



Paraxenylla norvegica sp. nov., the most northern species of the genus (Collembola, Hypogastruridae)

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The genus *Paraxenylla* so far has nine described species (Queroz & Deharveng 2008). All the species, except one, live in marine littoral environments and probably feed on algae and diatoms (Palacios-Vargas & Janssens 2006). One species is cosmopolitan, the others are living in warm parts of the world (Peru, Cuba, Mexico, New Caledonia, Gambia, Japan). *P. sooretamensis* Queiroz & Deharveng, 2008 was described from an inland forest in Brazil. The cosmopolitan species, *P. affiniformis* (Stach, 1930), is found north to the German coast. A new Norwegian species breaks both the southern distributional pattern and the morphological conformity of the genus.

Abbreviations. Abd I–VI: abdominal segments, Ant I–IV: antennal segments, Cx: coxa, Fe: femur, Lam 1–5: lamellae 1–5, Tib: tibia, Tr: trochanter, Scx 1–2: subsegments of subcoxa.

Paraxenylla norvegica sp. nov.

Figs 1–14, Tab. 1

Type locality. Norway, Rogaland County, W of Brusand, N 58.53644°, E 05.70024°.

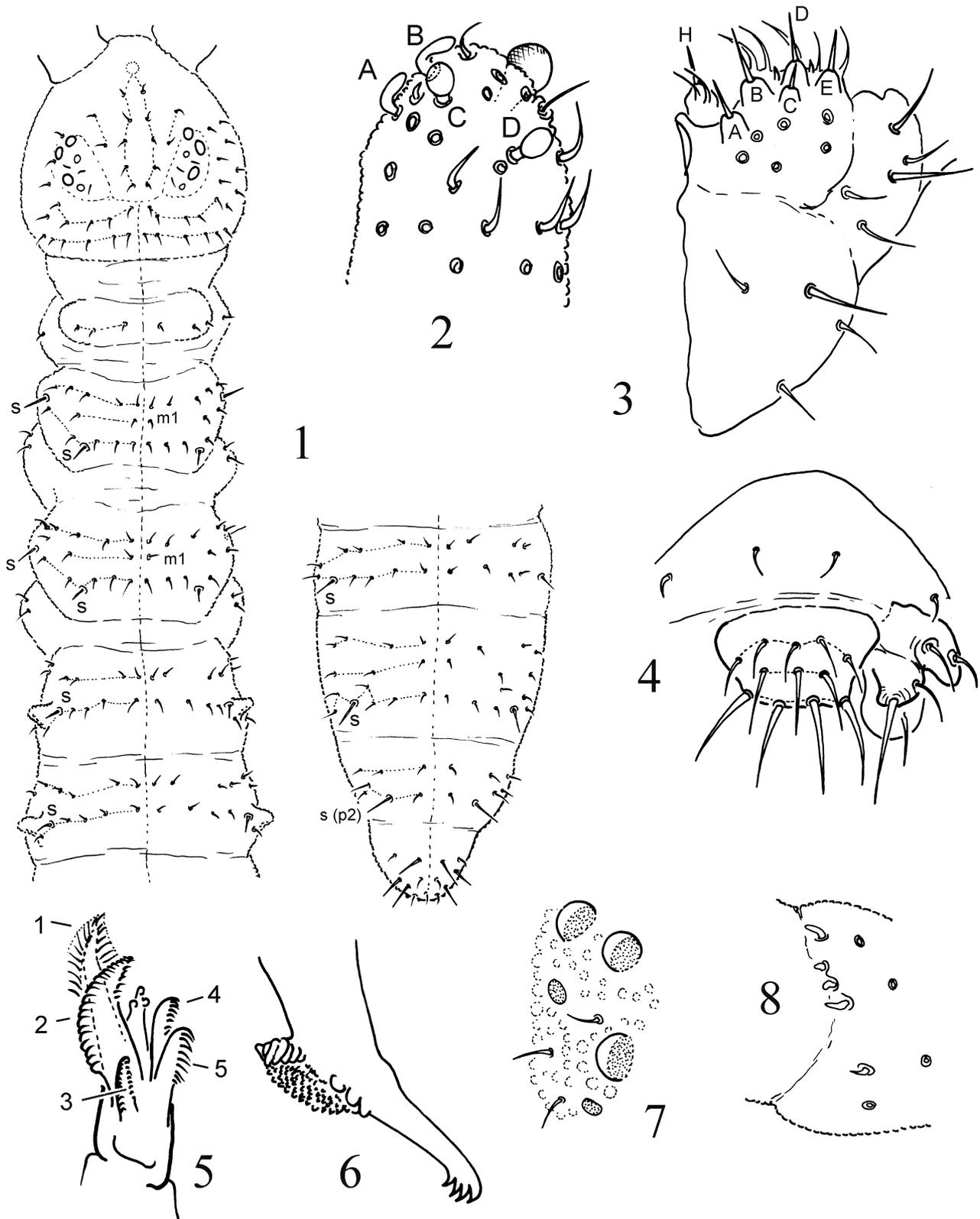
Type material. Holotype, male (slide), labelled "Norway. Rogaland: W Brusand, N 58.53644°, E 05.70024°, *Ammophila* roots on sandy foreshore, 10.ix.2009. A. Fjellberg 9.320". Paratypes: 2 (slide), 10 (alc.) from the holotype sample. All types deposited at Museum of Natural History (Entomology), Oslo. Additional material: 15 specimens collected in cow dung on the sandy foreshore at the type locality, 13.x.2009. A. Fjellberg leg.

Description. Body length 0.45 mm. Colour bluish grey. Eyes 5+5, of which 2+2 are smaller than others (Figs 1, 7). Antennae 0.8–0.9 as long as width of head measured from above. Ant I with 7 setae, Ant II with 11 setae. Ant III organ with two exposed short sensilla flanked on each side by guard sensillum, slightly longer than the short sensilla. Spine-shaped sensillum present in ventroapical position (Fig. 8). Ant IV with four enlarged sensilla A–D, of which A and B blunt and cylindrical, C and D egg-shaped (Fig. 2). In addition five slender, curved and pointed sensilla. Short microsensillum and subapical organite (buried peg) present between sensilla A, B, C. Apical bulb large and unlobed.

Labrum with 5,3,4 setae, apical four particularly long (Fig. 4). Clypeal field with four setae, prelabrals absent. Basal fields of labium with 4+5 setae. Labial palps with papillae A–E distinct, five guard setae present. Two small accessory papillae (transformed guards) found between papillae B–D and D–E. Six proximal setae present (Fig. 3). Hypostomal group with 3 subequal setae (H straight, h1–h2 curved). Ventral side of head with 2+2 setae along *linea ventralis*. Mandibles unmodified, with granulated molar plate and four apical teeth (Fig. 6). Maxillary capitulum narrowed at tip, but the three primary cusps are distinct (Fig. 5). Two long ciliated lamellae (Lam 1, Lam 2) surpass tip of capitulum. A short ciliated Lam 3 present at base of Lam 2. Lam 4 distinct, ciliated. Lam 5 present at base of Lam 4 (proximal extension of Lam 4?). Maxillary outer lobe with simple palp and one sublobal hair.

Body with short setae, macrochaetae hardly distinguished. Integument with uniform small sharp granules. Sensilla only slightly longer than ordinary setae except on Abd IV–V where distinctly prolonged. Chaetotaxy as Figs 1, 9, 10. Thorax with sensilla in position p4, seta m1 present, m2 absent. Abd I–II with a pair of dorsolateral integumental tubercles outside sensilla = p5. Setae of p-row unstable (missing or extra added). Abd IV with m1 and m3 present. Sensilla on Abd V in position p2. Abd VI without anal spines. Anus subterminal with ventral lobes separated only apically. No ventral setae on thorax. Ventral tube with 4+4 setae (Fig. 14). Retinaculum with 3+3 teeth, no seta. *Linea ventralis* distinct, reaching the ventral tube.

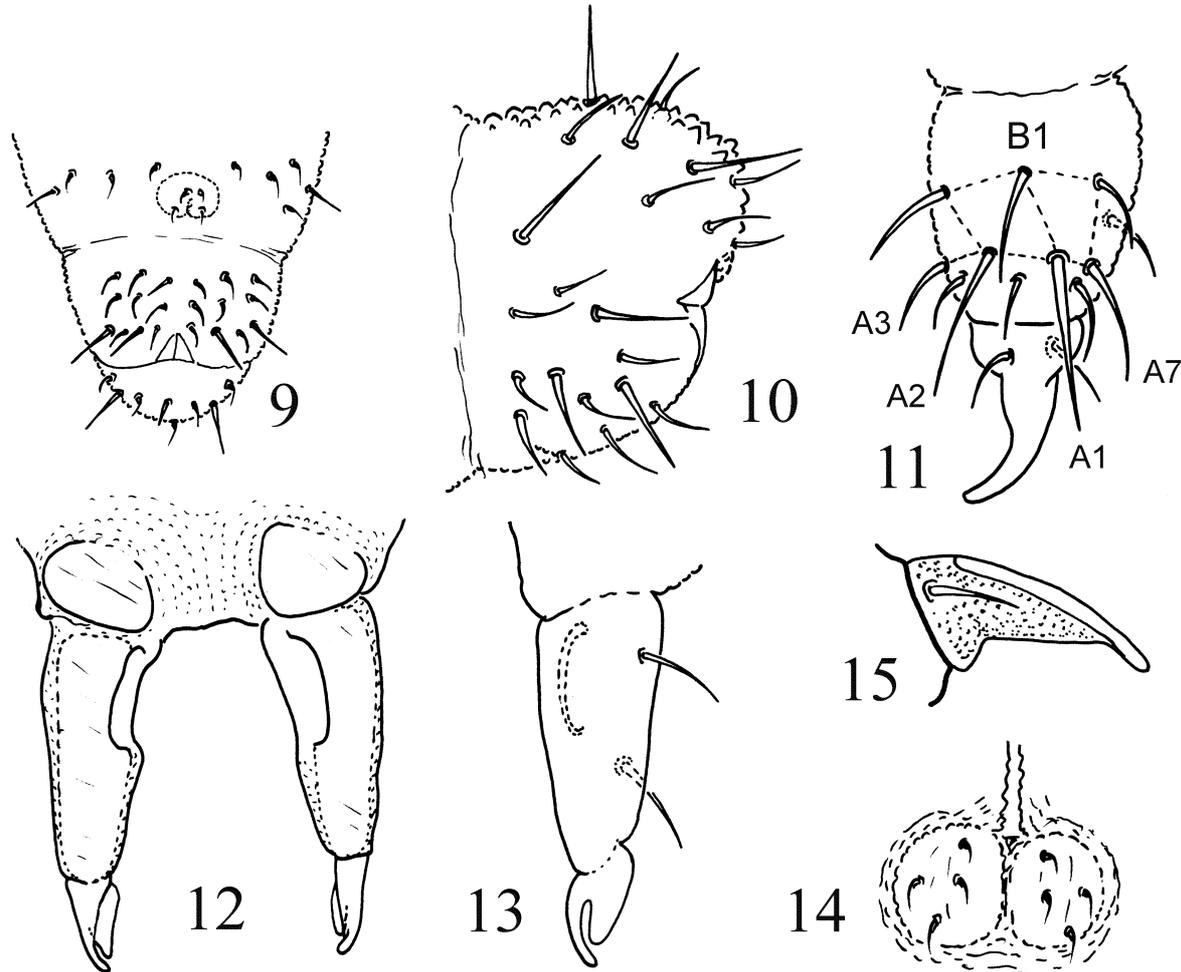
Chaetotaxy of legs as in Tab 1. Tibiotarsi with A1 enlarged, acuminate (Fig. 11). Claws without unguiculus, unguis without teeth (Fig. 15). Furca fully developed, dens 2.5 as long as mucro, with two dorsal setae. Mucro separated from dens, curved, with very distinct dorsal lamella. Ventral side of dens smooth, without primary granules. Similar smooth fields distally on manubrium (Figs. 12, 13).



FIGURES 1–8. *Paraxenylla norvegica* sp. nov.: 1, dorsal chaetotaxy (s: sensillum); 2, dorsal sensilla of Ant IV; 3, left labium, ventral; 4, labrum, maxillary outer lobe and frontoclypeal area; 5, maxilla; 6 mandible; 7, right eye spot; 8, left Ant III organ.

Discussion. In the last survey of *Paraxenylla* Queiroz & Deharveng (2008) separate the genus from *Xenylla* by a set of characters which involved modification of the mouthparts, terminal position of anus and absence of anal spines on

Abd VI. Chaetotaxy characters of antennae and labrum are less consistent. The new Norwegian species matches *Paraxenylla* by absence of anal spines and the subterminal position of anus, but the modification of the mandibles, maxillae and labium are less advanced. Development of the mouthparts are highly adaptive, in particular among marine littoral species, and the informative value of the mouthparts in generic diagnosis is questionable. Moreover details of the mandibles and maxillae are only known from a few of the nine recognised species of *Paraxenylla*. I therefore rely on similarity in the terminal abdominal segment for linking *norvegica* to *Paraxenylla*.



FIGURES 9–15. *Paraxenylla norvegica* sp. nov.: 9, ventral side of Abd.IV–VI; 10, Abd VI, lateral; 11, chaetotaxy of outer side of left Tib III; 12, dens and apical part of manubrium, ventral side; 13, left dens, lateral; 14, ventral tube; 15, claw.

TABLE 1. Chaetotaxy of legs.

	Tib	Fe	Tr	Cx	Scx 2	Scx 1
Leg I	19	12	5	4	0	1
Leg II	19	11	5	7	2	2
Leg III	18	10	4	6	2	2–3

The new species differs from all other *Paraxenylla* by the very distinct curved mucro bearing a high dorsal lamella. Other species have a straight pointed mucro with a narrow dorsal lamella at most. The type displayed by *norvegica* probably represents an archaic type in Poduromorpha and may indicate that the species belongs to a plesiomorphic branch in the *Paraxenylla* complex. Presence of seta m1 on Th II–III is also a plesiomorphic character. Most species of *Paraxenylla* show the apomorphic condition (absence of m1), except for the two species *sooretamensis* and *arenosa* Uchida & Tamura, 1967. Also the position of the tergal sensillum at p2 on Abd V links *norvegica* to *sooretamensis*.

arenosa, while other *Paraxenylla* have that sensillum in p4. The type of integumental tubercles found on Abd I–II in *norvegica* is not described from any other *Paraxenylla*. Similar tubercles are found in several marine littoral species and may serve to increase the buoyancy when exposed to water or to increase the amount of air trapped around the body when specimens are suspended in water due to wave action. Actual examples are: lateral lobes on Abd I–III in *Hypogastrura viatica* (Tullberg, 1872); lateral tubercles on Th II–Abd III in *Hypogastrura arctandria* Fjellberg, 1988; the subcoxal lobe on last pair of legs in *Xenylla humicola* (Fabricius, 1780); the apical lobe on the outer side of last femur in many (all?) *Archisotoma* spp.; apical lobes on the inner side of Ant I–II in *Halisotoma maritima* (Tullberg, 1871).

The new species is recorded from a very exposed stretch of the Norwegian south coast. The beach at the type locality is composed of fine sand being exposed to strong wave action. Various amounts of marine algae are washed up and deposited on the foreshore which has a width of 20–50 metres in front of the aeolic dunes which rise 2–6 metres above the flat foreshore. The sand dunes have a dense vegetation of *Ammophila arenaria* which also form a pioneer community of scattered tufts in front of the dunes, in the upper part of the foreshore (Fig. 16). *P. norvegica* was collected in these pioneer tufts and in partly buried scats of cow dung in the surrounding area.



FIGURE 16. Type locality of *Paraxenylla norvegica* sp. nov. at Brusand, 50 km south of Stavanger, Norway. Specimens were collected in the *Ammophila* tufts in the foreground, in the upper part of the foreshore at foot of the sand dunes.

Acknowledgements

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