

Two new species of *Protaphorura* ABSOLON, 1901 from north Karelia (Russia), with notes on the position of altered pseudocelli (psx) in the *armatus*-group  
(*Collembola*, *Onychiuridae*)

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ABSTRACT. *Protaphorura stogovi* n. sp. and *Protaphorura boedvarssoni* n. sp. from Karelia (Russia) are described and illustrated. Position of altered pseudocelli typical for *armatus*-group is discussed.

Thanks to the co-operation of the Institute of Ichthyology and Hydrobiology of the University of St. Petersburg and the Zoological Institute, University of Wrocław, I had an opportunity to make three trips to north Karelian coast of the White Sea (Inlet Chupa, 66° 10' - 66° 20' N, 33° - 34° E), to collect *Collembola*. One of the trips was a part of the project 2020/W/IZ/92, financed by the University of Wrocław. In the material collected there were two species new to the science, members of the *armatus*-group within the genus *Protaphorura* ABSOLON, 1901.

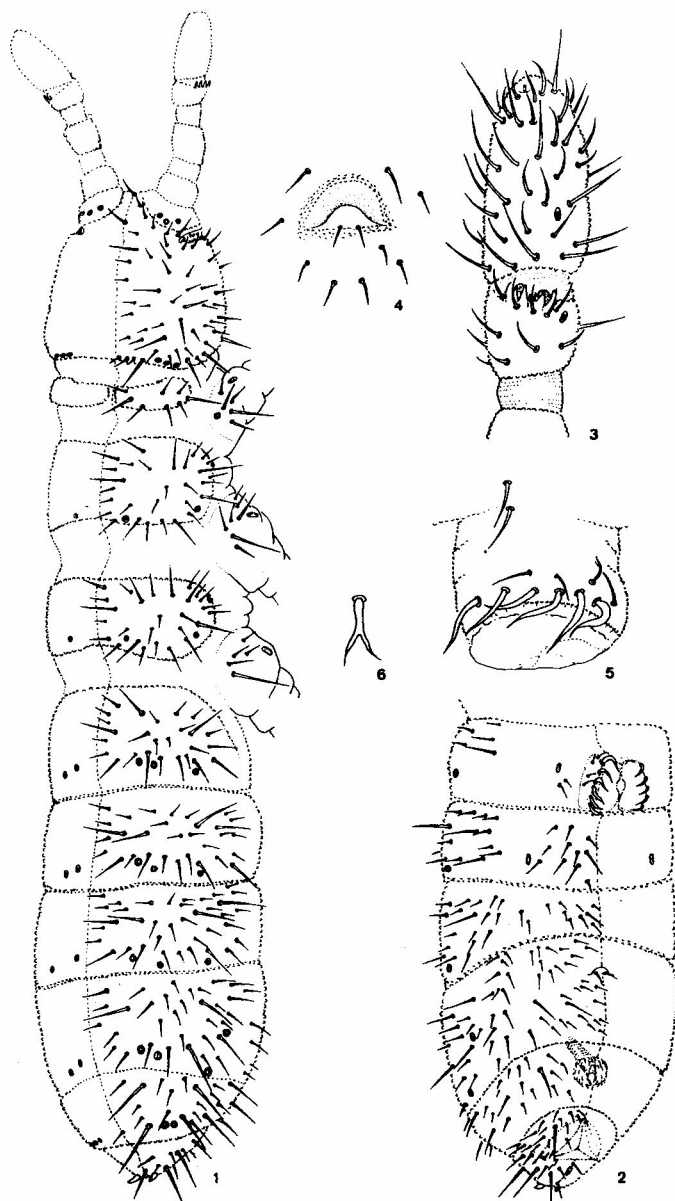
***Protaphorura stogovi* n. sp.**

DIAGNOSIS

PAO of *Protaphorura* type, composed of 29-35 simple vesicles. A remnant of furca as an integument fold, with 1+1 setae, and no setae at base. Formula pso dorsally: 33/022/33342, only first subcoxa with 1 pso. Formula psx ventrally: 1/000/110001<sup>m</sup>. Male with ventral organ situated on ventral tubus.

MATERIAL

Holotype (male) and 7 paratypes (on slides), Syedlovataya Island (Inlet Chupa, N



1-6. *Protaphorura stogovi* n. sp.: 1 - dorsal chaetotaxy, localization pso and psx; 2 - ventral abdominal chaetotaxy, localization psx; 3 - 3rd and 4th antennal segments, microsensillae and AOIII; 4 - remnant of furca; 5 - male ventral organ; 6 - modified, forked seta in male ventral organ

Karelia, Russia), 27 September 1992, on stones under moss, leg. R. J. POMORSKI. Other material: numerous specimens in alcohol, Syedlovataya Island, 25 September 1992, on rocks among plant roots, leg. R. J. POMORSKI and D. SKARZYŃSKI; 6 specimens (on slides), Cheremshiha Island, 13 June 1991, on rocks among grass roots, leg. R. J. POMORSKI; 5 specimens (on slides), Borsovec Island, 10 July 1992, on rocks under moss, leg. R. J. POMORSKI; 3 specimens (on slide), Kartes, Station of the Zoological Institute, Russian Academy of Sciences, 14 June 1991, on rocks under moss, leg. R. J. POMORSKI; 4 specimens, Srednij Island, 26 September 1992, under moss, leg. D. SKARZYŃSKI and M. WOŹNY.

#### DESCRIPTION

Length without antennae 1.2-2.0 mm, holotype 1.6 mm, 1st instar 0.5 mm, 2nd instar 0.75 mm.

Body shape typical of *armatus*-group, somewhat broader in the region of the 3rd and 4th abd. tergite. Antennae approximately as long as head or slightly shorter. A remnant of furca as an integument fold, with 1+1 setae and no setae at base (fig. 4).

Colour white.

Granulation homogenous, with no granular areas.

AOIII built of 5 guard setae, 2 sensory rods, 2 fine smooth slightly bent sensory clubs and 5 papillae (fig. 3).

PAO of *Protaphorura* type, consisting of 29-35 simple vesicles.

Pso and psx. Pso formula dorsally: 33/022/33342, ventrally head with 1+1 pseudocelli. Only first subcoxa with 1 pseudocellus. Psx formula only ventrally: 1/000/110001<sup>m</sup>. On 1st, 2nd and 3rd subcoxa (anapleurite) 1 psx. I have seen no psx on trochanteres. Femora of all legs with 1 psx ventrally. Position of pso and psx is presented in figs 1 and 2.

Chaetotaxy variable. Dorsal chaetotaxy as in fig. 1. Formula of 1st thoracal tergite is i3m. Anal spines usually shorter than the claw, especially in "spring form" (figs. 7, 8). On ventral side, between legs on pro-, meso- and metathorax 1+1, 2+2 and 2+2 setae, respectively. Tubus ventralis with 2+2 (in immature specimens 0+0 or 1+1) setae at base. Ventral abdominal chaetotaxy as in fig. 2. Straight lines passing through the bases of setae, localized in front of anal spines, parallel or nearly so.

Microsensillae. Ant. 4 with a subapical organ and ms in latero-external position, usually c. 1/3 length from the base. Ant. 3 with ms slightly below AOIII (fig. 3). Thoracic tergites 2nd and 3rd with ms laterally.

Legs. Claws always with small teeth.

Male ventral organ as a row of 6-8 thickened setae situated on apical part of tubus ventralis, fully developed only in mature specimens with ductus ejaculatorius; sometimes the setae forked (figs 2, 5, 6).

Variability. When studying the material collected in spring, I observed that adult specimens of *P. stogovi* n. sp. were usually smaller (1.2-1.6 mm) and had relatively small abdominal spines (fig. 7). Specimens collected in summer and autumn, despite being sexually immature (no ductus ejaculatorius) were distinctly larger (1.5-2.0 mm)

and had longer abdominal spines (fig. 8). Perhaps *P. stogovi* n. sp., like some species of the genus *Isotoma* BOURLET, 1839, undergoes cyclomorphosis (FJELLBERG 1976, 1978), but this needs confirmation with more detailed studies. Besides, I observed a variation in the number of pseudocelli typical for the members of the *armatus*-group. It can be expressed by the following pseudocellar formula: 3(4)3(2)/022/33(4)342(3).

#### BIOLOGY

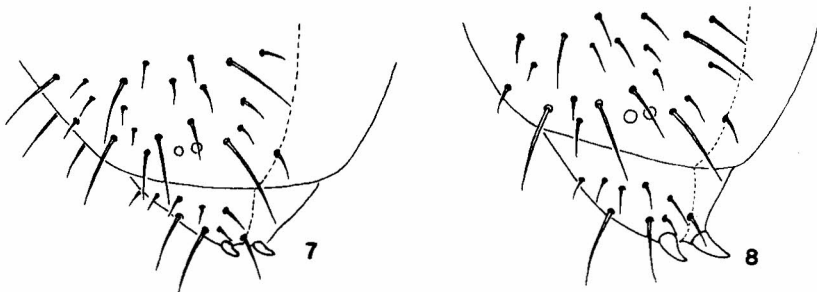
*P. stogovi* n. sp. is bisexual. It lives on the continent and on islands (also devoid of trees), in leaf litter, on rocks and stones under lichens and humid moss, and also in ornithogenic soil of rock crevices.

#### REMARKS

*P. stogovi* n. sp. differs from the other species of the *armatus*-group in its psx formula, in the presence of male ventral organ situated on tubus ventralis, and in the lack of pso on subcoxa of the 2nd and 3rd legs. Based on material of three species: *Protaphorura armata* (TULLBERG, 1869) sensu POMORSKI 1990; *P. fimata* (GISIN, 1952); *P. aurantiaca* (RIDLEY, 1880), sensu POMORSKI 1990 from laboratory culture, I have ascertained the number and position of psx typical for the *armatus*-group. In this group psx are usually paired, situated only on the ventral side of body and on legs. Their number on the body can be described with the following formula: 1/000/111101<sup>m</sup>. The "m" means that psx on anal lobes of the 6th abdominal segment is unpaired and situated medially. The arrangement of psx is presented in fig. 9. The leg psx are situated on anapleurites, external surface of trochanteres and internal, stronger granulated surface of femora. Their presence on trochanteres was revealed using SEM (RUSEK, 1984), but because of the delicate structure of trochanter cuticle they are poorly visible in light microscope. I saw them only in very large specimens of *P. armata*.

#### DERIVATIO NOMINIS

I dedicate the species to Dr. Igor Arseniyevich STOGOV, a specialist in Karelian lake plankton and a great angler. Without his help I would not have gone to Karelia or tasted a real Russian fish soup "ukha".



7-8. *Protaphorura stogovi* n. sp.: 7 - 5 and 6 abdominal tergite in "spring form"; 8 - 5 and 6 abdominal tergite "autumn form"

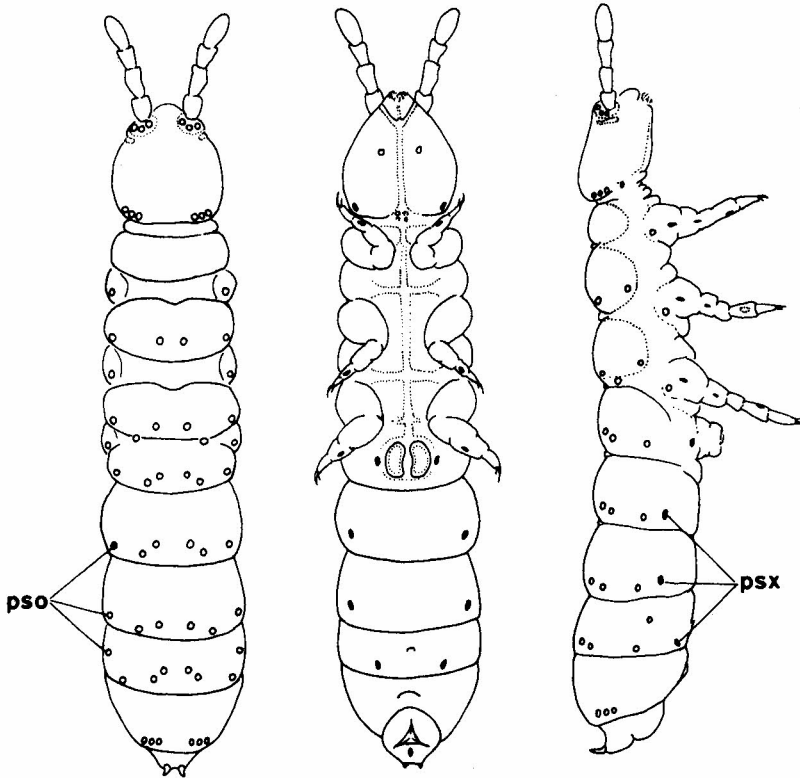
*Protaphorura boedvarssoni* sp. n.

## DIAGNOSIS

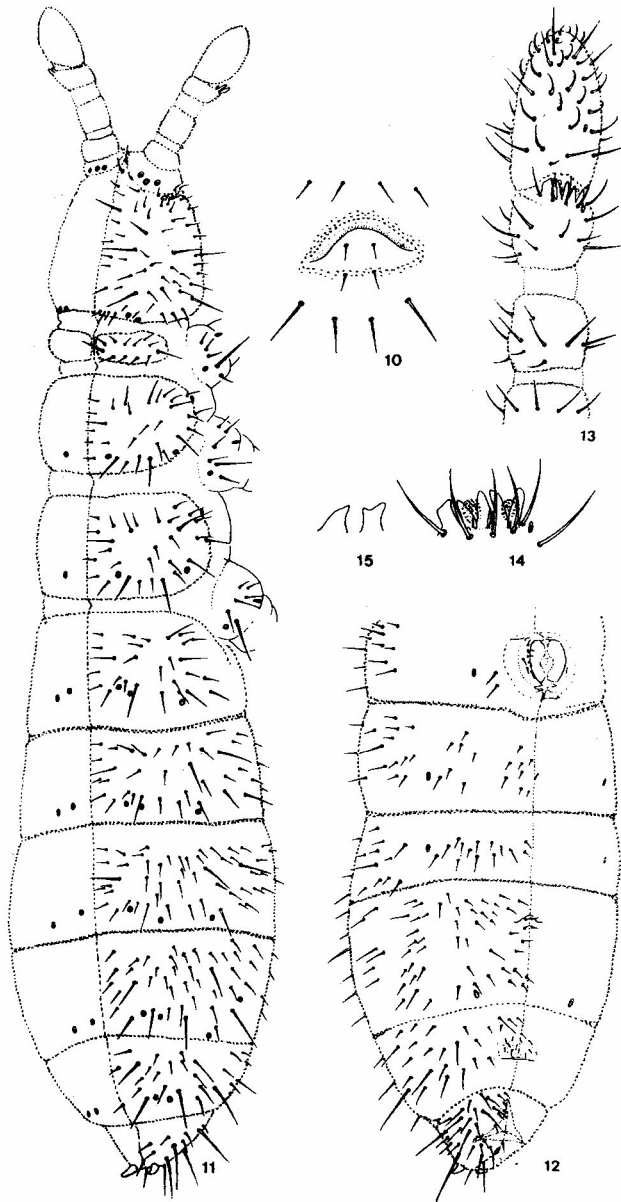
PAO of *Protaphorura* type, composed of 36-40 simple vesicles. A remnant of furca as an integument fold, with 1+1 setae, and 1+1 setae at base. 1st, 2nd and 3rd abdominal tergite with seta *s'*. Formula pso dorsally: 33/022/33342, all subcoxa with 1 pso. Formula psx ventrally: 1/000/111101<sup>m</sup>.

## MATERIAL

Holotype (female) and 11 paratypes (on slides), Srednij Ostrov Island (Guba Chupa, N Karelia, Russia), 24 September 1992, under moss on the rocks, leg. D. SKARŻYŃSKI. Other material: 6 specimens, Srednij Ostrov Island, 16 June 1991, salt meadow, under pieces of wood, leg. R. J. POMORSKI.



9. Typical localization pso and of psx in *armatus*-group of the genus *Protaphorura*



10-15. *Protaphorura boedvarssoni* n. sp.: 10 - remnant of furca; 11 - dorsal chaetotaxy, localization of pso and psx; 12 - ventral abdominal chaetotaxy, localization of psx; 13 - antenna, microsensillae and AOIII; 14 - AOIII; 15 - shape of 1st internal papilla in AOIII

## DESCRIPTION

Length without antennae 1.3-2.0 mm, holotype 1.6 mm.

Body shape typical of *armatus*-group. Antennae as long as head. A remnant of furca as an integument fold, with 1+1 setae and 1+1 setae at base (fig. 10).

Colour white.

Granulation homogenous, with no granular areas.

AOIII built of 5 guard setae, 2 sensory rods, 2 gently granulated sensory clubs and 5 papillae one of which (the first internal) for the most part is thicker and sometimes forked (figs 14, 15).

PAO of *Protaphorura* type, consisting of 36-40 simple vesicles.

Pso and Psx. Pso formula dorsally: 33/022/33332, ventrally head with 1+1 pseudocelli. All subcoxa with 1 pso. Psx formula only ventrally: 1/000/111101<sup>m</sup>. On 1st, 2nd and 3rd subcoxa (anapleurite) with 1 psx. I have seen no psx on trochanteres. Femora of all legs with 1 psx ventrally. Position of pso and psx is presented in figs. 11 and 12.

Dorsal chaetotaxy as in fig. 11. Formula of chaetotaxy of 1st thoracal tergite: i3m. 1st, 2nd and 3rd abdominal tergites with setae s'. Anal spines as long as claw. On ventral side, between legs on pro-, meso- and metathorax 1+1, 2+2 and 2+2 setae, respectively. Tubus ventralis with 3+3 setae. Ventral abdominal chaetotaxy as in fig. Straight lines passing through the bases of setae, localized in front of anal spines, parallel or nearly so.

Microsensillae very small. Ant. 4 with a subapical organ and ms in latero-external position, usually c. 1/3 length from the base. Ant. 3 with ms very close to AOIII (fig. 13). Thoracic tergites 2nd and 3rd with ms laterally.

Legs. Claws with very small teeth.

Variability. The first internal papilla in AOIII is always thicker than the remaining ones, but its shape may vary (figs 14, 15). The variability of the number of pseudocelli can be described with the following formula: 33(2)/022/ 33332(3). Besides, I have observed a higher number of setae between legs on metanotum, than is typical (3+3 and 4+3). The number of setae at the base of tubus ventralis is also variable (1+1 and 2+2).

## BIOLOGY

*P. boedvarssoni* is bisexual. It lives in leaf litter and under moss on the rocks.

## REMARKS

*P. boedvarssoni* is closely related to *Protaphorura campata* (GISIN, 1952) sensu POMORSKI, 1990, from which it differs first of all in the arrangement of setae in front of anal spines (in *P. boedvarssoni* straight lines passing through the bases of setae situated anterad to anal spines are parallel, in *P. campata* they are convergent). The other differences are: shape of the first internal papilla in AOIII, pseudocellar formula, and the presence of seta s' only on 1, 2 and abdominal tergites. *P. boedvarssoni* is also similar to imprecisely described *Onychiurus armatus* f. *scanica* BÖDVARSSON, 1970, from which it differs in the pseudocellar formula.

## DERIVATIO NOMINIS

I dedicate this species to dr Hogni BÖDVARSSON, the author of *Onychiurus armatus* f. *scanica*. *P. boedvarssoni* is probably identical with that form.

## REFERENCES

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- FJELLBERG, A., 1978. Generic switch-over in *Isotoma nivea* SCHÄFER, 1896. A new case of cyclomorphosis in *Collembola (Isotomidae)*. Norw. J. Ent., **25**: 221-222.
- RUSEK, J., 1984. A new location and type of pseudocelli in *Onychiurus* spp. (*Collembola, Onychiuridae*). Annls Soc. r. zool. Belg., **114**: 3-7.