

Collembola from New Zealand Caves

By J. T. SALMON

Abstract

THIS paper records three new species and eight already known species of Collembola collected from caves in the Te Kuiti and Wairarapa districts.

INTRODUCTION

I HAVE long thought that the extensive caves in the Te Kuiti district of New Zealand must contain endemic species of Collembola, but until recently neither I nor any other person has had the opportunity to look for Collembola in these places. Of recent years Dr. A. M. Richards, who was studying the ecology of the cave wetas at Waitomo, managed to make some small collections of Collembola from the glow-worm cave and the Ruakuri cave at Waitomo. More recently still, Mrs B. M. May, during speleological investigations, has also made several collections of Collembola from hitherto unexplored caves in the Te Kuiti and Te Awamutu districts. To both of these collectors I am much indebted for the opportunity of examining their collections and working up the material contained therein.

In addition to the new species, the following known species were included in these collections:

Ceratophysella armata Nic, from the Waitomo cave, collected by A. M. Richards, March 1955

Same species, in trap 500 yards inside Waipuna cave near Te Kuiti, from the B. M. May collection (collected F. Walton)

Tullbergia subantarctica Salmon, 1949. Several specimens captured 500 yards inside Waipuna Cave, Te Kuiti, in a trap by Mrs. May, are, I consider, so closely related to *T. subantarctica* that I cannot separate them.

These cave specimens have a postantennal organ with 100–122 lobes, whereas previous specimens of *T. subantarctica* show this organ with up to 84 lobes only.

The unguiculus on the cave specimens is very rudimentary, even more so than in previous specimens of this species which I have seen. With the exception, perhaps, of the pseudocelli, in all other respects these Waipuna specimens agree with the type specimens of the species.

The pseudocelli of the cave specimens are as follows: Ant. base 1 + 1, Post. margin of head 1 + 1, Th. I, II and III each 1 + 1, Abd. I, II, III each 1 + 1, Abd. IV 2 + 2 or 0 + 0, Abd. V 1 + 1, Abd. VI 0 + 0. This differs from the type specimens of *T. subantarctica* but re-examination of my material shows that in the specimens of this species I recorded in 1954 from Allen's Beach, Dunedin, additional pseudocelli are present on some specimens on Th. I 1 + 1 and Th. II 1 + 1.

It would seem, therefore, that the species *T. subantarctica* exhibits geographical variation in the number and position of the pseudocelli, and in the size of the post-antennal organ which contains from 76–122 lobes arranged as two interlocking rows in a shallow groove.

Mesaphorura krausbaueri Börner, 15 feet inside side branch of Ruakuri cave, Waitomo, collected by A. M. Richards, May 1955.

Same species on rat droppings 150 yards inside Karamu cave, near Te Awamutu, collected by B. M. May, April 1957.

Same species in moss inside cave entrance, Ruakakapatuna, Wairarapa, collected by the author, May 1952.

Folsomia novae-zealandiae Salm., 100 yards inside an unused passage of the glow-worm cave, Waitomo, collected by A. M. Richards, July 1955.

Same species on rat droppings 100 yards inside Tomac Tomo cave near Te Awamutu, collected by B. M. May, April 1957.

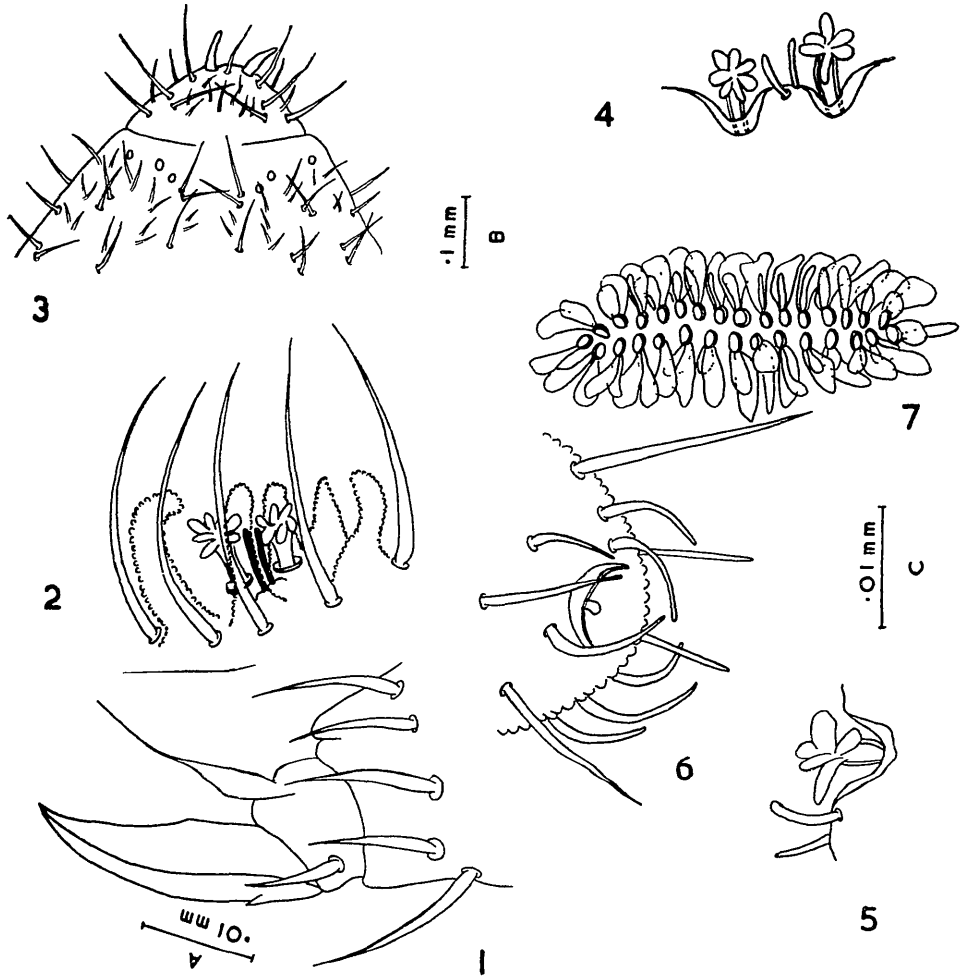
Isotomurus palustris Muller, in moss in cave entrance, Ruakakapatuna, Wairarapa, collected by the author, May 1952.

Pseudosinella insoloculata Salm., on mouldy rat droppings 500 yards inside Karamu Cave, Te Awamutu, collected by B. M. May, April 1957.

Lepidocyrtus cyaneus cinereus Folsom, from the glow-worm cave Waitomo, collected by G. W. Hobbs, A. M. Richards collection, February 1949.

Lepidosira sexmacula Salm., in moss in cave entrance, Ruakakapatuna Valley, Wairarapa, collected by the author, May 1952.

All the types of the new species are preserved in the author's collection.



FIGS 1-7—*Spelaphorura petallata* Fig. 1—Hind foot of type specimen Fig. 2—Sense organ of Ant III of type specimen Fig. 3—Posterior segments of body showing setae, of type specimen Fig. 4—Sense clubs and rods from sense organ, Ant III, of type specimen. Fig. 5—Sense club and rods from another specimen. Fig. 6—Apex Ant. IV, type specimen. Fig. 7—Post antennal organ, type specimen.

A = scale for Fig. 1 B = scale for Fig. 3. C = scale for Figs. 2, 4-7.

***Spelaphorura petallata* n. sp. Figs 1-7**

COLOUR: Entirely white.

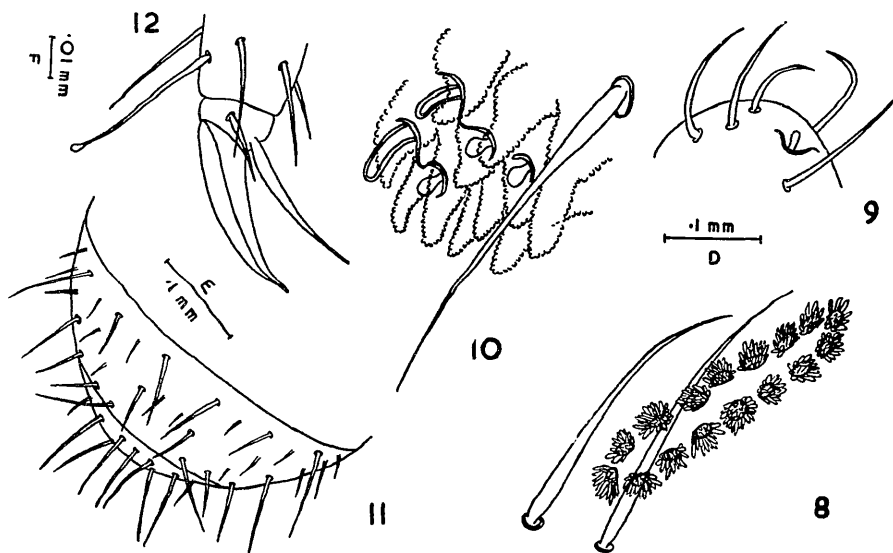
CLOTHING: Of very short and moderately long simple setae, more densely clothed with setae than is the case with most species of *Onychiurus*. The setae are normally arranged in groups, those of the posterior segments being shown in Fig 2

BODY: Length up to 1.1 mm; antennae about $\frac{2}{3}$ as long as the head, the four segments related as 5:10:10:18. Ant IV with a short cylindrical subapical sense rod behind strongly chitinous ridge and with numerous curved and straight sensory hairs and setae. Sense organ of Ant. III guarded by five long, strong, simple setae and consisting of five large granulose papillae the three central of which are usually conical, while the two lateral ones are bent or slightly hook-shaped, together with two centrally placed parallel-sided, faintly curved sense rods having on either side a petallate sense club: these sense clubs each arise from a very deeply chitinated pocket and consist of a basal, rod-like structure bearing a petal-like arrangement at the apex consisting of 5-7 distinct lamellae (Figs 3, 4, 5). Postantennal organ consisting of 14-16 pairs of basal nodule-like structures each of which bears a pair of foliaceous lobes projecting upwards and outwards (Fig. 7). Antennal base distinct, with smaller granules than the remainder of the head. Pseudocelli as follows: Antennal base, 3 + 3, two lying close together towards the inside and one towards the outside of the head on each side, posterior margin of the head 2 + 2, Th. I 2 + 2, Th. II 3 + 3, Th. III 3 + 3, Abd. I 3 + 3, Abd. II 3 + 3, Abd. III 3 + 3, Abd. IV 4 + 4, Abd. V 3 + 3; no pseudocelli on Abd. VI, but Abd. VI bearing a pair of moderately long faintly curved anal horns, not on papillae. Genital papilla with only a few irregular short simple setae.

LEGS: Claw without any inner teeth but with a pair of lateral external teeth about $\frac{1}{2}$ down and a long basal seta to each side, this seta reaching to the level of the external lateral teeth. Unguiculus long and tapering, lancet-like with terminal filament reaching to the level of the claw apex.

LOCALITY: From rat droppings 150 yards inside Karamu cave, collected by B. M. May, April 1957.

REMARKS: This species does not appear to be closely related to any known species of *Onychiuridae*. The distinct clothing and the unusual structure of the postantennal organ, associated with the petallate type of sense organ on Ant. III, which would seem to have their nearest counterparts in *Onychirus carpenteri* of Stach and *Spelaphorura glennei* of Bagnall, seem to make the species quite distinct.



Figs 8-12.—*Onychiurus acicindellus*. Fig. 8—Post antennal organ, type specimen. Fig. 9—Apex of Ant. IV, type specimen. Fig. 10—Sense organ, Ant. III, type specimen. Fig. 11—Posterior segments, showing setae, type specimen. Fig. 12—Hind foot, type specimen.

D = scale for Figs 8, 9, 10. E = scale for Fig. 11. F = scale for Fig. 12.

Onychiurus acindelius n. sp. Figs. 8–12.

COLOUR: Entirely white.

CLOTHING: Fairly densely clothed with both short and long, plain setae, the longer setae mostly on the sides of the head, the sides of the trunk, around the posterior, and on the legs and antennal segments III and IV. The setae are normally arranged in transverse rows, the setae on the posterior segments being shown in Fig. 11.

BODY: Length up to 1.1 mm, the antennae about $\frac{2}{3}$ as long as head, the four segments related as 6:9:11:17. Ant IV with distinct but very small subapical sense club behind thick chitinous ridge, and with numerous curved sensory hairs and long setae. Sensory organ of Ant III consisting of 11 granulated papillae arranged more or less as in Fig. 10, some being conical, some curved, guarded with from one to five long, stout, guard setae: interspersed amongst the granulated papillae are 3 short sense clubs and 2 longer curved sense rods, each arising from a strongly chitinised pocket. Post antennal organ rather of the *fimitarius* type with 16 lobes each of which bears many minute finger-like processes projecting upwards, usually with two guard setae at the inner end. Antennal base distinct. Pseudocelli as follows: Antennal base 3 + 3, two on the base, one just off the base; posterior margin of head, 1 + 1 or 2 + 2. Th. I, 0, Th. II 1 + 1, Th. III 1 + 1, Abd. I 3 + 3, Abd. II 3 + 3, Abd. III 3 + 3, Abd. IV 2 + 2, Abd. V 3 + 3 (two dorsal plus one lateral), Abd. VI 0. No anal spines. Genital papilla with 4 short, simple setae in a longitudinal row down each side surrounded by three U-shaped rows of 11–16 setae each with the open part of the U directed posteriorly; an additional 4–5 irregularly arranged setae on each lateral edge of the papilla.

LEGS: Claw normally without teeth, although two very minute basal teeth are sometimes visible when the claw is viewed from either in front or behind. Unguiculus lancet-like, long and tapering, the terminal filament almost as long as claw on front feet and reaching to the apex of the claw on the other feet. A prominent tenent hair to all feet, not usually clavate on the front feet but distinctly though lightly clavate on the hind feet in larger, mature specimens.

LOCALITY: From inside the glow-worm cave, Waitomo, collected by A. M. Richards, March 1955.

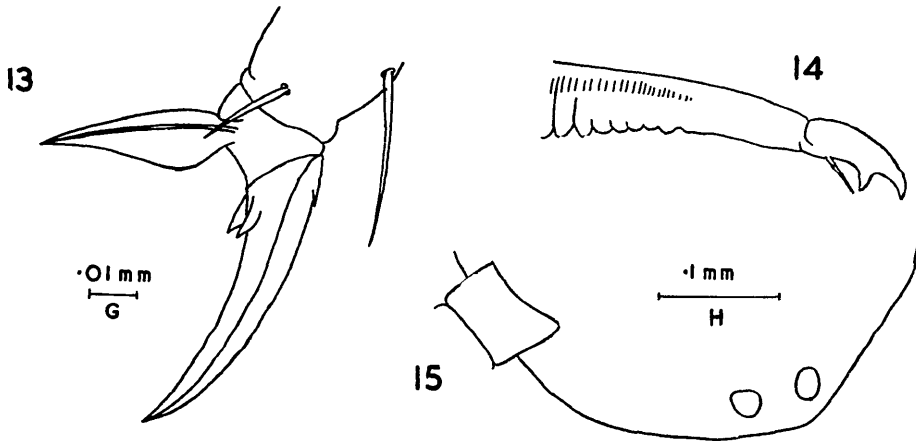
REMARKS: This species of *Onychiurus* would not seem to have any close relatives amongst the known species. Although it falls into the *fimitarius* group, the structure of the sense organ of Ant III and the clothing of quite long setae distinguish it from all other species.

Pseudosinella spelunca n.sp. Figs. 13–15.

COLOUR: Entirely white.

CLOTHING: Of somewhat hyaline scales and ciliated setae, the scales either rounded or bluntly pointed apically and bearing many rows of extremely fine striations which are only visible with a phase contrast microscope.

BODY: Length up to 1.75 mm. Mesonotum slightly overlying rear of head. Two unpigmented ocelli to each side of the head, somewhat separated and situated in the lateral posterior



Figs 13–15.—*Pseudosinella spelunca*. Fig. 13—Hind foot, type specimen. Fig. 14—Apex of dens and mucro, type specimen. Fig. 15—Left side of head, showing ocelli, type specimen. G = scale for Figs. 13 and 14. H = scale for Fig. 15.

region of the head (Fig. 15) Abd. III and IV as 1:4.5 Rami of tentaculum each with four barbs.

LEGS: Claw with a pair of moderately large basal inner wing-like teeth and sometimes a very small outer basal tooth. Unguiculus lancet-like, the outer lamella narrow, the inner lamella very broad and curved. No tenent hairs nor basal setae to the claw.

FURCULA: The manubrium to the mucrodens at 22:28, the uncorrugated portion of the dens subequal to the mucro in length. Mucro elongate, bidentate, with a long basal spine, the sub-apical tooth distinctly larger than the apical, the basal spine often overtopping the subapical tooth. The mucrodens joint rather indistinct.

LOCALITY: On wall above stream 600 yards inside Waipuna cave near Te Kuiti. Collected by B. M. May, May 1957.

REMARKS: This species is very close to *P. cavernarum* Moniez, but differs in possessing ocelli, and in the basal inner teeth of the claw and the apical tooth of the mucro all being smaller than they are in *cavernarum*. It is also close to *P. sollaudi* Denis in claw structure, but again differs in having ocelli and in having a mucro which is not nearly so curved as that of *sollaudi*.

The antennae in my specimens had all been broken, and I am therefore unable to describe the antennae in detail. The ocelli are difficult to see, but show up clearly with the phase contrast microscope.

DR J. T. SALMON, F.R.S.N.Z.,
Zoology Department,
Victoria University of Wellington,
P.O. Box 196, Wellington.