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A New Troglomorphic Collembola from Thailand: *Troglopedetes fredstonei,* New Species (Collembola: Paronellidae)

Louis Deharveng[1]

ABSTRACT

Troglopedetes fredstonei, n. sp., is the first Collembola to be described from Thailand caves. This troglomorphic species is related to edaphic forms from the same area and cannot therefore be considered relictual. Several new or poorly known morphological characters of the genus *Troglopedetes* are discussed.

INTRODUCTION

At one time, troglomorphic Collembola were thought to be restricted to temperate areas (Europe, Japan, and North America) or high altitude caves in the tropics. This idea is no longer tenable as several troglomorphic species of the genus *Troglopedetes* were described from tropical America in 1985 (Palacios-Vargas et al. 1985); the same genus is reported to comprise numerous undescribed related species in low altitude caves of Thailand by Deharveng (1986). In this paper I describe one of these species, *Troglopedetes fredstonei,* n. sp., from Chiang Dao Cave.

I use the standard description outline perfected by Yoshii (1985) for *Troglopedetes* (*Cyphoderopsis*) *kempi* (Carpenter, 1917). The following abbreviations are used: abd., abdominal segment; ant., antennal segment; th., thoracic segment.

SYSTEMATICS

Troglopedetes fredstonei Deharveng, **new species** Fig. 1–11

Length: 1.4 to 2.1 mm. Color: white, sometimes with scattered points of red pigment on the body. Antenna ca. 2.7× as long as cephalic diagonal; ant. ratios 10:17:17:(17+14) (Fig. 1); ant. I, II dorsally with scales; ant. IV subdivided into 2 subsegments; no apical bulb. Eyes absent. Clypeo-labral formula as 3,4,2,4/5,5,4. Clypeal setae all ciliated, including 4 prelabral ones (Fig. 3). Outer maxillary ramus with 1 papillated seta, 1 basal seta, and 2 sublobal hairs. Setae of labial basis as M1M2REL1l2, where R is slightly shorter and l2 is reduced to a smooth short and large spine (Fig. 2). Legs without scales. Unguis elongated, with a rather strong median tooth at 58–60% and a pair of subequal lateral teeth at 40% of the internal side of the claw. Empodial appendage slender, triangular, with slight crenulations (4–10) on its external side. Tenent hair capitate or pointed, shorter than or subequal to inner side of claw (Fig. 4). Trochanteral organ of PIII with ca. 30 pointed, smooth, straight, unequal setae. Ventral tube very long, with 2+2 long, slightly ciliated anterodistal setae and 1+1 long, thinner, rough anteroproximal setae; posterior face with more than 40 rough thin setae; lateral flaps with 4+4 distal short smooth setae and 3+3 basal feebly rugged ones.

1. UA 333 du CNRS, Laboratoire d'Ecobiologie des Arthropodes Edaphiques, Université P. Sabatier, 118 route de Narbonne, 31062, Toulouse Cedex, France.

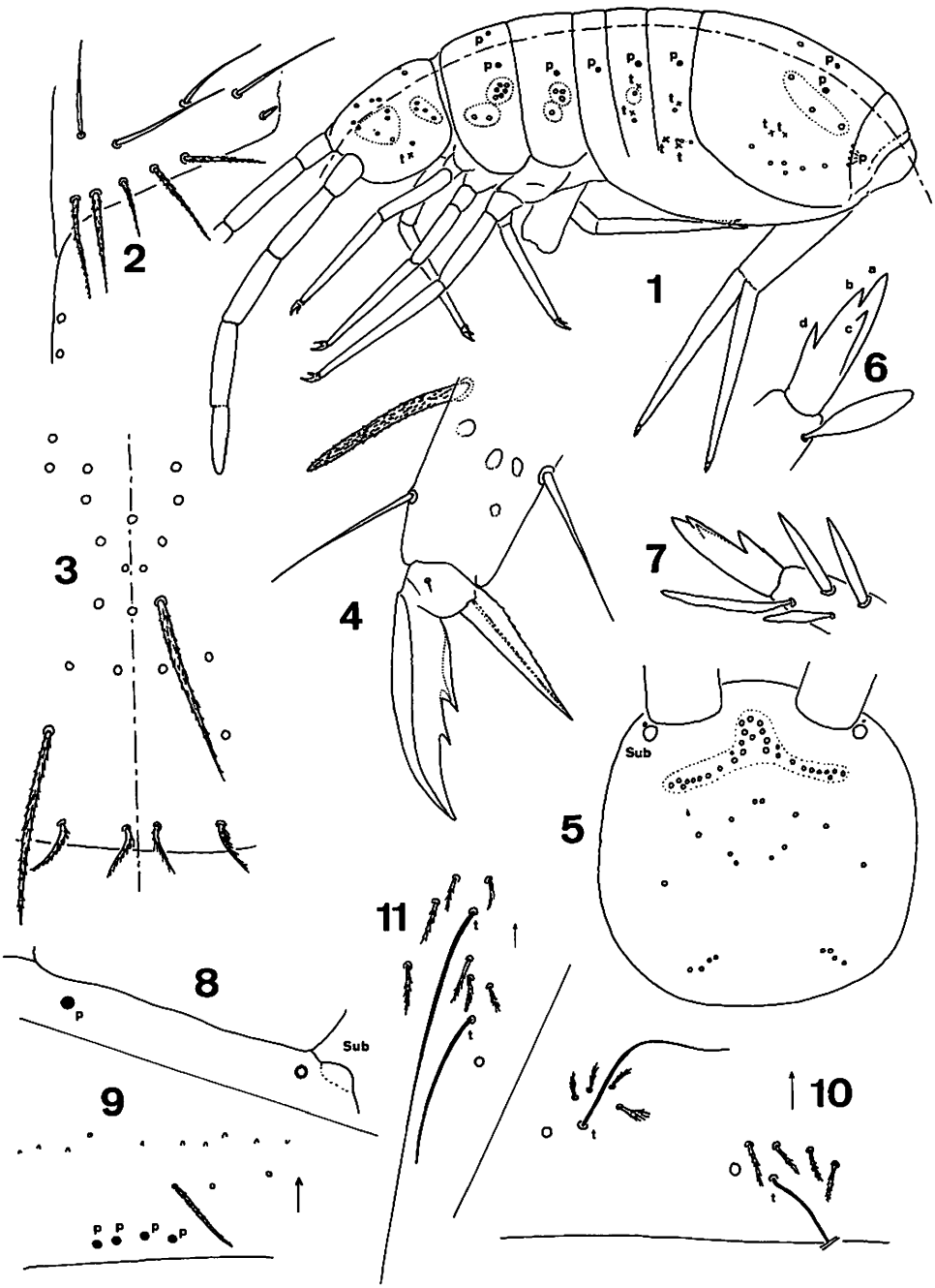

Fig. 1–11. **1,** Habitus and macrochaetotaxy. The setae groups used for the macrochaetae formula are surrounded by dotted lines. The lateral macrochaetae on head and th. II–III, the anterior ones on head and th. II, and all macrochaetae of abd. V–VI have not been represented. **2,** Labial basis. **3,** Clypeal zone. **4,** Praetarsus III. **5,** Cephalic macrochaetotaxy (the anterior group of macrochaetae is surrounded by a dotted line). **6, 7,** Mucro. **8,** Antennal basis, ventral face, left side. **9,** Pseudopora-like structures of abd. IV posterior margin, left side. **10,** Chaetotaxy of abd. II, left side. **11,** Trichobothrial complex of abd. IV, right side. p, pseudopora; Sub, subantennal structure; t, trichobothria.

Macrochaetae present on body with following pattern: 5,4/6+2,3+1/0,1,0,3 (Fig. 1, 5). Body otherwise covered with hyaline rounded scales. Manubrium scaled ventrally and with many subequal ciliated setae dorsally, leaving a median glabrous streak; no smooth setae on lateral border. Dens slightly tapering, ventrally scaled and with 2 dorsal rows of spines throughout. Long ciliated setae present only along dorsal side of dens. Mucro elongated but shorter than in most other *Troglopedetes* s.l., with 4 main rounded teeth, and sometimes with a very minute additional tooth at basis of teeth b and d (Fig. 6, 7).

Type material. Holotype ♂, 7 paratypes, THAILAND: Changwat Chiang Mai, Amphoe Chiang Dao, Tham Chiang Dao (=Chiang Dao Cave), "réseau Touristes," dark zone, 12.VII.1985 (Deharveng, sample TC38). Holotype and 4 paratypes in author's collection, 3 paratypes in Bishop Museum (Hawaii).

Other material examined. THAILAND: Changwat Chiang Mai, Amphoe Chiang Dao, Tham Chiang Dao, rotten wood, 7 specimens (F. Stone, sample 5253, vial C-1-5) (author's collection). Tham Chiang Dao, dark zone, "réseau Touristes" and "réseau Guano," 2–12.VII.1985, 16 specimens (Besson, Deharveng, Lebreton & Leclerc, samples TC 1, 3, 4, 8, 16, 14) (author's collection).

Derivatio nominis. This species is named for my friend and colleague Fred Stone, who collected it during his biospeleological trips to Thailand.

Additional morphological characters. Some interesting characters have been observed in *Troglopedetes fredstonei* that seem to have been previously overlooked or whose taxonomic value has never been checked.

Subantennal structure (Fig. 8). This structure lies on the outer side of the antennal basis. It is composed of an ocellus-like swelling associated with a small chitinous ring (?pseudopora). It could be a vestigial postantennal organ, but such an organ is considered to be absent in Paronellidae.

Pseudopora-like structures of abd. IV (Fig. 9). A line of 4 pseudopora-like structures has been observed on the posterior part of abd. IV tergite, behind the last row of setae.

Chaetotaxy of abd. II (Fig. 10) *and trichobothrial complex of abd. IV* (Fig. 11). These chaetotaxic characters are widely used in the taxonomy of Entomobryidae Lepidocyrtinae. Their usefulness for the genus *Troglopedetes* has to be established.

Ecology. *Troglopedetes fredstonei* is found in small populations in the lower levels of Chiang Dao Cave. It seems to be restricted to the dark zone, where it lives on humid clay banks with scattered bat feces. This kind of habitat is probably similar to the "SCAT" habitat described by Chapman (1982) for the Mulu Caves of Sarawak. The species is absent in the upper level of the cave ("réseau Supérieur"). It was not represented in the numerous samples of soil and litter collected above the cave, where several undescribed species of the same genus occur.

Relationships. Only 2 species of *Troglopedetes* s.l. have been reported from SE Asia, both from the Malayan Peninsula: *Troglopedetes kempi* (Carpenter, 1917) [=*Cyphoderopsis kempi* Carpenter, 1917, =*Troglopedetes* (*Cyphoderopsis*) *kempi* Yoshii, 1985] and *Troglopedetes doveri* (Carpenter, 1932), n. comb. [=*Pseudoparonella doveri* (Carpenter, 1932)].

Troglopedetes kempi has ant. IV entire, a long mucro with basal denticulations, legs with scales, and several other characters different from *T. fredstonei*. It is an edaphic form. Annulated antennae and short mucro were used by Carpenter (1932) to place his species *doveri* in the genus *Pseudoparonella*. Since then, several *Troglopedetes* with annulated antennae have been described. The reduced mucro of *doveri* is not fused to the dens and lacks the typical

2 teeth of that of *Pseudoparonella.* On the other hand, all *Pseudoparonella* species have 8+8 eyes while *doveri* has none, like many species of *Troglopedetes.* We therefore move *doveri* to the genus *Troglopedetes* s.l., which already contains all Paronellidae with reduced number of eyes (less than 6+6). Although insufficiently described, *Troglopedetes doveri* is probably not closely related to *T. fredstonei* from which it differs by its not subsegmented ant. IV and its shorter mucro. These 2 species are the only described cave-restricted Collembola in SE Asia.

Troglopedetes fredstonei belongs to a group of species characterized by a 4th antennal segment subdivided into 2 subsegments and a mucro devoid of basal denticulations. Five species are presently known in this group: 4 are African soil species and the 5th is described from a Nepalese cave (*T. churchillatus* Wilson, 1979). All differ from *T. fredstonei* by the presence of only 1 row of spines on the dens and 1–3+1–3 pigmented eyes. Dorsal chaetotaxy is unfortunately unknown in the African forms, but *T. churchillatus,* according to Wilson (1979), has a macrochaetae pattern (?/6,3+1/0,0,0,?4–5) rather similar to that of *T. fredstonei.*

The closest relationships of the new species are with the other *Troglopedetes* species of northern Thailand, which have not yet been described and which share characters as follows: ant. IV with 2 subsegments; no denticulations on the basal tooth of the mucro; 2 rows of dental spines; similar basic chaetotaxic patterns on head and tergites (with slight specific variations).

Evolution. Many *Troglopedetes* s.l. are restricted to caves in temperate and tropical zones and display characteristic troglomorphic features. This is true for *T. fredstonei,* which has no eyes, no or very reduced pigment, long appendages, large body size, and slender claws. Phyletically, however, the species is far from the other troglobitic forms of the world and closely related to the soil species (not yet described) that live in the same area of Thailand. *Troglopedetes fredstonei* is clearly not a relictual form.

LITERATURE CITED

Chapman, P. 1982. The ecology of caves in the Gunung Mulu National Park, Sarawak. Trans. Br. Cave Res. Assoc. 9(2): 142–62.

Deharveng, L. 1986. Biologie. 26—Collemboles. In: Thaï Maros 85. Rapp. Spéléol. Sci.: 191–98.

Palacios-Vargas, J., M. Ojeda & K.A. Christiansen. 1985. Taxonomia y biogeografia de *Troglopedetes* (Collembola: Paronellidae) en America, con enfasis en las especies cavernicolas. Folia Entomol. Mex. 65: 3–35.

Wilson, J. 1982. A review of the world Troglopedetini (Insecta, Collembola, Paronellidae). Cave Sci. 9(3): 210–26.

Yoshii, R. 1985. Notes on paronellid Collembola of Southeast Asia. Contrib. Biol. Lab. (Kyoto University) 25(1): 73–90.