

## The distribution and ecology of the mite *Ameronothrus dubinini* Sitnikova 1977 (*Acarina*, *Oribatei*) in northern Finland

Anne Laine, Markku Orell & Juhani Itämies

Laine, A., Orell, M. & Itämies, J. 1988: The distribution and ecology of the mite *Ameronothrus dubinini* Sitnikova 1977 (*Acarina*, *Oribatei*) in northern Finland. — Ann. Zool. Fennici 25:253–256.

*Ameronothrus dubinini* Sitnikova 1977 (*Acarina*, *Ameronothridae*) is reported for the first time in Finland. The mite was found most abundantly on Norwegian spruces in the Oulu area, but it also occurred in the inland areas of northern Finland. A possible connection with air pollution is discussed. SEM pictures of the dorsal and ventral side of one female are presented.

A. Laine, M. Orell & J. Itämies, Department of Zoology, University of Oulu, PL 191, SF-90101 Oulu, Finland.

### 1. Introduction

Mites living in soil and on vegetation have remained a poorly known group because of their small size and difficulties in their taxonomy. Karppinen & Krivolutsky (1982) compiled data concerning the distribution of species belonging to the suborder Oribatei in Europe. According to these authors the species *Ameronothrus dubinini* has not been encountered in Finland. So far it has been reported living in the soil of coniferous forests in the Leningrad area in the Soviet Union (Sitnikova 1977), as well as in Poland and on the Kola Peninsula (Karppinen & Krivolutsky 1982). In this paper we record new information concerning the distribution and ecology of this species.

### 2. Material and methods

Mites of the species *Ameronothrus dubinini*, among other invertebrates, were found on spruce *Picea abies* branches in the course of the "Air pollution and the invertebrate community of Norwegian spruce" project. Between February 1986–January 1987 a total of 220 branches were collected from 5 plots in northern Finland (Linnanmaa, Sanginjoki, Muhos, Taivalkoski

and Kuusamo, Fig. 1). In the Oulu area we collected in addition a total of 66 spruce branches in May and August 1987. The collecting sites ( $n=11$ ) were located around the city and along roads running northeastwards and eastwards from Oulu (Fig 2). One study plot was situated near the seashore at Ervastianranta, Haukipudas about 20 km north of Oulu (see Fig. 1).

The branches, which were about 2 m in length and 1.5 kg in dry weight, were cut from the lower parts of on average 10–15 m high spruces. In the laboratory the macroscopic invertebrates were collected manually, while the microscopic ones were collected using extraction cylinders in which the woody material was slowly dried. In 1986 each branch was extracted in its own cylinder. In 1987 extraction was carried out on the main branch, needle-bearing twigs, and epiphytic lichens separately.

In addition to the spruce samples mentioned above, 5 branches of the Scots pine *Pinus sylvestris* and 6 soil samples ( $25 \times 25$  cm) were collected at Linnanmaa in August 1987. Furthermore, 10 pitfall traps were set under large spruces at Vaala (Fig. 1) in September 1987. The intention was to obtain further information on the ecology of this mite species. In this paper all specimens (adults and nymphs) of *Ameronothrus dubinini* are considered.

### 3. Results and discussion

The mite *A. dubinini* has a dark colour and a robust build with an egg-shaped hysterosoma. Noto-

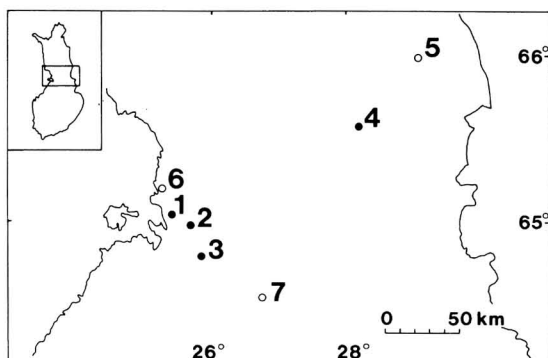


Fig. 1. The sites the material was collected in 1986 (1= Linnanmaa, 2= Sanginjoki, 3= Muhos, 4= Taivalkoski, 5= Kuusamo) and in 1987 (6= Haukipudas, 7= Vaala).

Table 1. Number of spruce branches studied and number of *A. dubinini*-specimens found in four study sites in northern Finland during February 1986–January 1987. The index refers to the number of individuals/1000 g dry weight of branch.

Study plot	Branches	<i>A. dubinini</i>	
		specimens	index
Linnanmaa	55	8346	148
Sanginjoki	50	753	19
Muhos	55	587	11
Taivalkoski	55	44	1
Kuusamo	5	3	1

gaster and femora are characterized by rough lines extending in all directions (Fig. 3). In the adults there are 15 pairs of notogastral hairs, whereas interlamellar hairs are lacking (Weigmann & Schulte 1977). The species has 4–5 pairs of hairs on the anal plate and 6 pairs on the genital plate (Sitnikova 1977, see also Fig. 4). In the related species *A. lapponicus* the corresponding hairs are 2 and 4 pairs respectively (Dalenius 1963).

The larvae of the genus *Ameronothrus* develop inside females which produce living nymphs (Thor 1931). These are similar to adults in their appearance and gradually attain their final size. They can with certainty be identified only by the genitals which are hidden under the genital plate.

In the samples collected during the period February 1986–January 1987 *A. dubinini* was most numerous at Linnanmaa, about 6 km north of the city of Oulu (Table 1). In other locations individuals were

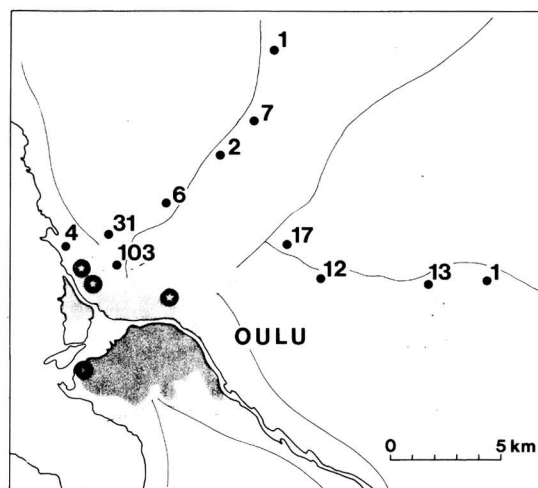


Fig. 2. The sampling sites near the city of Oulu (black dots). The numbers refer to *A. dubinini*-indices obtained in the summer of 1987. The most important emission sources are represented by stars.

obtained in much lower numbers. The numbers of *A. dubinini* were highest in samples collected in spring and autumn. A proportion of the individuals obviously overwinter on branches, because specimens were also found in mid-winter samples (Fig. 5).

The number of specimens captured at Linnanmaa amounted to 85% of the total material, i.e. the species seemed to favour spruce stands in that locality. Thus it is possible that the mite has a distribution in Finland which is concentrated along the coast of the Bothnian Bay. Other species of this genus are known to favour localities near shores and are found even on cliffs and meadows (Polderman 1974, Schulte 1975, Schulte et al. 1975, Weigmann & Schulte 1975, Schulte & Weigmann 1977, Gjelstrup & Søjting 1984). Only *A. lapponicus* seems to have spread into inland areas as well (Dalenius 1960).

In order to discover an explanation for the abundance of *A. dubinini* at Linnanmaa we collected more material in the Oulu area during the summer of 1987 (see Fig. 2). A total of 1708 specimens of *A. dubinini* were obtained from this material. The species was most numerous at Isko (index 103, Fig. 2), the location nearest to the city centre, whereas the corresponding index was only one third of that at Linnanmaa (31, Fig. 2), the most productive area in the previous year. At Taskila and Haukipudas, which are closest to the sea, the numbers were low, being 4 and



Fig. 3. A SEM picture of the dorsal side of an *A. dubinini* female.

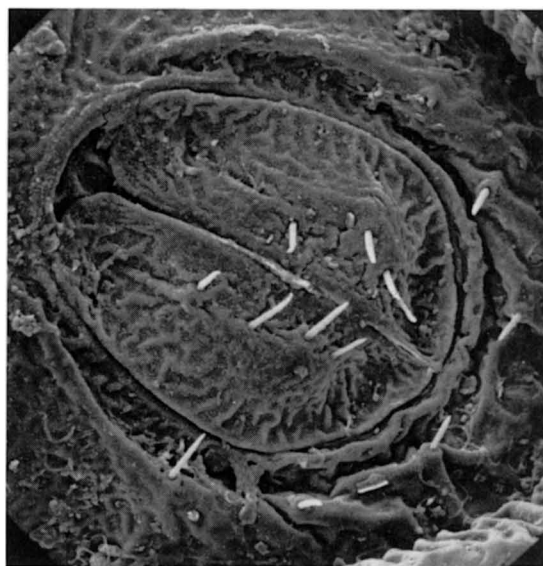


Fig. 4. A SEM picture of the anal plate of an *A. dubinini* female.

2 respectively. Along lines radiating northeast and east of Oulu this species was much more uncommon (range 1–17) than at Isko or Linnanmaa (Fig. 2).

According to these results the close proximity of the sea alone does not explain the abundance of *A. dubinini* near the centre of the city. The abundance may be a result of air pollutants causing different changes in the vegetation e.g. lack of lichens, an abundance of green algae, or biochemical changes in the needles. According to Schulte (1976) *Ameronothrus*-species live primarily on primitive fungi and algae and as nymphs they feed exclusively on unicellular microphytes. Perhaps *A. dubinini* takes advantage of green algae which are common in polluted areas and grow on trunks and branches at Oulu. The lichens, however, are not important for the existence of this species as individuals have tended to congregate in areas totally lacking in lichens (Isko), or where lichens are at least scarce (Linnanmaa).

*A. lapponicus* has been found on the Scots pine (Dalenius 1960) and it seems to be ecologically close to *A. dubinini*, favouring lichens growing on fallen trunks (Schulte 1976). At Linnanmaa no specimens of *A. dubinini* were found either in 6 soil samples or on 5 branches of the Scots pine taken in August 1987 when these mites were abundant on spruces. At Vaala 2 specimens were found in September 1987 using pitfall traps located under large spruces. Our observa-

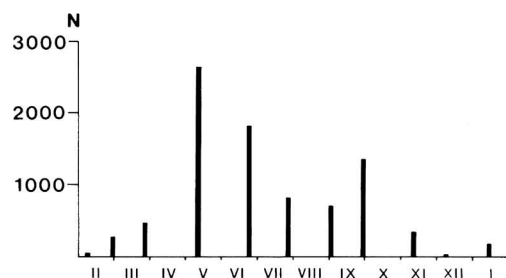


Fig. 5. Monthly numbers of *A. dubinini* obtained at Linnanmaa between February 1986–January 1987. One column represents the sum of the number of specimens found in 5 branches.

tions imply a close connection between *A. dubinini* and spruce branches from which individuals may at times fall to the ground. According to our results this species is common, in favourable habitats at least, in northern Ostrobothnia.

**Acknowledgements.** We would like to express our deepest gratitude to E. Karppinen and D. A. Krivolutsky for their help in determining the species. The comments of two anonymous referees improved the text. The work was financed by the Academy of Finland.

## References

- Dalenius, P. 1960: Studies on the Oribatei (Acari) of the Torneträsk in Swedish Lapland. I. A list of the habitats and the composition of their oribatid fauna. — *Oikos* 11:96–124.
- 1963: Studies on the Oribatei (Acari) of the Torneträsk territory in Swedish Lapland. V. Some interesting species. — *Arkiv för Zoologi* 16:1–8.
- Gjelstrup, P. & Søchting, V. 1984: Oribatid mites (Acarina) dominant in some lichen and moss species of marine rocks on Bornholm in the Baltic. — In: Griffiths and Bowmann (eds.), *Acarology* 6, vol. 1:528–533. Chichester.
- Karppinen, E. & Krivolutsky, D. A. 1982: List of oribatid mites (Acarina, Oribatei) of northern palaearctic region. I. Europe. — *Acta Entomol. Fennica* 41:1–18.
- Polderman, P. J. G. 1974: Some notes on the oribatid fauna of salt-marshes in Denmark. — *Acarologia* 16:358–366.
- Schulte, G. 1975: Holarktische Artareale der Ameronothridae (Acari, Oribatei). — *Veröff. Inst. Meeresforsch. Bremerh.* 15:339–357.
- 1976: Zur Nahrungsbiologie der terrestrischen und marinen Milbenfamilie Ameronothridae (Acari, Oribatei). — *Pedobiologia* 16:332–352.
- Schulte, G., Schuster, R. & Schubart, H. 1975: Zur Verbreitung und Ökologie der Ameronothriden (Acari, Oribatei) in terrestrischen, limnischen und marinen Lebensräumen. — *Veröff. Inst. Meeresforsch. Bremerh.* 15:359–385.
- Schulte, G. & Weigmann, G. 1977: The evolution of the family Ameronothridae (Acari Oribatei) II. Ecological aspects. — *Acarologia* 19:167–173.
- Sitnikova, L. G. 1977: Novie vidi pantsirnih klesei semeistv Ameronothridae i Hermanniiidae (Oribatei) fauni Sovetskava Sajuza. — *Parazitol. Sbornik* 27:160–163.
- Thor, S. 1931: Einführung in das Studium der Acarina (Milben). — *Die Tierwelt Deutschlands* 22:1–93.
- Weigmann, G. & Schulte, G. 1975: Ameronothrus schubarti n. sp. aus dem marinen Litoral Kaliforniens (Arachnida, Acari, Oribatei). — *Senckenberg. Biol.* 56:133–143.
- 1977: The evolution of the family Ameronothridae (Acari: Oribatei) I. Morphological aspects. — *Acarologia* 19:161–166.

Received 26.I.1988

Printed 25.XI.1988