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A second species in the millipede suborder Sinocallipodidea Shear, 2000 (Diplopoda: Callipodida)

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Abstract

Sinocallipus thai sp.n, is described from Saraburi Province, Thailand. This is the second species in the suborder Sinocallipodidea Shear, 2000, hitherto known only from *S. simplipodicus*, discovered in a cave in Yunnan, southern China. Although there are just a few differences in the structure of the gonopods, the new species can be easily distinguished from its congener by the larger number of ocelli and pleurotergites, the relative length of antennae, shape of antennomere 7, body coloration, etc. There also seems to be a habitat differentiation, *S. simplipodicus* is known only from a cave, while the unique specimen of *Sinocallipus thai* was collected under a rock and accordingly does not show any particular troglomorphic traits. The putative record of *S. simplipodicus* from Laos (Shear et al., 2003, Zootaxa, 365, 1–20) is discussed in the light of the new finding.

Key words: taxonomy, *Sinocallipus thai* sp. n., *S. simplipodicus*, Saraburi Province, Thailand

Introduction

The millipede order Callipodida Pocock, 1894, comprises three suborders – Schizopetalidea Hoffman, 1973, with approximately 130 valid species and subspecies distributed in the Northern Mediterranean realm, central and southeastern Asia and also North America; Callipodidea Pocock, 1894, with 5 species occurring in southern Europe, and the monobasic suborder Sinocallipodidea Shear, 2000, with a single species, *Sinocallipus simplipodicus* Zhang, 1993, described from the Xiao Cave in Hekou Yaozu Autonomous Region, Yunnan Province, China (cf. Zhang, 1993, Shelley, 2003, Shear et al. 2003). Originally described as a separate family (Zhang, 1993), it was subsequently given a rank of a suborder because of its very simple gonopods (Shear, 2000). Specimens collected from unspecified habitat in the city of Hanoi, Vietnam, were tentatively assigned to *S. simplipodicus* (Enghoff et al. 2004), as were others from an epigean habitat in Bolavens Plateau, Champasak/ Attapu Provinces in southern Laos (Shear et al., 2003). The authors of the latter paper provided a good re-description, involving also SEM pictures of different external somatic characters and the gonopods. Shear et al. (2003) further commented on the possible function of gonopods, supposing that the cannula represents the "functional" element that inseminates the female during the copulation. They observed differences in the shape of gonopods in the Chinese and Laotian material, but having no access to the type material and reliable information about the range of variation of these characters, they preferred to adopt a more conservative

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approach: not naming a new species but referring the material to the already described one. It is worth mentioning that the Laotian find is situated some 960 km south of the type locality.

Owing to the recent collecting activities of three of us (H.E., S.P., M.F.) in Thailand, a specimen of *Sinocallipus*, clearly representing a new species, became available for study. This is the first species from the order Callipodida to be described from Thailand (see also the recent review of Thai millipedes by Enghoff, 2005).

Material and Methods

The holotype is preserved in 70% ethanol. Drawings were made with the aid of a camera lucida mounted on Wild microscope, type 181300. Close up photos were taken under Olympus SZH 10 research stereo microscope, and with camera Olympus U-PMTVC Q-Color 3.

Sinocallipus thai sp. n.

Figs 1–7.

Material examined. Holotype: adult male; 72 pleurotergites (PT) + telson, length ca. 56 mm, width ca. 2.0 mm; Thailand, Saraburi Province, Muang District, Sriwilai Cave Temple, 14°41'40''N, 100°54'34''E, 44 m a.s.l., 31.viii.2006, M. Fuangarworn leg., deposited in the collection of Animal Systematic Research Unit, Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok.

Description of locality. The single specimen was collected under a rock at the base of a limestone hill. The vegetation at the site is deciduous forest which is, however, mostly destroyed by rock quarries. Other millipedes found at the site included *Anurostreptus sculptus* Demange, 1961 (Harpagophoridae) and two unidentified species of Pachybolidae. The pulmonate terrestrial snail *Cryptozona siamensis* (Pfeiffer, 1856) was dominant in the forest floor invertebrate fauna.

Etymology. The species name emphasizes the country of origin.

Diagnosis. The new species can be distinguished from *S. simplipodicus* by the characters summarized in Table 1.

TABLE 1. Diagnostic characters of the species of genus *Sinocallipus*. For *S. simplipodicus*, only the original data from Zhang (1993) are considered, cf. discussion.

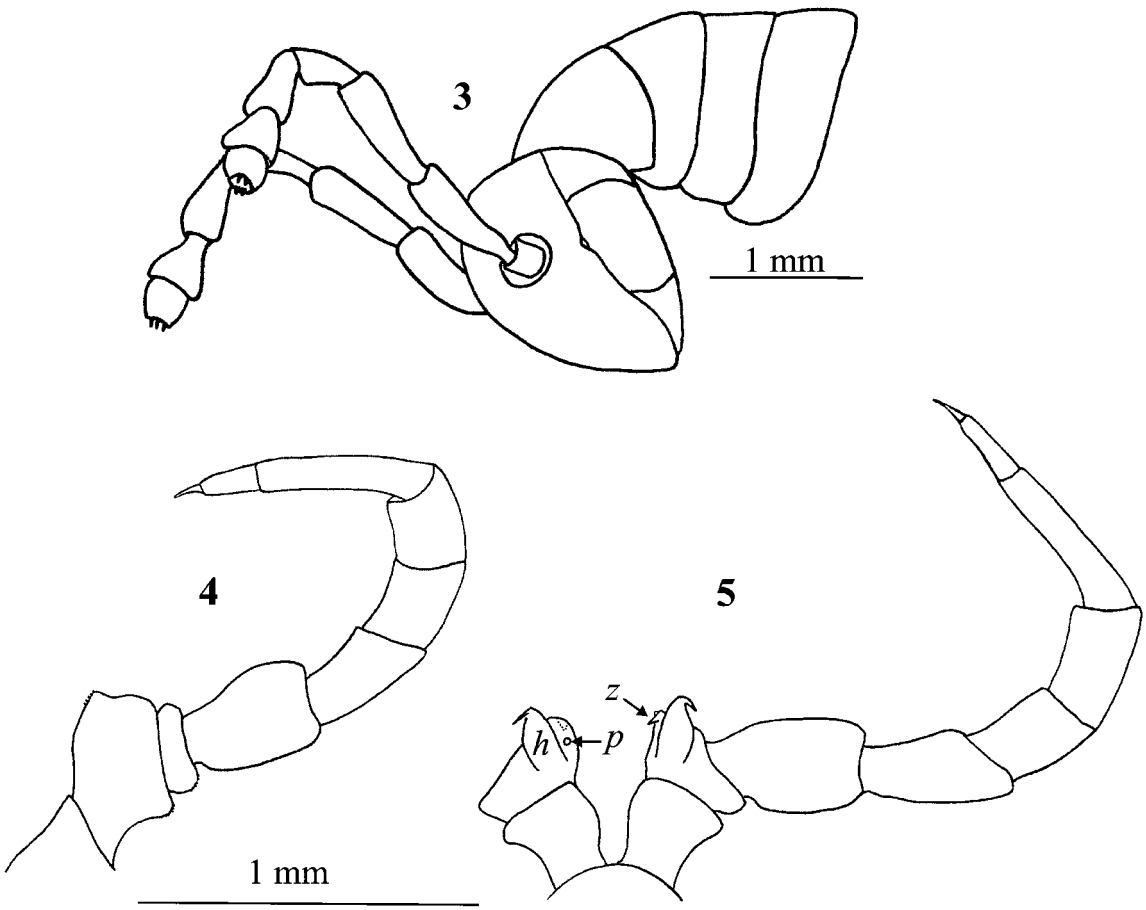
Characters	*S. simplipodicus*	*S. thai*
Body colour	pale yellow-whitish	generally brown, with first four PT, lower 2/3rd of head, and antennal articles 6 and 7 snow white; light middorsal band from PT 5 till body end
Number of ocelli (in adult male)	16	45–50
Colour of ocelli	colourless	black
Number of PT in adult males	55	72
Body length in adult males (mm)	approx. 40	approx. 56
Body width in adult males (mm)	approx. 2.4	approx. 2
Ratio: length/ width	16.7	28
Length of antennae	extending well beyond PT 7 when folded backwards	extending as far as posterior edge of PT 4 or slightly longer
Shape of antennomere 7	suboval	intermediate between spherical and subconical
Gonopod	cannula short and coiled	cannula long and straight
Habitat	cave	under a rock

FIGURES 1–2. *Sinocallipus thai*, male holotype: 1—general appearance, G. Brovad phot.; 2—antenna, lateral view.

Description. Length: ca. 56 mm, width: ca. 2.0 mm, 72 PT + telson. Body colour: generally dark brown mottled with lighter spots mostly on the lateral sides of metazonites; metazonites with a posterior light brown-yellowish semi-moniliform band. Dorsum with a broad snow-white medial band from PT5 to body end. PT 1-4 snow-white, sharply contrasting to subsequent ones (Fig. 1). Head: lower 2/3rd of frontal surface, stipes and cardo white; a yellowish subtriangular spot in the middle of frons; labrum yellowish, upper 1/3 of frons and posterior side of head brown, with numerous lighter spots, especially between eyes; cephalic suture lighter. Eyes: subovoid composed of 45-50 transparent ocelli in 7 horizontal rows (ca. 12 vertical rows, RO) lying on black ground. Organ of Tömösváry: very small, inconspicuous, situated close to anteroventral side of eye. Head in male convex (without even a trace of concavity), covered with minute setae. Antennae: short, slightly extending beyond the posterior edge of PT4 (Fig. 3); length of antennomeres: 7<1=6<4=5<2=3; tip of antennomere 7 with four cones; antennomere 6 infundibular (Fig. 2); antennomere 7 short, shape intermediate between spherical and subconical. Antennomeres 6-8 snow white, 1-5 brown (basal one less so). Basal podomeres lighter, tarsi darker.

PT 1-4 slightly narrower than subsequent ones, body broadest at midlength, gently tapering towards telson. Dorsal side of collum and PT 2-3 smooth; complete crests appearing from PT 4 onwards. Each hemipleurotergum with about 6 crests on midbody PT; all crests flattened, touching anteriorly and strongly diverging posteriorly; no significant difference in the shape of crests on different PT. Ozopores situated between crests 4 and 5, visible from sixth to last but two pleurotergites. Hypoproct tripartite, median sclerite largest, subtriangular, bearing a pair of macrosetae at base, lateral sclerites with a seta each. Paraprocts divided into smaller dorsal and bigger ventral sclerites. Each dorsal sclerite with pair of macrosetae situated in vertical line on a small lobe. Spinnerets: long and slender, ending with a long seta.

First and second leg-pairs in males shorter than following legs; tarsi undivided (also probably on 3rd leg-pair, but hard to see under the light microscope); gonopore opening through small protuberance on posterior side of the coxa 2. Tarsal pads poorly developed; absent on the first two pairs of legs; pads thinner towards body end, almost disappearing on midbody legs. No particular modifications on coxae of pregonopodal legs. Leg-pair 7: coxa subquadrate; prefemur swollen, tarsus divided, twice as long as tibia, ending with a long claw (Fig. 4). Leg-pairs 4-6: all podomeres with generally the same shape as in leg-pair 7. Leg-pair 9: coxa subrectangular, expanded postero-laterally; trochanter with two processes: anterior one (*h*) higher, leaf-shaped, its tip very sharpened, spine-like, curved cephalad; posterior process (*z*) rounded with a small bulge, pointing cephalad too, at the medio-ventral side of the coxa; a small pore opening (*p*) under the bulge; prefemur slightly swollen (Fig. 5). Coxal sacs on leg-pairs 3–11.



FIGURES 3–5. *Sinocallipus thai*: 3—schematic illustration of head and first PT showing the length of antennae; 4—leg-pair 7, anterior view; 5—leg-pair 9, anterior view.

Chaetotaxy (Table 2): the only traceable setae on PT are the anterior setae *a* and *b* on PT 2, 3 and 4, others either missing or broken off; it is even hard to see the pits where usually the setae are attached.

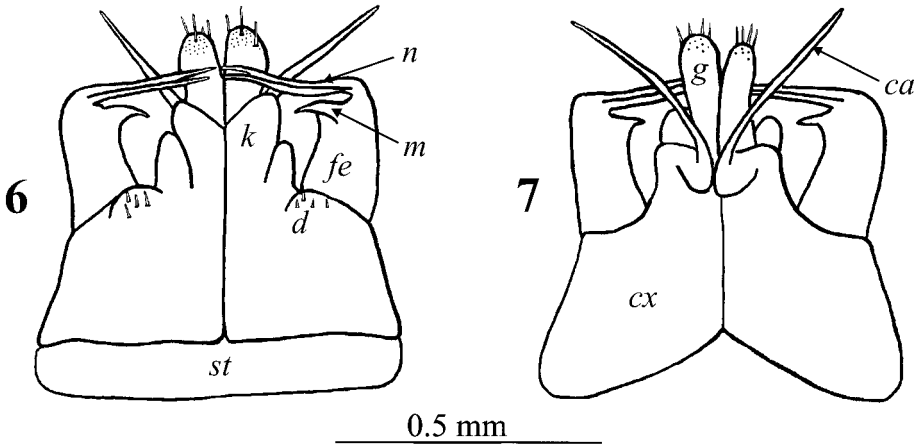
TABLE 2. Chaetotaxy of anterior PT in *Sinocallipus thai* sp. n.

	Anterior setae	Posterior setae
Collum	1+1	-
PT 2	2 +2	-
PT 3	2 +2	-
PT 4	2 +2	-
PT 5	-	-

Gonopods (Figs 6–7): since we could not find any differences in the structure of gonopods of our specimen and the description of the Laotian *Sinocallipus* (see below our interpretation of its status), the following part is to a large extent a repetition of the description of gonopods made by Shear et al. (2003). Sternum (*st*): broad, rectangular, lying at the base of gonocoxae extending over their entire breadth. Coxae (*cx*): with two clavate processes extending directly ventrad on anterior side; a short, glabrous, anterior process (*k*) arising basally from anterior side of longer, caudal process, the latter apically setose (*g*); several long setae on a small bulge arising at the articulation with femoroid (*d*). Femoroid (= telopodite; *fe*): short and broad, positioned lateral to coxa and extending directly ventrad, without prostatic groove, with two slender, acicular (*n*), and one short and subfalcate (*m*) narrowly separated terminal projections directed strongly mediad; caudalmost projec-

tion longest, overlapping longer coxal process and nearly meeting corresponding projection from opposite gonopod; medial projection slightly shorter; anteriormost projection shortest, broad, extending slightly beyond telopodal margin and terminating well short of coxal processes. Cannula (*ca*): long and slender, not coiled, arising near midlength of caudal side of coxa at level of origin of shorter anterior process, angling dorsomediad basally and converging with opposite member, then curling and diverging, angling anteriolaterad, apices overhanging the longer femoroidal projections.

Female unknown.



FIGURES 6–7. *Sinocallipus thai*, gonopods: 6—anterior view, 7—posterior view.

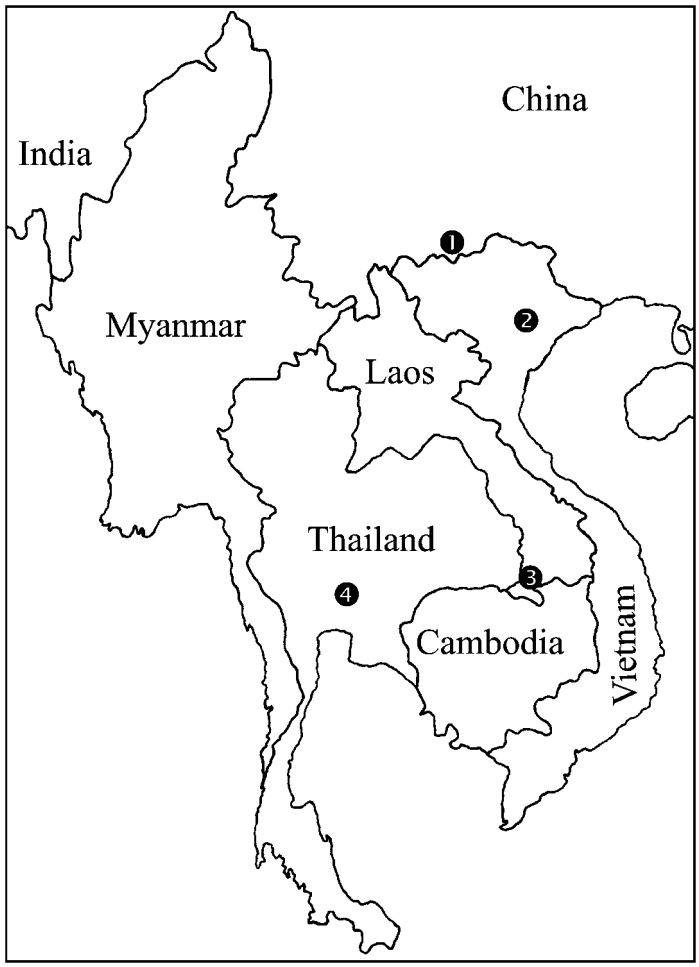


FIGURE 8. Distribution map of genus *Sinocallipus*: 1—*S. simplipodicus*; 2—*S.* cf. *simplipodicus*; 3—*S.* cf. *thai*; 4—*S. thai*.

Discussion

The type locality of the new species is approximately 1000 km south of the type locality of *S. simplipodicus* (Fig. 8). Except for the listed morphologic features, there may also be a habitat difference between the two species. *S. simplipodicus* is a cave-dwelling species showing traits of troglomorphism such as reduced ocelli, pale coloration, long antennae and legs, whereas the unique specimen *S. thai* was found under a rock at the base of a limestone cliff (however, since intense search by half a dozen people failed to reveal further specimens, this may not be the typical habitat). In the light of the new finding, the putative records of *S. simplipodicus* from Laos (Shear et al., 2003) and Vietnam (Enghoff et al., 2004) should be reassessed. The Laotian material is currently in a very poor condition being damaged during SEM preparations (R. Shelley, in litt.), so only re-collecting can reveal its true taxonomic position. Morphologically, it is very closely related, if not conspecific, with *S. thai*, the only differences being the presence of white coloration on the first three PT (vs. first four PT in *S. thai*), the slightly longer antennae reaching PT 6 (vs. reaching PT 5 when folded backward) (Shelley, in litt.). Given the fact that the distance between the sites in Thailand and Laos is more than 500 km if the species identity is confirmed in the future, then *S. thai* will be the first tropical callipodidan showing such a wide distribution.

Acknowledgements

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