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The first instar larvae of *Onychiurinae* - a systematic study* (*Collembola*: *Onychiuridae*)

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ABSTRACT. First instar larvae of 27 species of *Onychiurinae* BÖRNER, 1909 are described. A map of morphoevolutionary activity, based on the descriptions is presented. A preliminary cladistic analysis of 27 species based on 53 characters made it possible to propose solutions of taxonomic problems within *Onychiurinae*, especially at the tribal and generic level. The following genera are justified: *Argonychiurus* Bagnall, 1949; *Onychiuroides* BAGNALL, 1949; *Allaphorura*, BAGNALL, 1949; *Deuteraphorura* ABSOLON, 1901; *Onychiurus* GERVAIS, 1841; *Orthonychiurus* STACH, 1954; *Archaphorura* BAGNALL, 1949; *Micraphorura* BAGNALL, 1949; *Oligaphorura* BAGNALL, 1949; *Protaphorura* ABSOLON, 1901; *Supraphorura* STACH, 1954; *Hymenaphorura* BAGNALL, 1948, and their diagnoses are provided (based on morphology of I instar larvae). The genus *Handschiniella* BAGNALL, 1940 is probably a junior synonym of *Allaphorura* BAGNALL, 1949. Two new genera are proposed: *Bionychiurus* gen. n. and *Tantulonychiurus* gen. n., as well as a provisional division of the subfamily *Onychiurinae* into four tribes: *Onychiurini* BÖRNER, 1903 stat. n.; *Oligaphorurini* BAGNALL, 1949 stat. n.; *Protaphorurini* BAGNALL, 1949 stat. n.; *Hymenaphorurini* trib. n.

Key words: entomology, taxonomy, *Collembola*, larvae, morphology, classification.

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CONTENS

1. INTRODUCTION

The genus, as a taxonomic category, does not and should not have any objective definition. Out of necessity a pragmatic definition is usually adopted which, however, permits a considerable freedom when distinguishing taxa of this rank. As a result, classification of any given group in practice depends on the authority of its author or on an agreement between numerous investigators. When the latter is absent, several equally widespread classifications may function in the literature.

This is very well exemplified by the family *Onychiuridae*. Though its division into subfamilies (*Pachytullbergiinae* STACH, 1954; *Tetrodontophorinae* STACH, 1954; *Tullbergiinae* BAGNALL, 1935; *Onychiurinae* BÖRNER, 1909) raises no greater doubts, and most authors agree on this point (STACH 1954, SALMON 1964, BABENKO et al. 1988), the problem of the generic-level classification still remains to be solved. Authors of the most popular determination keys for collembolans (STACH 1954, GISIN 1960, PALISSA 1960, CHRISTIANSEN and BELLINGER 1980) accepted *Onychiurus* GERVAIS, 1841 as the only genus, divided into several (usually three to six) subgenera. A similar approach was adopted by YOSHII (1995), who erected one new and accepted 14 earlier distinguished subgeneric taxa, suggesting at the same time that their ultimate number should be higher.

BAGNALL's (1948, 1949) concept is also known in the literature. That author elevated the subfamily *Onychiurinae* BÖRNER, 1909 to the family rank (*Onychiuridae* BÖRNER, 1909 sensu BAGNALL, 1949), divided it into four subfamilies (*Psyllaphorurinae* BAGNALL, 1949; *Oligaphorurinae* BAGNALL, 1949; *Onychiurinae* BÖRNER, 1909; *Protaphorurinae* BAGNALL, 1949) and erected 20 new genera. The division of the *Onychiurinae* into more numerous generic taxa was also advocated by SALMON (1964), who accepted 12 genera, and by BABENKO et al. (1988), who accepted 10 genera.

It follows from the above outline of the systematics of the *Onychiurinae*, that in the group there is a nomenclatorial chaos at the generic level. There are no unequivocal criteria for distinguishing genera, and the rare attempts at introducing such criteria are based on subjective views of their authors, who only rarely try to justify their taxonomic decisions more comprehensively. The problem was already mentioned by WEINER (1986, 1989).

The presently functioning, far too general, diagnoses are based on traditionally applied characters that were never analysed in detail. In the light of observations on other collembolan groups (DEHARVENG 1989) and in view of my own observations, I think that character states found in many species only apparently are the same. In many cases they result from a mosaic evolution, in which parallelism (homoplasy) is common. These characters, beside the imprecise and outdated descriptions, are a source of numerous taxonomic misunderstandings. In conclusion it should be said that the situation presented above creates a need for a modern generic-level revision of the *Onychiurinae*.

Juvenile development stages of the *Collembola* constitute an excellent object of morphological-systematic studies. Results of such studies on many occasions threw a new light on phylogenetic relationships and taxonomic problems (BARRA 1975, GRUIA 1974, RUSEK 1980, SNIDER 1977, SZEPTYCKI 1969, 1972, 1977, 1979, THIBAUD 1970, POMORSKI 1986, 1990a, 1990b, SKARŻYŃSKI 1991). In this respect the I instar larvae of the *Onychiurinae* are especially useful, since:

- they occupy the same ecological niche as adults and are very short-lasting (usually c. 9 days), hence there is no question of a distinct adaptive evolution of the larvae;
- their morphology, compared with the adults, is simple, clear and little variable.

In my opinion, comparative studies on this development stage create a better chance of ascertaining the actual relationships between species, than do analogous studies on the adults. Thus e.g. cladistic classification based on the morphology of I instar larvae, might be more reliable.

The objectives of this study were the following:

- to propose a method of creating or verifying the generic level taxa in the *Onychiurinae*, based on the morphology of the I instar larvae;
- to analyse the I instar larval morphology in detail;

In this paper, in the descriptions of the I instar larvae, I use a nomenclature in which I have tried to assign the examined species to the proper generic names known from the literature, irrespective from whether I regard the names as justified or not. In some cases I could study the type species, in others I had to be guided by the similarity to the type species, or else the diagnosis was precise enough to allow a certain or highly probable generic placement. Where I could not assign species to genera, or where the generic placement was unequivocally stated by the species author, I used names under which the species were originally described.

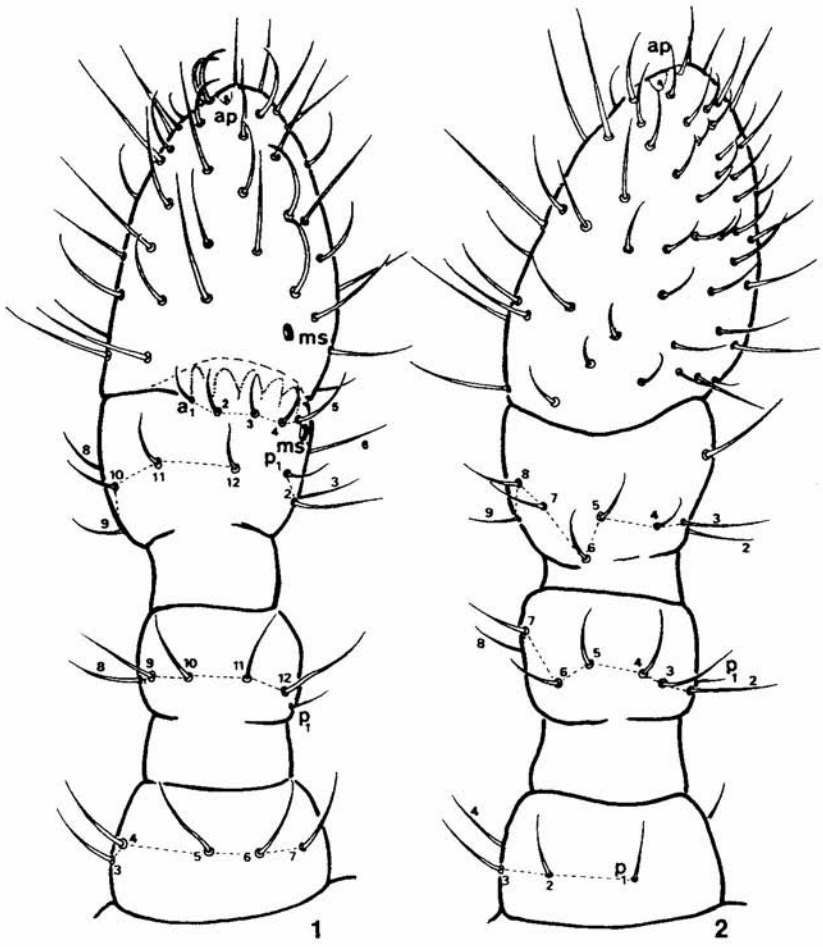
2. INTRODUCTION TO THE MORPHOLOGY OF I INSTAR LARVA

Because of the extensive material at my disposal, I have used specimens of *Protaphorura subarmata* (GISIN, 1952) as a reference point when describing the morphology of the I instar of the *Onychiurinae*. I have adopted the pseudocelli nomenclature proposed by POMORSKI (1986, 1990a) and SKARŻYŃSKI (1991). I have omitted information on the observed parapseudocelli (psx), which I saw only in a few specimens. Probably in the I instar larvae they are not fully developed or, because of the small size, they are very poorly visible in contrast-phase microscope. Describing chaetotaxy I have used the a-m-p system, commonly accepted in descriptions of the *Poduromorpha*, for the thoracal and abdominal tergites (row m appears in none of the examined species !), and on the antennae and legs. Besides, in many

cases I have modified the system in accordance with the specific nature of stage I, e.g. by introducing new rows or groups of setae, especially on abdominal sternites.

2.1 ANTENNAE

Because of the complicated arrangement, small size and poor morphological differentiation of setae on antennomere IV, I could not apply the chaetotaxy nomenclature used previously (ANDRE 1988, NAYROLLES 1992). For antennomeres I-III I have introduced a simple nomenclature based on that used for thoracal and abdominal tergites.



1-2. *Protaphorura subaramata*, antenna: 1 - dorsolateral view, 2 - ventrointernal view; ap - subapical organ, ms - microsensillum

IV antennal segment. Free, with subapical organ (ap) and microsensillum (ms), located above antennal III sense organ; with ca. 73 setae (figs 1, 2).

III antennal segment. p-chaetotaxy - 12 setae; a-chaetotaxy - 6 setae, of which 5 (a_1-a_5) accompany antennal III sense organ, seta a_6 separated from the remaining ones by microsensillum; microsensillum - located on ventral side, slightly below antennal III sense organ (figs 1, 2); antennal III sense organ - 2 sensory rods, 2 sensory club and 5 papillae.

II antennal segment p-chaetotaxy - 12 setae (figs 1, 2).
I antennal segment p-chaetotaxy - 7 setae (figs 1, 2).

2.2 HEAD

I have divided the head capsule chaetotaxy into several rows (vertical and horizontal) or groups of setae, partly using the commonly accepted nomenclature proposed by many authors (Yossi 1956, 1961, Gama 1969, Najt and Rubio 1978, Andre 1988). I have also introduced an array of nomenclature modifications in accordance with the specificity of the *Onychiuridae*. Within the mouthparts, I have described the morphology of their external components: labrum, labium and maxillary palp, omitting the external parts: mandibles and maxillae, because of their small size and the consequent technical difficulties involved in examining an extensive material.

Head capsule (figs 3, 4). d-chaetotaxy - 4 setae + medial seta a_0; sd-chaetotaxy - 6 setae; pao-chaetotaxy - 4 setae; o-chaetotaxy - 2 setae; v-chaetotaxy - 2 setae; c-chaetotaxy - 4 setae; p-chaetotaxy - 6 setae; l-chaetotaxy - 7 setae; s-chaetotaxy - 9 setae; z-chaetotaxy - 6 setae; x-chaetotaxy - 7 setae; y-chaetotaxy - 3 setae; i-chaetotaxy -2 setae.

Area antennalis with 3+3 pseudocelli (*a*, *b*, *c*); hind margin of head capsule with 2+2 pseudocelli (*a*, *b*).

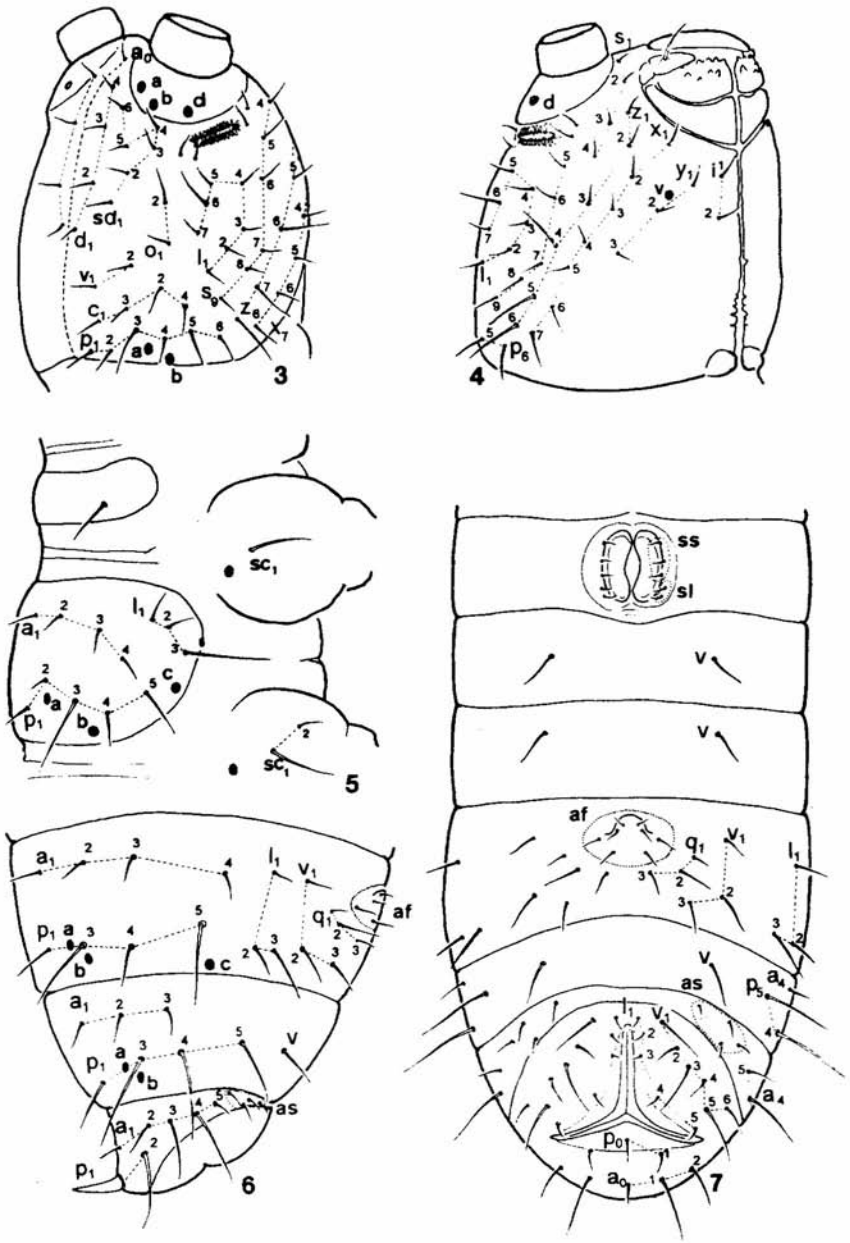
Labrum (fig. 11). a-chaetotaxy 2+2 setae; p-chaetotaxy 2+2 setae + p_0; 2+2 prelabral setae.

Labium. Mentum accreted to submentum.

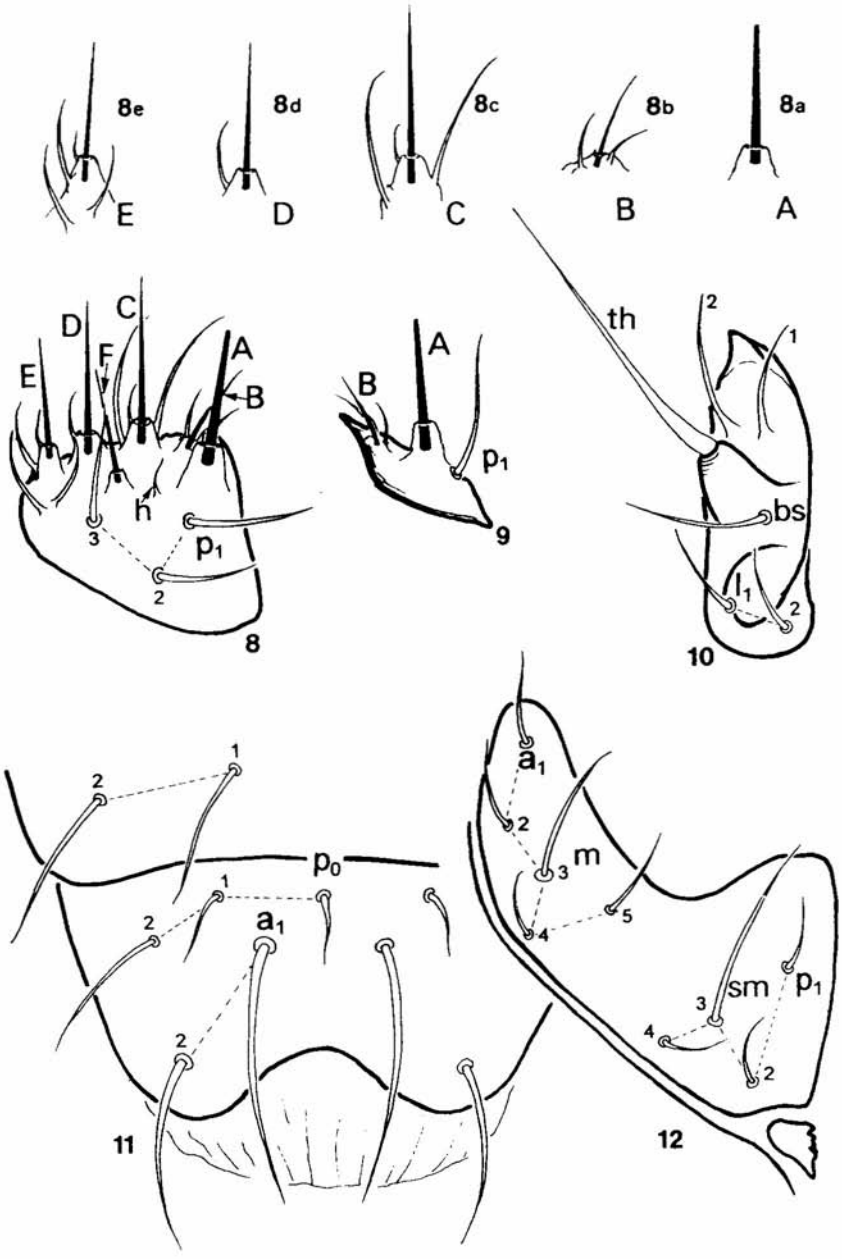
Mentum a-chaetotaxy 5 setae, a_3 -macrochaeta;

Submentum (fig. 12). p-chaetotaxy 4 setae, p_3 -macrochaeta

Palpus labialis (figs 8, 8a-8e, 9). p-chaetotaxy - 3 typical setae (fig. 8); 6 thickened setae with bases embedded in conical papillae: seta A straight, usually bluntly terminated, with no sensory hairs at base (figs. 8a, 9); seta B hidden behind seta A, gently curved, embedded in a small papilla, with 2 sensory hairs at base (fig. 8b, 9); seta C usually straight or very gently curved, embedded in papilla, with 3 sensory hairs at base (fig. 8c); seta D straight, embedded in papilla, with 1 sensory



3-7. *Protaphorura subarmata*, chaeatotaxy and position of pseudocelli: 3 - dorsolateral view of head; 4 - ventrointernal view of head; 5 - I and II thoracal segments, lateral view; 6 - IV-VI abdominal segments, lateral view; 7 - I-VI abdominal sternites. af - area furcalis; as - area subanalis; ss - subapical setae; sl - additional setulae



8-12. *Protaphorura subaramata*, external parts of mouth apparatus: 8 - palpus labialis, ventral view; 8a-8e - details of mentum sense chaetotaxy; 9 - palpus labialis, ventrointernal view; 10 - palpus maxillaris; 11 - labrum and prelabral setae; 12 - mentum accreted to submentum. m - mentum, sm - submentum, th - terminal sense hair, bs - basal seta

hair at base (fig. 8d); seta E straight, embedded in papilla, with 4 sensory hairs at base (fig. 8e); seta F straight, embedded in papilla, with no sensory hairs (fig. 8); between papillae of setae A and F a small sensory hair - h (fig. 8)

Palpus maxillaris. Describing the morphology of this structure I have used the terminology introduced by FJELLBERG (1984). l-chaetotaxy - 2 setae on pleural lobe; 1 big, terminal sense hair (th) on coniform papilla with basal seta (bs) and 2 sublobal sense hairs (fig. 10).

Postantennal organ (PAO). ca. 25 simple vesicles, situated perpendicular to the long axis of the organ (figs 3, 4).

Pseudocelli at base of antennae. 3 + 3 pseudocelli (*abd*) on area antennalis (fig. 3).

Pseudocelli on hind margin of the head. 2 + 2 pseudocelli (*ab*), situated below seta p_4 (fig. 3)

Pseudocelli on ventral side of the head. 1 + 1 pseudocelli (*v*), between setae y_1 and y_2 (fig. 4)

2.3 THORAX

When describing the chaetotaxy of thoracal tergites II and III, I have come to a conclusion that, like in the genus *Xenylla* (GAMA 1969, 1988, ANDRE 1988), the three setae situated most laterally and the microsensilla were most probably originally situated on the paratergite that later became completely accreted to the tergite, hence I have distinguished these setae in a separate row 1 of chaetotaxy. With respect to the tibiotarsal chaetotaxy, I have resigned the setae nomenclature used by LAWRENCE (1977) and, because only two verticils of setae are present in the onychiurin I instar larvae, I have called them a and p.

I thoracal segment

Chaetotaxy of tergite: 1 seta (fig. 5).

Leg of I pair: subcoxa1 - 1 pso + 1 seta (fig. 5); subcoxa2 - 3 setae (figs 13, 17); trochanter - 7 setae (figs 13, 17, 18); femur - 13 setae, f_2 - very short seta sensualis (figs 13, 14, 15, 16); tibiotarsus - 2 regular verticil of setae (figs 13, 19, 20, 21):

a-verticil - 11 setae, seta a_1 odd, setae a_1, a_3, a_5 distinctly thicker and longer,

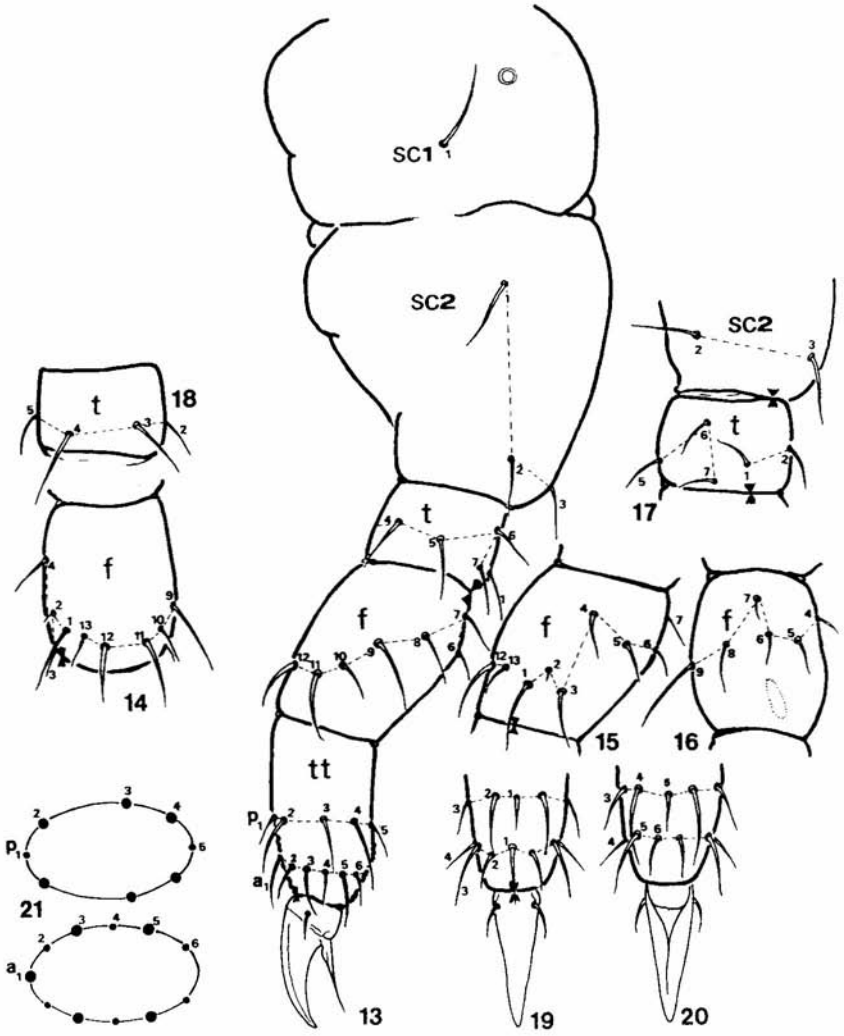
b-verticil - 12 setae, setae p_1 and p_7 odd, setae p_2 and p_6 thicker and longer.

II thoracal segment

Chaetotaxy of tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum (fig. 5).

Pso - 2+2 pso (*ac*).

Leg of I I pair: subcoxa1 - 1 pso + 2 setae (fig. 5); subcoxa2 - 3 setae (fig. 13, 17); trochanter - 7 setae (figs 13, 17, 18); femur - 13 setae, f_2 - seta sensualis (figs 13, 14, 15, 16); tibiotarsus - 2 regular verticil of setae (figs 13, 19, 20, 21):
a-verticil - 11 setae, seta a_1 odd, setae a_1, a_3, a_5 distinctly thicker and longer,
b-verticil - 12 setae, setae p_1 and p_7 odd, setae p_2 and p_6 thicker and longer.



13-20. *Protaphorura subaramata*, chaeatotaxy of I pair leg, diagrammatic: 13 - externolateral view; 14 - femur, dorsal view; 15 - femur, interolateral view; 16 - femur, ventral view; 17 - trochanter and subcoxa, ventral view; 18 - trochanter, dorsal view; 19 - tibiotarsus, dorsal view; 20 - tibiotarsus, ventral view; 21 - arrangement of setae in a and p verticils on tibiotarsus, diagrammatic. t - trochanter, f - femur, tt - tibiotarsus, sc1 - subcoxa1, sc2 - subcoxa2

III thoracal segment

Chaetotaxy of tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae, + microsensillum (fig. 5).

Pso - 3+3 pso (*abc*)

Leg of I I I pair: subcoxa1 - 1 pso + 2 setae (fig. 5); subcoxa2 - 3 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, lack of setae f_8 and f_9; tibiotarsus - 2 regular verticil of setae (figs 13, 19, 20, 21):

a-verticil - 11 setae, seta a_1 odd, setae a_1, a_3, a_5 distinctly thicker and longer,

b-verticil - 12 setae, setae p_1 and p_7 odd, setae p_2 and p_6 thicker and longer.

2.4 ABDOMEN

I abdominal tergite. a-chaetotaxy 3 setae, p-chaetotaxy 5 setae, 3 pso (*abc*).

II abdominal tergite. a-chaetotaxy 4 setae, p-chaetotaxy 5 setae, 3 pso (*abc*).

III abdominal tergite. a-chaetotaxy 4 setaey, p-chaetotaxy 5 setae, 3 pso (*abc*).

IV abdominal tergite. a-chaetotaxy 4 setaey, p-chaetotaxy 4 setae (seta p_2 reduced), 3 pso (*abc*) (fig. 6).

V abdominal tergite. a-chaetotaxy 3 setaey, p-chaetotaxy 4 setae, 2 pso (*ab*) (fig. 6).

VI abdominal tergite. a-chaetotaxy 4 setae, p-chaetotaxy 2 setae (b_1 - spines) (fig. 6).

I abdominal sternite. Tubus ventralis - 5 setae: 3 subapical setae (ss) + 2 additional setulae (sl) (3/2) (fig. 7).

II abdominal sternite. 1 seta (v) (fig. 7).

III abdominal sternite. 1 seta (v) (fig. 7).

IV abdominal sternite. l-chaetotaxy 3 setae, v-chaetotaxy 3 setae, q-chaetotaxy 3 setae, (area furcalis) with 2+2 setulae on cuticular fold and 2+2 setae at base (figs 6, 7).

V abdominal sternite. 1 seta (v) (figs 6, 7)

VI abdominal sternite. Anal lobes: a-chaetotaxy 2 setae + seta a_0, p-chaetotaxy 2 setae + seta p_0, l-chaetotaxy 5 setae, v-chaetotaxy 6 setae, area subanalis with 4+4 setae (figs 6, 7)

3. REVIEW OF THE I INSTAR LARVAL MORPHOLOGY

Because of the limited material, comprising in some cases only one specimen, I have limited the description to those morphological characters that I could observe in all the studied species. Hence, in the descriptions presented below, I have omitted the following morphological characters: l, s, z, x, y, and i-chaetotaxy on the head capsule, labrum and prelabral region chaetotaxy, labium structure, anal lobe and subanal field chaetotaxy (it should be noted that some of the characters omitted, e.g. subanal field chaetotaxy, show a considerable variation in the studied species, and if not for the limited material, they would constitute additionally excellent characters for comparative studies).

Protaphorura armata (TULLBERG, 1869)

Dorsal chaetotaxy - figs 21, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

MATERIAL

20 spp. of I instar - culture, parents collected in Ślęża Massif, Sudety Highlands, Poland, litter in beech forest, 17 September 1984, leg. R. J. POMORSKI.

DESCRIPTION

Length without antennae 0.55-0.65 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

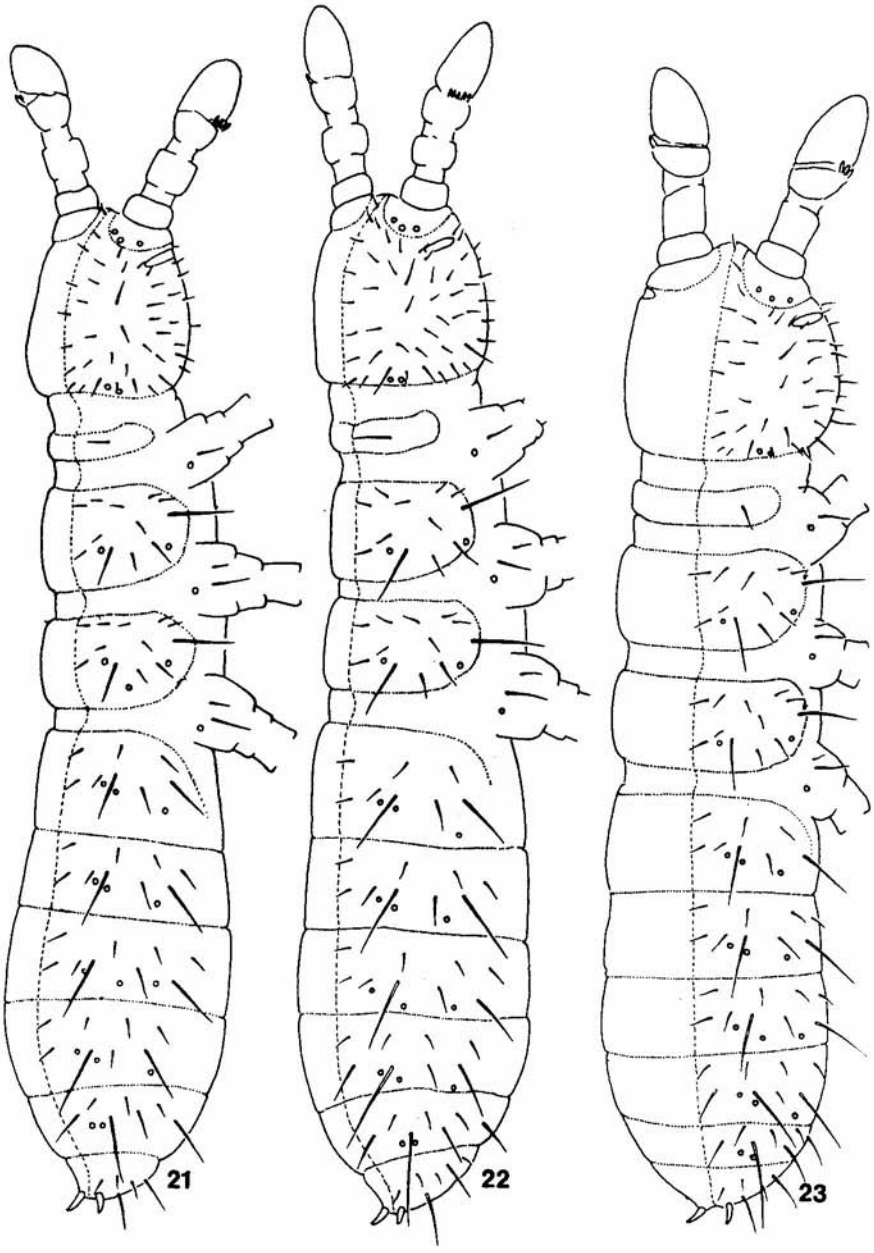
Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocelli (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.



21-23. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 21 - *Protaphorura armata*, 22 - *Protaphorura campata*, 23 - *Protaphorura meridiata*

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Protaphorura campata (Gisin, 1952)

Dorsal chaetotaxy - figs 22, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

MATERIAL

16 spp. of I instar - culture, parents collected in Śnieżnik Massif, Sudety Mts., nature reserve "Jaskinia Niedźwiedzia", Poland, litter in beech forest, 14 June 1984, leg. R. J. POMORSKI.

DESCRIPTION

Length without antennae 0.6-0.7 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Protaphorura meridiata (Gisin, 1952)

Dorsal chaetotaxy - figs 23, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

Material

4 spp. of I instar - Złotniki, Izerskie Highlands, Sudety Mts., Poland, under wet moss on rocks near Jezioro Złotnickie lake shore, 6 June 1994, leg. R. J. Pomorski.

Description

Length without antennae 0.6 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory

rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

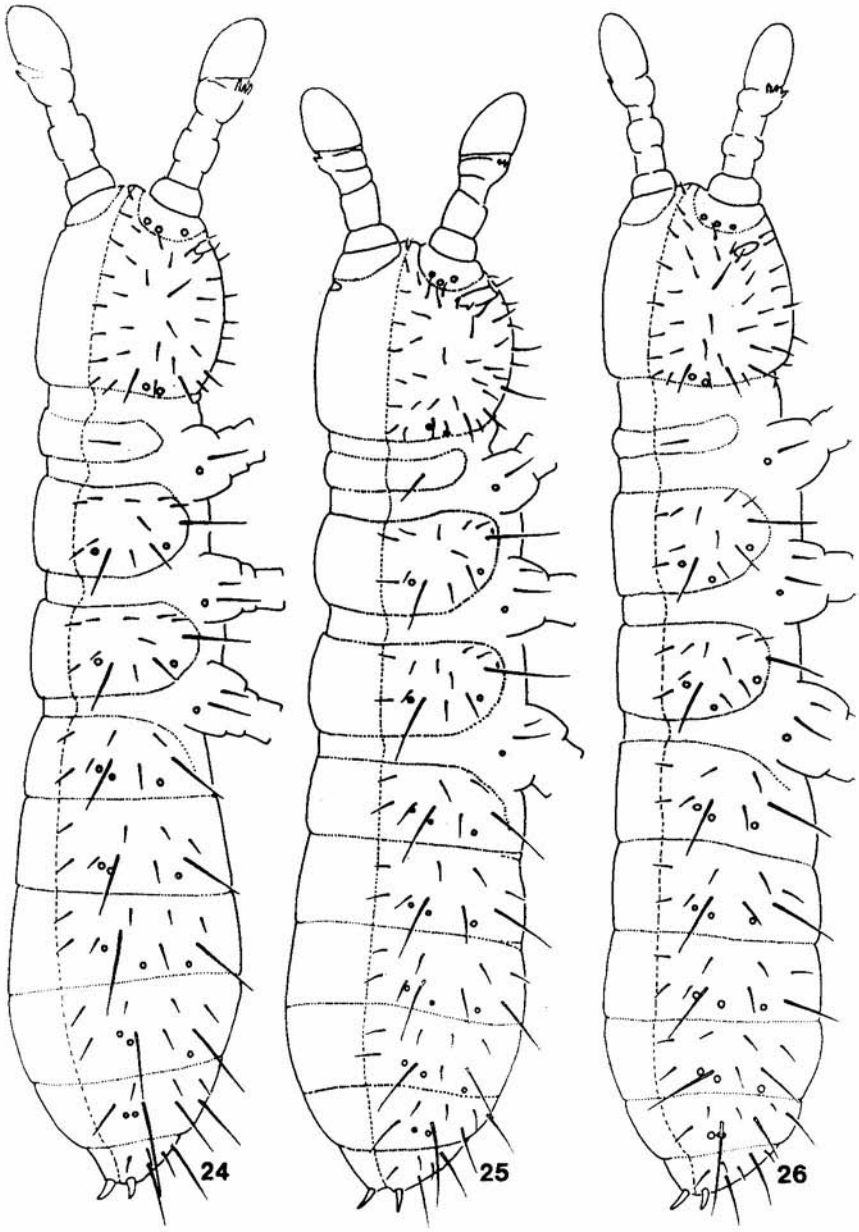
Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).



24-26. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 24 - *Protaphorura fimata*, 25 - *Protaphorura eichhorni*, 26 - *Protaphorura pannonica*

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).
VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli
I sternite: tubus ventralis - 5 setae (3/2).
II sternite: 1 seta (v).
III sternite: 1 seta (v).
VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.
V sternite: 1 seta (v).

Protaphorura fimata (Gisin, 1952)

Dorsal chaetotaxy - figs 24, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

Material
20 spp. of I instar - culture, parents collected in Nizina Śląska, Czernica Wrocławska, Poland, compost, 14 June 1984, leg. R. J. Pomorski.

Description
Length without antennae 0.65-0.7 mm.

Head
IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.
III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.
II antennal segment: p-chaetotaxy - 12 setae.
I antennal segment: p-chaetotaxy - 7 setae.
Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),
Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.
Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Protaphorura eichhorni (GISIN, 1954)

Dorsal chaetotaxy - figs 25, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

MATERIAL

3 spp. of I instar - Our River valley, Oberreisenbach near Holzbeichsbaach, Luxemburg, exp. N, litter with moss among oaks 5 July 1991, leg. M. URSONE & M. TAMMASI.

DESCRIPTION

Length without antennae 0.85 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Protaphorura pannonica (Haybach, 1960)

Dorsal chaetotaxy - figs 26, 61; area furcalis - fig. 71; chaetotaxy of head capsule - fig. 48.

Material

2 spp. of I instar, Kaczawskie Highlands, Sudety Mts., nature reserve "Ostrzyca Proboszczowicka", Poland, epilithic grasses, 15 May 1994, leg. R. J. Pomorski.

Description

Length without antennae 0.6 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 30 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

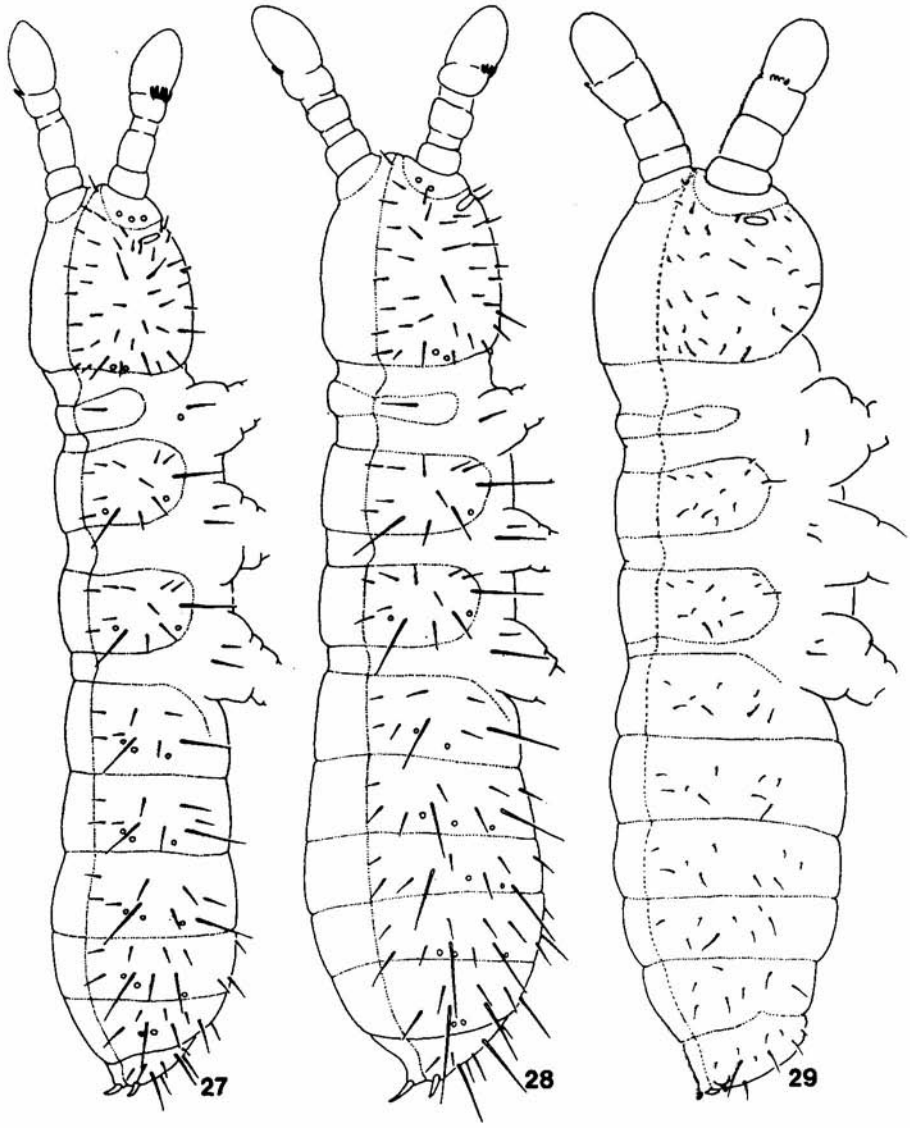
Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5, unpaired, setae p_2, p_3 and p_4 longer and thicker.



27-29. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 27 - *Protaphorura stogovi*, 28 - *Supraphorura furcifera*, 29 - *Hymenaphorura polonica*

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Protaphorura stogovi Pomorski, 1993

Dorsal chaetotaxy - figs 27, 61; area furcalis - fig. 72; chaetotaxy of head capsule - fig. 48.

Material

7 spp. of I instar - culture, parents collected in Srednij Island, Chupa Inlet, Karelia, Russia, on rocks under moss, 26 September 1992, leg. R. J. Pomorski, D. Skarżyński.

Description

Length without antennae 0.6 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 3+3 pseudocelli (*abd*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 25 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (3/3)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setulae on cuticular fold and 2+2 setae at base.

V sternite: 1 seta (v).

Supraphorura furcifera (BÖRNER, 1901)

Dorsal chaetotaxy - figs 28, 60; area furcalis - fig. 70; chaetotaxy of head capsule - fig. 49.

MATERIAL

3 spp. of I instar - culture, parents collected in Pełcznica Ravine, Wałbrzych Highland, Sudety Mts., Poland, soil samples in mixed deciduous-coniferous forest, 22 February 1989, leg. D. SKARŻYŃSKI.

DESCRIPTION

Length without antennae 0.68-0.7 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: 2+2 pseudocelli (*ab*) on area antennalis, 2+2 pseudocelli (*ab*) close together on posterior margin of head capsule below seta p_4, ventrally 1+1 pseudocellus (*v*) between setae y_1 and y_2.

Postantennal organ (PAO): ca. 20 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 1+1 pseudocellus (*c*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae:

a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 2 pseudocelli (*ab*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 2 pseudocelli (*bc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

V tetgite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (3/3)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae and 1+1 setae on 2 knobby remnants of furca (with spine-like mucrones) and 2+2 setae at base.

V sternite: 1 seta (v).

Hymenaphorura polonica Pomorski, 1990

Dorsal chaetotaxy - figs 29, 67; area furcalis - fig. 79; chaetotaxy of head capsule - fig. 56.

Material

2 spp. of I instar - Ociemne, Pieniński National Park, Carpathian Mts., Poland, a piece of rotten wood, 26 May 1994, leg. R. J. Pomorski.

Description

Length without antennae 0.6 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located at 1/3 height of IV antennal segment, above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 5 setae, of which 4 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 4 papillae. Microsensillum located slightly below antennal III sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 3 setae (sd_3, sd_4 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta),

Pseudocelli: absent (POMORSKI, 1995).

Postantennal organ (PAO): ca. 9 simple, ovoid, bubble-shaped vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; pseudocelli absent.

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; pseudocelli absent.

Leg of I pair: subcoxa1- 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1- 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1- 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

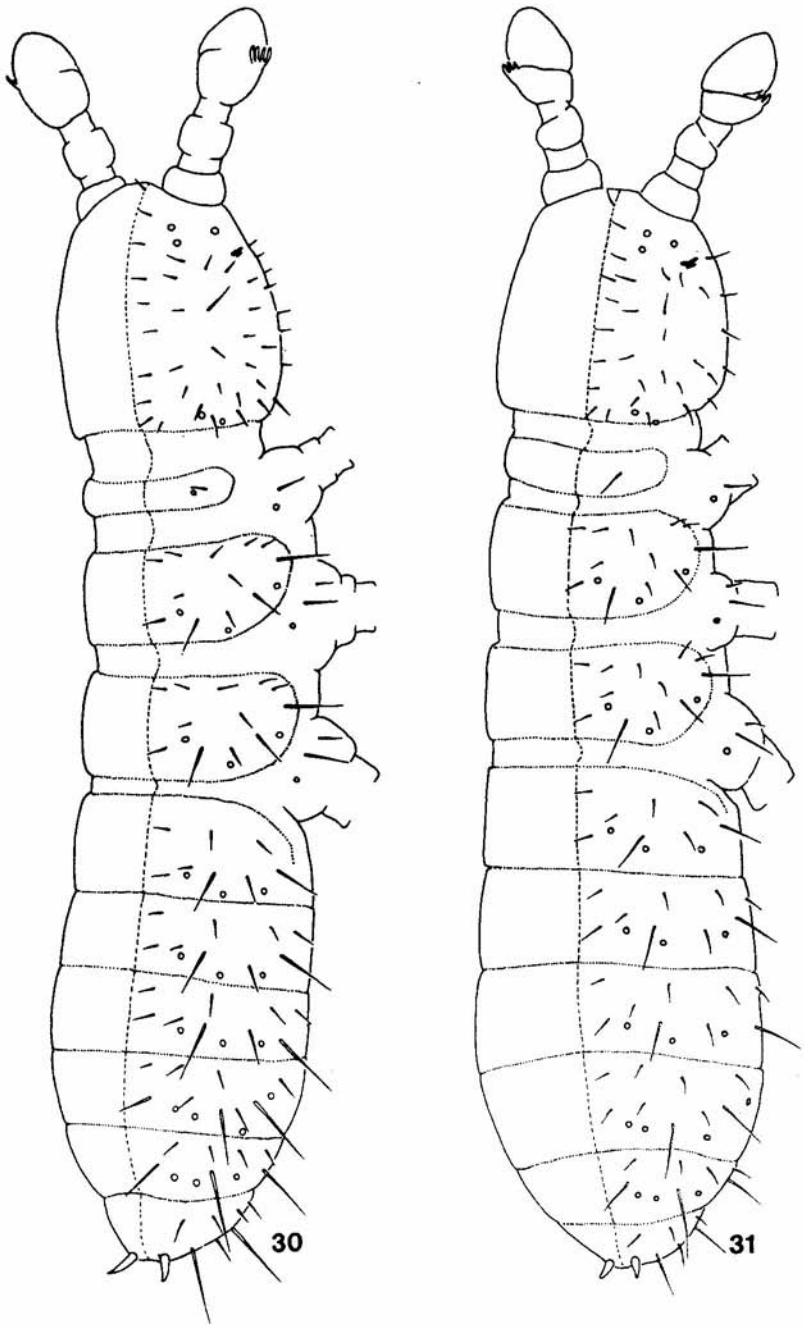
Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; pseudocelli absent.

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; pseudocelli absent.

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; pseudocelli absent.

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); pseudocelli absent.



30-31. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 30 - *Oligaphorura groenlandica*, 31 - *Dimorphaphorura judithae*

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; pseudocelli absent
VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli
I sternite: tubus ventralis - 6 setae (3/3)
II sternite: 1 seta (v).
III sternite: 1 seta (v).
VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 2 setae, area furcalis with 2+2 setulae.
V sternite: 1 seta (v).

Oligaphorura groenlandica (TULLBERG, 1876)

Dorsal chaetotaxy - figs 30, 57; area furcalis - fig. 76; chaetotaxy of head capsule - fig. 47.

MATERIAL
1 spp. of I instar - Wolin Island , Poland, under stone on the shore of Kamieński Gulf, 17 September 1983, leg. R. J. Pomorski, D. SKARŻYŃSKI.

DESCRIPTION
Length without antennae 0.52 mm.

Head
IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.
III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.
II antennal segment: p-chaetotaxy - 12 setae.
I antennal segment: p-chaetotaxy - 7 setae.
Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_2 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).
Pseudocellus: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule, ventrally 2+2 pseudocelli (*qv*).
Postantennal organ (PAO): small, consisting of 1 vesicle with 3 elongate lobes, situated transversely.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 4 pseudocelli (*abcd*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae (p_3 displaced anterad); 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base.

V sternite: 1 seta (v).

Dimorphaphorura judithae WEINER, 1994

Dorsal chaetotaxy - figs 31, 57; area furcalis - fig. 76; chaetotaxy of head capsule - fig. 47.

MATERIAL

1 spp. of I instar - Sujang-san near Haeju, S. Hwanghae Prov., N. Korea, valley below a waterfall, a slope close to a stream, deciduous forest (oak, maple, hornbeam etc.), fresh litter with upper layer from under a rock (granite) with many plant roots, 14 June 1985, leg. A SZEPTYCKI.

DESCRIPTION

Length without antennae 0.57 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_2 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule, ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): small, consisting of 1 vesicle, with 3 elongate lobes, situated transversely.

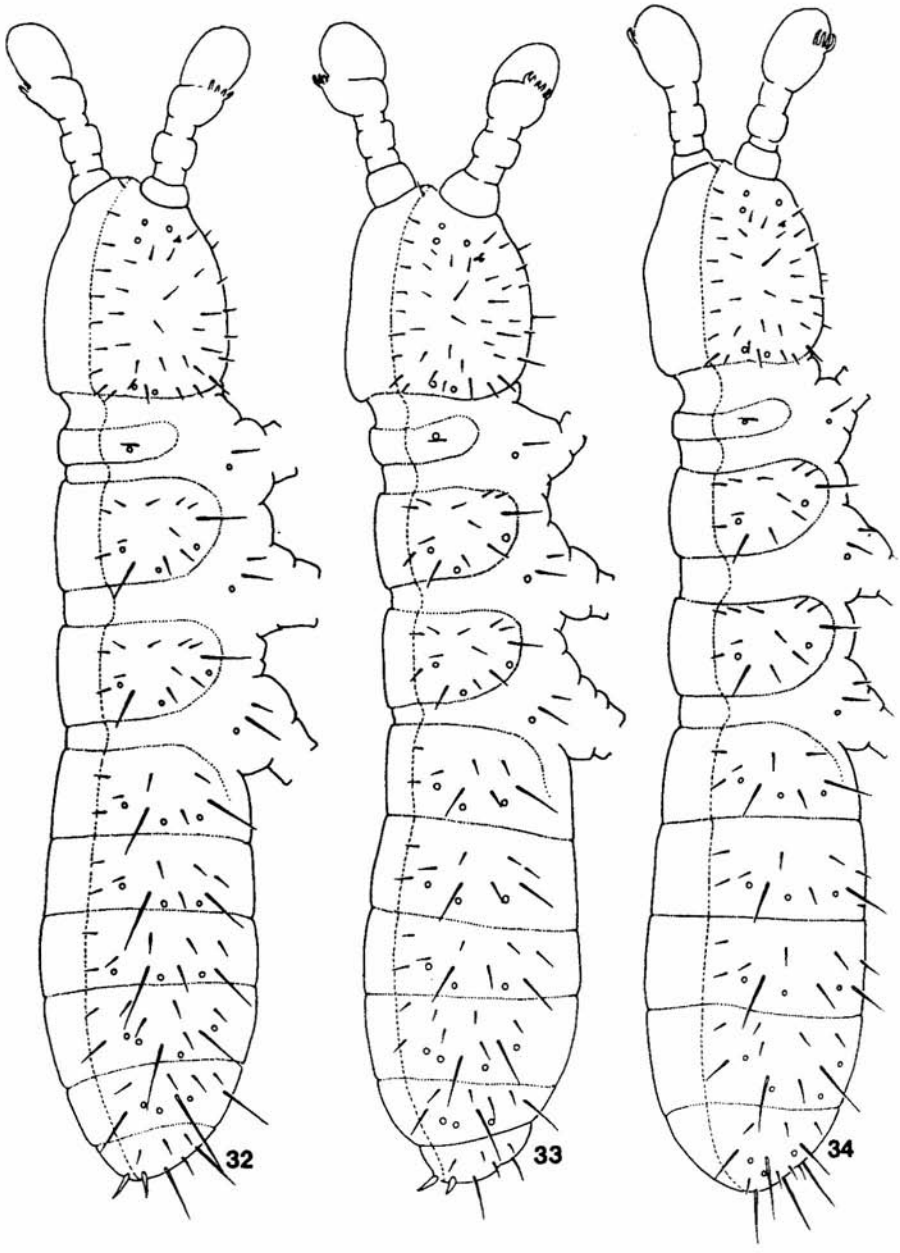
Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.



32-34. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 32 - *Micraphorura absoloni*, 33- *Micraphorura pieninensis*, 34 - *Archaphorura serratotuberculata*

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 4 pseudocelli (*abcd*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae (p_3 displaced anterad); 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 5 setae (3/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base.

V sternite: 1 seta (v).

Micraphorura absoloni (Börner, 1901)

Dorsal chaetotaxy - figs 32, 58; area furcalis - fig. 77; chaetotaxy of head capsule - fig. 47.

Material

7 spp. of I instar - culture (parthenogenic species), adult female collected in Ślęża Massif, Sudety Highlands, Poland, litter with moss, 7 March 1988, leg. R. J. Pomorski.

Description

Length without antennae 0.4-0.48 mm.

Head

IV antennal segment: in part grown together with III antennal segment, with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 4 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_2 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Psudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis ; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule, ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): small, consists 1 vesicle, with 3-4 lobes.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae (t_7 absent); femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (p_2 displaced anterad); 4 pseudocelli (*abcd*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae (p_3 displaced anterad); 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (4/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and between them 1+1 setulae below cuticular furrow.

V sternite: 1 seta (v).

Micraphorura pieninensis Weiner, 1988

Dorsal chaetotaxy - figs 33, 58; area furcalis - fig. 77; chaetotaxy of head capsule - fig. 47.

Material

1 spp. of I instar - Wisla, Beskid Śląski, Carpathian Mts., Poland, gravel bed of the Vistula River, 13 Nowember 1993, leg. D. Skarżyński, R. J. Pomorski.

Description

Length without antennae 0.5 mm.

Head

IV antennal segment: free, with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_1 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule, ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): small, consists 1 vesicle with 3-4 lobes.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae (t_7 absent); femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (p_2 displaced anterad); 4 pseudocelli (*abcd*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae (p_3 displaced anterad); 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (4/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and between them 1+1 setulae below cuticular furrow; 1 pseudocellus (*q*).

V sternite: 1 seta (v).

Archaphorura serratotuberculata (STACH, 1933)

Dorsal chaetotaxy - figs 34, 59; area furcalis - fig. 76; chaetotaxy of head capsule - fig. 47.

MATERIAL

1 spp. of I instar - Ślęża Massif, Sudety Highlands, Poland, soil sample taken under big stone in mixed forest, 20 April 1987, leg. R. J. POMORSKI.

DESCRIPTION

Length without antennae 0.5 mm.

Head

IV antennal segment: grown together with III antennal segment, with subapical organ and microsensillum hidden by papillae of antennal III sense organ.

III antennal segment: p-chaetotaxy - ? setae, a-chaetotaxy - ? setae. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 long papillae. Microsensillum displaced downwards.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - 4 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_1 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule, ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): small, consists of 1 vesicle with 3 bi- and trilobate primary lobes.

Thorax

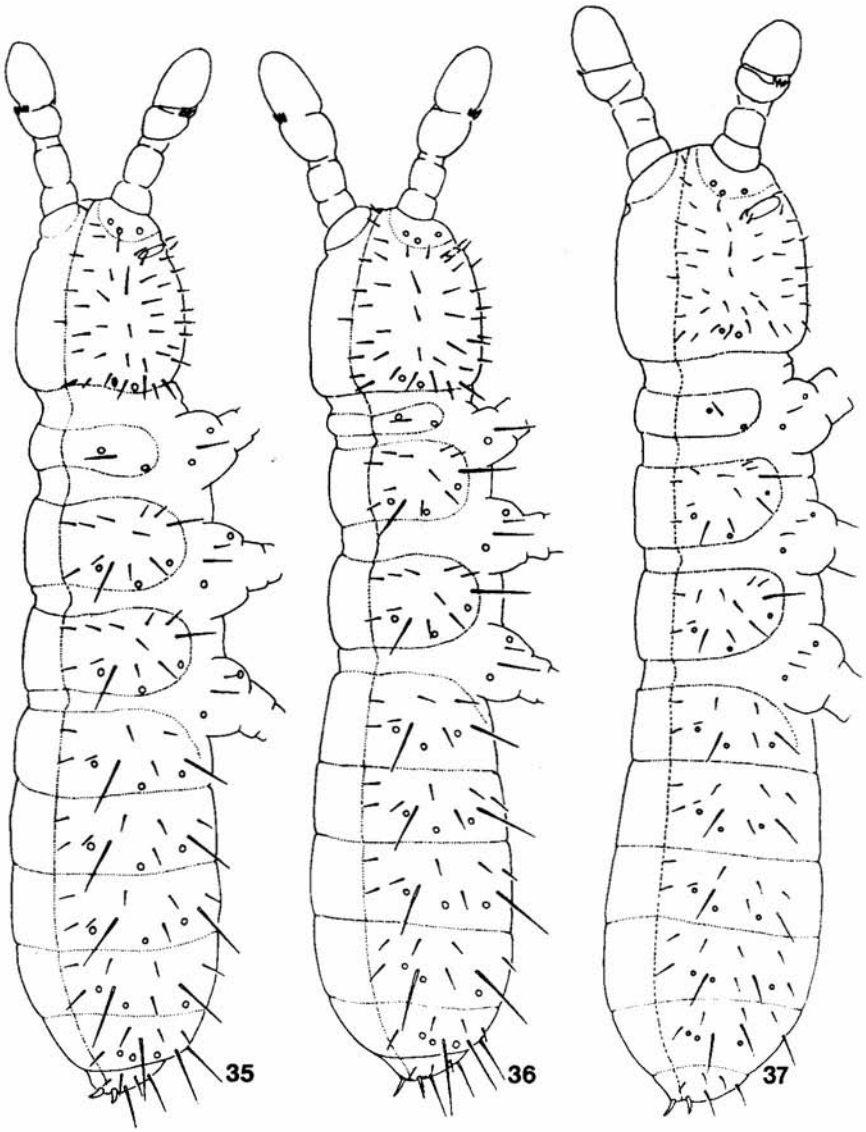
Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae, 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_4 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae (t_7 absent); femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5



35-37. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 35 - *Allaphorura hortensis*, 36 - *Handschiniella zschokkei*, 37 - *Allaphorura petaloides*

distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae (t_7 absent); femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (p_2 displaced anterad); 4 pseudocelli (*abcd*).

V tergite: grown together with tergite VI; a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - macrochaetae).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (4/2)

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base.

V sternite: 1 seta (v).

Allaphorura hortensis Gisin, 1949

Dorsal chaetotaxy - figs 35, 62; area furcalis - fig. 75; chaetotaxy of head capsule - fig. 50.

Material

15 spp. of I instar - culture, parents collected in Zoological Institute of Wrocław University, soil in flowerpot, Poland, 7 September 1988, leg. R. J. Pomorski.

Description

Length without antennae 0.6 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).

Pseudocelli: 3+3 pseudocelli (*abc*) on area antennalis, ventrally 2+2 pseudocelli (*qv*).

Postantannal organ (PAO): ca. 25 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 2+2 pseudocelli (*ab*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker (sometimes asymmetrical absence of seta a_4); p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).
VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli
I sternite: tubus ventralis - 4 setae
II sternite: 1 seta (v); 1 pseudocellus (*q*).
III sternite: 1 seta (v); 1 pseudocellus (*q*).
IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and 2+2 setulae between them; 2 pseudocelli (*vq*).
V sternite: 1 seta (v).

Allaphorura petaloides (RUSEK, 1981)

Dorsal chaetotaxy - figs 37, 62; area furcalis - fig. 75; chaetotaxy of head capsule - fig. 50.

MATERIAL
2 spp. of I instar - Rhasidiay Famia n. Bagdad, Iraq, date palm plantation, 29 April 1978, leg. W. WEINER.

DESCRIPTION
Length without antennae 0,5 mm.

Head
IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.
III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.
II antennal segment: p-chaetotaxy - 12 setae.
I antennal segment: p-chaetotaxy - 7 setae.
Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).
Pseudocelli: 3+3 pseudocelli (*abc*) on area antennalis, ventrally 2+2 pseudocelli (*qv*).
Postantennal oragn (PAO): ca. 25 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax
Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 2+2 pseudocelli (*ab*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1- 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1- 2 Pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1- 2 Pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker (sometimes asymmetrical absence of seta a_4); p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and 2+2 setulae between them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).

Handschiniella zschokkei (Handschin, 1919)

Dorsal chaetotaxy - figs 36, 62; area furcalis - fig. 75, chaetotaxy of head capsule - fig. 50.

MATERIAL

3 spp. of I instar - Miłek Mt., Kaczawskie Mts., Sudety Mts., Poland, under moss and in roots of grass on limestone rocks, 30 June 1991, leg. R. J. POMORSKI.

DESCRIPTION

Length without antennae 0.4 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).

Pseudocelli: 3+3 pseudocelli (*abc*) on area antennalis, ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 20 simple, ovoid vesicles arranged transversely to the long axis of the organ.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 2+2 pseudocelli (*ab*).

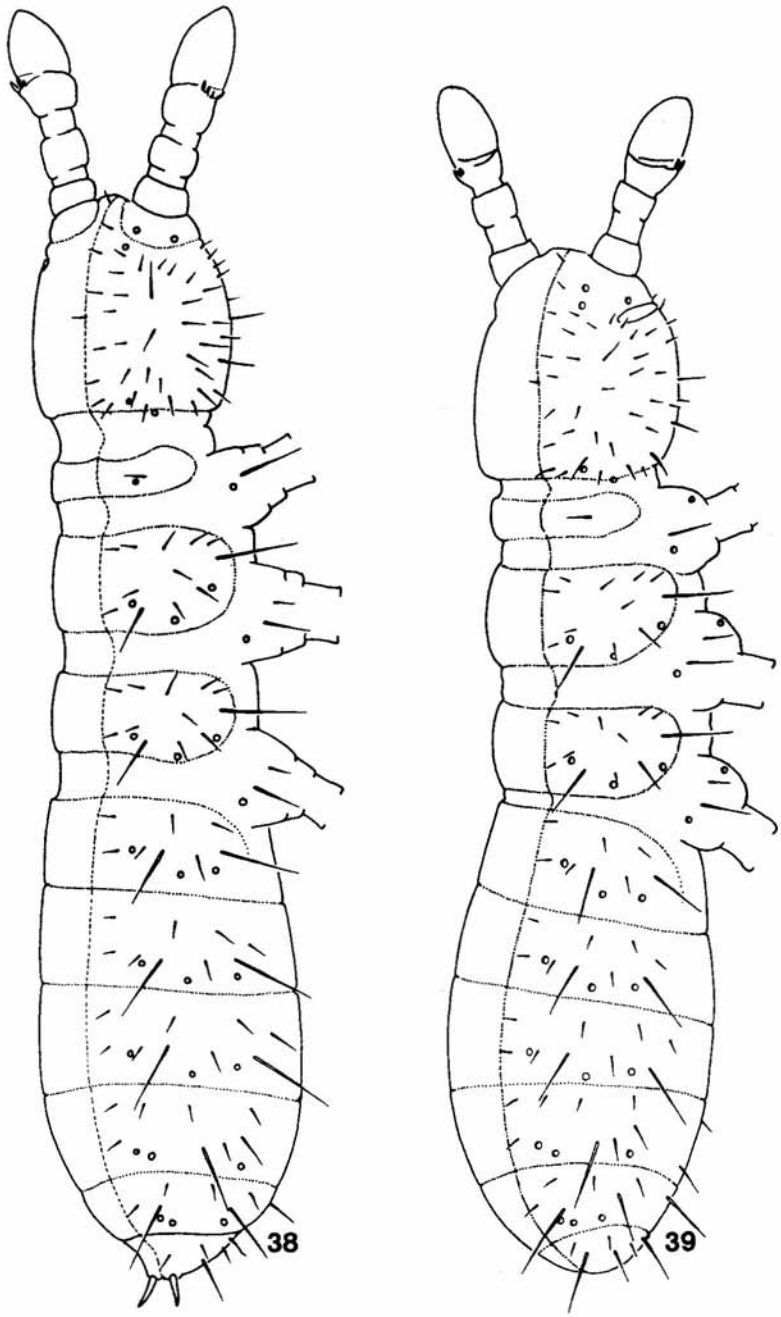
Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1- 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1- 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1- 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae



38-39. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 38 - *Onychiurus circulans*, 39 - *Deuteraphorura scotaria*

a_1, a_3, a_5 distinctly longer and thicker (sometimes asymmetrical absence of seta a_4); p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and 2+2 setulae between them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).

Onychiurus circulans Gisin, 1952

Dorsal chaetotaxy - figs 38, 65; area furcalis - fig. 74, chaetotaxy of head capsule - fig. 53.

Material

6 spp. of I instar - culture, parents collected in Ojców National Park, Wyżyna Krakowsko-Wieluńska, Poland, sample of soil with grass taken under stone near "Brama Krakowska", 17 October 1993, leg. R. J. Pomorski.

Description

Length without antennae 0.85-0.9 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 18 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1- 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1- 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards) setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae.

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae in 1 row and 1+1 setae below them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).

Deuteraphorura scotaria (Gisin, 1954)

Dorsal chaetotaxy - figs 39, 66; area furcalis - fig. 74; chaetotaxy of head capsule - fig. 53.

Material

1 spp. of I instar - Pełcznica ravine near Książ, Wałbrzych Highlands, Sudety Mts., Poland, leaf litter in deciduous forest, 20 May 1990, leg. D. Skarżyński; 3 spp. of I instar - culture, parents collected in Ojców National Park, Wyżyna Krakowsko-Wieluńska, Poland, sample of soil with grass taken under stone near "Brama Krakowska", 17 October 1993, leg. R. J. Pomorski.

Description

Length without antennae 0.65-0.8 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 20 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (macrochaetae knobbed), l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (macrochaetae knobbed), l-chaetotaxy - 3 setae + microsensillum, 3+3 Pseudocelli (*abc*).

Leg of I pair: subcoxa1- 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards) , setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae (macrochaetae knobbed); 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (macrochaetae knobbed); 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae (macrochaetae knobbed); 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent) (macrochaetae knobbed); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae (macrochaetae knobbed); 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - acuminate macrochaeta).

Sternites - chaetotaxy and pseudocelli

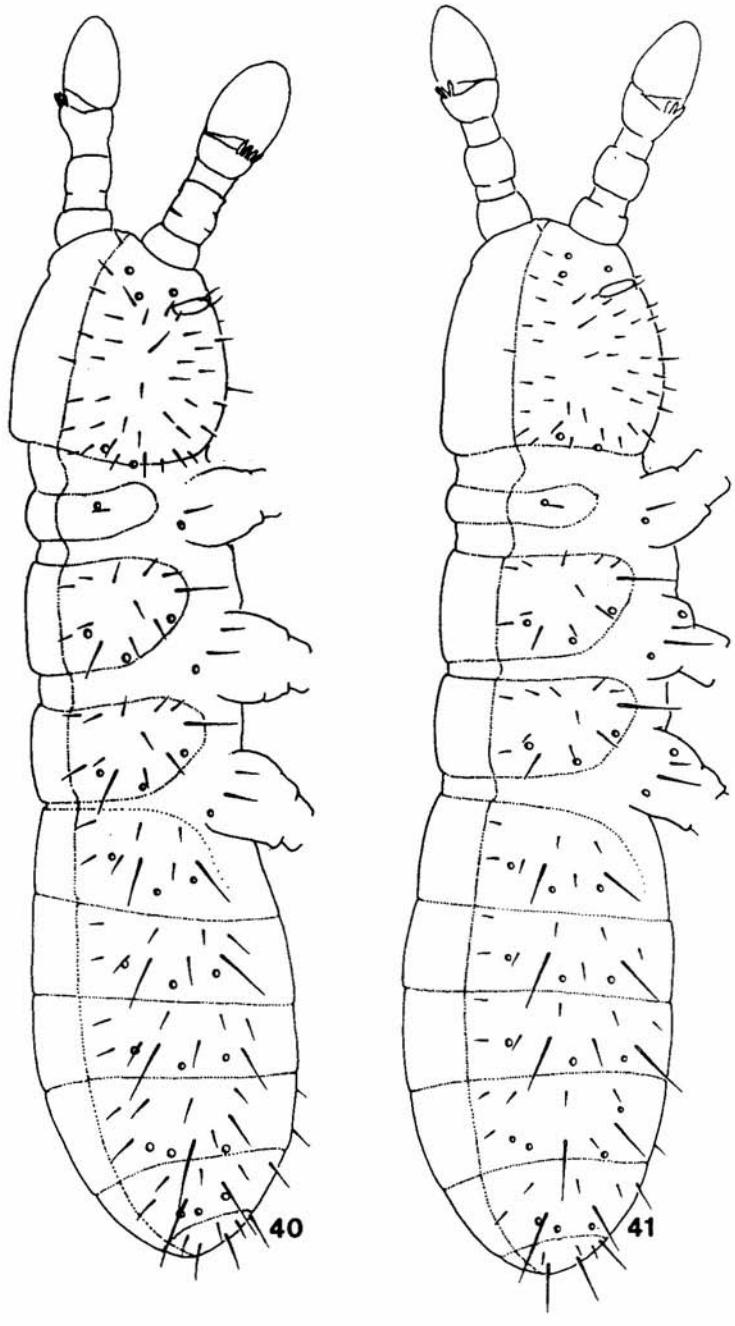
I sternite: tubus ventralis - 4 setae.

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae in 1 row and 1+1 setae below them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).



40-41. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 40 - *Deuteraphorura variabilis*, 41 - *Deuteraphorura cebennaria*

Deuteraphorura cebennaria (GISIN, 1952)

Dorsal chaetotaxy - figs 41, 66; area furcalis - fig. 74, chaetotaxy of head capsule - fig. 53.

MATERIAL

many spp. of I instar - culture, parents collected in cave "Jaskinia Radochowska" Złote Mts., Sudety Mts., Poland, 24 October 1986, leg. D. SKARŻYŃSKI.

DESCRIPTION

Length without antennae 0.58-0.62 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 20 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1 pseudocellus (*a*) .

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1- 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer

and thicker; **p-verticil** - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 **longer** and thicker.

Leg of III **pair**: **subcoxa**1- 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; **femur** - **11 setae**, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular **verticils of setae**: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 **distinctly longer** and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 **longer** and thicker.

Abdomen

Tergites - **chaetotaxy** and pseudocelli

I tergite: **a-chaetotaxy** - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: **a-chaetotaxy** - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: **a-chaetotaxy** - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: **a-chaetotaxy** - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: **a-chaetotaxy** - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: **a-chaetotaxy** - 4 setae, p-chaetotaxy - 2 setae (p_1 - macrochaeta).

Sternites - **chaetotaxy** and pseudocelli

I sternite: **tubus ventralis** - 4 setae.

II sternite: **1 seta (v)**; 1 pseudocellus (*q*).

III sternite: **1 seta (v)**; 1 pseudocellus (*q*).

IV sternite: **1-chaetotaxy** - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis **with 2+2 setulae** in 1 row and 1+1 setae below them; 2 pseudocelli (*vq*).

V sternite: **1 seta (v)**.

Deuteraphorura variabilis (STACH, 1954)

Dorsal **chaetotaxy** - figs 40, 66; area furcalis - fig. 74, chaetotaxy of head capsule - fig. 53.

MATERIAL

many spp. **of I instar** - culture, parents collected on Srednij Island, north Karelia, Russia, **ornithogenic** soil on rocks, 26 September 1992, leg. R. J. POMORSKI, D. SKARŻYŃSKI.

DESCRIPTION

Length **without antennae** 0.48-0.51 mm.

Head

IV **antennal segment**: free with subapical organ and microsensillum located just above **antennal III sense** organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_3 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 8 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1 pseudocellus (*a*) .

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

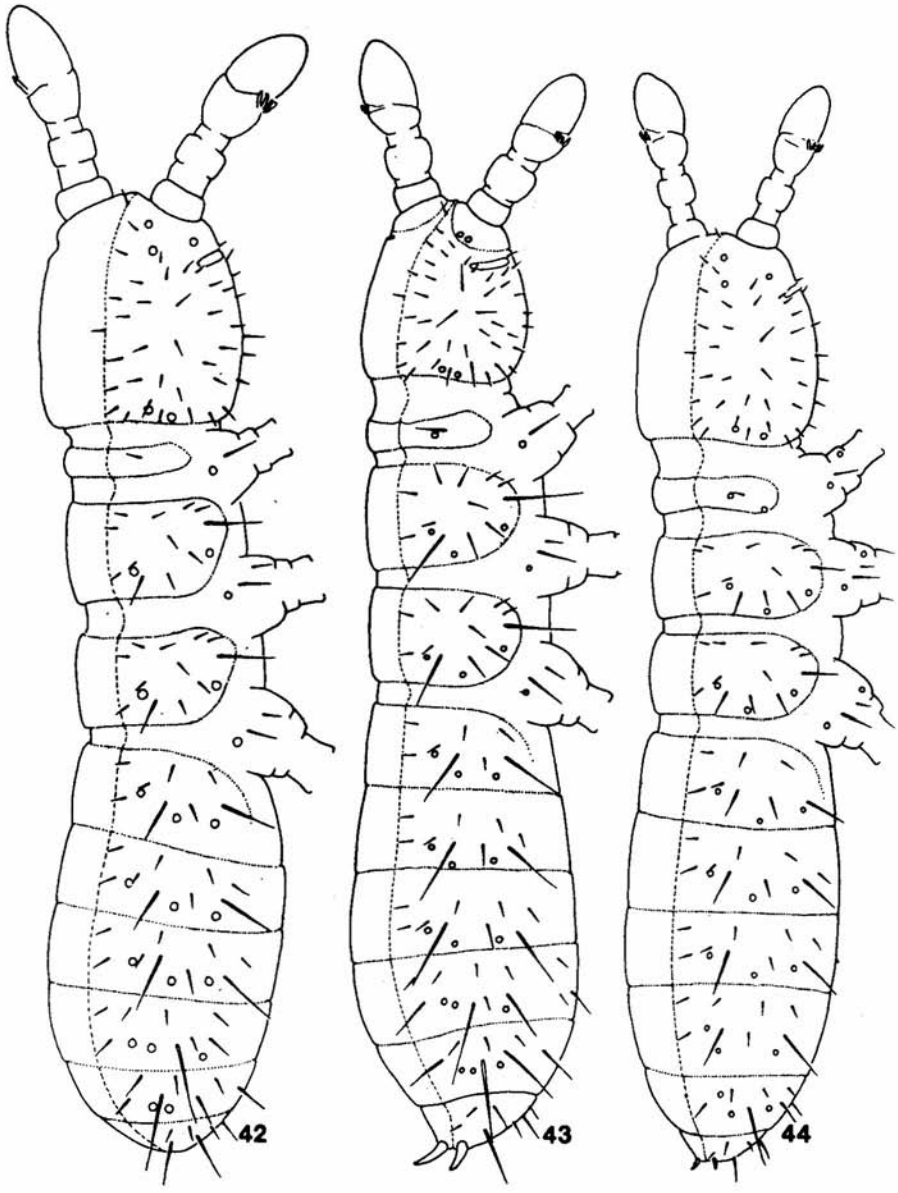
Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).



42-44. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 42 - *Orthonychiurus rectopapillatus*, 43 - *Onychiurus normalis*, 44 - *Onychiurus volinensis*

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - macrochaeta).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae.

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae in 1 row and 1+1 setae below them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).

Orthonychiurus rectopapillatus (Stach, 1933)

Dorsal chaetotaxy - fig. 42, area furcalis - fig. 78, chaetotaxy of head capsule - fig. 53.

Material

4 spp. of I instar - culture, parents collected in valley Ociemny, Pieniny National Park, Carpathians, Poland, litter, 26 May 1994, leg. R. J. Pomorski.

Description

Length without antennae 0.5 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 4 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 8 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta, pseudocelli absent.

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 2+2 pseudocelli (*ac*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 2+2 pseudocelli (*ac*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 absent; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - macrochaeta).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae.

II sternite: 1 seta (v).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and 1+1 setulae between them; 1 pseudocellus (*v*).

V sternite: 1 seta (v).

Onychiurus normalis Gisin, 1949

Dorsal chaetotaxy - figs 43, 64; area furcalis - fig. 73, chaetotaxy of head capsule - fig. 51.

Material

1 spp. of I instar - culture, parents collected in Skierniewice, Nizina Mazowiecka, Poland, soil in greenhouse, 15 May 1991, leg. G. Sojka.

Description

Length without antennae 0.65 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 5 setae (sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 34 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*a*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 1 pseudocellus + 1 seta; subcoxa2 - 3 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 1 pseudocellus + 2 setae; subcoxa2 - 4 setae; trochanter - 7 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae; 1 pseudocellus (v).

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 2+2 setulae in 1 row on cuticular fold and 1+1 setae at base; 1 pseudocellus (*v*).

V sternite: 1 seta (v).

Onychiurus volinensis Szeptycki, 1964

Dorsal chaetotaxy - figs 44, 63; area furcalis - fig. 75, chaetotaxy of head capsule - fig. 52.

Material

1spp. of I instar - Sopot, Baltic coast, Poland, moss on a sand dune overgrown with willow shrubs, 1 September 1991, leg. R. J. Pomorski.

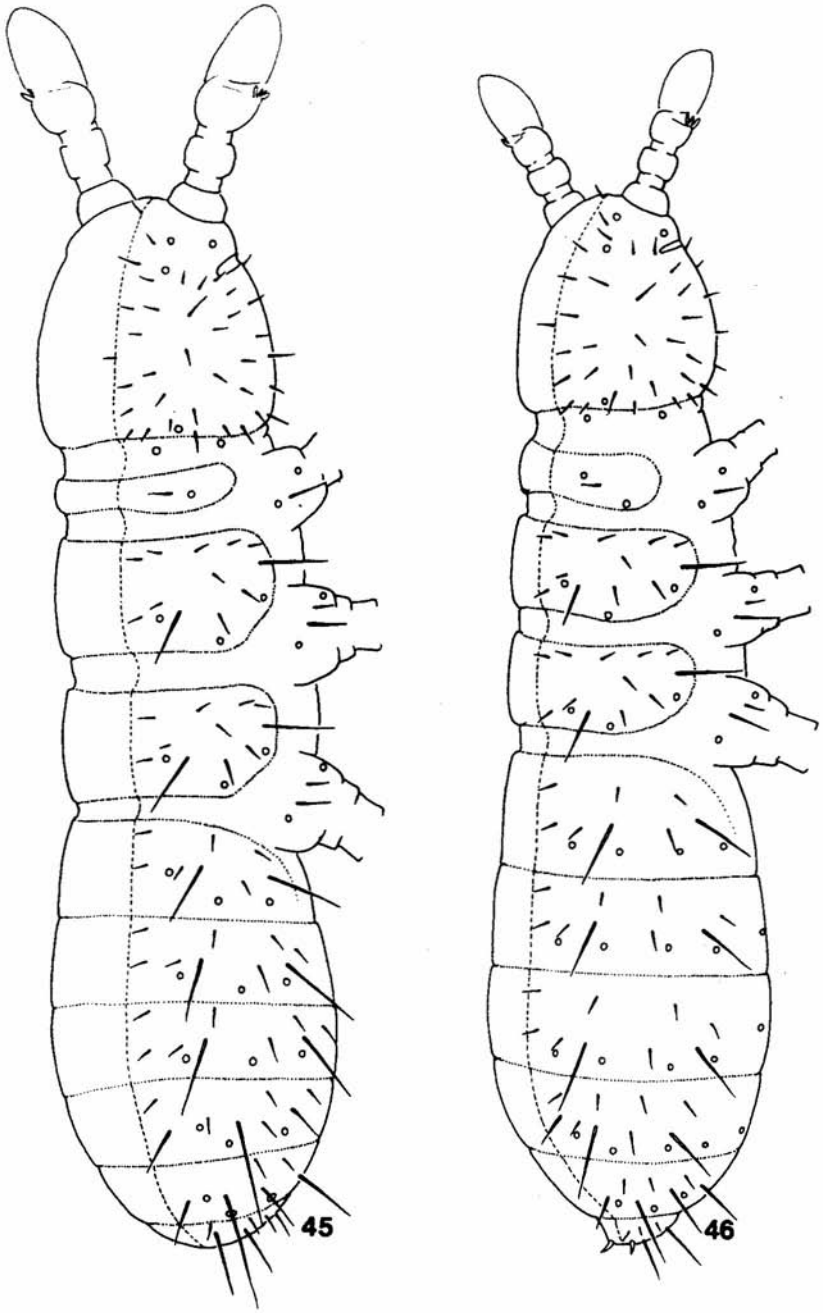
Description

Length without antennae 0.35 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory



45-46. Dorsal chaetotaxy and position of pseudocelli in I instar larvae: 45 - *Onychiuroides granulosus*, 46 - *Argonychiurus denisi*

rods, 2 sensory clubs and 4 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - medial seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 6 setae, o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta).

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 2+2 pseudocelli (*ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): broad, consisting of ca. 8 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 2+2 pseudocelli (*ab*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - ? setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - ? setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 5 setae (t_5 and t_7 absent); femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 9 setae, seta a_1 unpaired, setae a_2 absent, setae a_1, a_3, a_5 distinctly longer and thicker (asymmetrical absence of seta a_4); p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 4 setae (p_2 absent); 3 pseudocelli (*abc*), pseudocellus *a* displaced anterad.

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*), pseudocellus *a* displaced anterad.

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 4 setae; 1 pseudocellus (*v*) ?

II sternite: 1 seta (v); 1 pseudocellus (*q*).

III sternite: 1 seta (v).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setae and 2+2 setulae between them; 2 pseudocelli (*vq*).

V sternite: 1 seta (v).

Onychiuroides granulosus (Stach, 1930)

Dorsal chaetotaxy - figs 45, 68; area furcalis - fig. 78; chaetotaxy of head capsule - fig. 55.

Material

4 spp. of I instar - culture, parents collected in Zakrzów-Kotowice near Wrocław, Lower Silesia, Poland, litter in decidous forest , 15 August 1986, leg. R. J. Pomorski; 2 spp. of I instar - Ojców National Park, Wyżyna Krakowsko-Wieluńska, Poland, sample of litter taken in beech forest, 17 October 1993, leg. R. J. Pomorski.

Description

Length without antennae 0.5 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.

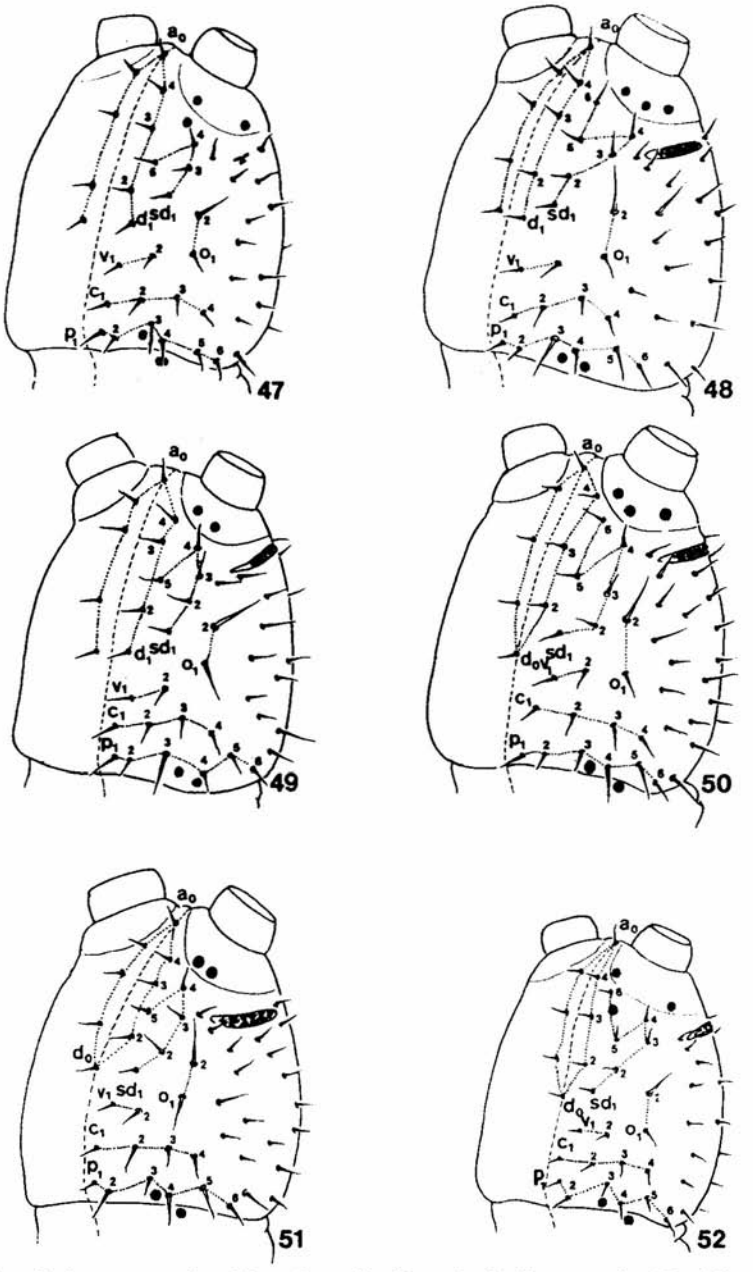
III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 4 setae (sd_4 and sd_6 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 3 setae (c_4 absent), p-chaetotaxy - 6 setae (p_4 - macrochaeta),

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 3+3 pseudocelli (*a 'ab*) somewhat apart on posterior margin of head capsule; ventrally 1+1 pseudocelli (*v*).



47-52. Dorsal chaetotaxy and position of pseudocelli on head, diagrammatic: 47 - *Oligaphorura groenlandica*, *Dimophaphorura judithae*, *Micraphorura absoloni*, *M. pieninensis*, *Arphaphorura serratotuberculata*; 48 - *Protaphorura subarmata*, *P. armata*, *P. campata*, *P. meridiata*, *P. fimata*, *P. eichhorni*, *P. pannonica*, *P. stogovi*; 49 - *Supraphorura furcifera*; 50 - *Allaphorura hortensis*, *A. petaloides*, *Hanschiniella zschokkei*; 51 - *Onychiurus normalis*; 52 - *O. volinensis*

Postantennal organ (PAO): ca. 8 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 1+1 pseudocellus (*b*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 3 setae (a_2 absent), p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 7 setae (asymmetrical absence of seta p_3), setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

IV tergite: a-chaetotaxy - 3 setae (a_2 absent), p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).

V tergite: a-chaetotaxy - 2 setae (a_1 absent), p-chaetotaxy - 4 setae; 2 pseudocelli (*ab*).

VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - macrochaeta).

Sternites - chaetotaxy and pseudocelli

I sternite: tubus ventralis - 6 setae (4/2); 1 pseudocellus (*v*).

II sternite: 1 seta (v); 2 pseudocelli (*qv*).

III sternite: 1 seta (v); 1 pseudocellus (*q*).

IV sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setulae between 1+1 setae; 2 pseudocelli (*qv*).

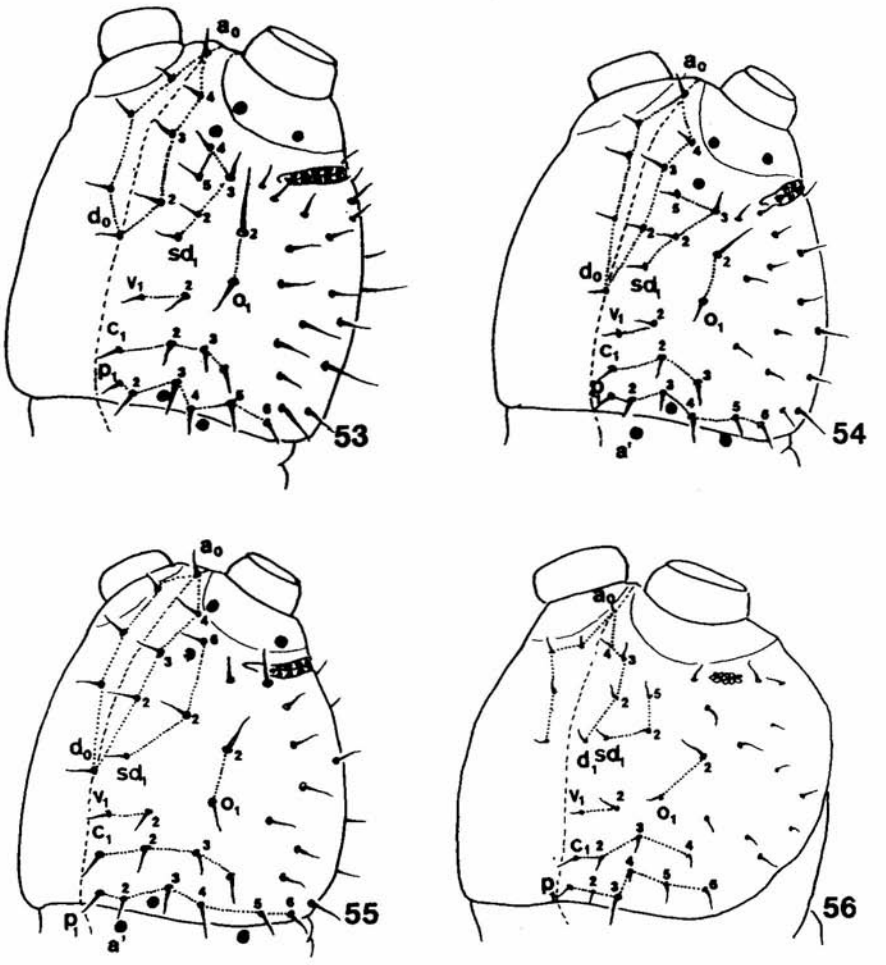
V sternite: 1 seta (v).

Argonychiurus denisi (STACH, 1920)

Dorsal chaetotaxy - figs 46, 69; area furcalis - fig. 78; chaetotaxy of head capsule - fig. 55.

MATERIAL

9 spp. of I instar - cave "Solna Jama", Bystrzyckie Mts., Sudety Mts., Poland, 25 July 1984, leg. R. J. POMORSKI.



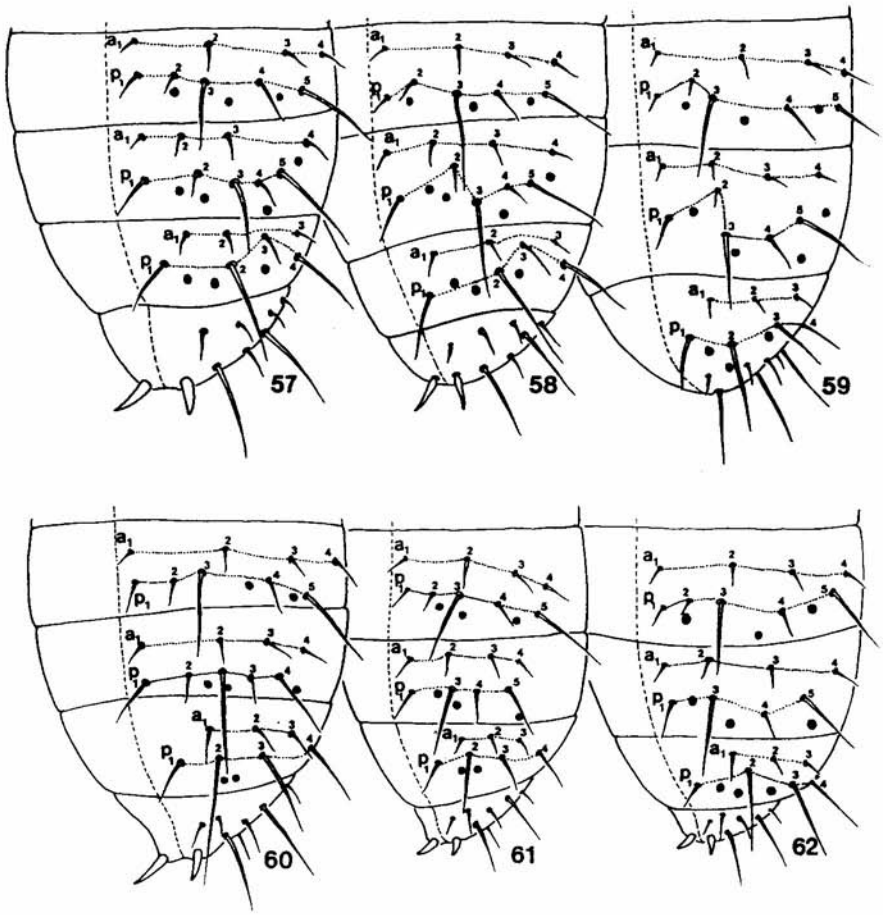
53-56. Dorsal chaetotaxy and position of pseudocelli on head, diagrammatic: 53 - *Onychiurus circulans, Deuteraphorura scotaria, D. variabilia, D. cebennaria, Orthonychiurus rectopapillatus*; 54 - *Onychiuroides granulosus*; 55 - *Argonychiurus denisi*; 56 - *Hymenaphorura polonica*

DESCRIPTION

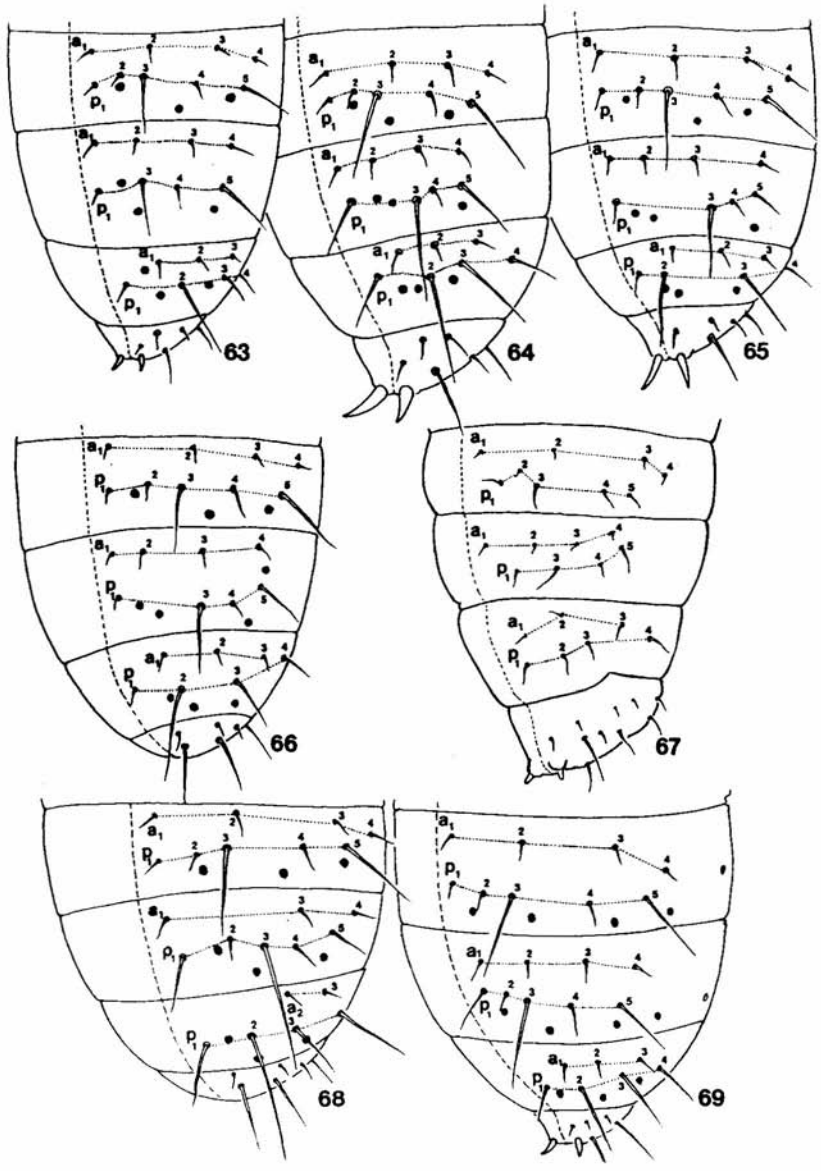
Length without antennae 0.5 mm.

Head

IV antennal segment: free with subapical organ and microsensillum located just above antennal III sense organ.



57-62. Dorsal chaetotaxy and position of pseudocelli on III-VI abdominal tergites, diagrammatic: 57 - *Oligaphorura groenlandica, Dimophaphorura judithae*; 58 - *Micraphorura absoloni, M. pieninensis*; 59 - *Arphaphorura serratotuberculata*; 60 - *Supraphorura furcifera*; 61 - *Protaphorura subarmata, P. armata, P. campata, P. meridiata, P. fimata, P. eichhorni, P. pannonica, P. stogovi*; 62 - *Allaphorura hortensis, A. petaloides, Hanschiniella zschokkei*



63-69. Dorsal chaetotaxy and position of pseudocelli on III-VI abdominal tergites, diagrammatic: 63 - *Onychiurus volinensis*; 64 - *O. normalis*; 65 - *O. circulans*; 66 - *Deuteraphorura scotaria, D. variabilis, D. cebennaria*; 67 - *Hymenaphorura polonica*; 68 - *Onychiuroides granulosus*; 69 - *Argonychiurus denisi*

III antennal segment: p-chaetotaxy - 12 setae, a-chaetotaxy - 6 setae, of which 5 accompany antennal III sense organ. Antennal III sense organ built of 2 sensory rods, 2 sensory clubs and 5 papillae. Microsensillum located slightly below antennal sense organ.

II antennal segment: p-chaetotaxy - 12 setae.

I antennal segment: p-chaetotaxy - 7 setae.

Chaetotaxy of head capsule: d-chaetotaxy - seta d_0 + 3 setae + medial seta a_0, sd-chaetotaxy - 3 setae (sd_3, sd_4 and sd_5 absent), o-chaetotaxy - 2 setae, v-chaetotaxy - 2 setae, c-chaetotaxy - 4 setae, p-chaetotaxy - 6 setae (p_4 - macrochaeta),

Pseudocelli: 2+2 pseudocelli (*ac*) on area antennalis, 1+1 pseudocellus (*b*) slightly posterad, beyond area antennalis; 3+3 pseudocelli (*a'ab*) somewhat apart on posterior margin of head capsule; ventrally 2+2 pseudocelli (*qv*).

Postantennal organ (PAO): ca. 8 granulated vesicles.

Thorax

Chaetotaxy and pseudocelli of I thoracal tergite: 1 seta; 2+2 pseudocelli (*ab*).

Chaetotaxy and pseudocelli of II thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum; 3+3 pseudocelli (*abc*).

Chaetotaxy and pseudocelli of III thoracal tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae, l-chaetotaxy - 3 setae + microsensillum, 3+3 pseudocelli (*abc*).

Leg of I pair: subcoxa1 - 2 pseudocelli + 1 seta; subcoxa2 - 3 setae; trochanter - 6 setae; femur - 13 setae, f_2 - very short seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of II pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 13 setae, f_2 - seta sensualis; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 8 setae, setae p_1 and p_5 unpaired (p_1 displaced upwards), setae p_2, p_3 and p_4 longer and thicker.

Leg of III pair: subcoxa1 - 2 pseudocelli + 2 setae; subcoxa2 - 4 setae; trochanter - 6 setae; femur - 11 setae, f_2 - seta sensualis, setae f_8 and f_9 reduced; tibiotarsus - 2 regular verticils of setae: a-verticil - 11 setae, seta a_1 unpaired, setae a_1, a_3, a_5 distinctly longer and thicker; p-verticil - 7 setae, setae p_1 and p_5 unpaired, setae p_2, p_3 and p_4 longer and thicker.

Abdomen

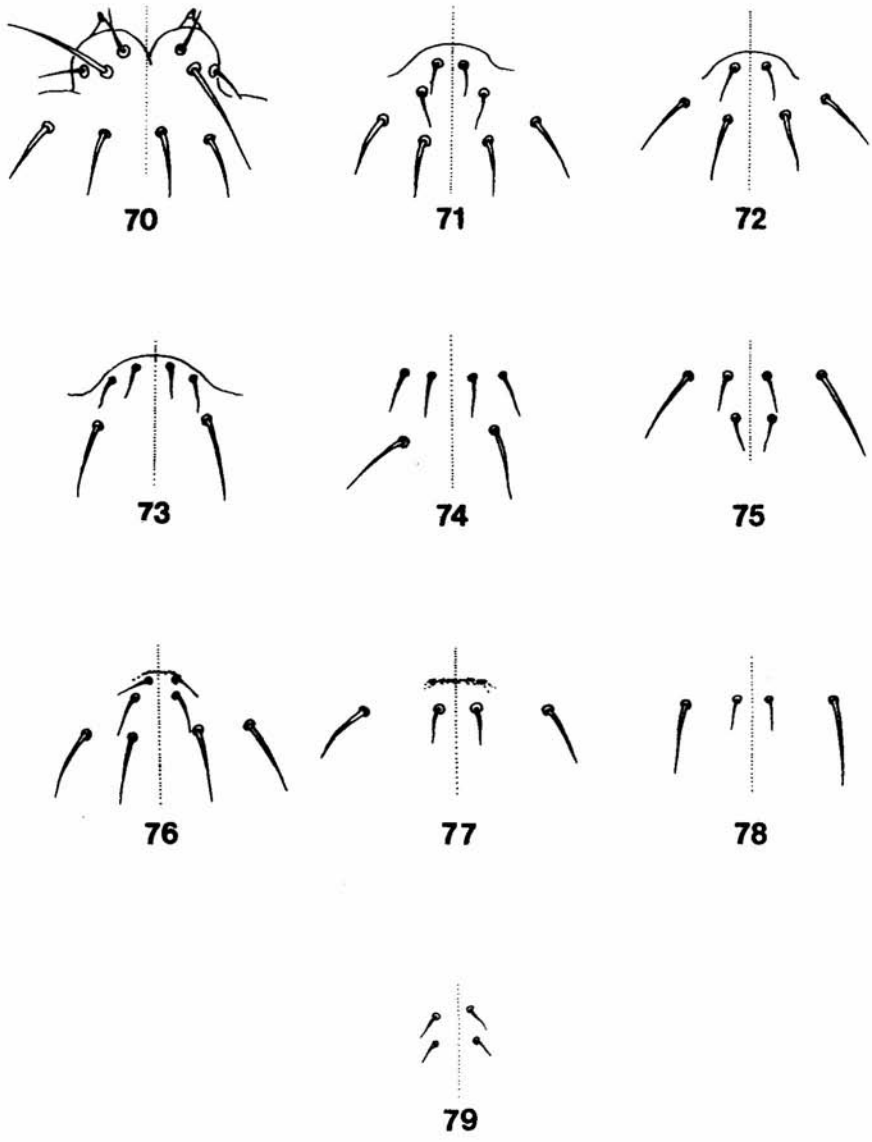
Tergites - chaetotaxy and pseudocelli

I tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 5 setae; 4 pseudocelli (*abcd*).

II tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 4 pseudocelli (*abcd*).

III tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 4 pseudocelli (*abcd*).

IV tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 5 setae; 3 pseudocelli (*abc*).



70-79. Area furcalis of I instar larvae: 70 - *Supraphorura furcifera*; 71 - *Protaphorura subarmata, P. armata, P. campata, P. meridiata, P. fimata, P. eichhorni, P. pannonica*; 72 - *P. stogovi*; 73 - *Onychiurus normalis*; 74 - *O. circulans, Deuteraphorura scotaria, D. variabilis, D. cebennaria*; 75 - *Allaphorura hortensis, A. petaloides, Hanschiniella zschokkei, Onychiurus volinensis*; 76 - *Oligaphorura groenlandica, Dimophaphorura judithae, Arphaphorura serratotuberculata*; 77 - *Micraphorura absoloni, M. pieninensis*; 78 - *Orthonychiurus rectopapillatus, Onychiuroides granulosus*; 79 - *Hymenaphorura polonica*

V tergite: a-chaetotaxy - 3 setae, p-chaetotaxy - 4 setae; 3 pseudocelli (*abc*).
VI tergite: a-chaetotaxy - 4 setae, p-chaetotaxy - 2 setae (p_1 - anal spines).

Sternites - chaetotaxy and pseudocelli
I sternite: tubus ventralis - 6 setae (4/2); 1 pseudocellus (*v*).
II sternite: 1 seta (v); 1 pseudocellus (*q*).
III sternite: 1 seta (v); 1 pseudocellus (*q*).
VI sternite: l-chaetotaxy - 3 setae, v-chaetotaxy - 3 setae, q-chaetotaxy - 3 setae, area furcalis with 1+1 setulae between 1+1 setae; 2 pseudocelli (*vq*).
V sternite: 1 seta (v).

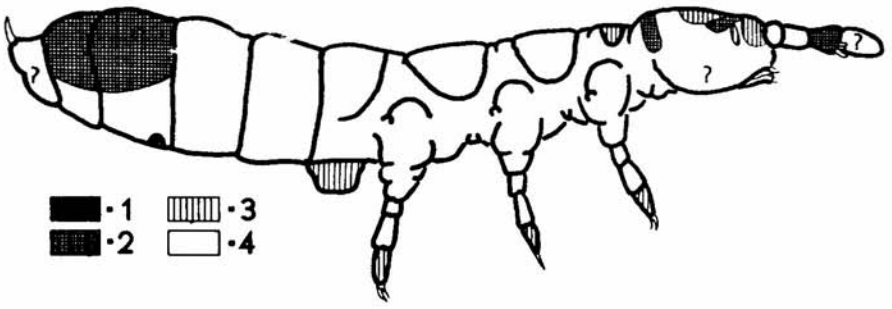
4. MORPHOEVOLUTIONARY ACTIVITY

As a result of my comparative studies, I have found that the morphology of some body regions of the I instar larvae is extremely conservative, whereas other regions are morphologically very diverse. To illustrate the observed phenomenon, I have divided the body of a hypothetical I instar onychiurin larva into regions which can be compared. For each such region I have calculated the number of possible variants observed in the examined material, considering only those characters which I used in the cladistic analysis. The final outcome of these procedures is shown in fig. 80. It shows which body regions of the I instar onychiurin larvae are evolutionary "hot spots", undergoing the most intense evolutionary transformations, and which are "cold".

The "hot spots" concentrate in the "peripheral" regions which probably means that they are of a high adaptive significance. They undergo the strongest environment pressure and thus in many species have to be modified according to their ecological niche. The "hot" character of many areas of the head, antennae, tibiotarsi, VI abdominal segment and tubus ventralis could be thus explained. However, the "hottest spot" - area furcalis - should be in my opinion interpreted differently. Here a reduction of the organ is observed. It can be supposed that it no more plays an important role in the life of animal and the selection pressure is minimum. Consequently, its morphology does not have to be of adaptive significance and a certain variation in its shape is possible, obviously depending on genetic conditions. In my opinion this is the basic reason for such a great morphological diversity of area furcalis.

"Cold spots" undergo the least evolutionary change. Their conservative character probably was formed as a result of stabilizing selection. These spots concentrate generally in the central part of the animal body and include areas of I and II thoracal segments, with basal segments of all the pairs of legs, I, II and III abdominal segments and two basal antennal segments, whose conservative character seems to be most surprising. The data only supplement SZEPTYCKI's (1972) observation that thoracal segments II and III are the most conservative; they partly contradict the

view of LAWRENCE (1973) and CASSAGNAU (1974). According to those authors, the morphological conservatism of *Poduromorpha* is distributed along an "axial, postero-anterior, centrifugal gradient", in which the regions of head and thorax are more conservative than the terminal abdominal segments.

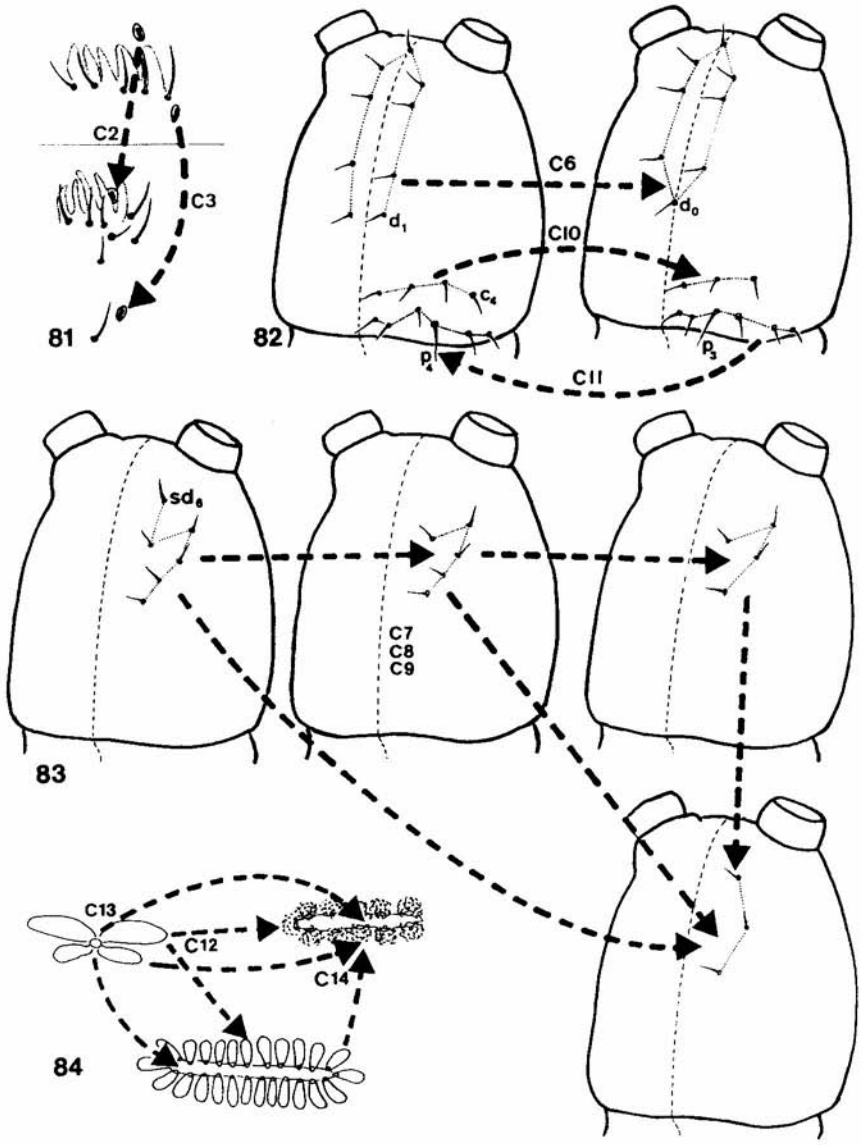


80. Map of morphoevolutionary activity of I instar larvae of the *Onychiurinae*: 1 - 10 and more morphological variants, 2 - 7-9 morphological variants, 3 - 4-6 morphological variants, 4 - 1-3 morphological variants. ? - not examined areas

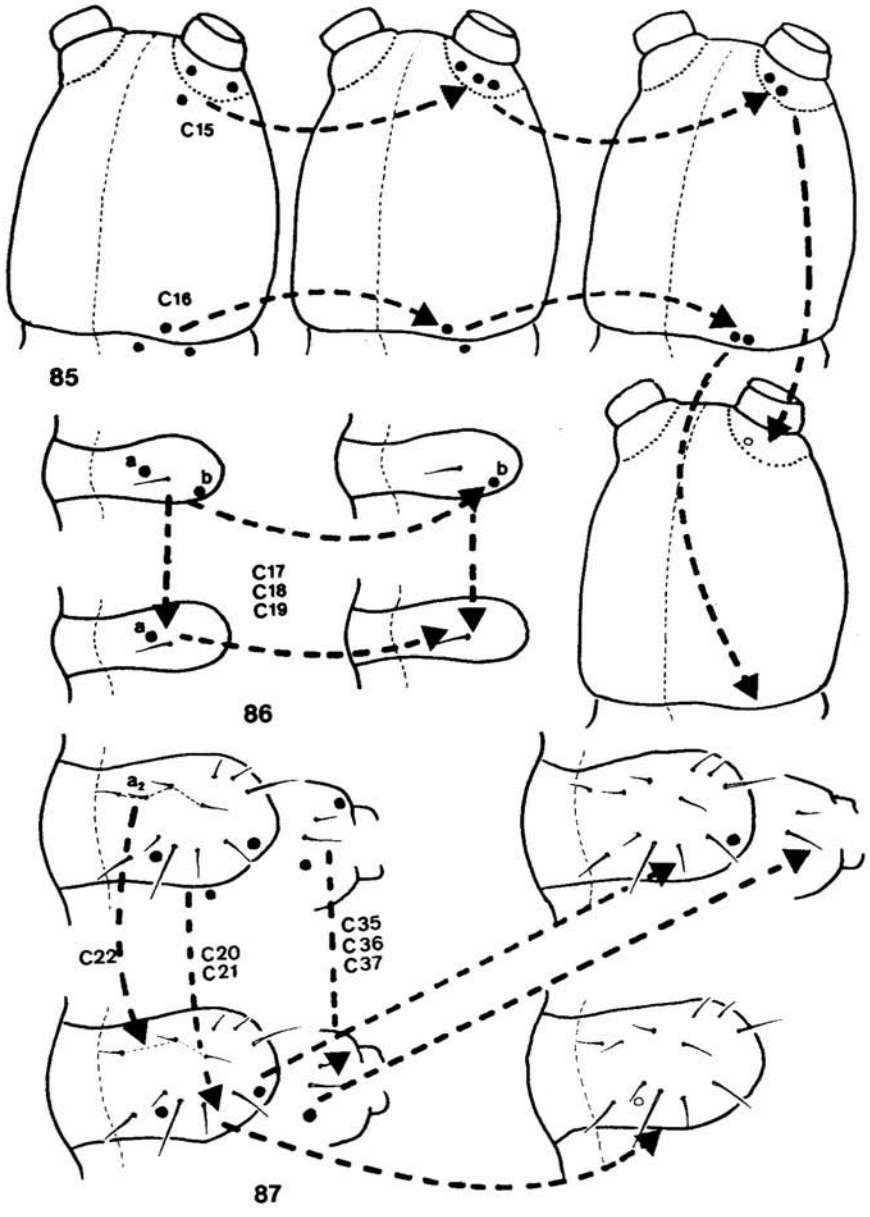
In phylogenetic considerations the most important role in my opinion is played by the "cold spots", since it can be supposed that just those places, because of their conservatism, preserved ancestral morphological characters (and in this particular case these will be characters of the I instar larvae of the *Onychiurinae*). Thus such places may constitute a "reference point" when trying to determine the transformation series in cladistic analysis, i.e. its apomoprhy vs. plesiomorphy. The observation is important, since I have observed that in the *Onychiurinae* it is possible to use the principle of serial homology of structures between some segments (BEKLEMISHEV 1957). In practice this can be expressed in the following way: the state observed on a "cold" segment is plesiomorphous relative to the state on the "hot" segment. I have used this reasoning when polarizing many characters (see next chapter).

5. CHARACTER ANALYSIS

The morphological review of the I instar larvae of the *Onychiurinae* makes it possible to advance a hypothesis on the morphoevolutionary processes that take place in this group of *Collembola*. In my opinion these processes are manifest as transformations of the structures present in the ancestral I instar larva. On the basis of the material examined, it can be said that the transformations are as follows:



81-84. Polarization of morphological characters on: 81 - III and IV antennal segments; 82-83 - head capsule; 84 - postantennal sense organ



85-87. Polarization of morphological characters on: 85 - head capsule; 86 - I thoracal tergite; 87 - II, III thoracal tergites and subcoxa1. Hollow circle - pseudocelli appearing in the IInd instar

1. Reduction of some chaetotaxy components and other morphological structures (e.g. pseudocelli, furca or the number of papillae in antennal III organ).

2. Translocations of some morphological structures relative to the others, e.g. displacement of one or a pair of pseudocelli relative to the chaetotaxy.

3. The only structure to undergo increasing complication is the postantennal organ - PAO. The result of this complication is generally an increase in the surface area of the organ, manifest as increased number of vesicles and their secondary granulation.

Further complications of chaetotaxy and increase in the number of pseudocelli take place only at later stages of postembryonic development.

Attempts at finding a sister group of the *Onychiurinae* have failed. The I instar larvae of both collembolan groups regarded as the closest related (SALMON 1964, BABENKO et al. 1988) - the subfamily *Tetrodontophorinae* in the *Onychiuridae* and the *Hypogastruridae* - are not suitable for this kind of studies. Chaetotaxy of the I instar larva of *Tetrodontophora bielanensis* (WAGA, 1842) bears polychaetosis characters (own, unpublished results) and makes it practically impossible to ascertain homologies between the setae. Hypogastrurid larvae have no pseudocelli, whereas a considerable number of morphological characters of the *Onychiurinae* are based on the number and position of these structures. These facts made me adopt as a sister group a hypothetical common ancestor, plesiomorphous in all respects.

When polarizing the studied characters, i.e. distinguishing between their plesiomoprhous and apomorphous states, I have used the following criteria, some of them commonly adopted in cladistic analysis, and some proposed by me.

1. Ontogenetic criterion - as was mentioned in the introduction, the whole paper pertains more or less to the use of this criterion.

2. Out-group comparison - compared with the remaining *Collembola* the *Onychiuridae* are a specialized group, with an array of apomorphous characters, and thus the criterion could be used only in case of a few characters, commonly found within the group.

3. In-group comparison criteria

a/ commonality criterion; though a far-reaching caution is recommended when using this criterion (see e.g. FOREY et al. 1995), I had to use it rather often, especially with respect to characters which appeared once only, or whose apomorphy was additionally confirmed by the serial homology criterion.

b/ complexity criterion - with the same reservation, it was applied only to polarize the characters associated with the structure of PAO, and such polarization was additionally supported by the out-group comparison;

c/ correlation criterion: if in a taxon there is a tendency to reduce some structures, the reduced state of the character is regarded as apomorphous. I have used it practically in all the situations, where I observed manifestations of the general tendency to reduce the number of pseudocelli and chaetotaxy structures;

d/ serial homology criterion - its definition and logical justification are presented in the previous chapter. In this study it played a crucial role in polarization of most characters.

The criteria listed above are discussed in detail with respect to each character. Besides, my hypotheses regarding evolutionary transformations are in most cases illustrated by diagrammatic figures.

Table I presents an attempt at reconstructing the evolutionary transformations of selected homologous characters, observed in the studied material of the *Onychiurinae*. Along with a short description of the way of transformation of each character, its plesiomorphy vs. apomorphy is suggested, and accordingly they are placed in respective columns, which correspond to consecutive states of the same character. Each character is denoted by C and a numeral (e.g. C1), both in the table and in the text of the discussion on character states.

Characters denoted as C1-C5, involving details of the structure of antennae and AIIIO have been polarized based on the commonality criterion. This means that their state which I have regarded as apomorphous, appeared only once among the studied species (fig. 81). Besides, in the case of character C1, I have used an outgroup comparison criterion, since generally antennae in all the groups of *Collembola* are four-segmented and thus the three-segmented state is no doubt apomorphous.

In the case of character C6 I have assumed that the tergite chaetotaxy in the *Collembola* was originally symmetrical. This is indicated by the fact that setae located symmetrically on both sides of the body are common on all tergites. Besides, most other, median, setae appear at later stages of postembryonic development of the *Onychiurinae*. Thus the existence of the median seta on the head capsule of the I instar larva is an apomorphous condition (fig. 82), and the above reasoning follows from the ontogenetic criterion.

Considering the polarization of characters C7-C9, involving d-chaetotaxy of the head, I have used an observation made when comparing the chaetotaxy of other body tergites of all the studied species, in which I saw not a single case of appearing new, additional seta, but only a reduction of those already existing. In my opinion the same reduction tendency is visible in the case of d-chaetotaxy of head, and hence the arrangement of six d setae is the most conservative and thus plesiomoprhous (fig. 83) (correlation criterion).

In order to polarize characters C10 and C22, I have used the commonality and correlation criteria. The reduction of c_4 setae on the head capsule and a_2 seta on thoracal tergites was found in one species only, which suggests that these characters are apomorphous (figs 82, 87).

Character C11 pertains to p-chaetotaxy on the posterior margin of head capsule. As the plesiomorphous state I have accepted development of seta p_3 as a macrochaeta. As it follows from the chaetotaxy review of the studied species, seta p_3 is a macrochaeta on II and III thoracal tergites and on most abdominal tergites, so that it

Table 1. Character analysis (continued on p. 77-78).

No	Plesiomorphous (0)	I order apomorphous	II order apomorphous	III order apomorphous
C1	antennal IV segment free	antennal IV segment partly accreted to antennal III segment	antennal IV segment accreted to antennal III segment	
C2	microsensillum on antennal IV segment located just above antennal III sense organ	microsensillum hidden behind papillae of antennal III sense organ		
C3	microsensillum on antennal III segment located slightly below antennal III sense organ	microsensillum on antennal III segment displaced downwards		
C4	antennal III sense organ with 5 papillae	antennal III sense organ with 4 papillae		
C5	antennal III sense organ with 5 guard setae	antennal III sense organ with 4 guard setae		
C6	d-chaetotaxy of head with setae d_1	d-chaetotaxy of head with seta d_0		
C7	sd-chaetotaxy of head - 6 setae	sd-chaetotaxy of head - less than 6 setae		
C8	sd-chaetotaxy of head - more than 4 setae	sd-chaetotaxy of head - less than 4 setae		
C9	sd-chaetotaxy of head - seta sd_6 present	sd-chaetotaxy of head - seta sd_6 absent		
C10	c-chaetotaxy of head - 4 setae	c-chaetotaxy of head - 3 setae, seta c_4 absent		
C11	p-chaetotaxy of head - p_3 macrochaeta	p-chaetotaxy of head - p_4 macrochaeta		
C12	postantennal sense organ of 3 - 4 vesicles	postantennal sense organ consist more than 3 - 4 vesicles		
C13	in postantennal organ vesicles arranged in a rosette	in postantennal organ vesicles arranged on both sides of long axis of the organ		
C14	vesicles in postantennal organ smooth	vesicles in postantennal organ granulated		
C15	2+2 pseudocelli on area antennalis and 1+1 pseudocellus slightly posterad, beyond area antennalis	3+3 pseudocelli on area antennalis	2+2 pseudocelli on area antennalis	1+1 pseudocellus or no pseudocelli on area antennalis
C16	3+3 pseudocelli on hind margin of head; pseudocellus *a* situated on head capsule, pseudocelli *a'* and *b* located on articular surface of head	2+2 pseudocelli on hind margin of head; pseudocellus *a* situated on head capsule, pseudocus *b* located on articular surface of head	2+2 pseudocelli on hind margin of head; both pseudocelli situated on head capsule	no pseudocelli on hind margin of head
C17	2+2 pseudocelli on I thoracal tergite	1+1 pseudocelli on I thoracal tergite	no pseudocelli on I thoracal tergite	
C18	I thoracal tergite with pseudocellus *a*	pseudocellus *a* on I thoracal tergite absent		
C19	I thoracal tergite with pseudocellus *b*	pseudocellus *b* on I thoracal tergite absent		

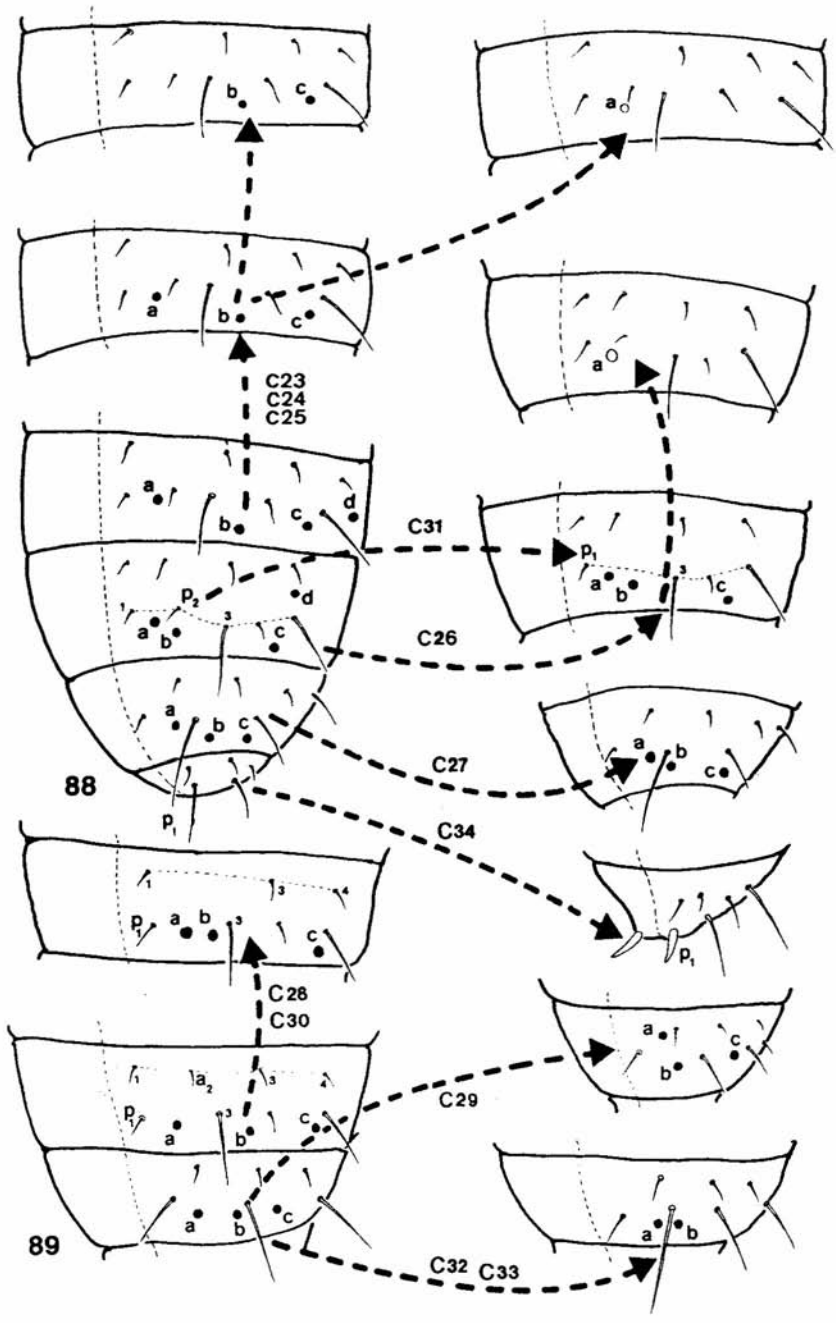
C20	3+3 pseudocelli on II thoracal tergite	2+2 pseudocelli on II thoracal tergite	1+1 pseudocellus (*a*) or no pseudocelli on II thoracal tergite	
C21	3+3 pseudocelli on III thoracal tergite	2+2 pseudocelli on III thoracal tergite	1+1 pseudocellus (*a*) or no pseudocelli on III thoracal tergite	
C22	a-chaetotaxy III thoracal tergite - 4 setae	a-chaetotaxy III thoracal tergite - 3 setae, p_2 absent		
C23	4+4 pseudocelli on I abdominal tergite	3+3 pseudocelli on I abdominal tergite, *d* absent	2+2 pseudocelli on I abdominal tergite, *c* and *d* absent	1+1 pseudocellus (*a*) or no pseudocelli on I abdominal tergite
C24	4+4 pseudocelli on II abdominal tergite	3+3 pseudocelli on II abdominal tergite, *d* absent	1+1 pseudocellus (*a*) or no pseudocelli on II abdominal tergite	
C25	4+4 pseudocelli on III abdominal tergite	3+3 pseudocelli on III abdominal tergite, *d* absent	2+2 pseudocelli on III abdominal tergite, *a* and *d* absent	1+1 pseudocellus (*a*) or no pseudocelli on III abdominal tergite
C26	4+4 pseudocelli on IV abdominal tergite	3+3 pseudocelli on IV abdominal tergite, *d* absent	1+1 pseudocellus (*a*) or no pseudocelli on IV abdominal tergite	
C27	on IV abdominal tergite distance between pseudocelli *a* and *b* roughly the same as like between *b* and *c*	on IV abdominal tergite distance between pseudocelli *a* and *b* distinctly shorter than between *b* and *c*		
C28	pseudocelli *a* and *b* on IV abdominal tergite situated below seta p_3, on both its sides	pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3		
C29	pseudocelli *a* on IV and V abdominal tergite roughly in line with other pseudocelli	pseudocelli *a* on IV and V abdominal tergite distnctly displaced anterad		
C30	a-chaetotaxy on IV abdominal tergite - 4 setae	a-chaetotaxy on IV abdominal tergite - 3 setae, a_2 absent		
C31	p-chaetotaxy on IV abdominal tergite - 5 setae	p-chaetotaxy on IV abdominal tergite - 4 setae, p_2 absent		
C32	on V abdominal tergite 3+3 pseudocelli	on V abdominal tergite 2+2 pseudocelli, *c* absent		
C33	pseudocelli *a* and *b* on V abdominal tergite distinctly separated	pseudocelli *a* and *b* on V abdominal tergite very close to each other		
C34	setae p_1 on VI abdominal tergite - macrochaetae	setae p_1 on VI abdominal tergite - anal spines		
C35	subcoxa of I pair leg with 2 pseudocelli	subcoxa of I pair leg with 1 pseudocellus	subcoxa of I pair leg without pseudocelli	
C36	subcoxa of II pair leg with 2 pseudocelli	subcoxa of II pair leg with 1 pseudocellus	subcoxa of II pair leg without pseudocelli	
C37	subcoxa of III pair leg with 2 pseudocelli	subcoxa of III pair leg with 1 pseudocellus	subcoxa of III pair leg without pseudocelli	
C38	a-chaetotaxy on tibiotarsi all pairs of legs - 11 setae	a-chaetotaxy on tibiotarsi all pairs of legs - 9 setae, symmetrically absence of a_2		

C39	all setae in p-chaetotaxy of I pairs leg arranged in one row	seta p_1 in p-chaetotaxy of I pairs of leg distinctly displaced upwards		
C40	all setae in p-chaetotaxy of II pair leg arranged in one row	seta p_1 in p-chaetotaxy of II pair of leg distinctly displaced upwards		
C41	all setae in p-chaetotaxy of III pair leg arranged in one row	seta p_1 in p-chaetotaxy of III pair of leg distinctly dislplaced upwards		
C42	tubus ventralis - 4+4 subapical setae	tubus ventralis - 3+3 subapical setae		
C43	tubus ventralis - 3+3 additional setulae	tubus ventralis - 2+2 additional setulae	tubus ventralis - no additional setulae	
C44	I abdominal sternite - 1+1 pseudocelli (*v*)	I abdominal sternite without pseudocelli		
C45	II abdominal sternite with 2+2 pseudocelli (*qv*)	II abdominal sternite with 1+1 pseudocellus (*q*)	I abdominal sternite without pseudocelli	
C46	III abdominal sternite with 1+1 pseudocellus (*q*)	III abdominal sternite without pseudocelli		
C47	IV abdominal sternite with 2+2 pseudocelli	IV abdominal sternite with 1+1 pseudocellus	IV abdominal sternite without pseudocelli	
C48	IV abdominal sternite with pseudocellus *q*	IV abdominal sternite without pseudocellus *q*		
C49	IV abdominal sternite with pseudocellus *v*	IV abdominal sternite without pseudocellus *v*		
C50	area furcalis with vestigial dens and mucro	area furcalis with cuticular fold	area furcalis with cuticular furrow	area furcalis without cuticular vestige of furcula
C51	area furcalis with 2+2 setae at base	area furcalis with 1+1 setae at base	area furcalis without setae at base	
C52	area furcalis with 3+3 setulae	area furcalis with 2+2 setulae	area furcalis with 1+1 setula	
C53	q-chaetotaxy on IV abdominal sternite - 3+3 setae	q-chaetotaxy on IV abdominal sternite - 2+2 setae		

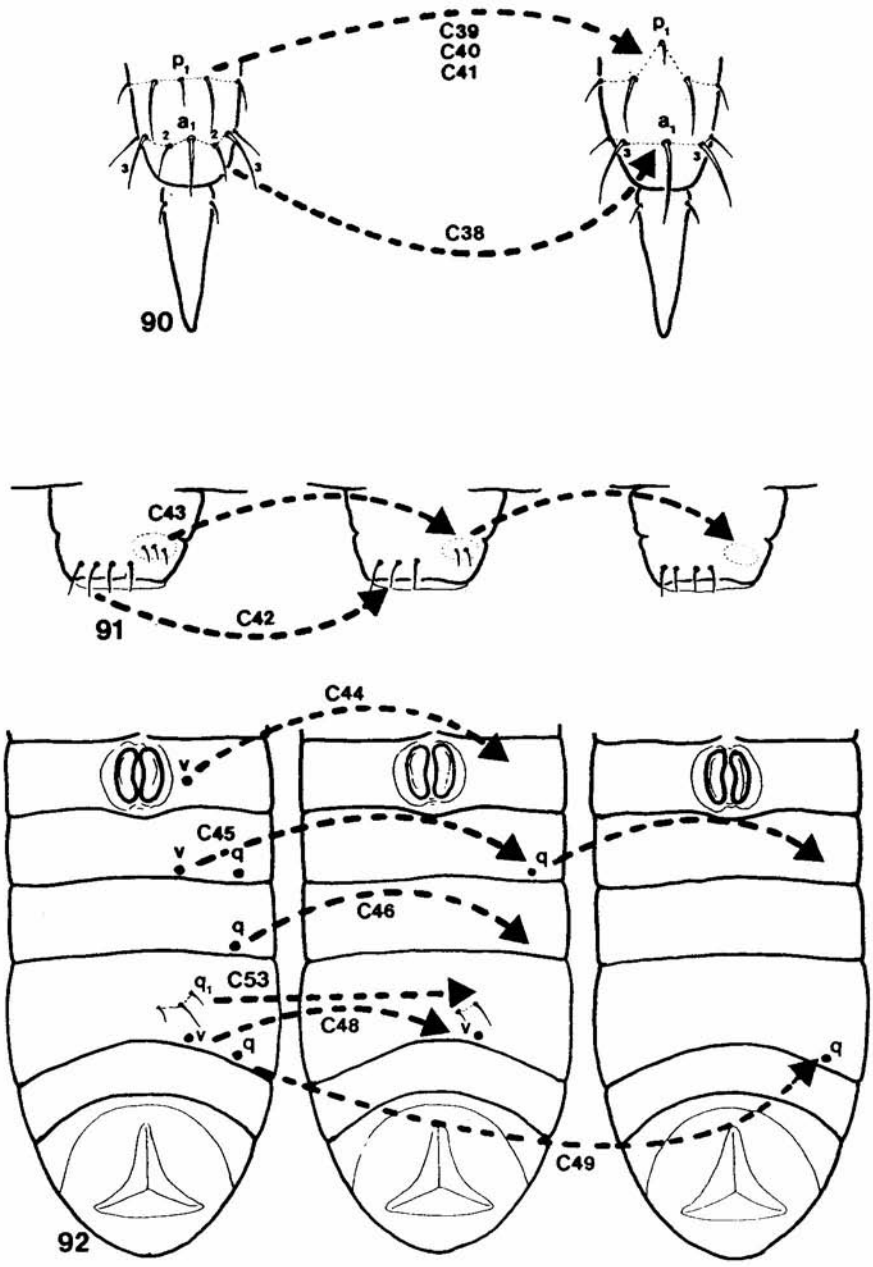
can be supposed that an identical arrangement of setae on the posterior margin of the head capsule is more conservative (fig. 82) (serial homology criterion).

Attempting to polarize characters C12-C14, I have used the out-group criterion; it follows from the comparison, that of all the *Collembola*, the subfamily *Onychiurinae* has the most complicated PAO. For this reason I think that in this group the basic evolutionary tendency is to complicate this organ. Using the complexity criterion, I consider the simplest PAO to be the plesiomorphous state. The resulting polarization of the character is shown in the table (fig. 84).

Characters C15, C16, C20, C21 pertain to the number and position of the pseudocelli on the head and II and III thoracal tergites. Polarizing them, I have come to a conclusion that the most primitive state is 3+3 pseudocelli, arranged more or less evenly on the posterior margin of all the tergites, abdominal, thoracal and those forming the head capsule. The character typically occurs most often on the "cold tergites" and this state is regarded as plesiomorphous. Other states were considered to be apomorphous since in my opinion in the family *Onychiuridae*, in the I instar larvae, there is a general tendency to reduce the number of pseudocelli. An opposite



88-89. Polarization of morphological characters on: 88 - III-VI abdominal tegites; 89- IV-V abdominal tergites. Hollow circle - pseudocelli appearing in the IInd instar



90-92. Polarization of morphological characters on: 90 - tibiotarsus; 91 - tubus ventralis; I-IV abdominal sternites

tendency, leading to a decreased (sometimes considerably) number of these structures can be observed at subsequent stages of postembryonic development, as some species reach their ultimate number of pseudocelli only at instar III (POMORSKI 1990a, 1990b, SKARŻYŃSKI 1991) (figs 85, 87) (ontogenetic, correlation and serial homology criteria).

In the case of I thoracal tergite (characters C17-C19), the maximum number of pseudocelli observed in the studied I instar larvae was 2+2, and I regard this character state as plesiomorphous (fig. 86) (correlation criterion).

In the case of polarization of characters based on the number of pseudocelli (characters C23-C26, C32), located on abdominal tergites, I have applied the following reasoning (correlation criterion). The most primitive state is 4+4 pseudocelli (abcd), pseudocelli a, b and c being homologous with the corresponding pseudocelli of the head and thorax, while pseudocellus d is most probably homologous with one of the pseudocelli located on the subcoxael of all pairs of legs. Other states are always apomorphous, but I have assumed that the reduction in the number of pseudocelli was gradual - pseudocellus d would be the first to get reduced (figs 88, 89). The above reasoning was supported by observations on the morphology of the I instar larva of *Tertodontophora bielanensis* (own, unpublished data).

Polarizing characters C27, C29 and C33, based on the position of pseudocelli on abdominal tergites, I have assumed that the most primitive state - plesiomorphous - is pseudocelli arranged evenly, in a single line, at more or less equal distances. Other states, consisting in shortening the distances or shifting of pseudocelli are apomorphous. A consequence of such a reasoning (correlation criterion) is polarization of these characters, contained in table II (figs 88, 89).

In the case of character C28 I have used the serial homology criterion and commonality criterion, since nearly in all species, on the other abdominal and thoracal tergites, especially the "cold" ones, pseudocelli a and b are located on both sides of seta p_3. In my opinion this state should be regarded as plesiomorphous (fig. 89).

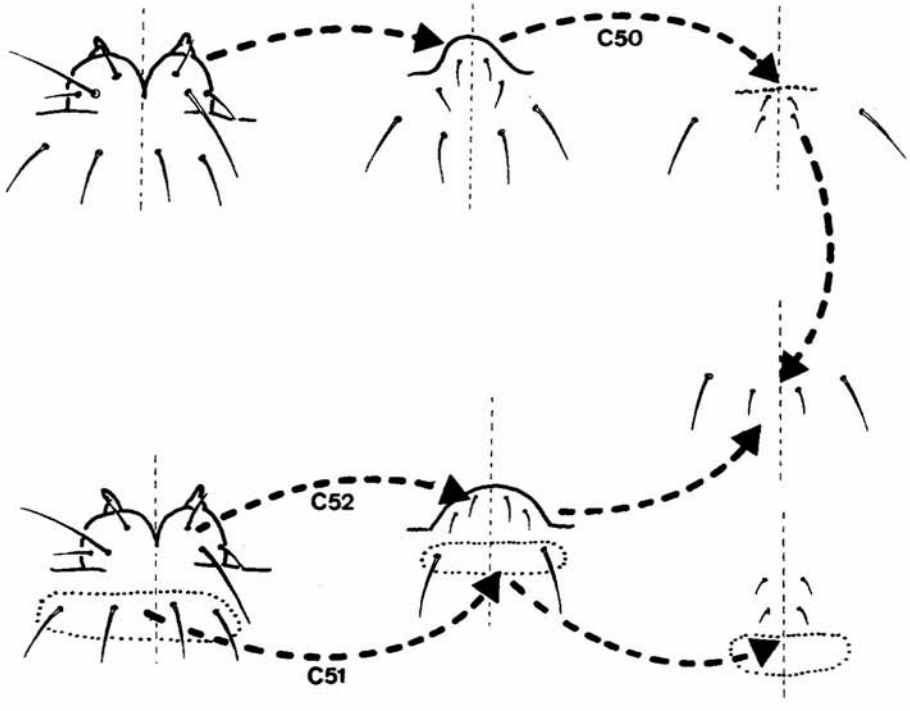
Polarizing characters C30 and C31, based on the chaetotaxy of abdominal tergites IV and V, I have also used parallely the principles of correlation, commonality and serial homology. The states of these characters, without setae a_2 and p_2, are no doubt a result of reduction and thus I regard them as apomorphous (figs 88, 89).

To decide how, cladistically, to treat the presence of abdominal spines (character C34), I have adopted the following reasoning. It is commonly accepted that transformation of setae p_2 on VI abdominal segment into spines is generally apomorhous within the *Poduromorpha*, though appearing many times, independently in various groups; thus it is a typical homoplasy. It can not be excluded, however, that the character may reverse to its original state, being even a homoplasious reversal. This does not change the fact that the starting point was probably a form without spines. It is likely that similar phenomena took place within the *Onychiurinae*, and thus I think that here also a spineless form was a starting point. The subfamily probably separated very early from the common poduromorph line-

age, which is indicated by an array of specific morphological characters - absence of eyes in the entire group, lack of pigment, presence of pseudocelli, complex structure of antennal III sense organ and postantennal organ. The separation could take place at the stage of spineless ancestors and hence I regard the presence of spines as apomorphous (fig. 88) (out-group criterion).

Polarizing characters C35-C37, pertaining to the number of pseudocelli located on subcoxae of all pairs of legs, I have adopted 2 pseudocelli as a plesiomorphous condition. All other states result from a reduction in the number of pseudocelli and are thus apomorphous (fig. 87) (correlation criterion).

Characters C38-C41 are based on the chaetotaxy of tibiotarsi of all pairs of legs. In my opinion the following arrangement is plesiomorphous: a-chaetotaxy - 11 setae in one verticil, p-chaetotaxy - 8 setae in one verticil. All reductions of setae (a_2) or their translocations (p_1) are apomorphous (fig. 90). Polarizing these characters I have applied the principle of commonality and correlation; translocations of setae on tibiotarsi are comparatively rare. I have assumed also that, like on other body parts, here also a general tendency to reduce setae is expressed.



93. Polarization of morphological characters on area furcalis

A similar logic (correlation criterion) was applied when polarizing characters C42-C43, based on the chaetotaxy of tubus ventralis. I think that here also a reduction of setae takes place (fig. 91).

Characters C44-C49 involve both the number and the position of pseudocelli on abdominal sternites. I have assumed that in the studied material the most conservative arrangement of pseudocelli on consecutive abdominal sternites can be expressed with the following formula: 1212, and this state is plesiomorphous. Other states, consisting in various combinations associated with the loss of pseudocelli, are apomorphous (fig. 92) (correlation criterion).

Characters C50-C52 are associated with the morphology and chaetotaxy of area furcalis - a structure being a remnant of reduced furca. Considering the out-group criterion, it appears that the tendency to reduce this organ within the *Onychiurinae* is obvious, and the polarization of the character should be in agreement with it. The most conservative - plesiomorphous - state is the greatest complexity of these characters. Other states are thus apomorphous and form distinct morphoclines (fig. 93).

Character C53 was polarized according to the commonality and correlation criteria; the absence of seta q_1, being a manifestation of the general reduction tendency was observed in one species only (fig. 92).

6. PHYLOGENETIC ANALYSIS

The 53 morphological characters of the I instar larvae of 27 species of the *Onychiurinae*, polarized above, are presented in the character matrix (tab. II) which served as a base for cladistic analysis, performed with the use of Hennig86, version 1.5 and Clados, version 1.2 programs, kindly made available by Prof. Lech BOROWIEC (Zoological Institute, Wrocław University). As an outgroup, a hypothetical ancestor was used, whose all characters were regarded as plesiomorphous and coded as 0. As a result, I obtained two cladograms, 156 steps long, of CI 49 and RI 80. The cladograms differ only in the relative estimate of two characters (C20 and C23) which have no effect on the ultimate arrangement of the evolutionary lineages; it is the same in both cladograms. Such a low number of cladograms results no doubt from the decisions taken at the level of character analysis, i.e. many morphoclines (e.g. characters C15, C16, C50), which decided about the final shape of the cladograms. A different polarization, with no morphoclines, resulted in 19-30 different trees. Finally I have decided that arranging characters into morphoclines, based on distinct morphoevolutionary tendencies, is more convincing. Thus I have avoided problems that might appear in this kind of studies (DEHARVENG 1989).

The resulting cladogram (figs 94, 95) represents the first attempt at ascertaining phylogenetic relationships within the *Onychiurinae*. It clearly indicates that they constitute a monophyletic group. Besides, a detailed analysis of the cladogram reveals a very high number of homoplasies and reversals. The occurrence of these phenomena is one of the basic rules of mosaic evolution. Multiple combinations of

Data matrix

Number of character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
ancestor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
subarmata	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
armata	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
campata	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
meridiata	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
fimata	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
eichhorni	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
pannonica	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	1	0	1	0
stogovi	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	2	2	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	2	2	0	0	0	0	1	0	1	2	1	2	1	1	1	0	2	0
furcifera	0	0	0	0	0	0	1	0	1	0	0	1	1	0	2	2	2	1	1	1	1	0	2	1	2	2	1	1	0	0	0	1	1	1	2	2	2	0	0	0	0	1	0	1	2	1	2	1	1	0	0	0	0
polonica	0	0	0	1	1	0	1	1	1	0	0	1	1	0	3	3	2	1	1	2	2	0	3	2	3	2	?	?	?	0	1	1	1	1	2	2	2	0	0	0	0	1	0	1	2	1	2	1	1	3	2	1	1
groenlandica	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	2	0	1	0
judithae	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	2	1	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	2	1	2	1	1	2	0	1	0
absoloni	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	1	1	2	1	2	1	1	2	1	2	0
pieninensis	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	1	1	2	1	2	0	1	2	1	2	0
serratotuberculata	2	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	1	1	1	0	1	1	1	0	0	1	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	2	1	2	1	1	1	0	1	0
hortensis	0	0	0	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
petaloides	0	0	0	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	1	1	0	0	0	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
zschokkei	0	0	0	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	1	1	1	0	0	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
normalis	0	0	0	0	0	1	1	0	1	0	1	1	1	1	2	1	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	2	0	1	1	1	1	0	1	1	0
circulans	0	0	0	0	0	1	1	0	1	0	0	1	1	1	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
scotaria	0	0	0	0	0	1	1	0	1	0	0	1	1	1	0	1	2	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
cebennaria	0	0	0	0	0	1	1	0	1	0	0	1	1	1	0	1	1	0	1	0	0	0	1	1	1	0	1	0	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	2	1	1	0	0	0	0	3	1	1	0
variabilis	0	0	0	0	0	1	1	0	1	0	0	1	1	1	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	0	2	1	1	0	0	0	0	3	1	1	0
rectopapillatus	0	0	0	1	0	1	1	0	1	0	1	1	1	1	0	1	2	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0	0	2	1	2	1	1	1	0	3	1	2	0
volinensis	0	0	0	1	0	1	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0	0	1	0	0	0	1	1	1	0	0	2	0	1	1	0	0	0	3	1	1	0
granulosus	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	3	1	2	0
denisi	0	0	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	3	1	2	0

the same characters, appearing in various phylogenetic lineages of the *Onychiurinae*, evidence that the evolution of the group is of this kind.

The cladogram has been based on species constituting only a slight per cent of the world fauna, and thus is not fully reliable, especially regarding the main phylogenetic lineages. In the present paper I generally do not discuss these problems, but concentrate on data on the relationships between the specific and generic level taxa. I think that they are well-grounded and may create a base for taxonomic considerations.

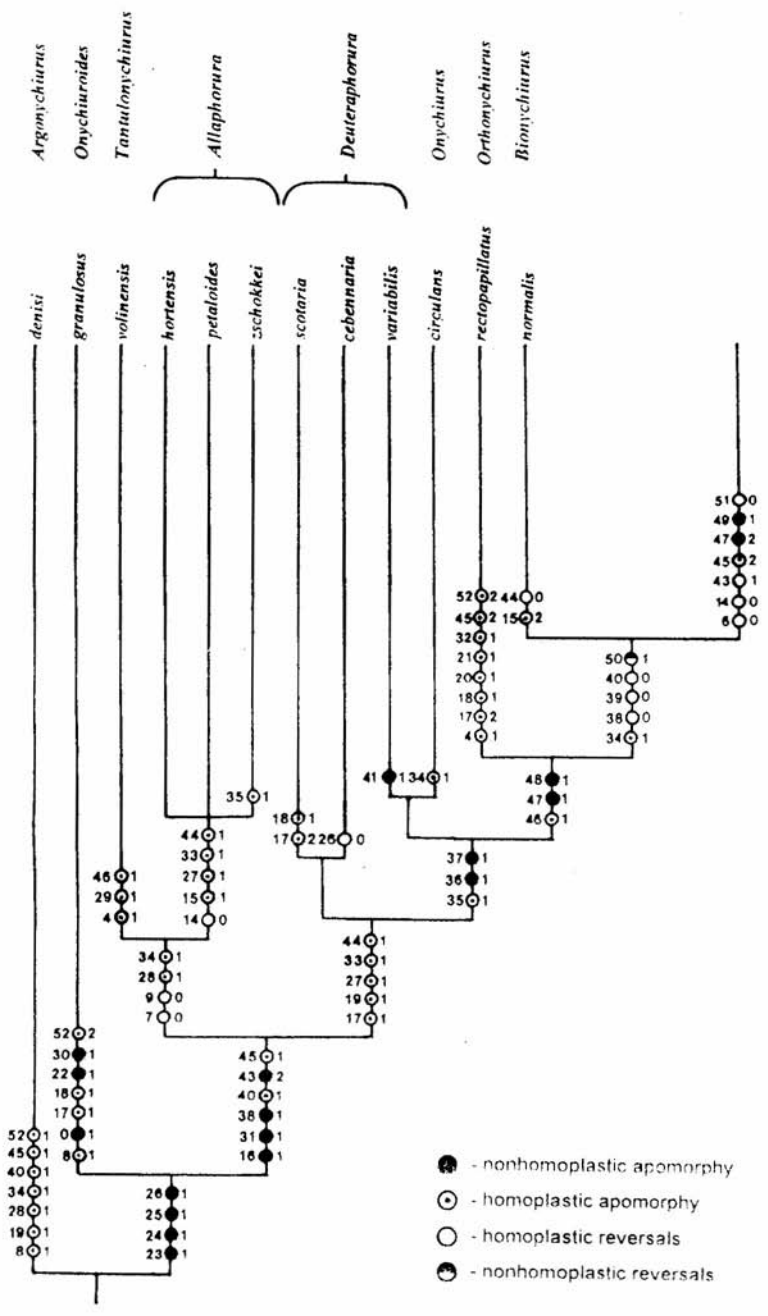
7. TAXONOMIC CONSEQUENCES AT THE GENERIC LEVEL

Each of the cladogram branches bears a generic name, either originally given to the species in question, or "proper" for them (figs 94, 95). All the species have been classified in genera, based on the adult morphology. Whenever I could not find a proper name, I used the name under which a given species was described. Considerations and proposals following from the cladogram analysis can be summarized as follows:

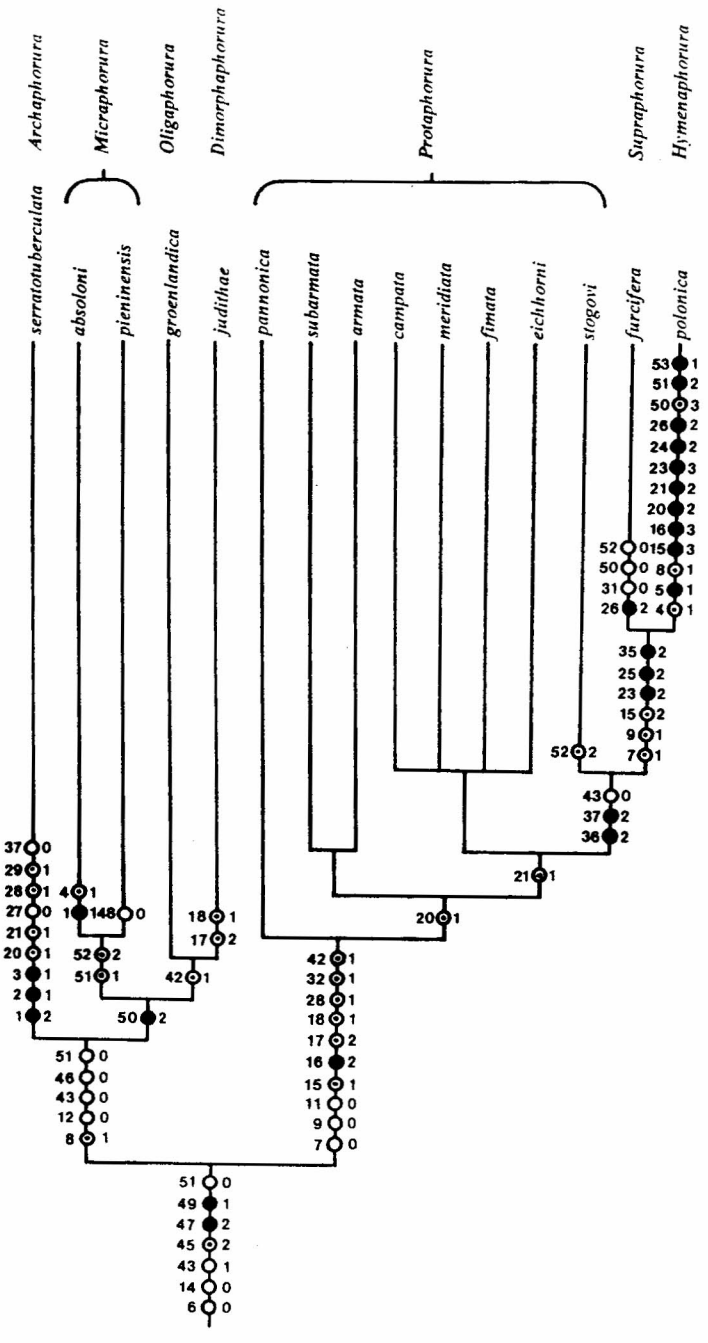
1. The I instar larva of *Argonychiurus denisi* occupies an isolated, well distinct position closest to the common ancestor. It is characterized by an array of plesiomorphies (presence of d pseudocelli on I-IV abdominal tergites) and numerous homoplasious apomorphies. The generic distinctness of the species raises no doubts. In my opinion, together with related species, it even deserves a higher taxonomic category of tribal rank, but this requires further studies. The type species of the genus *Argonychiurus* BAGNALL, 1949, including species with a high number of pseudocelli, is *Onychiurus perforatus* (HANDSCHIN, 1929). Adult forms of *A. denisi* and *A. perforatus* show, however, some differences (e.g. abdominal spines) and perhaps they should be classified in different genera. Studies on the I instar larvae of *A. perforatus* might solve this problem.

2. As indicated by the cladogram, the generic distinctness of *Onychiuroides granulosus* is well-grounded. The I instar larva of this species has as many as 3 nonhomoplasious apomorphies and 4 homoplasious apomorphies, and like *A. denisi* occupies an isolated position. Though the original diagnosis of the genus *Onychiuroides* BAGNALL, 1949 (type species: *Onychiurus postumicus* (BONET, 1931) is not complete, the appurtenance of this species to the above genus raises no doubts. Erecting a higher taxon of a tribal rank for *O. granulosus* and the related species is worth consideration.

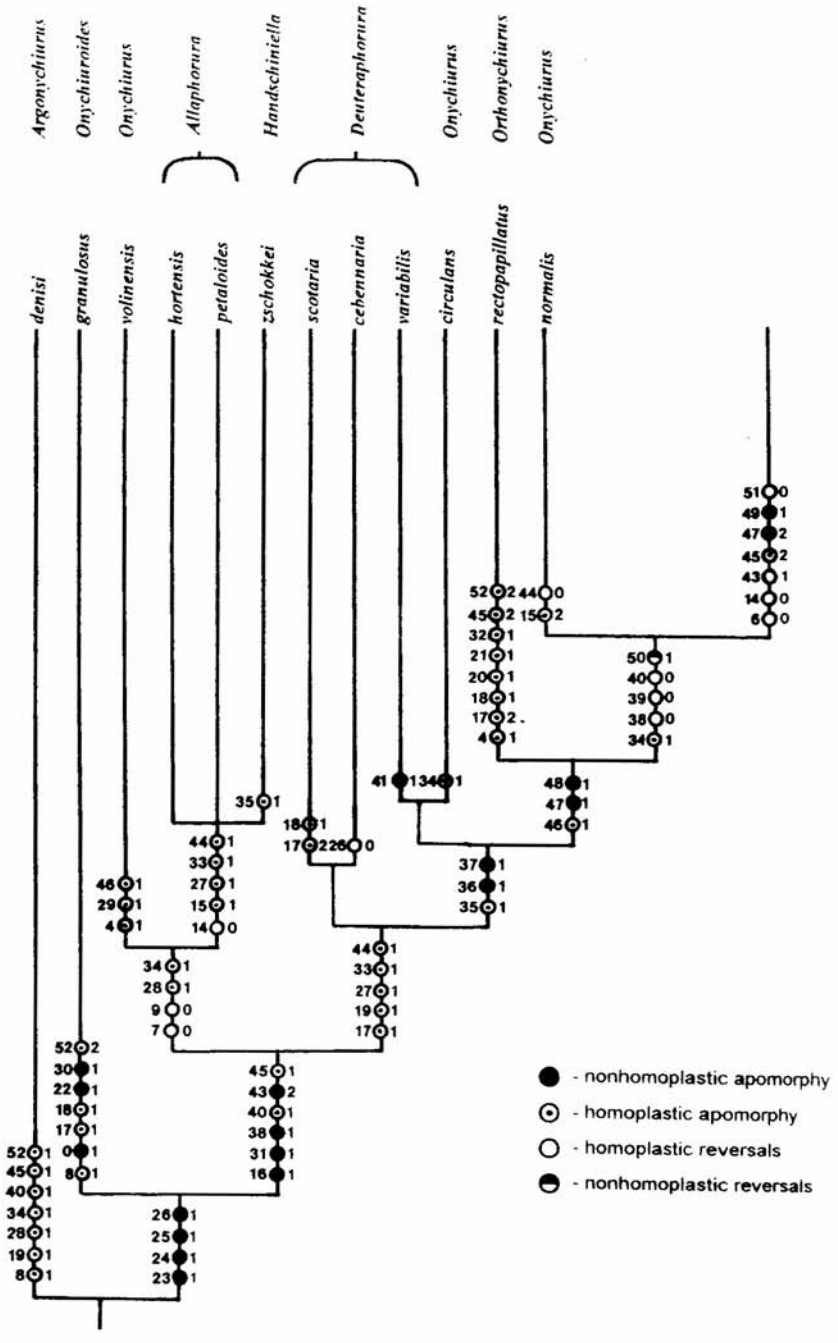
3. In the literature I could not find a proper genus, into which *Onychiurus volinensis* would "fit". The I instar larva of this species has 3 homoplasious apomorphies (4 papillae in AIIIO, pso *a* translocated on IV and V tergites, and the lack of pso on III abdominal sternite) and in the light of these studies its generic distinctness is well-grounded. Because of this I propose to erect for this species a new genus *Tantulonychiurus* gen. n. Its diagnosis is given in the key (chapter 8).



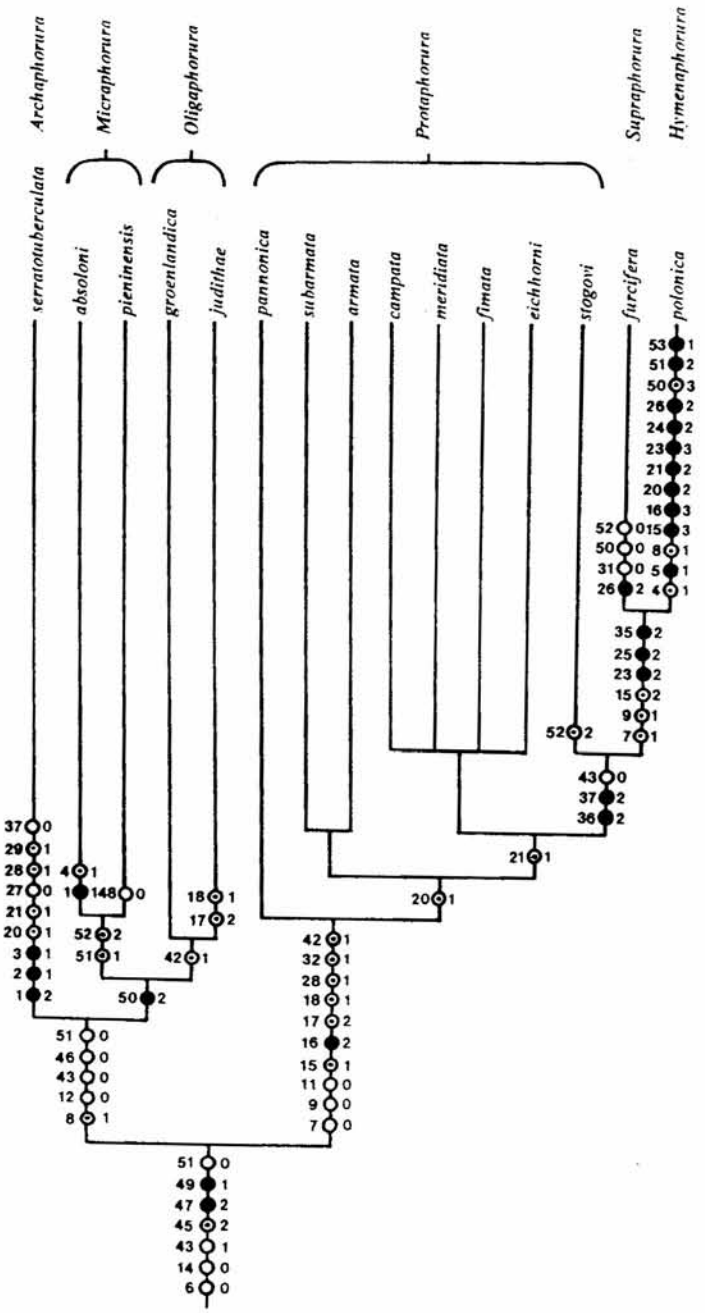
94 . Cladogram of I instar larvae of the *Onychiurinae* (part I)



95. Cladogram of I instar larvae of the *Onychiurinae* (part II)



96. Cladogram of I instar larvae of the *Onychiurinae* (part I), with proposed taxonomic changes at the generic level



97. Cladogram of I instar larvae of the *Onychiurinae* (part II), with proposed taxonomic changes at the generic level

4. The I instar larvae of *Allaphorura hortensis*, *A. petaloides* and *Handschiniella zschokkei* show a very high degree of relationship. In my opinion these species should be classified in one genus. They doubtless form a single phylogenetic lineage, characterized by one homoplasious reversal (smooth vesicles in PAO) and four homoplastic apomorphies. The type species of the genus *Allaphorura* BAGNALL, 1949 is *Onychiurus franzi* Stach, 1922, and of the genus *Handschiniella* BAGNALL, 1949 - *Onychiurus zschokkei* HANDSCHIN, 1919. The examined species fit within the diagnoses of both these genera (in the diagnosis of *Handschiniella* it is erroneously stated that *O. zschokkei* has no abdominal spines), but the diagnosis of *Allaphorura* is the first (BAGNALL 1949). On the basis of the principle of line priority, probably the genus *Handschiniella* is a junior synonym of *Allaphorura*. Of course, only studies on the I instar larvae of *A. franzi* might solve this problem.

5. The genus *Deuteraphorura* was erected by ABSOLON (1901), and its diagnosis as a subgenus was formulated by Stach (1954). Of the studied species, *Deuteraphorura scotaria*, *D. cebennaria* and *D. variabilis* fit within the diagnosis. They do not form a well-delimited phylogenetic lineage. Especially *Onychiurus circulans*, distinguished only by a single homoplasious apomorphy - the presence of abdominal spines (other characters are shared, especially with *D. variabilis*) - is surprisingly close to *D. variabilis*. Because of the unquestionable similarity to *Onychiurus ambulans* sensu STACH, 1954, the appurtenance of *O. circulans* to the subgenus *Onychiurus* s. str. is doubtless. It follows from the above data that the genera *Deuteraphorura* and *Onychiurus*, at the level of I instar larva, differ first of all in their abdominal spines. The taxonomic value of this character is debatable, and the problem requires further studies. Unless conclusive evidence is brought forward, I propose to classify species with abdominal spines in *Onychiurus*, and those devoid of them in *Deuteraphorura*.

6. The genus *Orthonychiurus* was erected by Stach (1954), and its type species is *O. rectopapillatus* (STACH, 1933), examined in this study. In the light of the cladogram, the species occupies an isolated position, confirmed by as many as 8 homoplasious apomorphies, and its generic distinctness is unquestionable.

7. An isolated position is occupied by *Onychiurus normalis*, and in my opinion its generic distinctness raises no doubts. In the literature I found no generic diagnosis that could accommodate this species and for this reason I propose erecting a new genus *Bionychiurus* gen. n. The diagnosis is presented in the key (chapter 8).

8. *Archaphorura serratoruberculata*, *Micraphorura absoloni*, *M. pieninesis*, *Oligaphorura groenlandica* and *Dimorphaporura judithae* form a very distinct phylogenetic lineage. BAGNALL (1949) united these genera into the subfamily *Oligaphorurinae*, which in the light of the present results seems well-grounded, but in my opinion the taxon should be of tribal rank and bear the name *Oligaphorurini* BAGNALL, 1949. Of these five species only the generic distinctness of *D. judithae* raises doubts. The type species of the genus *Dimorphaporura* BAGNALL, 1949 is *Onychiurus quadrituberculatus* (BÖRNER, 1901) and according to the original diagnosis it differs from the genus *Oligaphorura* BAGNALL, 1949 only in a coarser

granulation on VI abdominal tergite and in a distinctly marked area antennalis. These characters in my opinion have no taxonomic value that would allow erecting a genus. The problem may be solved only after examining the I instar larva of the type species of the genus - *O. quadrituberculatus*. The I instar larva of *D. judithae* differs from that of the related *O. groenlandicus* only in the absence of pseudocellus *a* on I thoracal tergite (characters C17, C18). I think that the character is of no great taxonomic value and the species should be classified in the genus *Oligaphorura*. Its new name should be *Oligaphorura judithae* (WEINER, 1994) comb. n. Distinguishing the genera *Archaphorura* BAGNALL, 1949 (type species *Onychiurus serratotuberculatus* STACH, 1933) and *Micraphorura* BAGNALL, 1949 (type species *Onychiurus absoloni* (BÖRNER, 1901) in the light of the present study, which included both their type species, is fully justified.

9. The genus *Protaphorura* was erected by ABSOLON (1901), and defined more precisely by STACH (1954), who proposed using the name for species constituting the *armatus*-group (HANDSCHIN 1920). The proposal, as can be seen from the cladogram, is fully justified. Species grouped in this genus form a distinct phylogenetic lineage, a sister group to the tribe *Oligaphorurini*. It is justified to treat them as a separate tribe *Protaphorurini* BAGNALL, 1949, including also a well distinct genus *Supraphorura* STACH, 1954.

10. The genus *Hymenaphorura* BAGNALL, 1948 is characterized by so many nonhomoplastic and homoplasious apomorphies, that in my opinion it deserves a higher category of tribal rank - *Hymenaphorurini* tribus n.

Figures 96 and 97 illustrate the results of the above considerations. All the generic-level taxonomic changes proposed in this paper have been marked in the cladogram.

8. KEY FOR IDENTIFICATION OF I INSTAR LARVAE OF *ONYCHIURINAE*

In most cases, the key makes it possible to identify the examined I instar larvae down to the specific level. Unfortunately, in case of some species within *Protaphorura*, I have not discovered well differentiating characters.

1. d-chaetotaxy of the head with medial seta d_0 (figs 50-55) ..... *Onychiurini* (p. 92)
-. d-chaetotaxy of the head without seta d_0 (fig 47-49, 56) ..... 2.
2. PAO composed of 1 vesicle with 3-4 lobes ..... *Oligaphorurini* (p. 96)
-. PAO composed of more vesicles ..... 3.
3. Thoracal and abdominal tergites with lateral psuedocelli (*c, d*) .....
..... *Protaphorurini* (p. 97)
-. Thoracal and abdominal tergites without lateral pseudocelli .....
..... *Hymenaphorurini* tribus. n. (p. 99)

Tribus *Onychiurini* Börner, 1906 status n.

Onychiurinae Börner, 1906: 159.
Onychiurinae: Bagnall, 1949: 499.

Type genus: *Onychiurus* Gervais 1841.

Head with seta d_0. PAO with numerous, usually granulated (rarely simple) vesicles. V abdominal tergite with 3 pseudocelli (rarely 2), usually *a* and *b* together + *c* separately or all pseudocelli situated separately.

Remarks

I erect this tribe provisionally, since in its present sense it probably comprises many different species groups and it is difficult to provide a single, conclusive diagnosis. Further studies may confirm my suggestions that it should be split into several tribes, the *Onychiurini* s. str. certainly should include the genera *Deuteraphorura* and *Onychiurus*.

1. Area furcalis in shape of cuticular fold with 2+2 setulae and 1+1 setae at base (fig. 73) ..... *Bionychiurus* gen. n.
-. Area furcalis different, with no cuticular fold ..... 2.
2. Area furcalis with 2+2 setule in 1 row and 1+1 setae below them (fig. 74) ..... 3.
-. Area furcalis with 2+2 setulae between 1+1 setae (fig. 75) ..... 4.
-. Area furcalis with 1+1 setulae between 1+1 setae (fig. 78) ..... 5.
3. Anal spines present ..... *Onychiurus*
-. Anal spines absent ..... *Deuteraphorura*
4. PAO composed of simple vesicles, pseudocellus *a* on V abdominal tergite situated near pseudocelli *b* (fig. 62) ..... *Allaphorura*
-. PAO composed of granulated vesicles, pseudocellus *a* on V abdominal tergite displaced anterad far from pseudocelli *b* (fig. 63) ..... *Tantulonychiurus* gen. n.
5. I-IV abdominal tergites with lateral pseudocelli *d* (fig. 69), and with pseudocelli *a'* on hind margin of head (fig. 55) ..... *Argonychiurus*
-. Abdominal tergites without lateral pseudocelli *d*, with pseudocelli *a'* on hind margin of head (fig. 54) ..... *Onychiuroides*
-. Abdominal tergites without lateral pseudocelli *b*, and without pseudocelli *a'* on hind margin of head ..... *Orthonychiurus*

Bionychiurus gen. n.

Type species: *Onychiurus normalis* Gisin, 1949. Gender: masculine.

Diagnosis

Body shape cylindrical, with strong anal spines. Sensory clubs in AIIIO granulated. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli only on area

antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 absent), 3 pso (*a* and *b* together + *c* separately) on V abdominal tergite. Area furcalis with 2+2 setulae on cuticular fold and 1+1 setae at base.

The I instar larvae known only in *B. normalis* - for description see page 58.

Onychiurus Gervais, 1841

Onychiurus Gervais, 1841:372, 440.

Type species: *Podura ambulans* Linnaeus, 1758

Diagnosis

Body shape cylindrical, with anal spines. Sensory clubs in AIIIO smooth. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 absent), 3 pseudocelli (*a* and *b* together + *c* separately) on V abdominal tergite. Area furcalis with 2+2 setulae in 1 row and 1+1 setae below them.

The I instar larvae known only in *O. circulans* - for description see page 47.

Deuteraphorura Absolon, 1901

Deuteraphorura: Absolon, 1901: 387.

Type species: *Onychiurus fimetarius* (auct.) Stach, 1934

Diagnosis

Body shape cylindrical, without anal spines. Sensory clubs in AIIIO smooth. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 absent); on V abdominal tergite 3 pseudocelli (*a* and *b* together + *c* separately). Area furcalis with 2+2 setulae in 1 row and 1+1 setae below them.

1. All subcoxae with 1 pseudocellus ..... *D. variabilis* (see p. 53)
-. All subcoxae with 2 pseudocelli ..... 2.
2. I thoracal tergite with pseudocellus *a* ..... *D. cebennaria* (see p. 52)
-. I thoracal tergitae without pseudocelli, macrochaetae knobbed .....
..... *D. scotaria* (see p. 49)

Allaphorura Bagnall, 1949

Allaphorura Bagnall, 1949: 504.
Handshinella Bagnall, 1949: 504. syn. n. ?

Type species: *Onychiurus franzi* Stach, 1946

Diagnosis

Body shape cylindrical, with differently developed anal spines. Sensory clubs in AIIIO finely granulated. PAO with simple vesicles, arranged transversely to the long axis of the organ. Head with seta d_0. 3+3 pseudocelli only on area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (p_2 absent); on V abdominal tergite 3 pseudocelli (*a* and *b* together + *c* separately). Area furcalis with 1+1 setae and 2+2 setulae between them.

1. Subcoxal with 1 pseudocellus, body length ca. 0,4 mm. ..... *A. zschokkei* (see p. 44)
-. Subcoxal with 2 pseudocelli, body length ca. 0,5 mm. ..... *A. petaloides* (see p. 43)
-. Subcoxal with 2 pseudocelli, body length ca. 0,6 mm. ..... *A. hortensis* (see p. 41)

Tantulonychiurus gen. n.

Type species: *Onychiurus volinensis* Szeptycki, 1964. Gender: masculine.

Diagnosis

Body shape cylindrical, with small anal spines. Sensory clubs in AIIIO finely granulated. PAO broad, with granulated vesicles. Head with seta d_0. At base of antennae, on area antennalis 2+2 pseudocelli, 1+1 pseudocellus located slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (p_2 absent); 3 pseudocelli on V abdominal tergite. Pseudocelli *a* on IV and V abdominal tergites displaced anterad. Area furcalis with 1+1 setae and 2+2 setulae between them.

The I instar larvae known only in *T. volinensis* - for description see page 59.

Argonychiurus Bagnall, 1949

Argonychiurus Bagnall, 1949: 502.

Type species: *Onychiurus perforatus* Handschin, 1920.

DIAGNOSIS

Body shape stout, broadened in the region of III-IV abdominal tergites, without or with anal spines. Sensory clubs in AIIIO granulated. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis; I-IV abdominal tergites with lateral pseudocellus *d*; pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (seta p_2 present), 3 pseudocelli (*a*,*b* and *c*) on V abdominal tergite arranged separately. Area furcalis with 1+1 setulae between 1+1 setae.

The I instar larvae known only in *A. denisi* - for description see page 65.

Onychiuroides BAGNALL, 1949

Onychiuroides BAGNALL, 1949: 51.

Type species: *Onychiurus postumicus* BONET, 1931.

DIAGNOSIS

Body shape stout, broadened and depressed in the region of III-IV abdominal tergites, without anal spines. Sensory clubs in AIIIO granulated. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis; hind margin of head with pseudocellus *a'*. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 present), 3 pseudocelli (*a*,*b* and *c*) on V abdominal tergite arranged separately. Area furcalis with 1+1 setulae between 1+1 setae.

The I instar larvae known only in *O. granulosus* - for description see page 62.

Orthonychiurus STACH, 1954

Orthonychiurus STACH, 1954: 26.

Type species: *Onychiurus rectopapillatus* STACH, 1933.

DIAGNOSIS

Body shape cylindrical, without anal spines. AIIIO with 4 papillae and smooth sensory clubs. PAO with granulated vesicles. Head with seta d_0. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 absent); on V abdominal tergite 2 pseudocelli (*a* and *b*). Area furcalis with 1+1 setulae between 1+1 setae.

The I instar larvae known only in *O. rectopapillatus* - for description see page 56.

Tribus *Oligaphorurini* BAGNALL, 1949 status n.

Oligaphorurinae BAGNALL, 1949: 500.

Type genus: *Oligaphorura* BAGNALL, 1949.

Head with setae d_1. PAO with 1 three- or four-lobed vesicle. Usually 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. a-verticil on all pairs of legs - 11 setae. V abdominal tergite with 3 pseudocelli (*a* and *b* together + *c* separately).

1. Anal spines absent ..... *Archaphorura*
-. Anal spines present ..... 2.
2. Area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base (fig. 76) ..... *Oligaphorura*
-. Area furcalis with 1+1 setae and between them 1+1 setulae below cuticular furrow (fig. 77) ..... *Micraphorura*

Archaphorura BAGNALL, 1949

Archaphorura BAGNALL, 1949: 509.

Type species: *Onychiurus serratotuberculatus* STACH, 1933.

DIAGNOSIS

Body shape cylindrical, without anal spines. III and IV antennl segments accreted, forming a club. Papillae of AIIIO long, cover microsensillum of IV antennal segment. On III antennal segment microsensillum displaced downwards. PAO with 1 three- or four-lobed vesicle. Head with setae d_1. 2+2 pseudocelli on area antennalis and 1+1 pseudocellus slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (p_2 present), on V abdominal tergite 3 pseudocelli (*a* and *b* together + *c* separately). Pseudocelli *a* on IV and V abdominal tergite displaced anterad. Area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base.

The I instar larvae known only in *O. serratotuberculata* - for description see page 39.

Oligaphorura BAGNALL, 1949

Oligaphorura BAGNALL, 1949: 510.

Type species: *Lipura groenlandica* TULLBERG, 1876.

DIAGNOSIS

Body shape cylindrical, with strong anal spines. III and IV antennal segments free. Localization of microsensilli on III and IV antennal segments typical. PAO with 1 three- or four-lobed vesicle. Head with setae d_1. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 present); on V abdominal tergite 3 pseudocelli (*a* and *b* together + *c* separately). Area furcalis with 2+2 setulae below cuticular furrow and 2+2 setae at base.

1. I thoracal tergite with pseudocellus *a* ..... *O. groenlandica* (see p. 31)
-. I thoracal tergitae without pseudocelli ..... *O. judithae* (see p. 33)

Micraphorura BAGNALL, 1949

Micraphorura BAGNALL, 1949: 509.

Type species: *Aphorura absoloni* BÖRNER, 1901.

DIAGNOSIS

Body shape cylindrical, with anal spines. III and IV antennal segments free or partly accreted. Localization of microsensilli on III and IV antennal segments typical. PAO with 1 three- or four-lobed vesicle. Head with setae d_1. 2+2 pseudocelli on area antennalis and 1+1 pseudocelli slightly posterad, beyond area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated between setae p_1 and p_3 (p_2 present); on V abdominal tergite 3 pseudocelli (*a* and *b* together + *c* separately). Area furcalis with 1+1 setae and 1+1 setulae below cuticular furrow.

1. IV abdominal sternite with pseudocellus *q* ..... *M. pieninensis* (see p. 37)
-. IV abdominal sternitae without pseudocelli ..... *M. absoloni* (see p. 35)

Tribus *Protaphorurini* BAGNALL, 1949 status n.

Protaphorurinae BAGNALL, 1949: 500.

Type genus: *Protaphorura* ABSOLON, 1901.

Head with setae d_1. PAO always with simple vesicles, arranged transversely to the long axis of the organ. At base of antennae, pseudocelli situated only on area antennalis (usually 3+3). a-verticil on all pair of legs - 11 setae. V abdominal tergite with 2 pseudocelli (*a* and *b* together).

1. Area furcalis with 2+2 or 1+1 setulae on cuticular fold and 2+2 setae at base (figs. 71, 72) ..... *Protaphorura*
-. Area furcalis with 2+2 setulae and 1+1 setae on 2 knobby remnants of furca (with spine-like mucrones) and 2+2 setae at base (fig. 70) ..... *Supraphorura*

Protaphorura Absolon, 1901

Protaphorura Absolon, 1901: 387.

Type species: *Lipura armata* Tullberg, 1869.

Diagnosis

Body shape cylindrical, with anal spines. PAO with simple vesicles, arranged transversely to the long axis of the organ. Head with setae d_1 at base of antennae, 3+3 pseudocelli situated only on area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (p_2 absent); on V abdominal tergite 2 pseudocelli (*a* and *b* close together). Area furcalis with 2+2 or 1+1 setulae on cuticular fold and 2+2 setae at base.

1. II thoracal tergite with pseudocellus *b* ..... *P. pannonica* (see p. 22)
-. II thoracal tergite without pseudocellus *b* ..... 2.
2. III thoracal tergite with pseudocellus *b* ..... *P. armata* (see p. 12)
P. subaramata (see p. 4)
-. III thoracal tergite without pseudocellus *b* ..... 3.
3. Subcoxae of all pairs of legs with 1 pseudocellus ..... *P. fimata* (see p. 19)
P. camapata (see p. 14)
P. meridiata (see p. 16)
P. eichhorni (see p. 21)
-. Subcoxae of II and III pairs of legs without pseudocelli ..... *P. stogovi* (see p. 25)

Supraphorura Stach, 1954

Supraphorura Stach, 1954: 26.

Type species: *Aphorura furcifera* Börner, 1901.

DIAGNOSIS

Body shape cylindrical, with anal spines. PAO with simple vesicles, arranged transversely to the long axis of the organ. Head with setae d_1 at base of antennae, 2+2 pseudocelli situated only on area antennalis. Pseudocelli *a* and *b* on IV abdominal tergite situated on both sides of seta p_3 (p_2 present); on V abdominal tergite 2 pseudocelli (*a* and *b* close together). Area furcalis with 2+2 setulae and 1+1 setae on 2 knobby remnants, with spine-like mucrones and 2+2 setae at base.

The I instar larvae known only in *S. surcifera* - for description see page 27.

Tribus *Hymenaphorurini* tribus n.

Type genus: *Hymenaphorura* BAGNALL, 1948.

I instar larva is a resting stage. Head with setae d_1. AIIIO with 4 guard setae. PAO usually with numerous simple vesicles. Psedocelli ivisible. a-verticil on all pairs of legs - 11 setae.

Hymenaphorura BAGNALL, 1948

Hymenaphorura BAGNALL, 1948: 635.

Type species: *Lipura sibirica* TULLBERG, 1876.

DIAGNOSIS

I instar larva is a resting stage. Body shape robust, cylindrical, with anal spines. Pseudocelli invisible. AIIIO with 4 guard setae. PAO with simple vesicles. On dorsal side of the body II and later instars no lateral pseudocelli (*c* and *d*). Head with setae d_1. Area furcalis with 2+2 setulae.

The I instar larvae known only in *H. polonica* - for description see p. 28.

9. CONCLUSIONS

1. Morphology of the I instar larvae of 27 species of the *Onychiurinae* has been described.

2. On the basis of the descriptions, a map of morphoevolutionary activity has been prepared (fig. 79), from which it follows that the evolutionary "hot spots", undergoing the most intense evolutionary transformations, concentrate in the peripheral parts of the body. In my opinion this may have two reasons:

- these places have a high adaptive significance and undergo a strong selection pressure;

- they do not play any greater part in the animal's life and thus some variation in the shape of the character is possible, depending only on genetical conditions;

The evolutionary "cold spots" - the most conservative - are concentrated in the central part of the body; these are:

- II and III thoracal segments with basal parts of all pairs of legs;
- I, II and III abdominal segments except tubus ventralis;
- the first two antennomeres;

It has been found also, that the morphoevolutionary processes are expressed as transformations of structures present in the I instar larva of the ancestor. The transformations involve reductions, translocations and complication, the latter taking place mostly at subsequent stages of postembryonic development.

3. Preparing a map of morphoevolutionary activity was one of the arguments helpful in polarizing the characters in a preliminary cladistic analysis. The analysis resulting in the cladogram (figs 94, 95) has made it possible to propose solutions of several taxonomic problems within the *Onychiurinae*, especially at the generic level. In this respect it has been found that the following genera are justified: *Argonychiurus* BAGNALL, 1949; *Onychiuroides* BAGNALL, 1949; *Allaphorura,* BAGNALL, 1949; *Deuteraphorura* ABSOLON, 1901; *Onychiurus* GERVAIS, 1841; *Orthonychiurus* STACH, 1954; *Archaphorura* BAGNALL, 1949; *Micraphorura* BAGNALL, 1949; *Oligaphorura* BAGNALL, 1949; *Protaphorura* ABSOLON, 1901; *Supraphorura* STACH, 1954; *Hymenaphorura* BAGNALL, 1948, and their diagnoses have been provided (based on morphology of I instar larvae). It has been found that the genus *Handschiniella* BAGNALL, 1940 is probably a junior synonym of *Allaphorura* BAGNALL, 1949. Two new genera have been proposed: *Bionychiurus* gen. n. i *Tantul-onychiurus* gen. n., as well as a provisional division of the subfamily *Onychiurinae* into four tribes: *Onychiurini* BÖRNER, 1903 stat. n.; *Oligaphorurini* BAGNALL, 1949 stat. n.; *Protaphorurini* BAGNALL, 1949 stat. n.; *Hymenaphorurini* tribus n.

4. As demonstrated in the present study, classification based on the morphology of the I instar larvae has proved to be a very promising study method, permitting an objective erection and verification of generic categories. It seems also that the method may affect taxonomic studies on members of the entire family *Onychiuridae* and perhaps also other collembolan groups.

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