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Two new species of *Americanura* (Collembola: Neanuridae) from Belize, Central America

José G. Palacios-Vargas¹, Blanca E. Mejía-Recamier^{1,*}, and M. Magdalena Vázquez²

Abstract

Two new species of *Americanura* (Collembola: Neanuridae) from Belize are described and illustrated, *A. belicensis* sp. nov. and *A. denisi* sp. nov. *Americanura belicensis* sp. nov. has long barbulate setae and the dorso-internal tubercles chaetotaxy formula 033/2222, whereas *A. denisi* sp. nov. has short and less barbulate setae, and with a reduced chaetotaxy formula of dorso-internal tubercles of 011/1111.

Key Words: taxonomy; chaetotaxy; neotropics; comparison

Resumen

Se describen e ilustran dos nuevas especies de *Americanura* (Collembola: Neanuridae) de Belice, *A. belicensis* sp. nov. y *A. denisi* sp. nov. *Americanura belicensis* sp. nov. tiene sedas largas barbuladas y la fórmula de los tubérculos dorso-internos y quetotáxica de 033/2222; mientras que *A. denisi* sp. nov. tiene setas más cortas y menos barbuladas y una fórmula de las sedas en dichos tubérculos como 011/1111.

Palabras Clave: taxonomía; quetotáxica; neotrópicos; comparación

The Collembola of Belize are poorly known, previous research consists of a couple of contributions describing 3 new species of Paronellidae (Palacios-Vargas & Thibaud 1997; Soto-Adames & Taylor 2013). Although, Neanuridae is the second richest Collembolan family in the world, with 1,436 described species, not a single species has been reported from Belize (Palacios-Vargas 2013). Sensillanurini tribe genera include *Americanura*, *Palmanura*, *Sensillanura* and *Tabasconura*, of which *Americanura* is the most diversified in the Americas. Up to date, 21 species have been referred to *Americanura*, many of them local endemic species, and it seems that many undescribed forms remain to be discovered. Here, we provide the first record of the genus *Americanura* in Belize and describe 2 new species.

Materials and Methods

Collembola were cleared in 10% potassium, followed by chloral hydrate, and then were mounted in Hoyer's solution. Specimens were drawn under a compound microscope with the help of a camera lucida. Terminology for the descriptions is based mainly on Deharveng (1981) and Deharveng and Weiner (1984), modified by Palacios-Vargas and Simón Benito (2007).

Abbreviations: Abd = abdominal segment; Ant = antennal segment; Af = cephalic anteno-frontal tubercle; BM = barbulate macrosetae; bm = barbulate microsetae; bme = barbulate mesosetae; Cl = clypeal tubercle; De = dorso-external tubercle; Di = dorso-internal tubercle; DL = dorso-lateral tubercle; L = lateral tubercle; M = macrosetae; m = microsetae; Oc = ocular tubercle; Ocm = ocular median seta; Ocp = ocular posterior seta; S = cylindrical sensilla on Ant IV; Sgd = dorsal guard sensillum; Sgv = ventral guard sensillum; So = sub-ocular tubercle; ss = sensorial setae on body; Th = thoracic segment.

Americanura Cassagnau, 1983

Modified diagnosis: Eyes 2 + 2 dark pigmented. Body without hypodermic blue pigment. Usually white, yellow or light orange when alive, white in alcohol. Mouthparts reduced, maxillae styletiform. Sensillum S7 hyperatrophied, at least twice as thick as others. Posterior cephalic setae in 2 groups, Di1 isolated, and Di2 + De2 + De1 together (De2 is located behind Di2, but in half of the 24 species examined both were lacking). Head DL tubercle often separated and usually with 2 setae. Tubercles L and So difficult to distinguish. Di tubercle on thorax I always absent; 1 or 2 setae on De and always 1 seta on DL. Di on Abd IV and V with 1 or 2 setae. Tubercles De, DL, and L on Abd V fused and with a reduced chaetotaxy. Four, 6, or 8 crenulated setae between the ss on Abd IV, and 2 (half of the cases) to 6 between those of Abd V. Setae on Di and De tubercles crenulated, barbulate, or palmate.

Type species

Americanura mexicana Cassagnau, 1983.

Results

Americanura belicensis sp. nov. (Figs. 1–3)

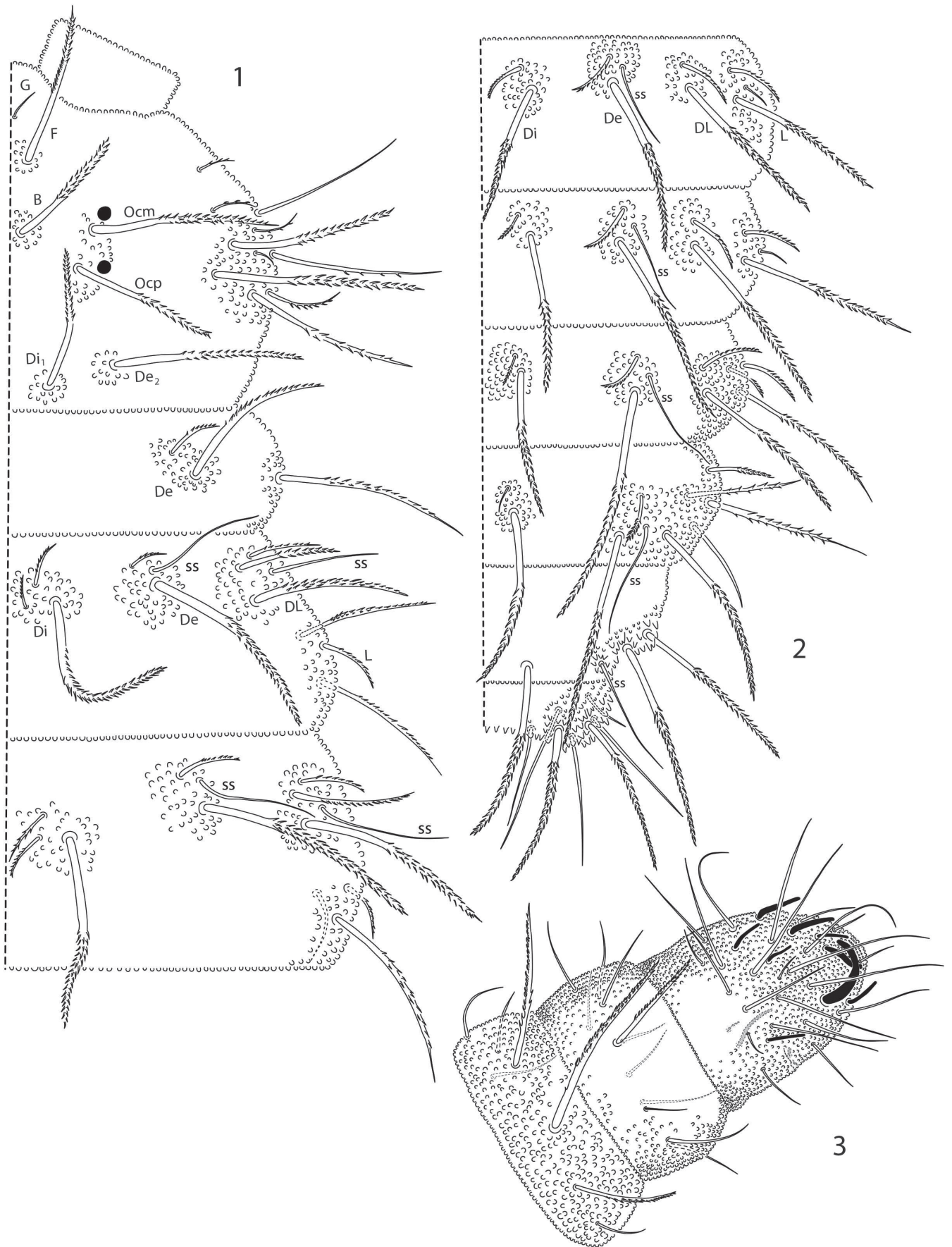
TYPE MATERIAL

HOLOTYPE female: One paratype female and 1 preadult. All the type material will be kept at senior authors' institution. Type Locality: BELIZE, Chikibul National Park, ex litter, 12 Nov 1998, ex litter, col. M. Vázquez, H. Klompen, C. Chargoy.

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Figs. 1–3. *Americanura belicensis* sp. nov. 1, antennal dorsal chaetotaxy; 2, head and thorax chaetotaxy; 3, abdominal chaetotaxy.

Table 1. Demi head chaetotaxy of *Americanura belicensis* sp. nov. +/- indicates presence/absence.

Head setae group	Tubercles	Number of setae	Kind of setae	Setae
Cl	+	2	BM, m	FG
Af	+	1	BM	B
Oc	+	2	BM	Ocm, Ocp
Di	+	1	BM	Di1
De	+	1	BM	De1
DL + L + So	+	10–11	3BM, 2M, bme, 5m	
Total	6	18		

DESCRIPTION

Length 1.6 mm (range 1.1–1.9 mm; $n = 3$). Color white in alcohol. Granulations fine, about half size of 1 eye. Tubercles well developed, both cephalic tubercles B coalesce, and those of Abd IV, De, DL and L fused. Head seta F long (128 μ m). Four kinds of body setae, long and heavy BM (on Di tubercle / Th II, III; Abd I and IV) 153, 155; 160 and 148 μ m; bme (on Di tubercle / Th II, III; Abd I and IV) 43, 46; 56, 53 μ m, and M 151 μ m (range 133–155 μ m), with few barbulations, almost smooth, inserted near ss, which is around 100 μ m long (Fig. 1).

Ant I with 7 setae, 3 are dorsal BM, Ant II with 11 setae, 1 dorsal barbulated seta. Ant III sensorial organ with 2 globular sensilla in a cuticular fold, and 2 guard sensilla. Sgd straight, shorter than Sgv, 1 microsensillum ventro-external. Ant IV typical for the genus (Fig. 3) with sensillum S7 hypertrofied, and S1, S2 and S5 thinner and shorter than others.

Eyes 2 + 2 with dark pigment. Setae Ocm and Ocp long (131 μ m). Mandibles with 3 teeth, maxillae styliform. Head with tubercles well developed, chaetotaxy as in Fig. 1 and Table 1.

Tibiotarsi I, II, and III without tenent hairs, with 18, 18, and 17 setae, respectively. Thoracic and abdominal chaetotaxy as in Figs. 1 and 2. Total chaetotaxy as in Tables 1 and 2.

Ventral tube with 4 + 4 setae, 2 anterior distal setae subequal in size, 2 posterior setae different, 1 larger. Female genital plate with 3 + 3 pregenital setae, 20–23 circumgenital, 2 eugenital setae. Furcal vestige without microsetae.

ETYMOLOGY

Species is named after the country Belize, the type locality.

REMARKS

Americanura belicensis sp. nov. has long barbulate setae and the Di setae formula 033/2222, lacks cephalic setae "A," has 2 ocular setae

and is unique for the fusion of DL and L tubercles on Abd III and IV. In addition, it only has 1 seta between the ss of Abd V. Thirteen other forms share the chaetotaxy of Th I Di on Th II to III with the new species. The head chaetotaxy of *Americaura belicensis* sp. nov. is similar to *A. palaciosi* Paniagua Nucamendi, 2012 from Turrialba, Costa Rica. The most evident difference between both species is *A. belicensis* sp. nov. lacks cephalic setae "A" and tubercle Di on Abd V carries 1 seta, whereas *A. palaciosi* bears 2 setae. Variation: On Th II tubercle De, asymmetrically, 1 bifid seta.

Americanura denisi sp. nov. (Figs. 4–6)

TYPE MATERIAL

HOLOTYPE female: 4 paratype females, 1 paratype male. All the type material will be kept at senior authors' institution. Type Locality: BELIZE, Chikibul National Park, ex litter, 12 Nov 1998, ex litter, col. M. Vázquez, H. Klompen, C. Chargoy.

DESCRIPTION

Length 1.2 mm (range 1.3–1.6 mm; $n = 3$). Color white in alcohol. Granulations fine, about half size of 1 eye. Tubercles well developed, cephalic tubercles B not coalesce, and those of Abd IV, De, DL, and L fused. Head seta F short (93 μ m). Four kinds of body setae, relatively short and slightly barbulated macrosetae (BM on Di tubercle / Th II, III; Abd I and IV) 119, 111; 111 and 128 μ m, short barbulated mesosetae (bme) 83 μ m (range 67–86 μ m), and M 122 μ m (range 109–130 μ m) nearly smooth with few barbulations, microsetae 38 μ m (range 33–45 μ m) besides sensorial seta (ss) around 100 μ m (Fig. 5).

Ant I with 7 setae, 3 are dorsal BM, Ant II with 11 setae, 4 dorsal weakly barbulated. Ant III sensorial organ with 2 globular sensilla in a cuticular fold, and 2 guard sensilla. Sgd slightly curved and as long as Sgv, 1 microsensillum ventro-external. Ant IV typical for genus (Fig. 4) with sensilla S7 hypertrofied and S1 and S2 subequal to others.

Eyes 2 + 2 with dark pigment. Setae Ocm and Ocp short (99 μ m). Mandibles with 3 teeth, maxillae styliform. Head with tubercles well developed, chaetotaxy in Fig. 2 and Table 3.

Tibiotarsi I, II and III without tenent hairs, with 18, 18, and 17 setae, respectively. Thoracic and abdominal chaetotaxy in Figs. 5 and 6. The total chaetotaxy is shown in Tables 3 and 4.

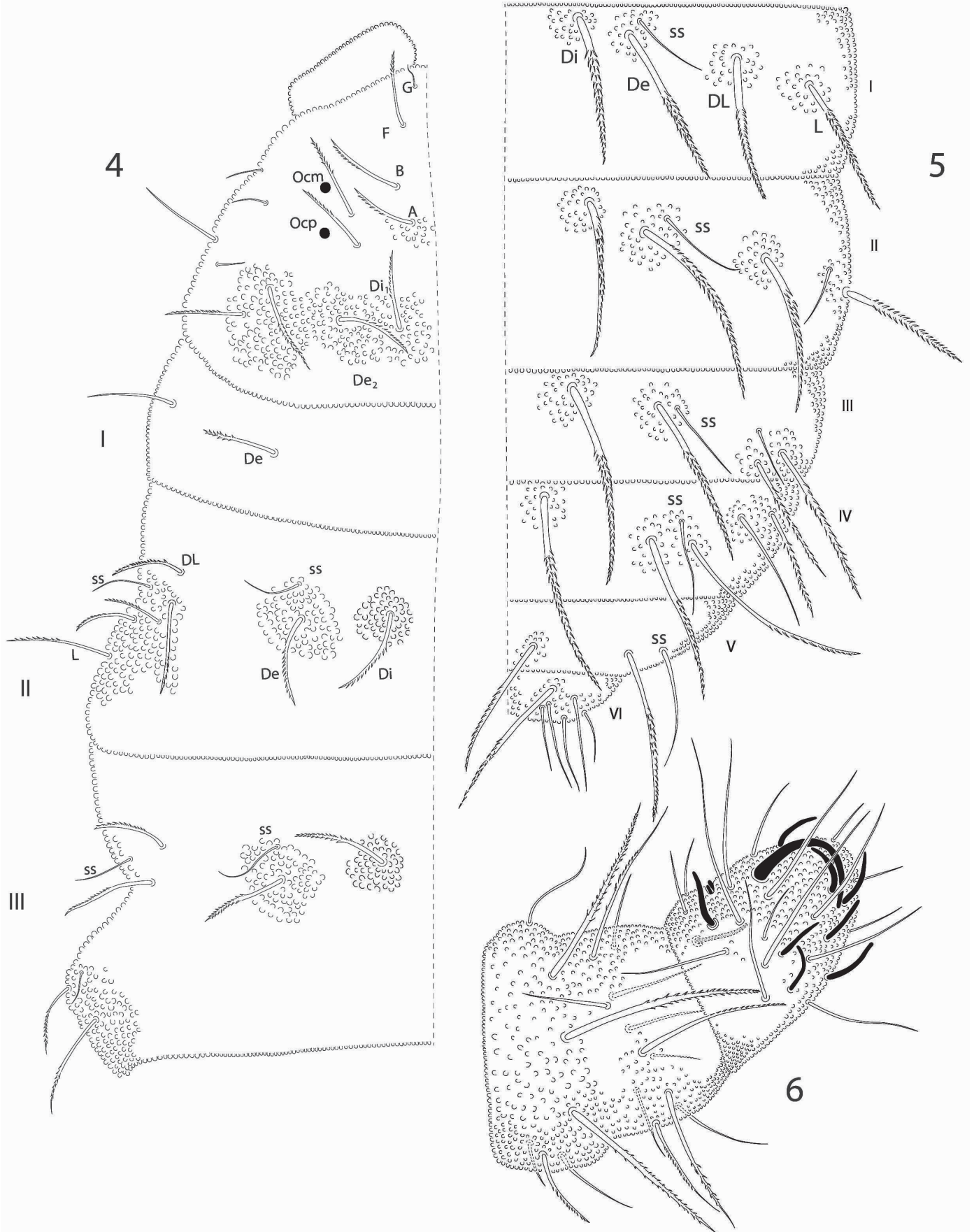
Ventral tube with 4 + 4 setae, the 2 distal setae subequal in size. Female genital plate with 3 + 3 pregenital seate, 20 to 23 circumgenital, 2 eugenital setae. Furcal vestige without microsetae.

ETYMOLOGY

Species is named after Dr. Edouard Denis, for his contributions to the Collembola of Central America.

Table 2. Chaetotaxy of *Americanura belicensis* sp. nov. by demitergite. +/- indicates presence/absence.

Body part	Demitergite	Di	De	DL	L
Thorax	I	—	BM, bme	BM	—
	II	BM, 2bme	BM, bme + ss	BM, 2bme + ss	2BM, bme
	III	BM, 2bme	BM, bme + ss	BM, 2bme + ss	BM, 2bme
Abdomen	I	BM, bme	BM, bme + ss	BM, bme	BM, bm, m
	II	BM, bme	BM, bme + ss	BM, bme	BM, bm, m
	III	BM, bme	BM, bme + ss	BM, bme	BM, bm, bme
	IV	BM, m	2BM, bme + ss		2BM, M, bme
	V	BM		ss + 2BM	
	VI				



Figs. 4–6. *Americanura denisi* sp. nov. 4, antennal dorsal chaetotaxy; 5, head and thorax chaetotaxy; 6, abdominal chaetotaxy.

Table 3. Demi head chaetotaxy of *Americanura denisi* sp. nov. +/- indicates presence/absence.

Head setae group	Tubercles	Number of setae	Kind of setae	Setae
Cl	—	2	BM, m	FG
Af	—	2	BM	AB
Oc	—	2	BM	Ocm, Ocp
Di	+	1	BM	Di1
De	+	1	BM	De1
DL + L + So	1	6	2BM, M, 3m	6
Total	3	14		

Table 4. Chaetotaxy of *Americanura denisi* sp. nov. by demitergite. +/- indicates presence/absence.

Body part	Demitergite	Di	De	DL	L
Thorax	I	—	BM	BM	—
	II	BM	BM + ss	2BM, me + ss	3BM
	III	BM	BM + ss	2BM + ss	2BM, m
Abdomen	I	BM	BM + ss	BM	BM, m
	II	BM	BM + ss	BM	BM, m
	III	BM	BM + ss	BM	2BM, m
	IV	BM	2BM + ss		BM, m
	V	BM		BM + ss	
	VI			7	

REMARKS

Americanura denisi sp. nov. has short and not heavily barbulated setae, Di setae formula 011/1111, presents cephalic setae "A", has 2 ocular setae and there is not any fusion of DL and L tubercles on Abd III and IV. In addition, it has 2 setae between the ss of Abd V.

Americaura denisi sp. nov. is very closely related to one group of species that share a similar reduced chaetotaxy of the thorax and abdomen: *A. banksi* (Denis, 1933), *A. bara* (Christiansen and Bellinger, 1980), *A. castagnorum* Palacios-Vargas, Simón Benito, Paniagua Nunca-mendi, 2009, *A. interrogator* (Cassagnau and Palacios-Vargas, 1983), *A. setafoliacea* (Cassagnau and Palacios-Vargas, 1983), and *A. sotanophila* (Cassagnau and Palacios-Vargas, 1983). It differs very clearly from *A. setafoliacea* from Los Tuxtlas, Veracruz (Mexico), which has palmate setae on head and thorax, and from *A. sotanophila* from Querétaro (Mexico), which is much smaller (0.9 mm) and has only 1 + 1 seta be-

tween the ss on Abd V. *Americaura denisi* sp. nov. differs from *A. castagnorum* from Panama in having a more abundant cephalic chaetotaxy (with head seta A and Ocp). Head tubercles Di, De and L are not well developed and are fused. Differences among these new species and the most similar taxa are shown in Table 5.

Variation: The presence of 2 abdominal bifurcate setae in 1 specimen was the most outstanding variation observed.

Discussion

Cassagnau (1983) briefly discussed the genus *Americanura* and referred to Cassagnau and Palacios-Vargas (1983), which was in press at the time, for a more detailed diagnosis. However, the discussion by Cassagnau (1983) was inadvertently sufficient to establish the genus as *Americanura* Cassagnau, 1983, which is unfortunate because Cassagnau & Palacios-Vargas (1983, p. 5, original in French) provided a more detailed diagnosis, as follows:

"Habitus typical Neanurinae, lacking blue hypodermic pigment; eyes 2+2, unpigmented. When cephalic tubercles present, antennal and frontal fused; cephalic dorso-internal tubercles isolate from dorso-external and with only one seta. Last antennal segment with sensillum S7 thicker than others. Buccal pieces reduced. Dorso-internal setae on thorax I always absent. Tendency in the most evolved species to the fusion of tubercles in the posterior region of body."

Cassagnau & Palacios-Vargas (1983) described 8 additional species in *Americanura*, but now the genus includes 21 species, and some aspects of both 1983 diagnoses must be modified. It is now clear that eyes can be dark in living individuals; antennal and frontal cephalic tubercles are always fused; and, when present, cephalic setae Di2 + De2 + De1 always form a group. The 1983 diagnoses do not mention the number of setae on the De tubercle on Th I, the number of setae between the ss on Abd IV, or those between ss of Abd V. The new diagnosis also describes the shape of setae, which can be crenulated, barbulate or palmate.

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Table 5. Comparison among the new species of *Americanura* and related taxa.

Species	Location, type, and number of setae																	
	Head		Th I		Th II			Th III				Abd I–III				Abd IV		
	"A"	Ocp	De	Di	De	DL	L	Di	De	DL	L	Di	De	DL	L	Di	De	DL
<i>belicensis</i>	0	1	2	3	2	3	3	3	2	3	3	2	2	2	3	2	2	2
<i>palaciosi</i>	1	1	2	3	2	3	3	3	2	2	3	2	2	2	3	2	2	2
<i>sotanophila</i>	1	1	1	1	1	2	3	1	1	2	3	1	1	1	3	1	1	1
<i>bara</i>	1	1	1	1	1	1	?	1	1	1	?	1	1	1	?	1	1	2
<i>basseti</i>	0	1	1	1	1	2	2	1	2	2	2	1	2	2	2	1	2	3
<i>castagnorum</i>	0	0	1	1	1	2	3	1	1	2	2	1	1	1	3	1	2	0
<i>denisi</i>	1	1	2	1	1	2	3	1	1	2	3	1	1	2	3	1	1	1
<i>interrogator</i>	1	1	1	1	1	2	3	1	1	2	3	1	1	1	3	1	1	1

Abbreviations: "A" = Cephalic setae A; Abd = abdominal segment; De = dorso-external tubercle; Di = dorso-internal tubercle; DL = dorso-lateral tubercle; L = lateral tubercle; Ocp = ocular posterior seta; Th = thoracic segment. ? indicates unknown.

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