

## Redescription of *Arctoseius haarlovi* Lindquist, 1963 (Acari: Ascidae) from Spitsbergen, Svalbard

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New descriptions of adult female, male and deutonymph body morphs of *Arctoseius haarlovi* Lindquist, 1963, collected from Spitsbergen in the High Arctic are presented. The occurrence of this species and its preferred microhabitats are described based both on the published literature and our own collections. An analysis of the morphological variability in *A. haarlovi* and a comparison with other species in this genus are given.

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### 1. Introduction

Thor (1930) established the genus *Arctoseius* on the basis of specimens of *Arctoseius laterincisus* collected on Spitsbergen, Svalbard, in the European High Arctic. The study by Thor does not contain an exhaustive description and detailed figures, but merely several photographs. Unfortunately, the type specimens upon which Thor based his original description of *A. laterincisus* were destroyed after Thor's death in accordance with his will (Lindquist 1963). It has therefore been difficult to review this species, to redescribe it in detail and to prepare appropriate figures. Nevertheless, Haarløv (1942) drew and re-described what he considered to be the type species, *A. laterincisus*, from specimens of *Arctoseius* collected by him in Greenland. The material from Greenland was identified by Haarløv (1942) as *A. laterincisus* based on the meagre description

and the aforementioned photographs contained in Thor (1930). Evans (1955) stated that it is impossible to be certain that the type material of Thor from Spitsbergen and the material of Haarløv from Greenland are conspecific without first examining Thor's original type material. Nevertheless, Evans (1955), like Willmann (1949), accepted Haarløv's concept of Thor's species. Indeed, Evans extended the description including a questionable sensory organ that Haarløv found on only the left tarsus of leg I on one of his two specimens as a diagnostic character *A. laterincisus*.

According to Lindquist (1961) the differences between *A. laterincisus* described by Thor (1930), and that described by Haarløv (1942) are sufficiently important to the extent that they may be the basis to treat them as two separate species. Lindquist (1961) claimed that *A. laterincisus sensu* Thor is a relatively large species when compared to the other species of the genus. Thor

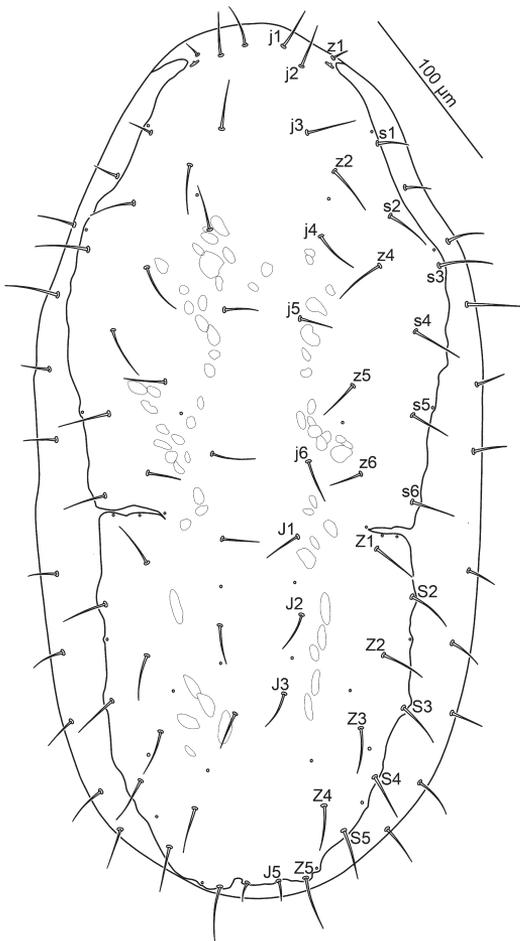


Fig. 1. *Arctoseius haarlovi*. Dorsal view of female. Scale 100 µm.

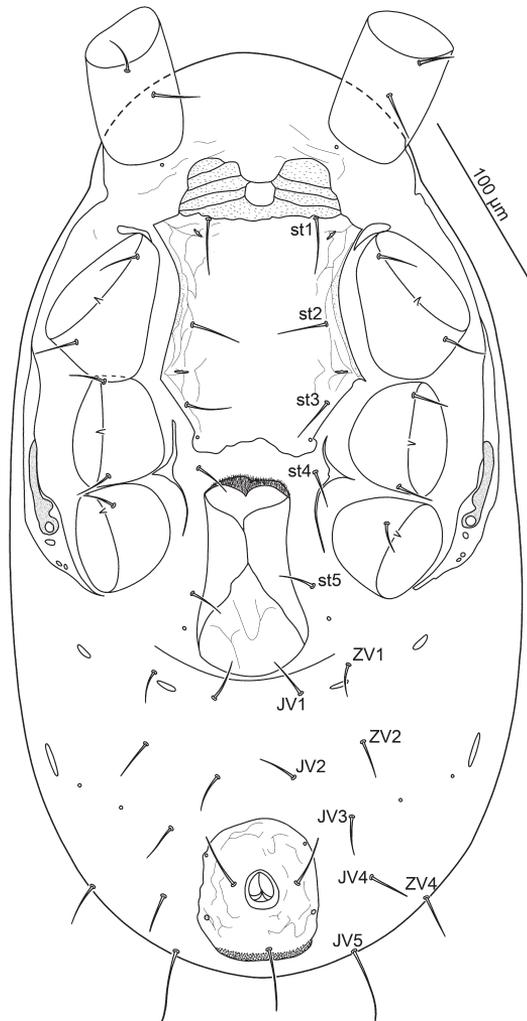


Fig. 2. *Arctoseius haarlovi*. Ventral view of female. Scale 100 µm.

(1930) gave the idiosoma dimensions of his female specimens as 750–800 µm long and 380–400 µm wide, while those of Haarløv have the smaller dimensions of 420 µm in length and 240 µm in width. Posteriormost pair of mediolateral setae on the dorsal shield and the posteriormost pair of ventral setae are relatively long in *A. laterincisus sensu* Thor, whereas these setae were described and drawn as short in the specimens of Haarløv.

In his doctoral dissertation Lindquist (1963) recognized specimens reported by Haarløv (1942) as a species new to the science and he named it *Arctoseius haarlovi*. Unfortunately, the description of this species has never been published and therefore it did not meet the rules of the International Code of Zoological Nomenclature.

The research of the present study conducted by the authors over several years, involving an examination of a few hundred samples from Spitsbergen and other islands in the Svalbard archipelago, failed to bring a breakthrough. So far, *A. laterincisus* has not been found, even though all other species of mesostigmatid mites described by Thor in 1930 have been reported (Coulson & Refseth 2004, Coulson 2007, Gwiazdowicz & Rakowski 2009).

This study presents the description and iconographic documentation of *A. haarlovi*, not only of adults, but also of deutonymphs which are almost unknown for this genus. Chaetotaxy, symbols and the numbering system of setae on the dorsal

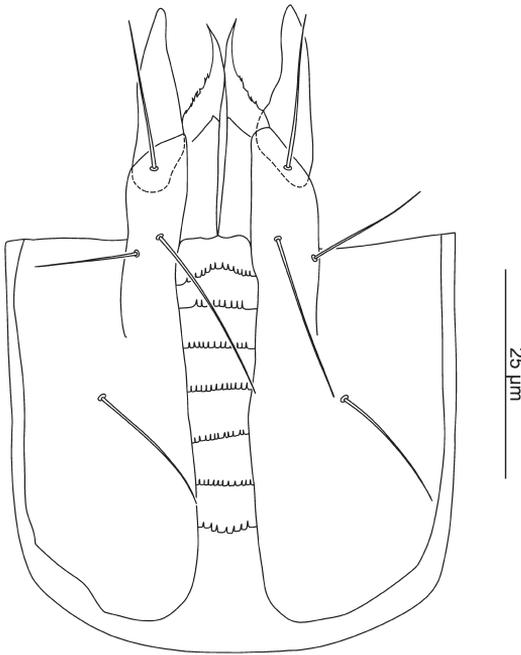


Fig. 3. *Arctoseius haarlovi*. Gnathosoma of female. Scale 25  $\mu\text{m}$ .

and ventral side are after Evans (1963), Lindquist & Evans (1965) and Lindquist (1994).

## 2. Material

The description is based on 45 females, 8 males and 4 deutonymphs collected from several localities on Spitsbergen: Bjørndalen (13♀, 4 deutonymphs) (78° 13.39' N 015° 17.628' E), Endalen (14♀, 5♂) (78° 11.13' N 015° 45.51' E), Hornsund (2♀) (77° 03.26' N 015° 08.69' E), Magdalenefjorden (15♀, 3♂) (79° 33.9' N 010° 52.2' E) and Mushamna (1♀) (79° 39.6' N 014° 13.1' E). At present, this material is deposited in the collection of Poznan University of Life Sciences, the Department of Forest Protection and the University Centre in Svalbard, Longyearbyen.

## 3. Redescription of female and male, and description of deutonymph

*Arctoseius haarlovi* Lindquist, 1963

Female. Dorsum (Fig. 1). Idiosoma 460–530

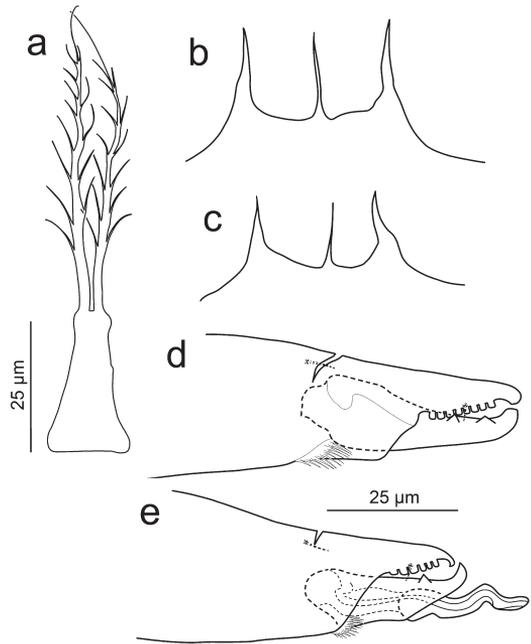


Fig. 4. *Arctoseius haarlovi*. – a. Tritosternum of female. – b. Epistome of female. – c. Epistome of male. – d. Chelicera of female. – e. Chelicera of male. Scale 25  $\mu\text{m}$ .

$\mu\text{m}$  long and 240–300  $\mu\text{m}$  wide. 30 pairs (17+13) of simple setae on the schizodorsal shield. No setae J4. 10 pairs of setae located on the lateral membrane. Most dorsal setae of same length ranging from 22 to 27  $\mu\text{m}$ . Setae J1–J3 (19–21) slightly shorter than setae Z1–Z5 (25–27  $\mu\text{m}$ ) and setae S2–S5 (26  $\mu\text{m}$ ). The shortest setae z1 (10  $\mu\text{m}$ ) and J5 (13  $\mu\text{m}$ ). Lateral incisions of 30–35  $\mu\text{m}$  deep. Edges of the schizodorsal shield irregular, sometimes ragged.

Venter (Fig. 2). The base of tritosternum (25  $\mu\text{m}$ ) significantly shorter than laciniae (50  $\mu\text{m}$ ) (Fig. 4a). Presternal plates fused with the sternal shield (110  $\mu\text{m}$  long), with setae st1 (25  $\mu\text{m}$ ) and st2–st3 (20  $\mu\text{m}$ ) located. Lineate ornamentation on the sternal shield visible only on its edges. Genital shield spatulate (100×50  $\mu\text{m}$ ). Two postgenital plates (sclerites) below this shield. Oval anal shield (65×65  $\mu\text{m}$ ), para-anal setae of similar length as postanal seta (25  $\mu\text{m}$ ), with cribrum below. Delicate, linear ornamentation visible on both genital and anal shields. Eight pairs of ventral setae of similar length (18–19  $\mu\text{m}$ ) and only seta JV5 slightly longer (23–24  $\mu\text{m}$ ). Between coxae III and coxae IV a relatively

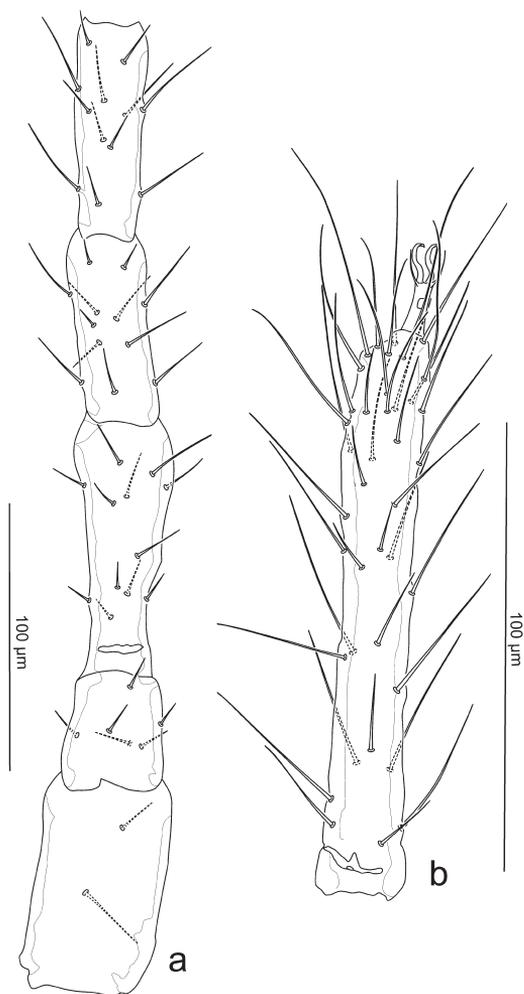


Fig. 5. Female of *Arctoseius haarlovi*. – a. Leg I without tarsus. – b. Tarsus I. Scale 100  $\mu\text{m}$ .

short peritreme (45  $\mu\text{m}$ ). Endopodal plates above coxae II and also between coxae III and IV. Not fused with the sternal shield. Metapodal plates elongated (20 $\times$ 5  $\mu\text{m}$ ).

Gnathosoma. Corniculi elongated (35  $\mu\text{m}$ ), significantly longer than setae h1. Seven rows of denticles located in the hypostomal groove (7 to 14 denticles per row). Hypostomal setae simple with variable length: h1 – 24  $\mu\text{m}$ , h2 – 12  $\mu\text{m}$ , h3 – 30  $\mu\text{m}$ , h4 – 22  $\mu\text{m}$  (Fig. 3). Epistome with three, sharply ended tips of the same height (Fig. 4b). Chelicera approximately 40  $\mu\text{m}$  long. Fixed digit with eight teeth and the movable digit with two teeth (Fig. 4d).

Legs variable in length: I – 470  $\mu\text{m}$ , II – 350  $\mu\text{m}$ , III – 320  $\mu\text{m}$ , IV – 440  $\mu\text{m}$ . Chaetotaxy of

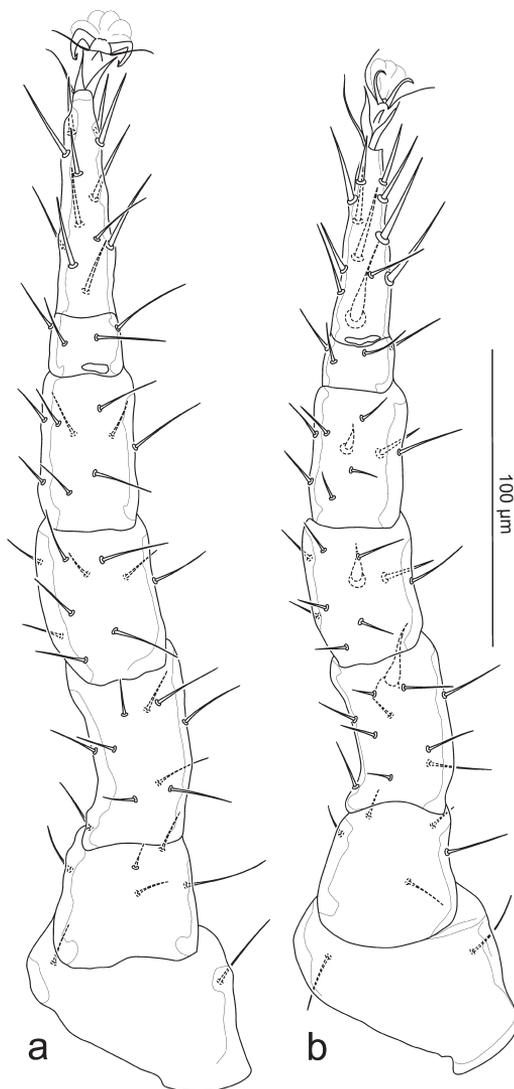


Fig. 6. *Arctoseius haarlovi*. – a. Leg II of female. – b. Leg II of male. Scale 100  $\mu\text{m}$ .

legs is peculiar for genus *Arctoseius*, leg I: 2-6-12-12-12-39, leg II: 2-5-(10)11-10-9-16, leg III: 2-5-6-7-7-16, leg IV: 1-5-6-7-7-16 (Fig. 5a, b, 6a, 7a, b).

Male. Dorsum (Fig. 8). Idiosoma 375–415  $\mu\text{m}$  long and 195–230  $\mu\text{m}$  wide. Like in the female, usually 30 pairs (17+13) of simple setae on the schizodorsal shield. No seta J4 (Fig. 8). 10 pairs of setae located on the lateral membrane. Most dorsal setae more or less of the same length (20  $\mu\text{m}$ ). Setae J1–J3 (16–17  $\mu\text{m}$ ) slightly shorter than setae Z1–Z5 and setae S2–S5 (20  $\mu\text{m}$ ). Setae

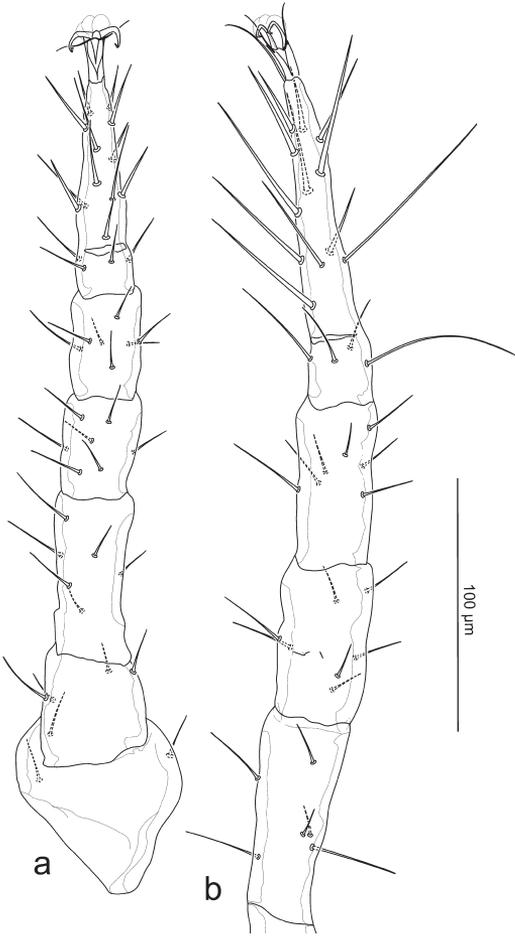


Fig. 7. Female of *Arctoseius haarlovi*. – a. Leg III. – b. Leg IV without coxa and trochanter. Scale 100 µm.

Z5 (27 µm) the longest ones, while setae z1 and J5 (9 µm) the shortest. Lateral incisions are approximately 35 µm deep. Edges of the schizo-dorsal shield irregular, sometimes ragged.

Venter (Fig. 9). The base of the tritosternum (20 µm) significantly shorter than laciniae (55 µm). Presternal plates fused with the sterni-genital shield. Sterni-genital shield (170 µm long) with five pairs of setae. Setae st1–st3 (20 µm) slightly longer than setae st4–st5 (15 µm). Genital orifice (20 µm) on the anterior edge of the sternal shield between setae st1. Delicate reticulate ornamentation on the edges of the shield. Ventrianal shield elongated, anterior part wider than posterior (130×90 µm), with a delicate, linear ornamentation. 5 pairs of ventral setae (15 µm) and three circum-anal setae (20 µm) located

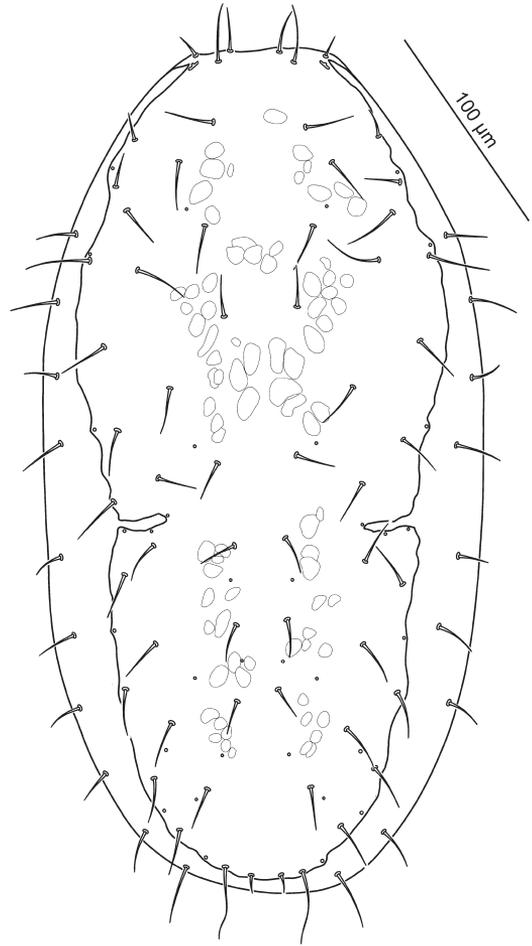


Fig. 8. *Arctoseius haarlovi*. Dorsal view of male. Scale 100 µm.

on this shield. One pair of sclerites and metapodal plates (15×3 µm) located below coxae IV. Peritremal shield very narrow, while peritremes relatively short (40 µm), located in the region of coxae III–IV. Endopodal plates located above coxae II and also between coxae III and IV. Usually not fused with the sternal shield.

Gnathosoma similar as in the female, 70 µm long. Corniculi elongated (30 µm); hypostomal setae simple and with variable length. Epistome with three, sharply ended tips of the same height (Fig. 4c). Chelicera approximately 35 µm long. Fixed digit with six teeth and the movable digit with one tooth and spermatodactyl (25 µm) (Fig. 4e).

Legs variable in length: I – 405 µm, II – 285 µm, III – 260 µm, IV – 370 µm. Chaetotaxy of

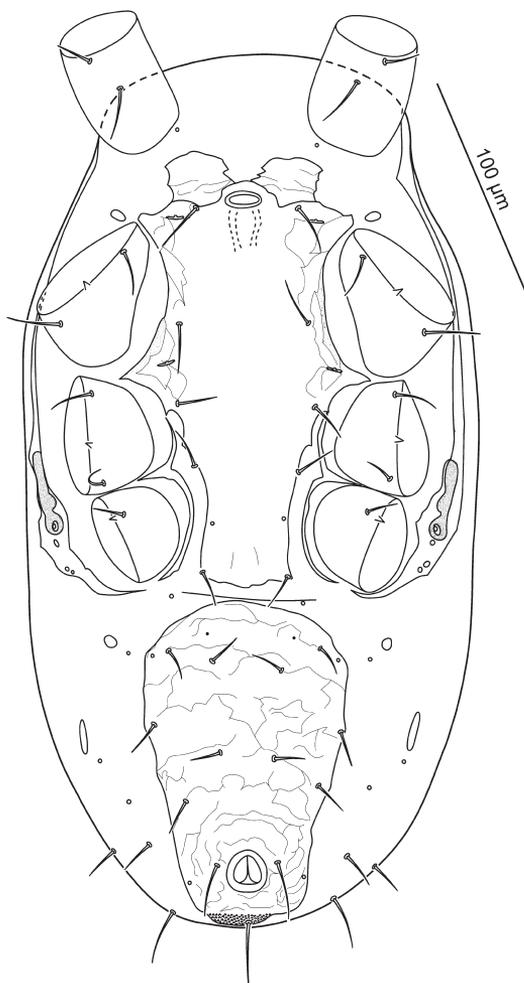


Fig. 9. *Arctoseius haarlovi*. Ventral view of male. Scale 100 µm.

legs as in the female, leg I: 2-6-12-12-12-39, leg II: 2-5-(10)11-10-9-16, leg III: 2-5-6-7-7-16, leg IV: 1-5-6-7-7-16. However, a difference is visible on leg II, where one of the setae is located on the internal side of femur, genu, tibia and tarsus is visibly thicker, spinate (Fig. 6b).

Deutonymph. Dorsum (Fig. 10). Idiosoma 375–400 µm long and 180–225 µm wide. As in adult specimens usually 30 pairs (17+13) of simple setae on the schizodorsal shield. No seta J4 (Fig. 10). 10 pairs of setae located on the lateral membrane. Most of the dorsal setae of similar length (25–30 µm) and only setae Z5 (35 µm) slightly longer, shortest setae z1 (10 µm) and J5 (6–8 µm). Lateral incisions of 30–35 µm deep.

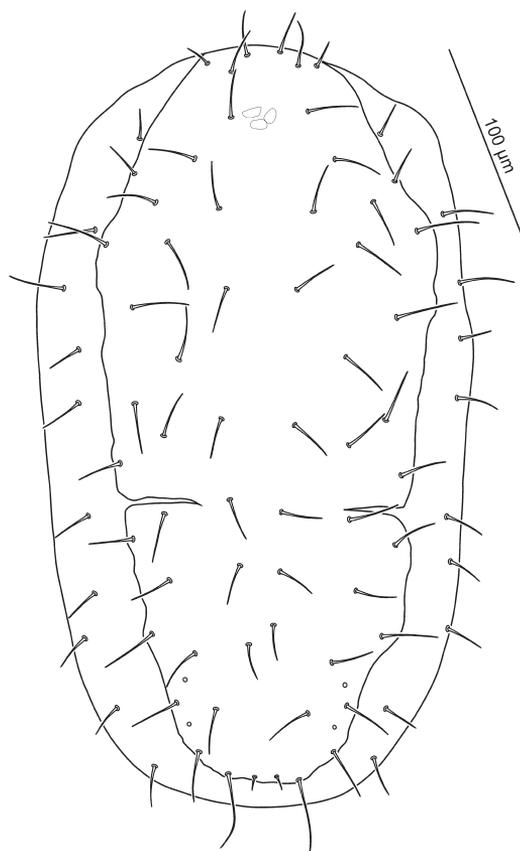


Fig. 10. *Arctoseius haarlovi*. Dorsal view of deutonymph. Scale 100 µm.

Edges of schizodorsal shield irregular, sometimes ragged. No ornamentation, most porae invisible.

Venter (Fig. 11). The base of tritosternum (30 µm) significantly shorter than laciniae (50 µm). Small sternal shield (190 µm) with three pairs of simple setae 25 µm long. Setae st4–st5 (16–18 µm) outside the shield. Oval anal shield (60×50 µm). Para-anal setae (20 µm) shorter than postanal seta (30 µm). Cribrum located below the postanal seta. Metapodal plates elongated (25 µm long), while endopodal plates absent. Eight pairs of ventral setae (20 µm) among which seta JV5 is the longest (25–27 µm) located between the sternal and anal shields. Peritremes short (35 µm) and as in adults located in the region of coxae III–IV.

Gnathosoma similar as in adult specimens.

Legs variable in length: I – 400 µm, II – 275 µm, III – 260 µm, IV – 360 µm. Chaetotaxy similar as in adult specimens.

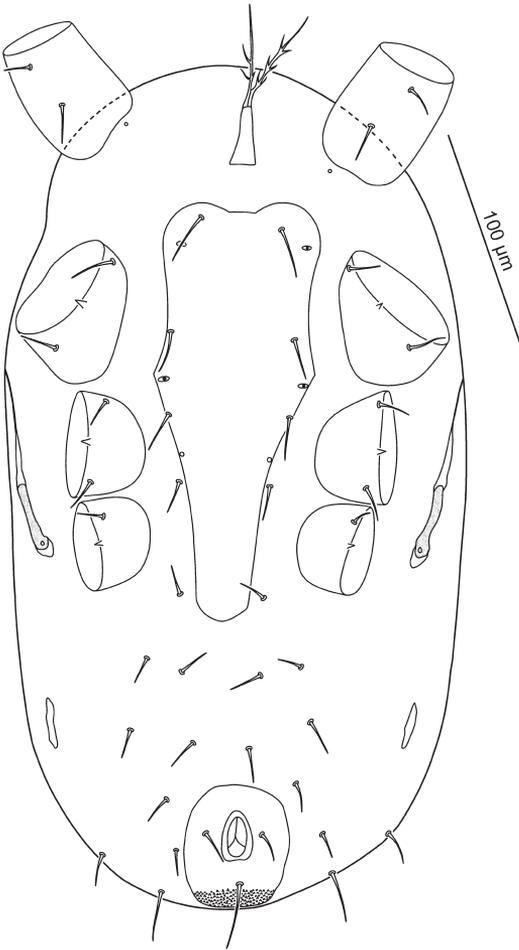


Fig. 11. *Arctoseius haarlovi*. Ventral view of deutonymph. Scale 100  $\mu\text{m}$ .

#### 4. Morphological variability

The most notable feature of morphological variability is the size of the idiosoma. Variability of the idiosoma size of *A. haarlovi* was compared with the data contained in the study by Haarløv (1942) concerning the population reported from Greenland.

According to Lindquist (1963), *A. haarlovi* females ( $N=12$ ) reported from Greenland were of lengths ranging from 413 to 456  $\mu\text{m}$  and of widths ranging from 162 to 181  $\mu\text{m}$ , whereas the dimensions of males ( $N=4$ ) were 358–376 $\times$ 138–147  $\mu\text{m}$ . Thus they were markedly smaller than those reported from Spitsbergen, where female ( $N=45$ ) idiosoma dimensions were 460–530 $\times$ 240–300  $\mu\text{m}$  and that of the males ( $N=8$ ) 375–415 $\times$ 195–

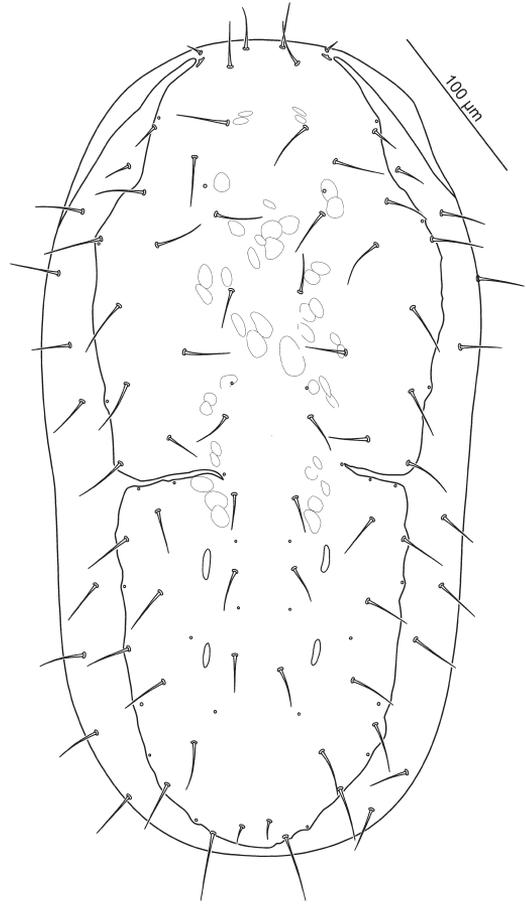


Fig. 12. Female of *Arctoseius haarlovi*. Morphological changes in chaetotaxy (lack of the setae S3 and S4). Scale 100  $\mu\text{m}$ .

230  $\mu\text{m}$ . The differences also concerned the deutonymphs since dimensions of the individual reported from Greenland ( $N=1$ ) were 350 $\times$ 135  $\mu\text{m}$ , whereas dimensions of those reported from Spitsbergen ( $N=4$ ) were 375–400 $\times$ 180–225  $\mu\text{m}$ .

In addition, the analysis included morphological variability concerning such features as the absence of sclerotization in some parts of the dorsal or ventral shields, duplication or reduction of some setae, as well as alteration of the shape of the epistome, as variability in these features is relatively common in specimens from the family Ascidae (Gwiazdowicz 2007). However, no substantial variability in the shapes of dorsal and ventral shields or epistome has been found in investigated specimens although there was clear variability in dorsal chaetotaxy.

Among the 53 *A. haarlovi* investigated specimens (45 females and 8 males), as many as 22 (18 females and 4 males, 41.5%), featured variability in chaetotaxy, for instance a lack of the setae S3 and S4 (Fig. 12). The most frequent case was the absence of single setae: J1 (in 1 specimen), J2 (1), J3 (5), Z1 (2), Z3 (1), Z4 (1), S2 (5), S3 (4), S4 (2).

Additionally, some specimens lacked a pair of setae: J3 (in 2 specimens), S2 (1), S3 (1). Such variability shows that in cases of describing a new species in the genus *Arctoseius*, a large number of specimens must be analyzed, otherwise the absence of a specific pair of setae could be recognized as a species-specific character.

A deeper analysis is required of the variability of the number of setae on femur II, of which there are usually 11. However, in some species of this genus variability exists even in a single specimen. A similar situation is found in some *A. haarlovi* specimens, in which 10 setae were found on one leg and 11 on the other. Such variability was found in 18% of females and 25% of males. Moreover, in two specimens 10 setae on both femur II were found.

## 5. Occurrence

So far, this species has been reported in north-east Greenland, Mørkefjord Station (Haarløv 1942) and also in Spitsbergen, Nova Zemlya, Wrangler Islands (Makarova 2000). It has been found in various microhabitats such as in *Cassiope* spp. plant communities (Haarløv 1942) or nests of *Larus* sp. (Makarova 2002). However, during this investigation it has been found in the surface layer of soil, between roots of many bryophyte and grass species and also in plant communities dominated by *Dryas octopetala* L., *Cassiope tetragona* (L.) D. Don or *Salix polaris* Wahlenb.

## 6. Differential diagnosis

In *A. haarlovi* 13 pairs of setae are located on the posterior of the schizodorsal shield. *A. brevichelis* has the same number of setae. The difference, however, relates to the absence of seta J4 in *A. haarlovi*, while *A. brevichelis* has no seta J1. A

characteristic trait of *A. haarlovi* is also a very short peritrema. In this genus, only *A. laterincisus* also has such a short peritrema but this species is much larger, the idiosoma in *A. laterincisus* is 750–800 µm long, while in *A. haarlovi* merely 413–530 µm in length and 161–300 in width.

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