

## ***Ectonocryptoides sandrops* – a new scolopendromorph centipede from Belize**

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### **Abstract**

A new representative of the rare subfamily Ectonocryptopinae (Scolopocryptopidae) is described from western Belize as *Ectonocryptoides sandrops* sp. nov. Both previously known representatives of this subfamily (*Ectonocryptops kraepelini* Crabill, 1977 and *Ectonocryptoides quadrimeropus* Shelley & Mercurio, 2005) and the new species have been compared and the taxonomic status of the latter has been analysed.

**Keywords:** Ectonocryptopinae, new species, Belize

### **1. Introduction**

Some years ago, working on exotic Scolopendromorpha from a collection of Prof. Alessandro Minelli I found one very small (ca 11–12 mm long) scolopendromorph centipede (Fig. 1). It had been collected by Francesco Barbieri in Mountain Pine Ridge of Western Belize (Fig. 2). With 23 pedal segments this blind centipede clearly belongs to the family Scolopocryptopidae Pocock, 1896. According to the very special structure of the terminal legs I have identified this animal as a new species of the very rare subfamily Ectonocryptopinae Shelley & Mercurio, 2005.

The structure of the terminal legs (= legs of the ultimate body segment) is of considerable taxonomic importance in the order Scolopendromorpha. Commonly the terminal leg consists of 5 podomeres (prefemur, femur, tibia, tarsus 1, tarsus 2) and pretarsus. The first four podomeres are always present, when tarsus 2 and the pretarsus may both be absent. The terminal podomeres are the most transformable ones.

There are six principle (or basic) types of terminal legs among scolopendromorph centipedes: 1) ‘common’ shape (the most similar to the locomotory legs), which is the least specialised (Fig. 3a). 2) ‘Pincer’-shaped (Fig. 3b), adapted for capturing prey (so they are a kind of functional forcipules) with the podomeres shortened, strongly enlarged (triangular in cross-section) and robust. In some genera (*Theatops* Newport, 1844; *Plutonium* Cavanna, 1881; *Scolopendropsis* Brandt, 1841 etc.) the ‘pincer’-shaped terminal legs are genus-specific, correlating with a strongly enlarged ultimate segment. Such an enlargement may be due to the presence of enlarged muscles, which are necessary to manipulate these appendages

as functional forcipules. But in the genus *Cormocephalus* Newport, 1844 there are some species (*C. bonaerius* Attems, 1928; *C. andinus* Kraepelin, 1903 etc.), which demonstrate (evidently, as a result of convergence) the similar shape of terminal legs (vs the majority of the species, which have terminal legs of ‘common’ shape). However, the ultimate segment is never enlarged in these species (Fig. 3c) and this character here is species-specific. 3) ‘Pocket-knife’-shaped (or ‘clasp apparatus’ sensu Shelley & Mercurio 2005), also adapted for capturing prey (Fig. 3d).

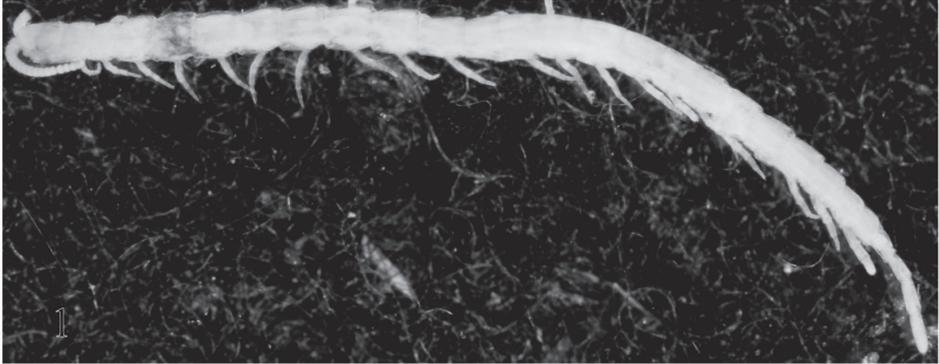


Fig. 1 *Ectonocryptoides sandrops* sp. nov. General view.

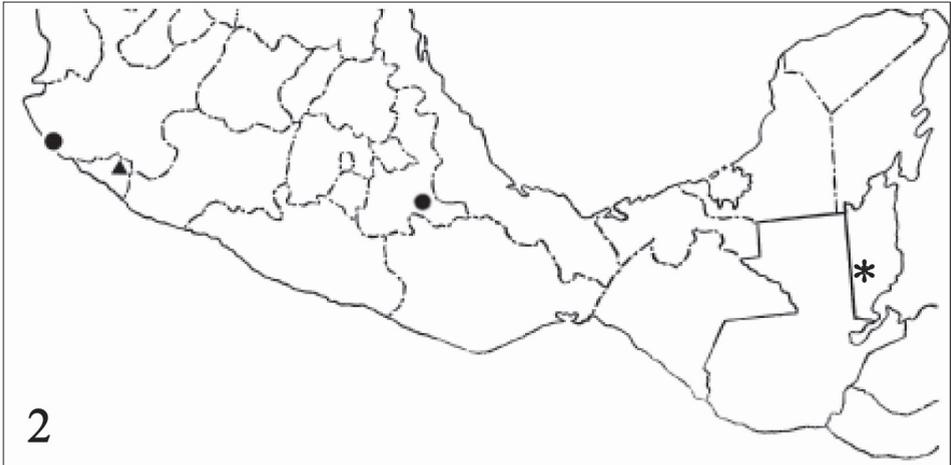


Fig. 2 The known localities of *Ectonocryptops kraepelini* (triangle), *Ectonocryptoides quadrimeropus* (dot) and *Ectonocryptoides sandrops* (asterisk). After Shelley & Mercurio 2005.

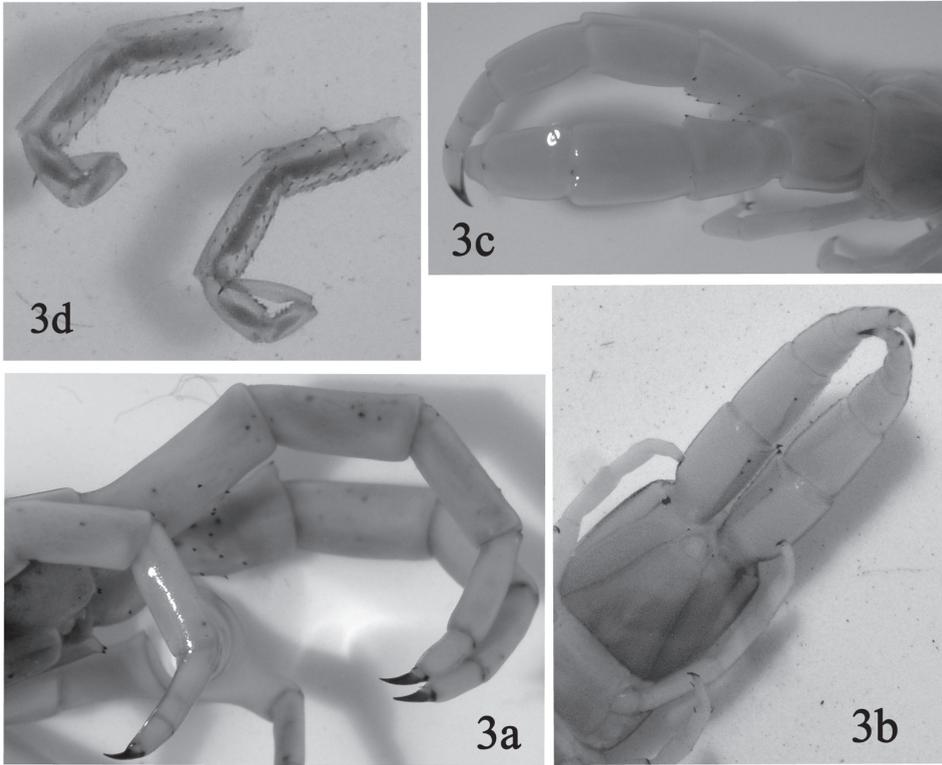


Fig. 3a–d Terminal legs of: a: *Scolopendra* sp. of ‘common’ shape; b: *Theatops spinicaudus* (Wood, 1862), ‘pincer’-shaped terminal legs; c: *Cormocephalus westwoodi anceps* Porat, 1871, ‘pincer’-shaped terminal legs; d: *Cryptops* sp., ‘pocket-knife’-shaped terminal legs.

The terminal legs of these three types have a well-developed pretarsus, whereas the following types have no pretarsus at all. The types are as follow: 4) ‘lasso’-shaped in *Newportia* Gervais, 1847 and *Tidops* Chamberlin, 1915 (Fig. 3e), with tarsus 2 divided in very numerous (7 to 40) number of more or less separated secondary articles forming a kind of functional antenna (one of the most specialised shapes). 5) ‘Leaf’-shaped in *Alipes* Imhoff, 1854 (Fig. 3f), the most specialised (the least similar to the primary condition), these are stridulatory organs, perhaps to frighten potential mammal predators (Skovmand & Enghoff 1980). 6) ‘Ectono’-type in Ectonocryptopinae (Fig. 3g), – enlarged, subclavate, with the inflated distal podomeres; Shelley & Mercurio (2005) have suggested for this type a ‘possible sensory function’.

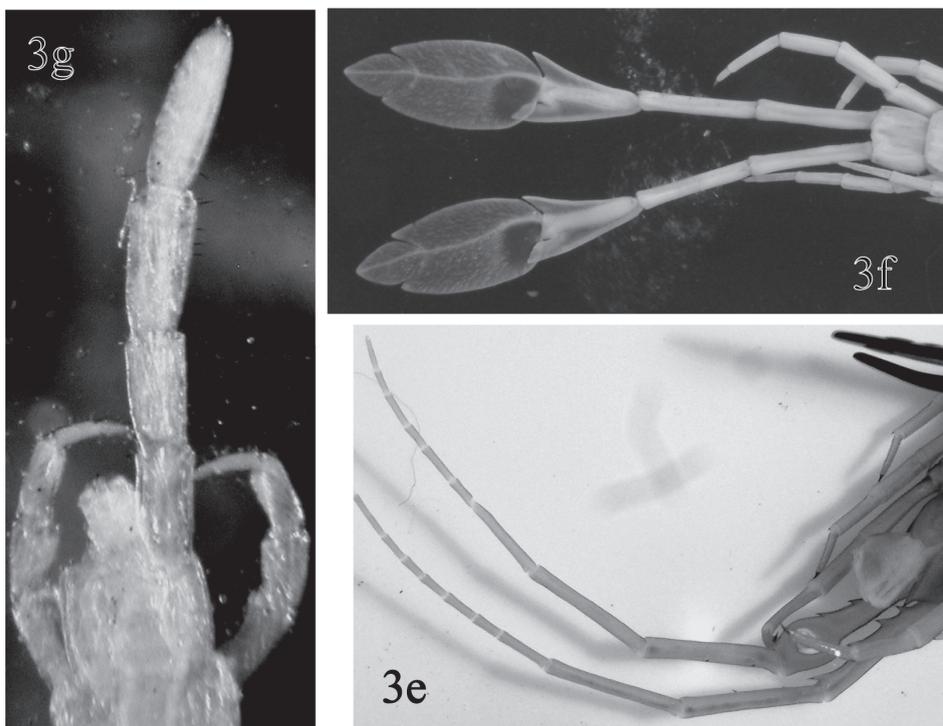


Fig. 3e–g Terminal legs of: e: *Newportia adisi* Schileyko & Minelli, 1998, ‘lasso’-shaped terminal legs; f: *Alipes grandidieri* (Lucas, 1864), ‘leaf’-shaped terminal legs; g: *Ectonocryptoides sandrops* sp. nov., left terminal leg and caudal body end, dorsally.

The structure of terminal legs is characteristic at the subfamily level in two families – Scolopocryptopidae and Cryptopidae. In other Scolopendromorpha (i.e., in family Scolopendridae) this character is mainly genus-specific but in a few genera (for instance in *Cormocephalus* s. str.) it may vary within one genus, being species-specific (see above).

The terminal legs of ‘ectono’-type are the rarest, being known solely in five specimens, which represent the subfamily Ectonocryptopinae. The first member of this taxon has been described in 1977 by Crabill, who established the monotypic genus *Ectonocryptops* for a single specimen from Colima in Mexico (Fig. 2). According to the original description, *Ectonocryptops kraepelini* has a terminal tarsus consisting of two podomeres with ‘ultimate second tarsus subclavate...’. Unfortunately, there are no illustrations in the original description, therefore Shelley & Mercurio (2005) note: ‘... and it is difficult for even a specialist to visualize a new form solely from a written characterization’. Crabill (1977) had placed his new genus in the Cryptopidae without mention of a subfamily.

In 2005 Shelley & Mercurio described the monotypic genus *Ectonocryptoides*. The type species – *E. quadrimeropus* (orig. designation) – was described on the basis of two specimens from Jalisco close to Colima (Fig. 2). We read in the original description: ‘The ultimate 2nd tarsi are clearly lost in these centipedes, a fundamental difference from *E. kraepelini* that, for

consistency within the Scolopocryptopidae and Scolopendromorpha as a whole, warrants generic-level recognition'. In the same paper the authors established for two these genera a new subfamily Ectonocryptopinae. The third specimen of *E. quadrimeropus* from Tehuacán (Puebla state, central Mexico; Fig. 2), was recently discovered by Shelley 'among the millipede holdings at the American Museum of Natural History' (Shelley 2009).

However, the formerly missing holotype of *Ectonocryptops kraepelini* has been recently found and Shelley & Mercurio (2008) redescribed it with drawings. The terminal legs of this animal are of 'ectono'-type (see Figs 5–6 in Shelley & Mercurio 2008), differing from those of both *Ectonocryptoides quadrimeropus* (see Figs 12–16 in Shelley & Mercurio 2005) and the new Belize species (Figs 3g, 8–10) in the much longer tibia and the presence of a small, globose tarsus 2. Unfortunately the condition of this holotype did not allow confirmation of Crabill's (1977) information about absence of sternal paramedial sutures and the number of spiracles in *E. kraepelini* (11 pairs, according to the original description).

Tab. 1 Comparative table for *Ectonocryptops kraepelini*, *Ectonocryptoides quadrimeropus* and *E. sandrops* sp. nov.

	<i>Ectonocryptops kraepelini</i>	<i>Ectonocryptoides quadrimeropus</i>	<i>Ectonocryptoides sandrops</i>
spiracles at 7th segment	present	?	present
antennomeres	17	17	17
forcipular appendages	no	no	no
paramedian sutures of tergum 1	semicomplete	semicomplete	complete
lateral margination at	terga 2(3)–23	tergum 23	terga 2(3)–23
sternal sutures	absent	absent(?)	lateral + margination
coxopleural process with	'2 adjacent setae'	'1 lateral spine apiece'	1–2 spine-like setae
coxopleural pores	about 20	present	about 20
tarsus of locomotory legs	bipartite	monopartite	monopartite
spurs at locomotory legs	absent	absent	absent
Terminal legs:			
ventral spinous processes of prefemur	3	3	3
ventral spinous processes of femur	2	2	2
additional small spines at femur and prefemur	absent	present	absent
length of tarsus 1	< tibia	> tibia	> tibia
tarsus 2	present	absent	absent
pretarsus	absent	absent	present (rudimentary)

## 2. Comparison of the members of Ectonocryptopinae and the taxonomic status of the new Belizean species

The diagnostic characters of the new form have been compared with those of two known ectonocryptopines (Tab. 1). The comparative table is incomplete because the known specimens of this subfamily are few in number, small, delicate and mainly in bad condition. It is evident, however, that the new animal is at least a new species, which is closer to *Ectonocryptoides quadrimeropus* (rather than to *Ectonocryptops kraepelini*) because of absence of terminal tarsus 2 – the main diagnostic character of *Ectonocryptoides* (according to Shelley & Mercurio 2008).

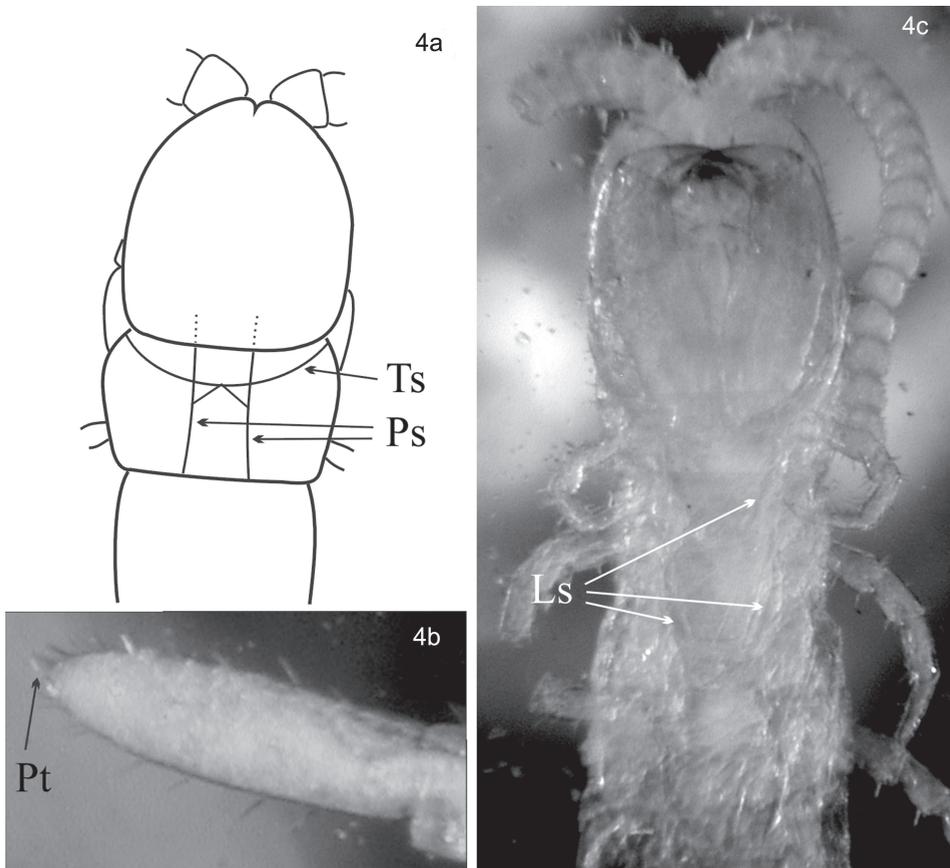
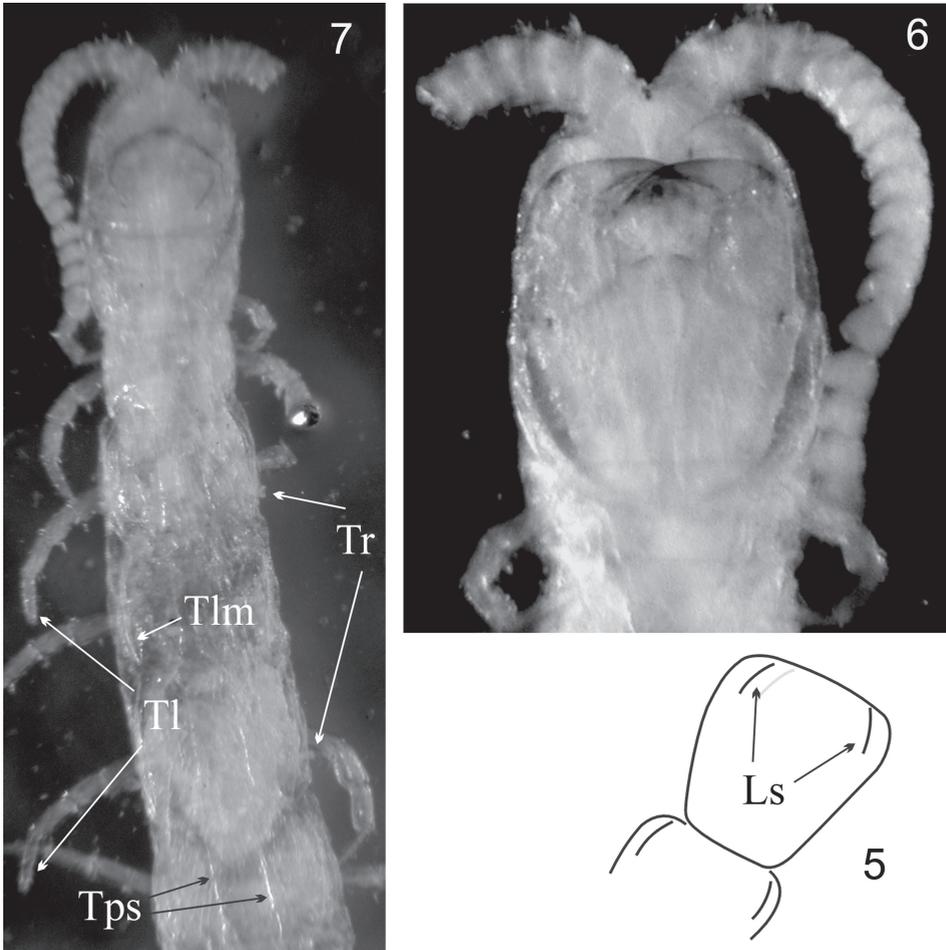


Fig. 4 a–c *Ectonocryptoides sandrops* sp. nov.: a: head + tergum 1, dorsally; Ps: paramedian sutures; Ts: transverse suture; b: tarsus 1 of right terminal leg, medially; Pt: pretarsus; c: head + sternae 1–3, ventrally; Ls: lateral sutures + margination.



Figs 5–7 5: *Newportia adisi* Schileyko & Minelli, 1998: Sterna 18–20, ventrally; **Ls** lateral sutures; 6: *Ectonocryptoides sandrops* sp. nov.: forcipular segment + tergum 1, ventrally; 7: *E. sandrops* sp. nov.: head plate + terga 1–6, dorsally; **Tr**: distal part of trachea; **Tps**: tergal paramedian sutures; **Tlm**: tergal lateral margination; **Tl**: tarsus of locomotory leg.

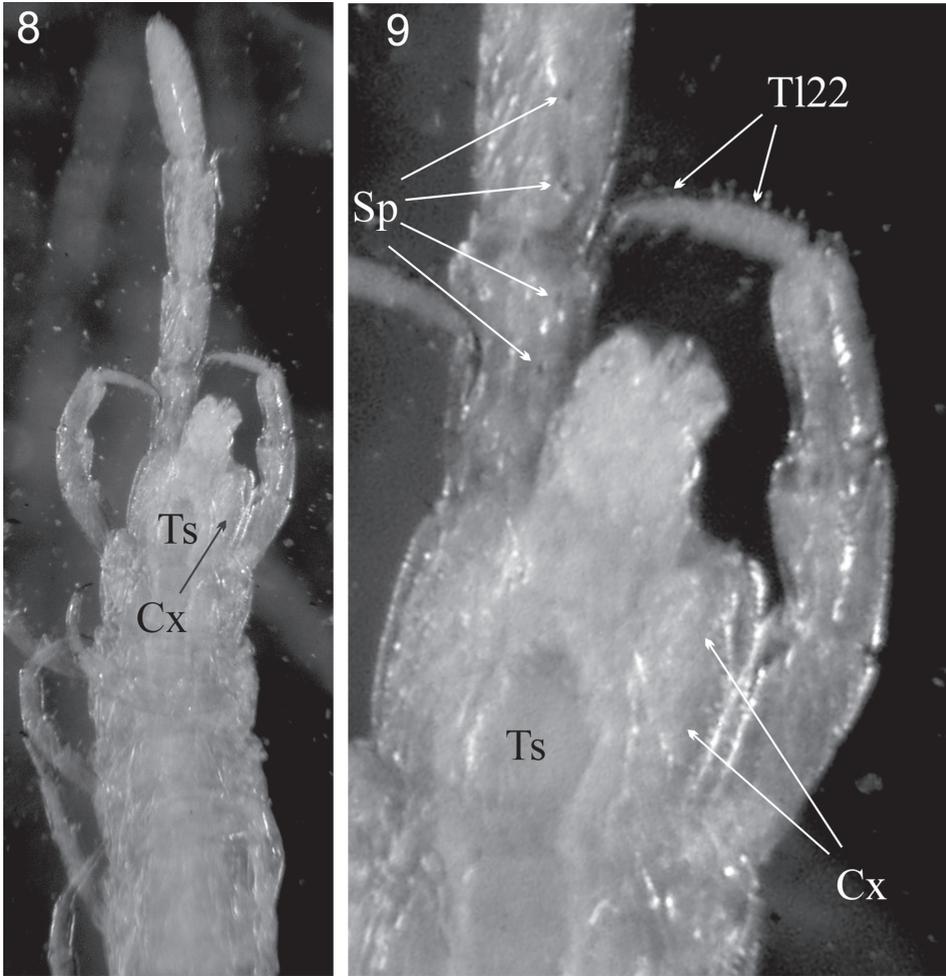
However, centipede from Belize differs from *E. quadrimeropus* in the following features: (1) minor difference in number of additional spines at coxopleural process (1–2 instead of 1 in *E. quadrimeropus*); (2) complete (vs incomplete) paramedian sutures of tergum 1 (Fig. 4a); (3) terga 2(3)–23 (vs only tergum 23 in *E. quadrimeropus*) are laterally margined; (4) presence (vs complete absence) of lateral sternal sutures and according margination; (5) absence of additional small spines at prefemur and femur of terminal leg and (6) presence of rudimentary claw-shaped pretarsus at terminal tarsus 1 (Figs 4b, 10).

As for the differences 1–3 they are not very important taxonomically, being species-specific. With respect to the fourth difference: the presence of sternal lateral sutures, whereas *E. quadrimeropus* has ‘Sterna... without depressions or sulci [= sutures]’ (Shelley & Mercurio 2005: 37); in the new species these sutures are well-developed, setting off distinctly elevated margins of sterna, so the sterna are margined laterally (Fig. 4c). In the family Scolopocryptopidae the lateral sternal sutures are known in *Newportia* (Fig. 5), *Tidops*, *Kartops* Archey, 1923 and *Kethops* Chamberlin, 1912. They may be developed in various degrees (from complete to quite short), but only *Kethops* (see Fig. 144 in Shelley 2002) and the new ectonocryptopine species have sterna with elevated lateral margins. One should take into consideration, however, that both syntypes of *E. quadrimeropus* are in rather bad condition; Shelley & Mercurio (2005) wrote: ‘... the cuticles are detached from the underlying tissues...; one specimen is broken in two and held together only by the cuticle ... while the other is mashed flat...’ So, sternal sutures may be overlooked in *E. quadrimeropus* because of the poor condition of the syntypes.

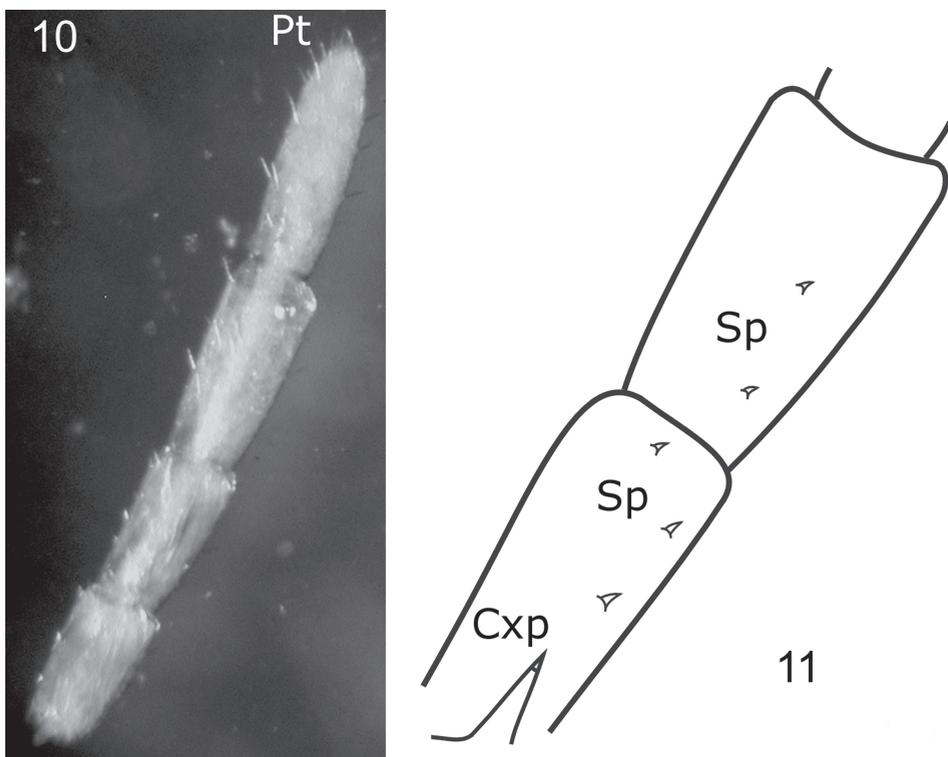
The differences 5–6 are more important, because the structure (and various details) of the terminal legs are diagnostic for this subfamily. The new Belizean species evidently has no additional small spines at the terminal prefemur and femur. As for a small apical claw-shaped process at the terminal leg tarsus of this form, it seems to be a rudimentary pretarsus. It has been already noted that an overwhelming majority of scolopendromorphs have terminal legs with well-developed and additionally chitinised claw-shaped pretarsus (Fig. 3a–d). Exceptions are *Alipes* in Scolopendridae (Fig. 3f) and Newportiinae + Ectonocryptopinae in Scolopocryptopidae (Fig. 3e, g). However, two species of the genus *Newportia* (*N. amazonica* Brolemann, 1905 and *N. unguifer* Chamberlin, 1921) have terminal legs with a normally developed claw-shaped pretarsus (see Schileyko & Minelli 1998). There are some specimens of *Newpirtia* in the Zoological Museum of Moscow Lomonosov State University (ZMMU) with a rudimentary ‘terminal pretarsus’ (similar to those of the new species from Belize), for example some specimens of *N. ernsti* Pocock, 1891 – a species which normally lacks this structure. In the Belizean species of Ectonocryptopinae this pretarsus is very weak and not strongly chitinised, being as delicate (and as pale in colour) as the terminal podomere. Accordingly, there is some possibility that this ‘claw’ is a case of abnormality, but I believe that it is a rudimentary pretarsus. In any case it is not possible to estimate the true taxonomic significance of this structure at the moment, because of the shortage of material. Summing up, the terminal leg tarsus 1 in the new species has a rudimentary pretarsus, but in *Ectonocryptoides quadrimeropus* ‘the 1st tarsus exhibits an apical impression that gives rise to fine hairs’ (Shelley 2009).

However, the situation with respect to the taxonomic status of the new ectonocryptopine species is even more complicated, because there are no precise data on as important (at least of ‘generic-value’ in Scolopocryptopidae) a taxonomic character as the number of spiracles in *E. quadrimeropus*. We read in the original description of this species (p. 38): ‘Because of the detached cuticles and the poor conditions of the syntypes, we were unable to detect the spiracles’. I would suggest that *E. quadrimeropus* has 11 pairs of spiracles as such that they are always present in Ectonocryptopinae.

Summing up, according to the all available data, I describe this new form from Belize as *Ectonocryptoides sandrops* sp. nov.



Figs 8–9 *E. sandrops* sp. nov.: 8: sterna 19–23 + left terminal leg, ventrally; Cx: coxopleuron, Ts: terminal sternum; 9: ultimate sternum + prefemur and femur of left terminal leg, ventrally; Cx: coxopleuron; Ts: terminal sternum; Sp: spinous processes of prefemur and femur; T122: tarsus of locomotory leg 22.



Figs 10–11 *E. sandrops* sp. nov.: 10: right terminal leg, laterally; Pt: pretarsus; 11: prefemur and femur of left terminal leg, ventrally; Cxp: coxopleural process; Sp: spinous processes of prefemur and femur. Schematic.

### 3. Description of *Ectonocryptoides sandrops* sp. nov.

Family Scolopocryptopidae Pocock, 1896

Subfamily Ectonocryptopinae Shelley & Mercurio, 2005

Genus *Ectonocryptoides* Shelley & Mercurio, 2005

**Type species:** *Ectonocryptoides quadrimeropus* Shelley & Mercurio, 2005; by original designation.

#### *Ectonocryptoides sandrops* sp. nov.

Figs 1, 3g, 4a–c, 6–11.

**Material:** W Belize, Cayo District, Augustine, Mountain Pine (Ridge), 1 specimen (holotype), 25.01.1994, leg. F. Barbieri, ZMMU N 7197.

**Diagnosis:** 11 pairs of spiracles on segments 3, 5, 7, 8, 10, 12, 14, 16, 18, 20, 22. Tergites 2(3)–23 margined. Sterna margined laterally, with lateral sutures. Ultimate legs with 4 podomeres (tarsus 2 absent), distal ones of which are bulbous; tibiae without any distal lobes/processes; tarsus 1 somewhat longer than tibia, the latter longer than femur. Prefemur

and femur with large spinous processes diagnostic for the subfamily but without additional small spines. Tarsus 1 with minute claw-shaped pretarsus.

**Derivatio nominis:** I name this species in honour of Professor Alessandro Minelli.

**Description of holotype:** Length of body ca 11–12 mm, length of somewhat curved/subclavate ultimate legs about 1.5 mm. Colour in ethanol: entire animal uniformly light-yellow with head and forcipular segment somewhat darker (Fig. 1).

**Antennae:** Short, just reaching the anterior margin of tergum 2 (Fig. 7). Left antenna of 17 short antennomeres, 2 thirds of right antenna are broken (5 basal antennomeres remain). 3 (4?) basal antennomeres with very few long setae, subsequent antennomeres (from 5th) densely microsetose. Basal third of antenna flattened dorsoventrally.

**Head:** Cephalic plate nearly square in shape (Figs 4a, 7), no visible sutures. Ocelli absent.

**Forcipular segment:** Coxosternum without any visible sutures; its anterior margin is evidently convex, without setae. Instead of tooth plates there are two low, additionally chitinised, lobes (Figs 4c, 9). Trochanteroprefemur without any median tooth. Tarsungula thin, clearly pointed, of normal length.

**Terga:** Anterior margin of tergum 1 covered by the cephalic shield; this tergum with complete paramedian sutures crossed by transverse suture (Fig. 4a). Terga 2–22 with complete paramedian sutures (Fig. 7); tergum 23 lacks sutures, its posterior margin slightly convex. Terga 2(3)–23 distinctly margined laterally. Tergum 23 somewhat wider than high with its lateral sides practically parallel to each other.

**Sterna:** trapeziform (shape is better visible in anterior sterna), without paramedian or transverse sutures. Well-developed lateral sutures present at sterna 2–21 (Fig. 4c), thus these sterna are narrowly but very distinctly margined laterally (unclear margination at sternum 22). Sterna 12–22 with very shallow median sulcus/depression. Terminal sternum as high as wide at base (Figs 8, 9), linguiform with posterior margin rounded.

**Spiracles:** too small to be seen in detail. In dorsal view the distal parts of trachea look like minute tubes orientated caudad (Fig. 7).

**Locomotory legs:** with a few short setae; tarsi undivided (Fig. 7) or this division is very unclear, only legs 20–22 seems to have bipartite tarsus (Fig. 9). Neither tibial nor tarsal spurs are present.

**Coxopleuron:** (Figs 8, 9) with about 20 scattered pores, posterior 1/4 of coxopleuron poreless. Well-developed, conical coxopleural process (very similar to that of *Ectonocryptops kraepelini*; see Fig. 4 in Shelley & Mercurio, 2008) pointed and darkly chitinised apically (Fig. 11). No additional spines are visible, but each process with strong (spine-like) spur at its base and left process additionally with 1 strong (spine-like) ventral spur at its middle.

**Ultimate legs:** (Figs 3g, 4b, 8–11) with 4 podomeres, tarsus 1 a little longer than tibia, which is longer than femur. Distal podomeres are somewhat bulbous. Terminal tarsus 1 apically with very small (less than 10 % of length of this podomere) unciform pretarsus (Figs 4b, 10). This rudimentary structure is practically transparent (i.e., not additionally chitinised) and surrounded by some setae. I have not recognised any unusual details like dorsal excavations, pits, lobes etc on tarsus 1. Prefemur with 3 ventral spinous processes, which are not ordered in one line; femur with 2 ventral spinous processes (Figs 9, 11). Both of these podomeres without any additional small spines.

**Remarks.** It was not possible to detect any details of the mouthparts nor of the pleurae because of the minute sizes and the delicate condition of the holotype, which is also flattened dorsoventrally. The corresponding photographs (Figs 8, 9) hardly allow recognition of the coxopleural pores or of the coxopleural process, closely pressed to underlying structures.

#### 4. Conclusions

A new member of Ectonocryptopinae from W Belize certainly belongs to the genus *Ectonocryptoides* and is described as *E. sandrops*. Discovery of *E. sandrops* improves our knowledge of the morphology and distribution of Ectonocryptopinae adding another country to the subfamily's range. This record confirms the suggestion of Shelley (2009) that '... a broader ectonocryptopine distribution that probably spans the breadth of the country and extends southward into Central America'.

#### 5. Acknowledgments

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