accidentally introduced (Kury 2003). This family was detached for the first time from a large non-monophyletic family, the Phalangodidae, by Mello-Leitão (1938) who grouped together 3 subfamilies, namely the Ibaloniinae, Erecananiinae, and Podoctinae, to form the Podoctidae. The family has never been reviewed, and characterization of the genera and subfamilies, mostly proposed by the German arachnologist Carl F. Roewer, is unsatisfactory. Roewer described 55% of the valid species of the Podoctidae and created 75 generic names (of which 30 are currently under synonymy) –

compared to 17 genera created by other authors (of which only 3 are under synonymy). Although the species descriptions carry substantial amounts of morphological information, they were never made into generic diagnoses by Roewer, who instead chose non-phylogenetically informative characters, such as tarsal counts and the armature of scutal areas and free tergites, which are extremely labile in species of the suborder Laniatores (e.g., Suzuki 1977, Kury 1990). Each single variation in any of the above-mentioned counts granted the creation of a new genus, which led to a very high percentage of monotypic genera.

In this paper, a group of species of Podoctidae endemic to Eastern Melanesia is newly recognized. With a comparative morphological study, as part of a larger project on the Podoctidae (e.g., Kury and Machado 2003), the concept of *Mesoceras* Sørensen, 1886 (Ibaloniinae) is here

\*To whom correspondence and reprint requests should be addressed. E-mail: [adrianok@gmail.com](mailto:adrianok@gmail.com)

retrieved and expanded based on the literature and examination of specimens of critical species. While typical species of *Ibalonius* are distributed in a range from the Seychelles to the Solomon Is. (through the Indo-Malay Archipelago and New Guinea), the Eastern Melanesian representatives of the Ibaloniinae are here deemed to constitute a separate generic entity, distinct from *Ibalonius*. The name *Mesoceras* is a junior homonym of a mollusk genus. Next in line there are 2 equally old available names for this group – *Mesoceratula* Roewer, 1949 and *Santobius* Roewer, 1949. The latter was chosen here by the Principle of First Reviser (Art 24.2 ICZN, 1999) and given an emended diagnosis. Additionally, a key is given to the 4 species of *Santobius*, additions are made to the descriptions of *S. annulipes* and *S. spinitarsus*, and some new morphological terms are defined for the taxonomy of the family Podoctidae.

### Historical Systematic Synopsis

Sørensen (1886: 67 ff) described the new genus *Mesoceras* for 2 new species from Fiji, placing it in his new family, the Epedanoidae. He also cited in the synonymy the name “*Mesocera* L. Koch in litt.” indicating that Koch had already recognized a new generic entity. However, it was not explained if he chose the slightly altered spelling with an “s” because he was aware of the homonymic collision with the Diptera *Mesocera* Macquart, 1839 (Macquart 1839: 289). In any case, his spelling of *Mesoceras* is also a junior homonym of a name created 9 yr previously in the Mollusca (Barrande 1877), a homonymy hitherto undetected. The 2 species described by Sørensen (1886: 68 and 70) were *Mesoceras annulipes*, from Fiji (material in Zoologisches Institut und Zoologisches Museum, Zoologisk Museum Universitat Kobenhavn, and Naturhistoriska Riksmuseet), and *Mesoceras spinigerum*, from “Polynesia, Viti Levu”, without repository indication. Both species were distinguished by the stoutness of the spines in scutal area IV.

At the beginning of the 20th century, Loman (1902) synonymized *Mesoceras* into *Ibalonius* Karsch, 1880, placing both species of Sørensen in the latter. Some years later, Roewer (1912, 1923) revalidated *Mesoceras* in Sørensen’s sense, and included it in the Phalangodidae. Roewer added new records from New Caledonia for both Fijian species and added 3 more species from the Seychelles (transferred from *Ibalonius* Karsch, 1880) and the Philippines, and a doubtful

6th species from Runion. He also cited the supposed homonymy of *Mesocera* (which was only a citation of a name in *schedula* and was never formally described) with Macquart’s name. Neave (uBio 2007) mistakenly followed Roewer, citing a genus *Mesocera* as if it had been authored by Sørensen (1886).

Roewer (1949) chose *Mesoceras spinigerum* Sørensen, 1886 as the type of his new monotypic genus, *Mesoceratula*, and a few pages below, described the new genus, *Santobius*, for the new species *Santobius spinitarsus* from “Neue Hebriden” (today’s Vanuatu) based on material in the Senckenberg Museum, Frankfurt am Main, Germany.

Šilhavy (1969) created the new monotypic genus, *Ibantila*, for Cuban material, being the only member of the family recorded from the New World. The Caribbean distribution of this species is completely incongruent with other podoctids. Only much later, Kury (2003) reported that the Cuban species is restricted to a botanical garden, probably representing an anthropic introduction. Šilhavy (1969) stated that his *Ibantila* was close to *Mesoceratula*.

The last author to work with the group was Suzuki (1977: 29), who synonymized several podoctid genera into *Ibalonius*, including *Mesoceras*, based on his study of material from the Philippines. Starega (1992), in a catalogue, adopted the synonymy proposed by Suzuki when citing the Seychellian Podoctidae.

### MATERIAL AND METHODS

Color names follow the NBS/ISCC color centroids system (see Kury and Orrico 2006 for details, also <http://www.anthus.com/Colors/Cent.html>). Some new terms are introduced in the text. Terminology used is marked and explained in table 1, and illustrations are found in figures 7 and 8. Abbreviations of depository institutions are: AMNH (American Museum of Natural History, New York, NY, USA), MCZ (Museum of Comparative Zoology, Harvard University, Cambridge MA, USA), NRMS (Naturhistoriska Riksmuseet, Stockholm, Sweden), SMF (Senckenberg Museum, Frankfurt am Main, Germany), ZMH (Zoologisches Institut und Zoologisches Museum, Universitat Hamburg, Hamburg, Germany), and ZMUC (Zoologisk Museum Universitat Kobenhavn, Copenhagen, Denmark).

The tooth-like, mostly triangular, conical,

or flat apophyses of the cutting edges of the cheliceral fingers (herein simply called “teeth”) have never been used in the systematics of the Podocetidae. By sampling the available information in the literature, it is easy to see that this may be a rich source of morphological information (Fig. 1). We still do not know how reliable it is, but it would be useful to try to detect homologies and to describe them with a certain detail. We herein propose a simple analogical nomenclature for the cheliceral teeth: the massive basal teeth are called molars (m), the robust pointed ones canines (c), and the distal simple ones incisors (i). They may be numbered from distal to basal in an analogous way that vertebrate morphologists do. Teeth on a fixed finger get an “F” before the nomenclature, and those on the movable finger get an “M”. So, the dentition of the movable finger of males of *Santobius* (hitherto known only from 2 species) might be: Mi1-3 short, simple/Mc1 stout/Mm1 robust, bifid. Likewise, females would be: Mi1-3 short, simple/Mc absent/Mm1 as a low crest.

Tarsal counts follow the pattern of the number of articles of tarsus I, the minimum-maximum

value in the range (distitarsus I)/same for tarsus II (distitarsus II)/same for tarsus III/same for tarsus IV. The number of articles in the distitarsi is only given for legs I and II as legs III and IV in all Laniatores always have the same count 1+2. The division of tarsi into 2 regions on legs I and II and into 3 regions on legs III and IV is already present in juveniles, while in adults, each region may be further subdivided (Roewer 1923).

## SYSTEMATIC ACCOUNTS

### Genus *Santobius* Roewer 1949

- Mesocera* L. Koch in *schedula* cited by Sørensen (1886: 67) [if available, it would have been a junior homonym of *Mesocera* Macquart, 1839: 289 (Diptera) as noted by Roewer (1923)].
- Mesoceras* Sørensen, 1886: 67; 1910: 60; Roewer, 1912: 190; 1923: 151 [junior homonym of *Mesoceras* Barrande, 1877 (Mollusca) first noted here; junior subjective synonym of *Ibalonius* Karsch, 1880: by Loman (1902), disclaimed by Roewer (1912), reinstated by Suzuki (1977); type species is *Mesoceras annulipes* Sørensen, 1886] syn. nov.

**Table 1.** List of abbreviations of morphological structures

Abbreviation	Meaning
AL	Abdominal scutum length from the scutal groove to the posterior border of the scutum
AW	Abdominal scutum maximum width
CL	Carapace length (from the anterior margin to the scutal groove)
claw	Pedipalpal claw
CW	Carapace maximum width
eb	Eyeballs: separated by ocular globes (individual eye mounds)
Fc	Canine (median shearing tooth) of the cheliceral fixed finger
Fe	Femur
Fi	Incisor (distal cutting tooth) of the cheliceral fixed finger
Fm	Molar (proximal grinding tooth) of the cheliceral fixed finger
ID	Interocular distance – measured between the internal rim of each cornea
im	Interocular mound: the bell-shaped eminence located median anteriorly on the carapace
Mc	Canine (median shearing tooth) of the cheliceral movable finger
mcf	Median cheliceral flap of the carapace
Mi	Incisor (distal cutting tooth) of the cheliceral movable finger
Mm	Molar (proximal grinding tooth) of the cheliceral movable finger
Mt	Metatarsus
ob	Ocular bridge formed by the tubercle of the ocular globe joined to the innermost tubercle of the palisade
Pa	Patella
ps	Palisade of pointed tubercles arranged closely together on the anterolateral margin of the carapace
sp	Spiniform process of the interocular mound
Ta	Tarsus
Ti	Tibia
Tr	Trochanter

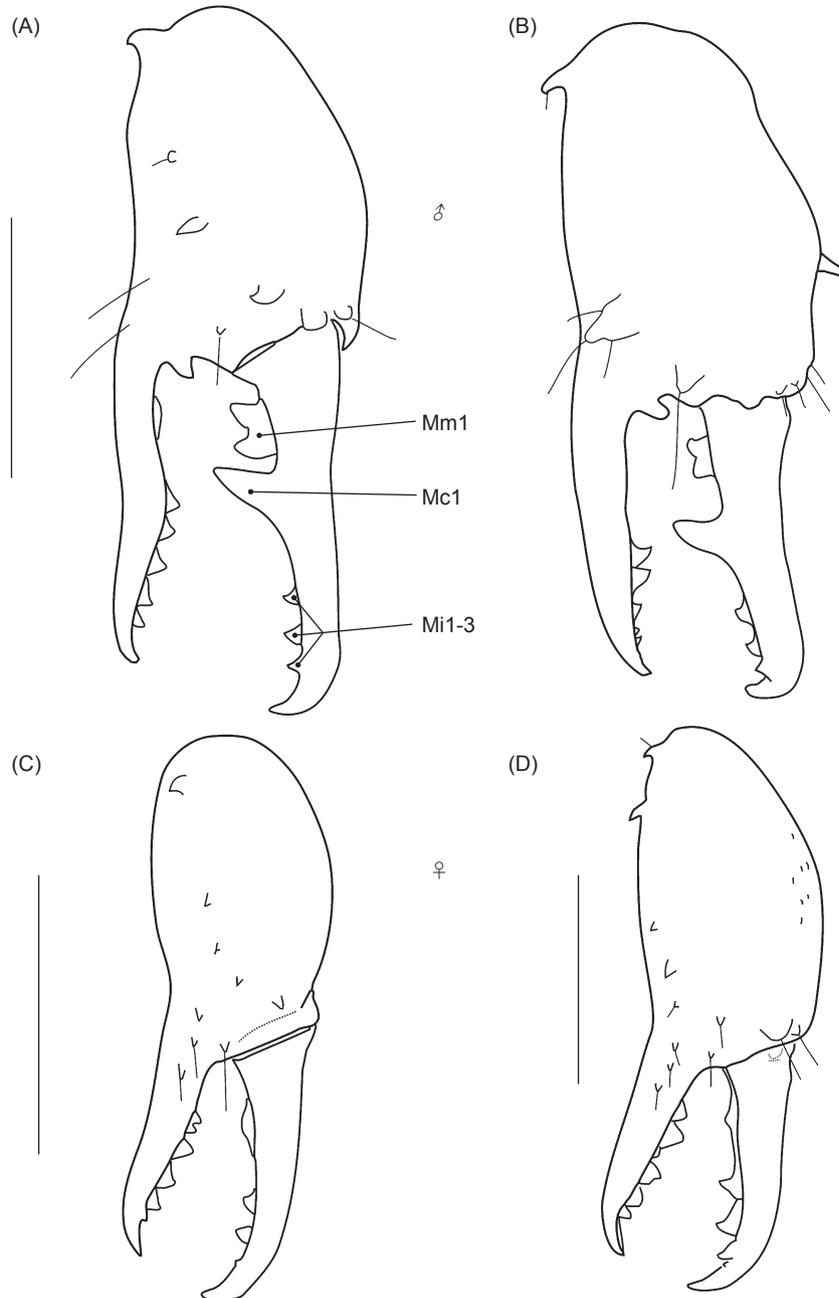
*Ibalonius* [part]: Loman, 1902: 200; Suzuki, 1977: 29.

*Mesoceratula* Roewer, 1949: 263 [type species is *Mesoceras spinigerum* Sørensen, 1886, by original designation] syn. nov.

*Santobius* Roewer, 1949: 268 [type species is *Santobius spinitarsus* Roewer, 1949, by original designation].

*Ibantila* Šilhavý, 1969: 373; Kury, 2003: 222 [type species is *Ibantila cubana* Šilhavý, 1969, by original designation] syn. nov.

**Emended diagnosis:** Scutum outline in dorsal view subrectangular with 2 constrictions, widest at posterior border, which has the shape of an axe (Figs. 2, 7). Median cheliceral flap long, rectangular (Figs. 7, 8B; mcf). Eyes widely separated from each other. Interocular mound present as a high granulous elevation bearing a stout anteriorly bent spine (Figs. 3, 8). Lower



**Fig. 1.** Comparison among cheliceral dentition in *Santobius*. All left chelicerae in frontal view. (A) Male *Santobius annulipes* (Sørensen 1886) (AMNH AK 280), from Fiji. (B) Male and (C) female *S. cubanus* (Šilhavý 1969) (adapted from the original description). (D) Female *S. spinitarsus* Roewer 1949 (lectotype, SMF 5062), from Vanuatu. Scale bars = 1 mm.

region in anterior lateral corners of carapace delimited by a palisade of strong tubercles (Figs. 3, 8). Scutal area IV with a paramedian pair of strong low tubercles (acuminate spines in *S. spinigerus*). Lateral parts of area IV sharply narrowed. Mesotergum with a “butterfly-shaped” spot extending from area I to carapace containing thin radiating dark stripes (Figs. 2, 7). Male basicheicerite very long, with attenuate bulla, without strong serrate spination. Cheliceral hand large in both sexes, but presumably much more swollen in males (both sexes only known for 1 species, Fig. 4). Cheliceral movable finger with

1 molar, Mm1 (much reduced in females and stout bifid in males); 1 stout canine, Mc1 in male only (absent in female); and 3 triangular incisors, Mi1-3 (Fig. 1). Pedipalpal coxa very long with stout dorsal spiniform apophysis. Pedipalpal tibia with 2 ectal spines (li), proximal one much longer than the other (apparently subequal in *S. spinigerus*). Pedipalpal tarsus spindle-like and swollen (specially in *S. spinitarsus*). Femur I with both dorsal and ventral rows of setiferous tubercles (Figs. 5B, 9D). Coxa IV with erect dorsomedial spiniform apophysis (Figs. 3A, 8A). Femora I-IV of both sexes long, sub-straight, with 2 wide lighter

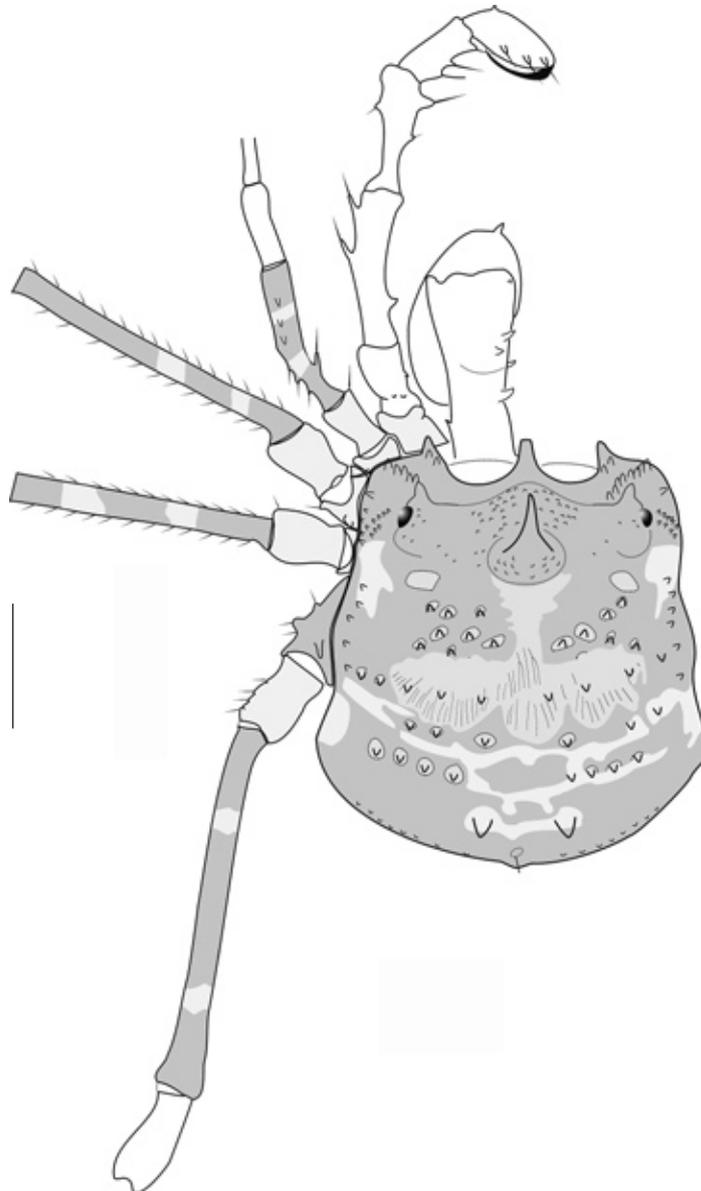


Fig. 2. *Santobius annulipes* (Sørensen 1886). Male (AMNH AK 280), from Fiji. Habitus, dorsal view. Scale bar = 1 mm.

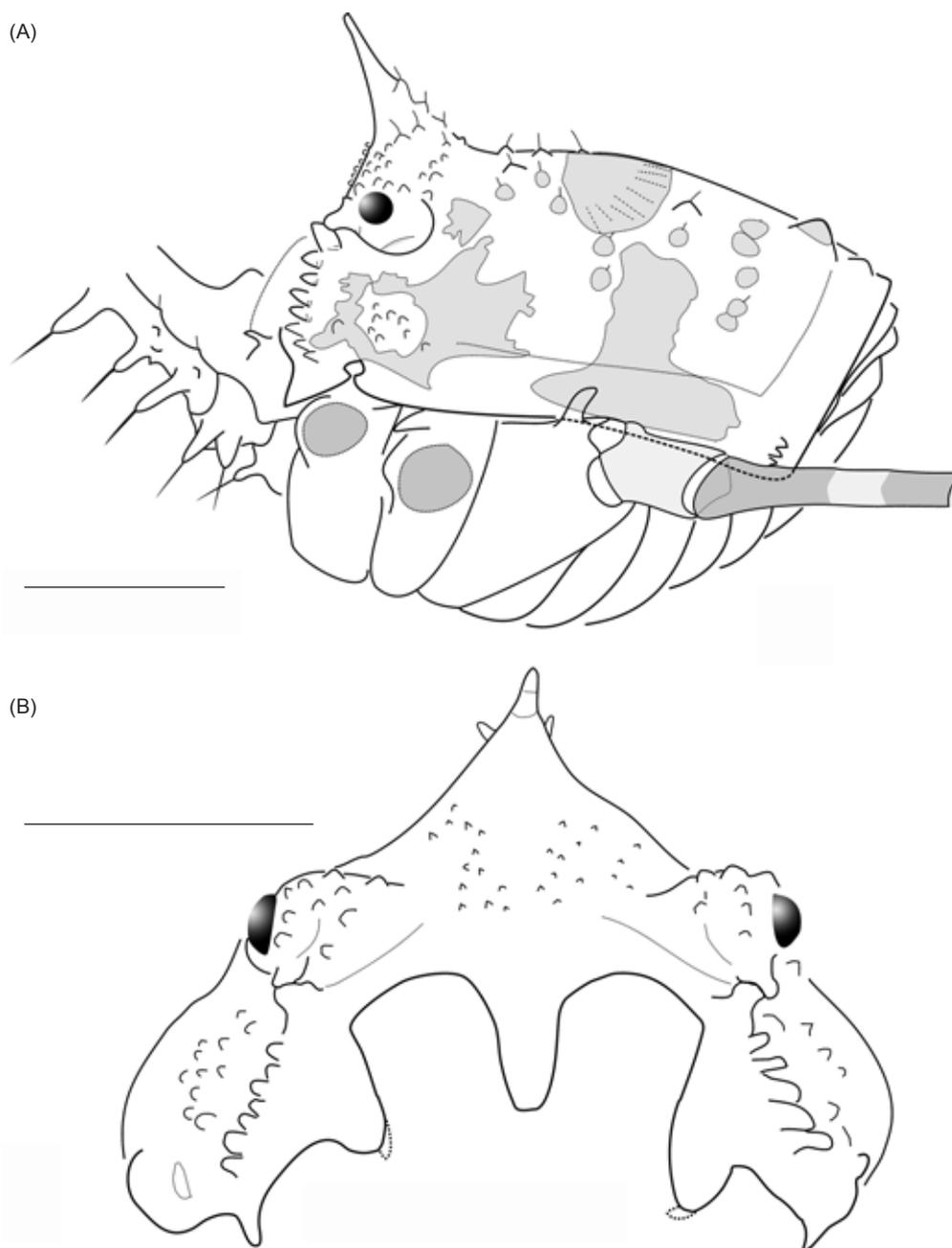
rings each. Tarsal counts: 3-4(2)/8-12(3)/4-5/5. Male genitalia known from only 2 species, in which they are virtually identical. Ventral plate of penis with gentle constriction at lateral borders and deep cleft in distal border. Lamellar sac high, reaching middle of ventral plate (Fig. 6).

*Etymology*: The genus name refers to the Espiritu Santo I. of Vanuatu + Greek *bios* = living. *Ibantila* is a combination of *Ibalonius* + Antilles.

*Mesoceras* is from the Greek middle + horn. *Mesoceratula* is only a variation of *Mesoceras* + suffix - *ula* (= small).

*Included species*: *Mesoceras annulipes* Sørensen, 1886, *Ibantila cubana* Šilhavý, 1969, *Mesoceras spinigerum* Sørensen, 1886, and *Santobius spinitarsus* Roewer, 1949.

*Combined distribution*: Known from eastern Melanesia (Fiji, New Caledonia, and Vanuatu), with



**Fig. 3.** *Santobius annulipes* (Sørensen 1886). Male (AMNH AK 280), from Fiji. (A) Habitus, lateral view. (B) Anterior part of carapace, frontal view. Scale bars = 1 mm.

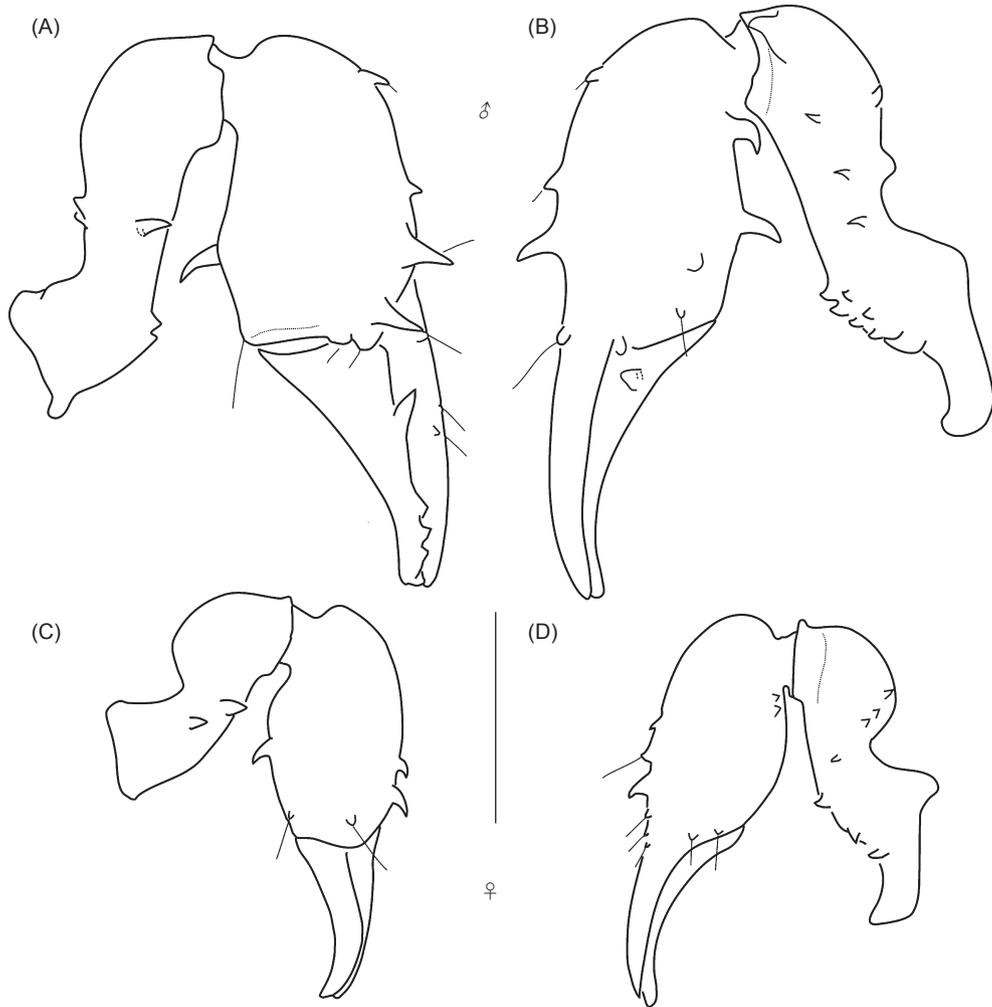
1 introduced species in the Greater Antilles (Cuba).

**Roewerian rationale for recognizing 4 different genera:** Roewer (1949) created the monotypic genus *Mesoceratula* based on a combination of 2 characters: the 3 jointed tarsus I (vs. 4 jointed in *Mesoceras*) and the high spines of area IV (vs. low, rounded tubercles in *Mesoceras*). The same characters were also used to separate *Santobius*, but the 2nd character in this case is not accurate, since the low, acuminate tubercles of the syntypes by no means correspond to the high pointed spines of his figure 50. Roewer's scheme can be summarized as: *Mesoceras* (leg I 4 jointed, low tubercles), *Mesoceratula* (leg I 3 jointed, high spines), and *Santobius* (leg I 4 jointed, high spines). Šilhavý (1969) explicitly distinguished *Ibantila* from *Mesoceratula* by "the armature of

the areas, by the form of the anterior margin of carapace and the position of spiracles".

**Key to the 4 species of *Santobius***

- 1. Area IV armed with 2 low paramedian tubercles ..... 2
- Area IV armed with 2 high paramedian spines.....  
.....*S. spinigerus*
- 2. Pedipalpal trochanter with only 1 ventral spine; pedipalpal tarsus strongly swollen (Fig. 9C); femur I dorsally with only 2 small distal spines (Fig. 9D) .....*S. spinitarsus*
- Pedipalpal trochanter with 2 ventral spines; pedipalpal tarsus slender (Fig. 5A); femur I dorsally with 9 or 10 spines, of which the distal 3 or 4 are largest (Fig. 5B)..... 3
- 3. Tarsus I 4-jointed; pedipalpal tibia with 3 short, stunted spines; femur I with 6 ventral spines .....*S. annulipes*
- Tarsus I 3-jointed; pedipalpal tibia with 2 long spines; femur I with 4 ventral spines..... *S. cubanus*



**Fig. 4.** *Santobius annulipes* (Sørensen 1886) (AMNH AK 280), from Fiji. Male right chelicera: (A) ectal and (B) mesal views. Female right chelicera: (C) ectal and (D) mesal views. All drawings are to the same scale. Scale bar = 1 mm.

***Santobius annulipes* (Sørensen, 1886) comb. nov.**

(Figs. 1A, C, 2-6)

*Mesoceras annulipes* Sørensen, 1886: 68, pl. 5, fig. 7; Roewer, 1912: 191; 1923: 152, fig. 164. [types: ZMUC and ZMH, ♂ ♀, not examined].

*Ibalonius annulipes*: Loman, 1902: 201.

**Type locality:** MELANESIA. Fiji. Viti Levu. WWF Ecoregion OC0105 (Fiji tropical moist forests).

**Records:** MELANESIA. New Caledonia (Roewer 1923). WWF Ecoregion AA0103 (New Caledonia moist forests).

**Material examined:** 1 ♂, 2 ♀ ♀ (AMNH AK 280) Fiji, Viti Levu, Nadarivatu, c. 870 m, 9 Jan. 1987 Norman I. Platnick leg.; 1 ♀ (AMNH AK 305) Fiji, Viti Levu, Nausori highlands, 10 Jan. 1987 Norman I. Platnick leg.

**Diagnosis:** Scutal area IV with a pair of paramedian low blunt tubercles (Figs. 2, 3A). Chelicerae sexually dimorphic, hand swollen in male (Fig. 4), Mm1 and Mc1 very stout on male and much reduced in female (Figs. 1A, C). Pedipalpal trochanter with 2 ventral spines, femur with 3 (Fig. 5A). Femur I with 9 dorsal and 7 ventral main setiferous tubercles (Fig. 5B). Tarsal counts: 4(2)/8-12(3)/4-5/5. Measurements of body and appendages given in tables 2 and 3.

***Santobius cubanus* (Šilhavý, 1969) comb. nov.**

(Fig. 1B)

*Ibantila cubana* Šilhavý, 1969: 375, figs. 2-7; Kury, 2003: 222 [type MCZ 14699, ♂ holotype, not examined].

**Type locality:** CUBA. Cienfuegos. Soledad [currently Jardín Botánico de Cienfuegos],

[Botanical Garden, introduced]. WWF Ecoregion NT0213 (Cuban dry forests).

**Diagnosis:** Scutal area IV with a pair of paramedian low blunt tubercles. Pedipalpal trochanter with 2 ventral spines, femur with 4. Femur I with 10 dorsal and 6 ventral main setiferous tubercles. Tarsal counts: 3(2)/9-11(3)/5/5. Measurements of body given in table 2.

***Santobius spinigerus* (Sørensen, 1886) comb. nov.**

*Mesoceras spinigerum* Sørensen, 1886a: 70, pl. 5, fig. 8; Roewer, 1912: 192; 1923: 152, fig. 165. [type: ZMH, 1 ♂, not examined].

*Ibalonius spinigerus*: Loman, 1902: 201.

*Mesocerotula spinigera*: Roewer, 1949: 263, fig. 40.

**Type locality:** MELANESIA. Fiji. Viti Levu. WWF Ecoregion OC0105 (Fiji tropical moist forests).

**Records:** MELANESIA. New Caledonia (Roewer 1923). WWF Ecoregion AA0103 (New Caledonia moist forests).

**Diagnosis:** Scutal area IV with a pair of paramedian acuminate high spines. Pedipalpal trochanter with 1 and femur with 3 ventral spines. Femur I with 5 dorsal and 4 ventral main setiferous tubercles Tarsal counts: 3(2)/9-10(3)/5/5.

***Santobius spinitarsus* Roewer, 1949**

(Figs. 1D, 7-9)

*Santobius spinitarsus* Roewer, 1949: 268, fig. 50a, b.

**Type locality:** MELANESIA. Vanuatu. West Santo: Tatarii. WWF Ecoregion AA0126 (Vanuatu rain forests).

**Table 2.** Body measurements of male *Santobius annulipes* (average of 3 females examined in parentheses), the female *S. spinitarsus* lectotype (female paralectotype in parentheses), and male holotype of *S. cubanus* (measurements extrapolated from Šilhavý 1969)

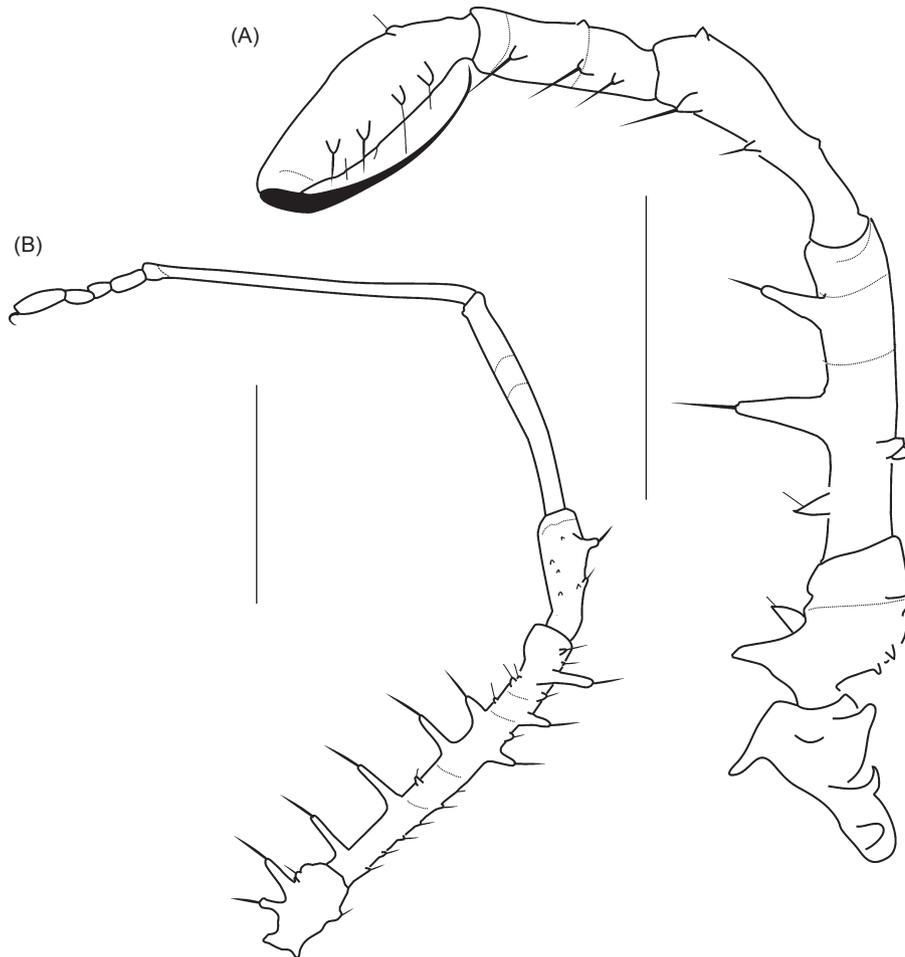
Species	Body part (mm)				
	ID	CL	AL	CW	AW
<i>S. annulipes</i>	1.3 (1.2)	1.3 (1.3)	1.1 (1.4)	1.8 (1.8)	2.1 (2.2)
<i>S. spinitarsus</i>	2.0 (1.9)	2.2 (2.0)	2.0 (2.2)	3.1 (2.8)	3.5 (3.3)
<i>S. cubanus</i>	1.7	1.5	1.5	2.4	2.8

Body parts are defined in table 1.

*Type material examined:* 1 ♀ lectotype, 1 ♀ paralectotype (instead of “male and female” as originally stated), herewith designated (SMF RII 5062/14), Vanuatu. West Santo: Tatarii. Right chelicera, pedipalpus, and leg I detached and mounted on slide by Roewer.

*Diagnosis:* Scutal area IV with a pair of paramedian low acuminate tubercles. Pedipalpal trochanter with 1 ventral spine, femur with 3. Femur I with 2 dorsal and 3 ventral main setiferous tubercles Tarsal counts: 4(2)/9-10(3)/5/5.

*Redescription of female lectotype:* Dorsum:

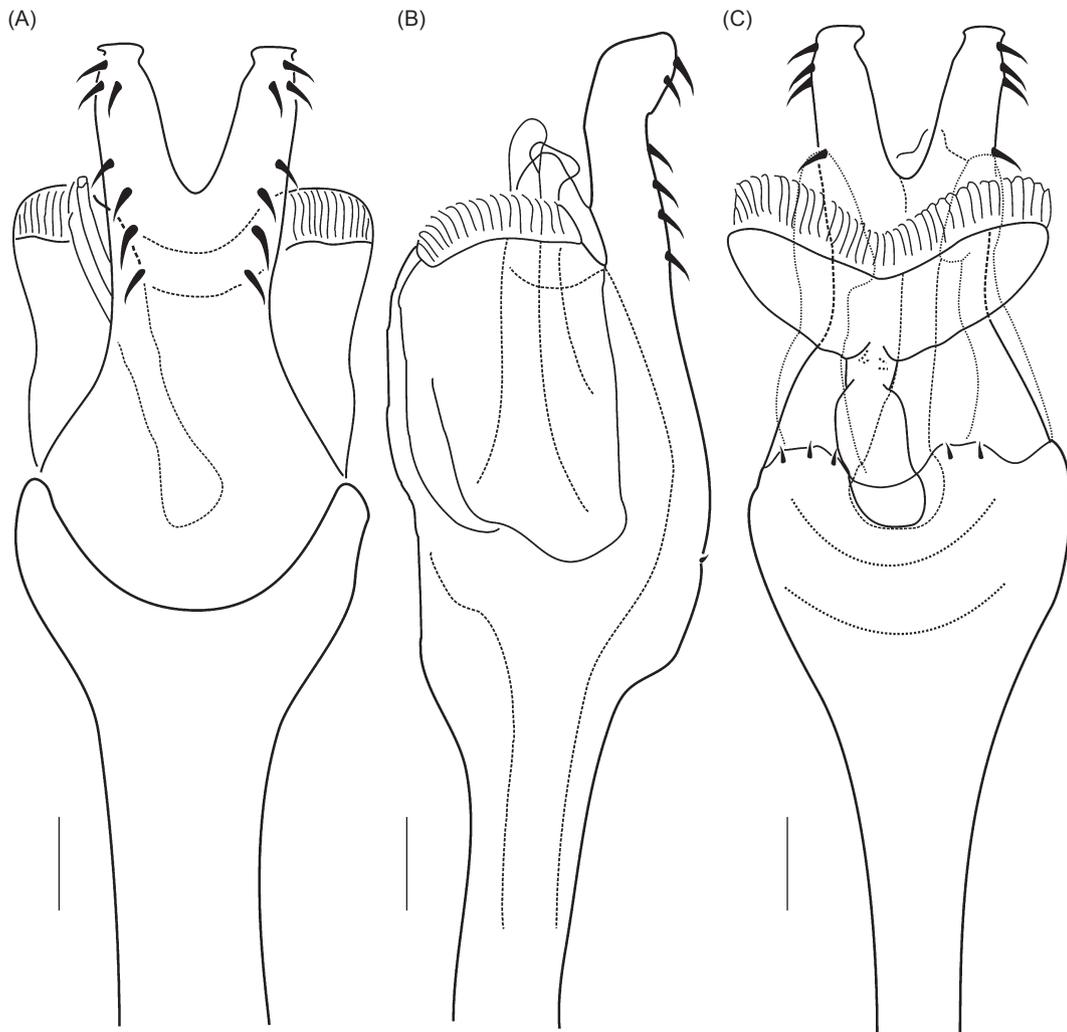


**Fig. 5.** *Santobius annulipes* (Sørensen 1886). Male (AMNH AK 280), from Fiji. (A) Right pedipalpus, mesal view. (B) Right leg I, mesal view. Scale bars = 1 mm.

**Table 3.** Appendage measurements of male *Santobius annulipes* (average of 3 females examined in parentheses)

Appendage	Segment (mm)						
	Tr	Fe	Pa	Ti	Mt	Ta	Claw
Pedipalpus	0.6 (0.8)	1.2 (1.8)	1.0 (1.2)	0.7 (1.4)	-	1.0 (1.6)	0.9 (1.3)
Leg I	0.5 (0.4)	2.0 (1.5)	0.7 (0.5)	1.3 (1.1)	1.8 (1.3)	0.7 (0.7)	-
Leg II	0.7 (0.6)	3.6 (3.3)	0.9 (0.8)	3.2 (3.0)	3.1 (2.7)	- (1.8)	-
Leg III	0.6 (0.5)	2.3 (2.0)	0.7 (0.6)	1.8 (1.6)	2.8 (2.2)	0.8 (0.6)	-
Leg IV	0.6 (0.5)	3.0 (2.6)	0.9 (0.7)	2.3 (2.0)	3.8 (3.3)	0.8 (0.8)	-

Segments are defined in table 1.



**Fig. 6.** *Santobius annulipes* (Sørensen 1886). Male (AMNH AK 280), from Fiji. Penis, distal part: (A) ventral view, (B) lateral view, and (C) dorsal view. Scale bars = 0.1 mm.

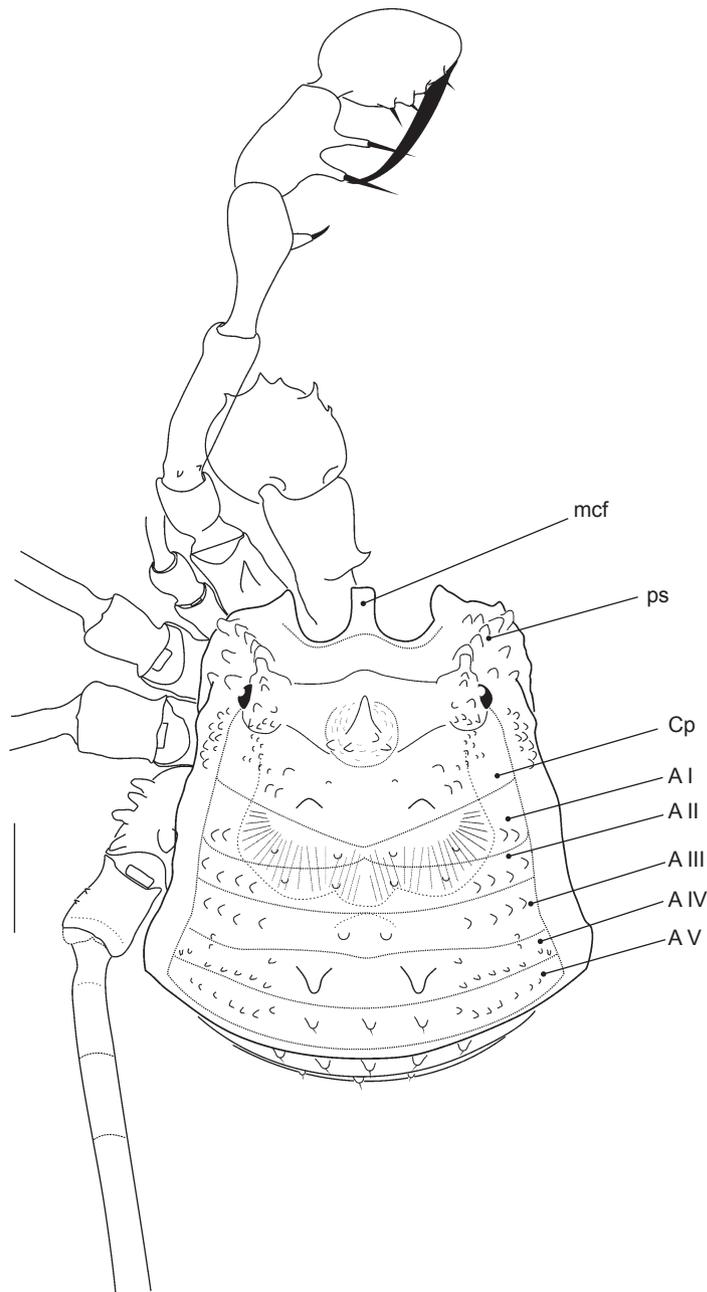
**Table 4.** Appendage measurements of the female *Santobius spinitarsus* lectotype (those of the female paralectotype in parentheses)

Appendage	Segment (mm)						
	Tr	Fe	Pa	Ti	Mt	Ta	claw
Pedipalpus	0.8 (1.0)	1.9 (1.9)	1.1 (1.0)	1.2 (1.3)	-	1.5 (1.6)	1.6 (1.5)
Leg I	0.5 (0.6)	2.6 (2.5)	0.7 (0.7)	2.0 (2.0)	2.7 (2.8)	1.1 (1.1)	-
Leg II	0.7 (0.8)	6.0 (5.4)	1.1 (1.2)	5.4 (5.0)	6.1 (5.6)	2.6 (2.6)	-
Leg III	0.9 (0.9)	4.4 (4.4)	1.2 (1.1)	3.2 (3.3)	5.3 (5.4)	1.4 (1.2)	-
Leg IV	0.8 (0.7)	5.7 (5.5)	1.3 (1.2)	4.0 (3.9)	7.1 (6.7)	1.3 (1.1)	-

Segments defined in table 1.

Dorsal scutum in dorsal view trapezoid, with 2 constrictions, 1 at scutal groove, 1 at groove III, widest at posterior border, posterior border convex (Fig. 7). Carapace with deep cheliceral sockets, mid cheliceral flap (Fig. 7; mcf) long with square border. Common eye mound (= ocularium) absent, but ocular complex consisting of 2 widely separated eyeballs (or ocular globes, Fig. 8B; eb), loosely connected to interocular mound (Figs.

8A, B; im), i.e., a high and well-developed mound tipped by a strong erect spiniform process (Fig. 8B; sp). Anterior part of carapace with a transverse sinuous ridge in middle and a high slanted palisade (Figs. 7, 8B; ps) on each side formed by a row of 5 teeth, of which the most-posterior is connected to a corresponding tooth arising from each eyeball forming the ocular bridge (Figs. 8A, B; ob). Carapace and scutal areas well defined

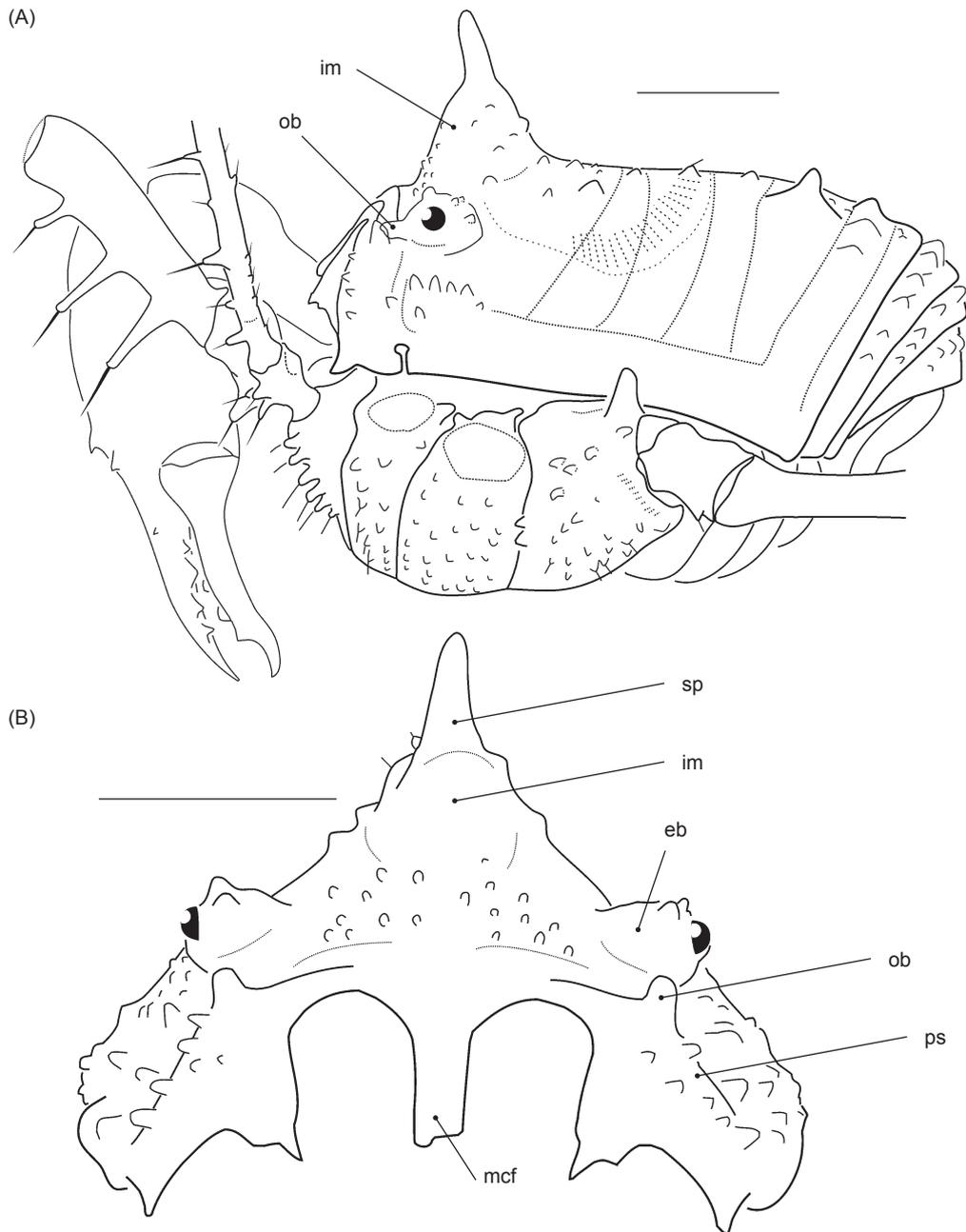


**Fig. 7.** *Santobius spinitarsus* Roewer 1949. Female lectotype (SMF 5062), from Espiritu Santo, Vanuatu. Habitus, dorsal view. Scale bar = 1 mm. Cp, carapace; A I to V, scutal areas I to V; mcf, median cheliceral flap; ps, palisade.

by 5 transverse grooves (Fig. 7). Scutal groove (= groove I) attenuate, V-shaped, accordingly causing area I to appear compressed in middle (Fig. 7). Mesotergum divided into 5 areas by transverse grooves II-V. All 5 areas more or less convex posteriorly. All scutal areas with a transverse row of low, rounded tubercles, a pair of more notable paramedian tubercles present in areas

I-IV, in area IV they are considerably larger and more widely separated (Fig. 7). Butterfly-shaped spot occupying post-ocular portion of carapace extending to area II, with thin radiating stripes (Fig. 7). Free tergites I-III each with a transverse row of tubercles.

Chelicera: Basichelicerite not especially elongate, bulla attenuate. Hand well-developed,

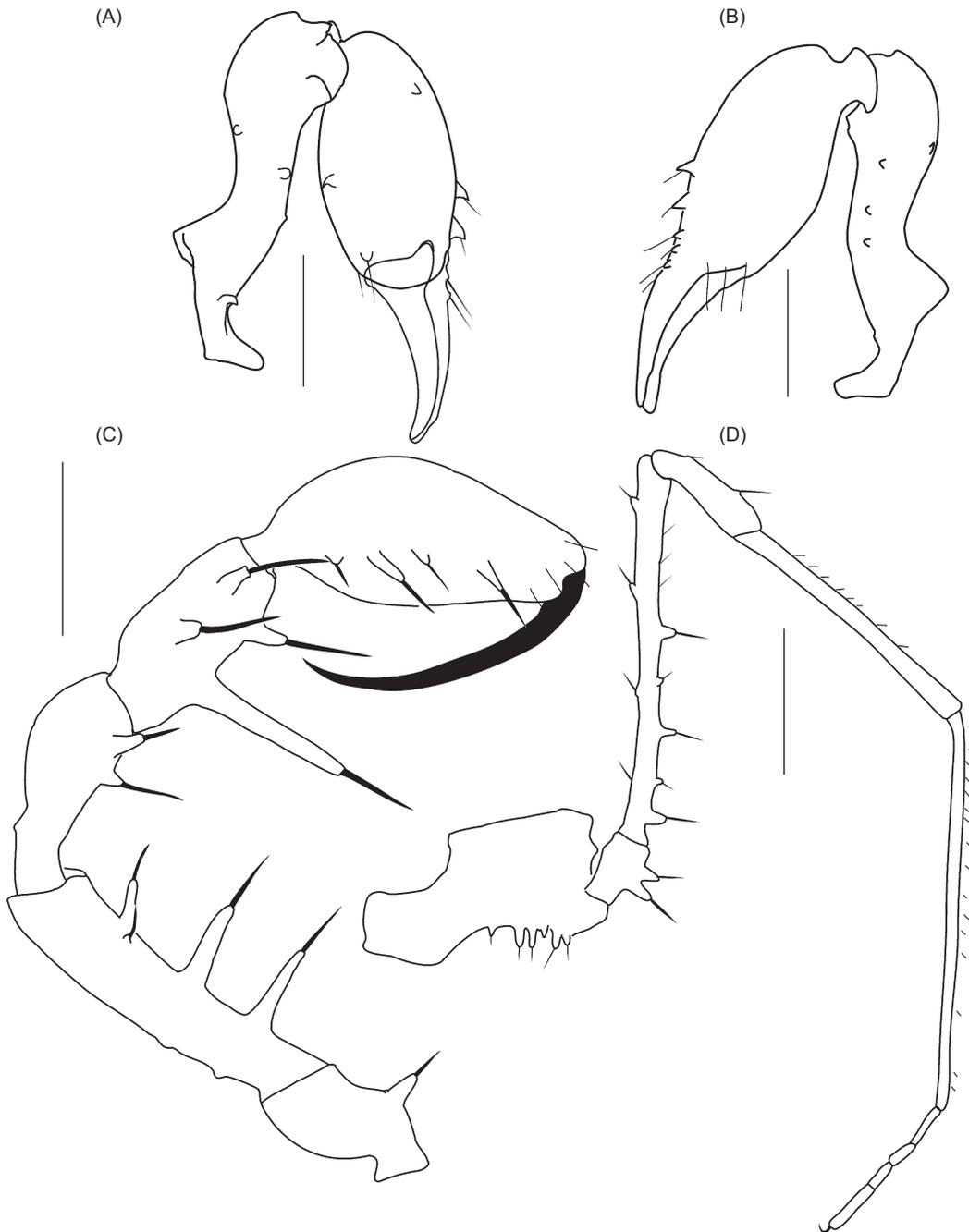


**Fig. 8.** *Santobius spinitarsus* Roewer, 1949. Female lectotype (SMF 5062), from Espiritu Santo, Vanuatu. (A) Habitus, lateral view. (B) Anterior part of carapace, frontal view. Scale bars = 1 mm. eb, eyeball (ocular globe); im, interocular mound; mcf, median cheliceral flap; ob, ocular bridge; ps, palisade; sp, spiniform process of im.

with a few ventral and 1 posterior pointed tubercles. Dentition (Fig. 1D): Mm1 as a low crest, Mc absent, Mi1-3 triangular, decreasing slightly apically. Fm and Fc absent, Fi1-5 subequal and triangular.

Pedipalpus (Fig. 9C): No segment especially elongate, trochanter short, with 1 ventral and 1 ventro-ectal (smaller) setiferous tubercle. Femur

with a row of 3 very strong setiferous tubercles Ili. Patella with 1 ventro-mesal + 1 ventro-ectal strong setiferous tubercle. Tibia with 4 stout setiferous tubercles: 2 ventro-ectal Ii + 2 ventro-mesal II. Tarsus powerful, convex dorsally with 8 very weak setiferous tubercles: 4 Ilii ventro-ectal + 4 Ilii ventro-mesal, also with ventral field of numerous minute setiferous granules. Claw robust and



**Fig. 9.** *Santobius spinitarsus* Roewer, 1949. Female lectotype (SMF 5062), from Vanuatu. Right chelicera: (A) ectal view and (B) mesal view. Right pedipalpus: (C) mesal view. Right leg I: (D) mesal view. Scale bars = 1 mm.

smooth.

Legs: All podomeres sub-straight and unarmed, excepted for leg I as follows: trochanter I with 3 ventral divergent setiferous tubercles; femur I with a ventral row of 5 stout setiferous tubercles I; a dorsal row of 4 weaker setiferous tubercles I; patella I with a dorsal row of small setiferous tubercles I (Fig. 9D). Tarsal counts: 4(2)/9(3)/5/5. Measurements of body and appendages given in tables 2 and 4.

Male: Unknown.

Variations in the paralectotype: Tarsal counts: 4(2)/9-10(3)/5/5, joints of distitarsus II more clearly marked.

## DISCUSSION

### Sexual dimorphism and scoring of character states

Roewer's referring any individual to a gender cannot be taken as an accurate guess. He was unaware of male dimorphism and apparently never dissected genitalia even to sex the specimens. Errors of male/female determination by Roewer are known to have occurred even in families with well-marked sexual differences (Kury 2003), let alone in the Podoctidae which shows some unusual features. Podoctids may have profuse sexual dimorphism in the elongation or armature of the interocular mound, basichelicerite, cheliceral hand, and pedipalps (A.B. Kury and G. Machado, unpubl. data). But little is known about specific variations in each species. The lack of 1 main semaphoront makes it difficult to score characters in a morphological data matrix due to the presence of large amounts of missing data. For example, judging by the literature alone, a well-developed canine is clearly present in *Ibantila* (a male drawn by Šilhavý), unknown or not-mentioned for *Mesoceras*, and absent from the supposed male of *Santobius* (a female called a male by Roewer), although after this study, we can fairly well predict that it will be present when males are discovered. That is why recognition of gender is so important in the Podoctidae.

### Relationships within the genus *Santobius*

There is no doubt that *S. annulipes* and *S. cubanus* are closely related species. The morphology of the penis and chelicerae, and the overall body proportions and color pattern are

almost identical, and preliminary data from an ongoing phylogenetic analysis of the Podoctidae indicate that the clade formed by these 2 species is supported by at least 5 synapomorphies (A.B. Kury and G. Machado, unpublished data). These results provide additional support for the hypothesis that individuals of *S. cubanus* were introduced in the Harvard botanical garden in Central Soledad (currently Jardín Botánico de Cienfuegos), probably together with soil or plant samples that came from Fiji or nearby islands.

Similarities in the cheliceral and pedipalpal morphology, as well as in the color and outline of the body, strongly suggest that *S. spinitarsus* is the sister species of the clade formed by *S. annulipes* + *S. cubanus*. *Santobius spinigerus*, on the other hand, differs most markedly from other species of *Santobius*. This species was not examined here, and it is apparently known only by a female.

### Relationships between *Santobius* and other genera of the Ibaloniinae

It is still early to advance detailed phylogenetic relationships within the subfamily Ibaloniinae. As evidenced in the synonymy proposals of both Loman (1902) and Suzuki (1977), *Santobius* is obviously close to *Ibalonius*, from which it differs by the typical egg-shaped body and genital morphology. Judging by the penis, coxa IV, and pedipalpus, *Santobius* is also close to genera such as *Pentacros*, *Proholozoster*, and *Heteropodoctis*, all from New Guinea, which suggests a phylogenetic connection between eastern and western Melanesia opilionofaunas. They can be distinguished by the typical armature and granulation of the scutum.

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