

A small population of an endemic mite species of the Gondwanan genus *Austrotrititia* in Finland (Acari, Oribatida: Oribotritiidae)

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The ptyctimous oribatid species, *Austrotrititia finlandica* Niedbala & Penttinen, 2006, was described in Finland as the single representative of the genus in Europe. The main area of distribution of the Gondwanan genus *Austrotrititia* covers the Oriental, Australian and southeastern Palaeartic Regions. In order to describe the more exact distribution and habitat of *A. finlandica*, more localities were studied in 2008–2012. Four hundred soil samples were studied from the southwestern archipelago and the islets along the Finnish coast of the Baltic Sea, and sixty tree hollows on an island. The number of records of the species increased from four to thirteen. Most of the islets where it was found were characterized by their small size (less than 1 km²) and remote location. It is concluded that a small but permanent population of *Austrotrititia finlandica* lives in a limited area in the SW archipelago of Finland.

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1. Introduction

The oribatid *Austrotrititia finlandica* was recently found and described from Finland by Niedbala & Penttinen (2006). The species (Fig. 1) is the only representative of the genus in Europe. Two species, *A. herenessica* (Pérez-Íñigo, 1986) and *A. engelbrechti* Niedbala, 2006, have been recorded in the Afrotropical Region. The main area of the distribution of this Gondwanan genus includes the Oriental, Australian and southeastern Palaeartic areas (Aoki 1980, Niedbala 2002, 2009, Liu *et al.* 2009). So far, no species of the genus have been recorded in the Nearctic and Neotropical Regions.

After the description of *A. finlandica* in 2006, we considered further studies justified in order to better understand the distribution of the species. Such studies were partly associated to the work on the ‘Red List of Species’ in Finland (Rassi *et al.* 2010), and the results are presented in this paper.

2. Material and methods

The bulk of the studied material came from the “unsorted collection” of the Zoological Museum of Turku (ZMUT). The soil samples were collected by the staff during the years 1983–2008

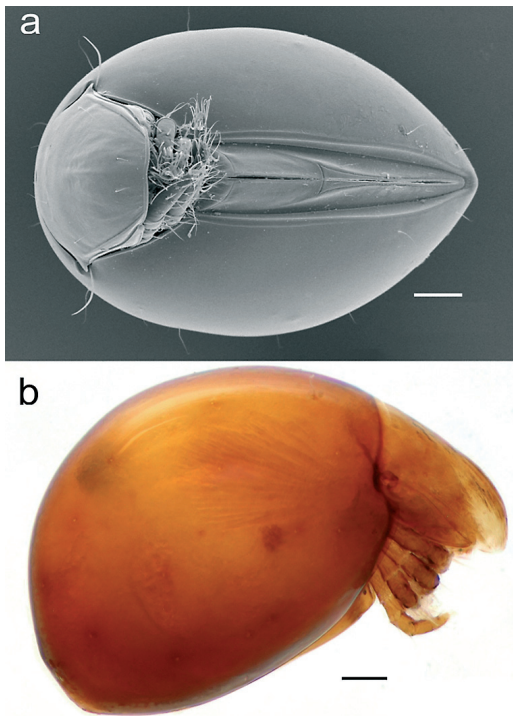


Fig. 1. *Austrotrititia finlandica*. – a. Ventral view. – b. Lateral view. Scales 100 μ m.

from different islands in the southwestern archipelago of the Baltic Sea. In addition, new soil samples were gathered during the years 2008–2012 from several islands and islets on the Finnish coast of the Baltic Sea. Altogether 400 soil samples were investigated. In addition, woody debris in the cavities of 60 old trees on the island Ruissalo (Turku) were sampled and studied in 2011. The study sites are shown in the map (Fig. 2).

The mites were extracted in Berlese funnels. The images have been taken by scanning electron microscope (SEM, JEOL JSM-5200) and by digital camera combined microscope (OLYMPUS SZX 16).

3. Results

By 2006, thirteen specimens of *A. finlandica* were found in 5 samples on four islands (Niedbała & Penttinen 2006). The further studies revealed 9 more localities. As a result, the species

was recorded in 16 samples on 13 islands. Altogether, 64 specimens were collected. The number of specimens in each sample was low (typically 1–6), except at two localities, Näsby (19) and Stora Hästö (11) (Appendix 1).

All the findings were made in the SW archipelago. No specimen was found on the islets of the Gulf of Finland or Gulf of Bothnia (Fig. 2). Neither did a systematic sampling, covering 15 habitat types and all the area of Finland, yield any specimen of the species (Huhta *et al.* 2010). According to the labels of the soil samples of the “unsorted” collection and a new material, the specimens were collected during thirty years.

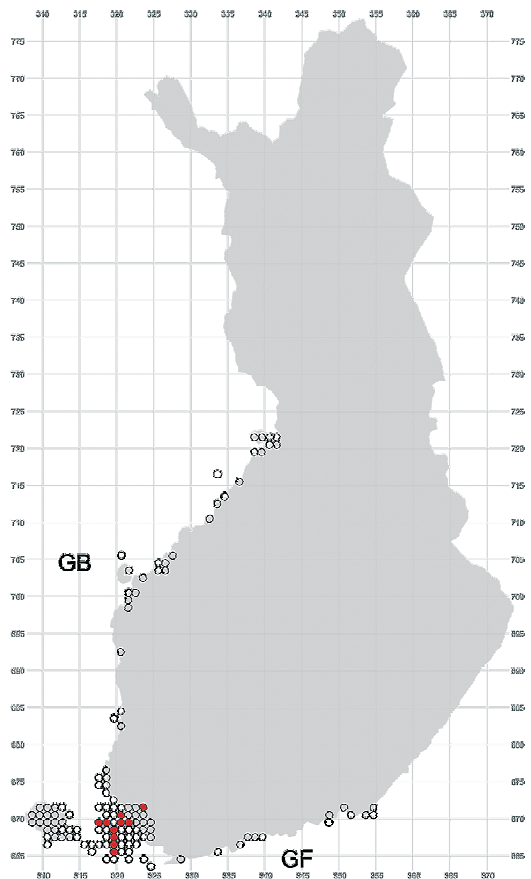


Fig. 2. Records of *Austrotrititia finlandica* in Finland (black dots), mapped using 10x10 km squares of the Finnish uniform Grid system (27°E). Circles represent squares from which samples were taken but the species was not found (inland samples not included). Many dots and circles include several soil samples. GF = Gulf of Finland, GB = Gulf of Bothnia.

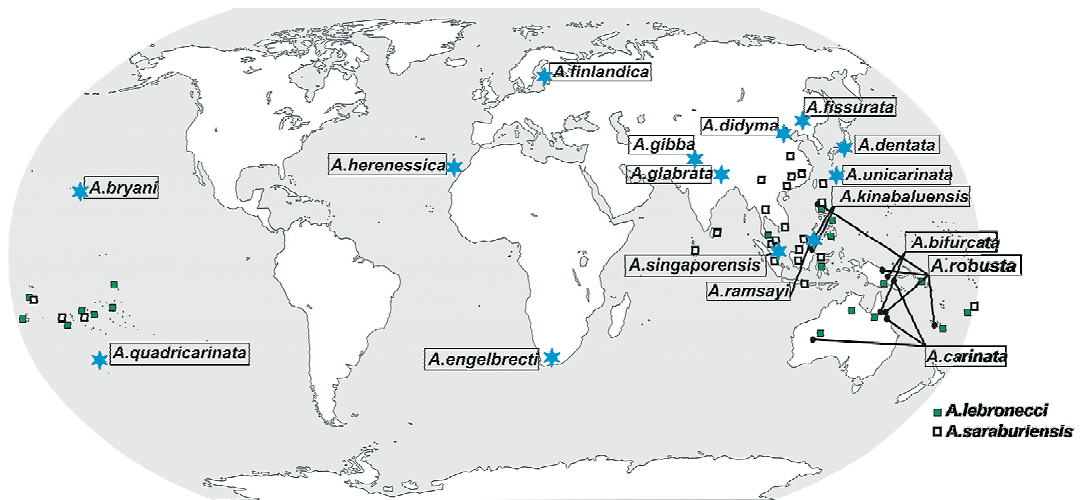


Fig. 3. Global distribution of *Austrotritia* species. Stars denote endemic species.

4. Discussion

Liu *et al.* (2009) listed 19 species in the genus *Austrotritia*. Thirteen of them have been found endemic, and seven of them have been recorded only on islands (Fig. 3). The endemic species *A. bryani* (Jacot, 1928a), *A. unicarinata* Aoki, 1980, and *A. quadricarinata* Sellnick, 1959 have been found on small and remote islands, under 50 km² in size. Almost all the findings of *A. finlandica* were also made on islands less than 1 km² in size, except Houts kari (Näsby) and Ruissalo, the latter one being a part of the city of Turku. The specimens were found mainly in the litter of deciduous trees and in rotten stumps close to the shoreline. Four specimens were collected in the woody debris of a tree hollow (*Sorbus aucuparia*) also close to the shoreline on the island of Ruissalo.

In the literature there is very little data on the habitat preferences of *Austrotritia* species, the exceptions being the widely spread species *A. lebronecci* (Jacot, 1934) and *A. saraburiensis* Aoki, 1965. Moss and deciduous litter seem to be their preferred microhabitat (Jacot 1934b, Hammer 1972, Niedbała 1998, 2006b).

Several hypotheses have been presented regarding the dispersal of oribatid mites to oceanic islands. Hammer (1982) considered that the majority of oribatid species reach the islands in Southern Pacific by sea currents, and the minority of them, for instance, by insects or humans. Dis-

persal by air currents is not possible, according to her, because oribatids would desiccate in the higher atmosphere. Nor did she consider dispersal by birds likely, because the migration routes follow the outlines of continents and go from north to south. In contrast to Hammer (1982), according to Schatz (1991), there are two main ways in which mites can reach islands: driftwood and transport by other animals, especially by birds. More recently, the spreading of oribatid mites by migratory birds has been proved by several other studies (e.g. Krivolutsky & Lebedeva 2002, 2004, Lebedeva 2012) as well.

The structure of the body surface is important in the spreading of mites. According to Hammer (1982), smooth and hard chitinous skin helps the dispersal better than soft skin with long hairs. These former characters fit the *Austrotritia* species. Niedbała (1998) has stated that Euptyctima have adapted to dispersal due to its hard and robust surface and the characteristic ability to draw legs under the prodorsum. In addition, large size may be useful e.g. against predators. On average, all *Austrotritia* spp. are large in size. *Austrotritia finlandica* is the second largest species of Euptyctima found in Finland after *Oribotritia fennica* Forsslund & Märkel, 1963 (Niemi *et al.* 1997, Niedbała 2011).

Apart from the specific ways of dispersal, it can be concluded that there lives a permanent and small population of *A. finlandica* in the area re-

stricted to SW Finland, as judged on the bases of the temporal and spatial distribution of the samples with the species present as well as the numbers of found specimens.

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Appendix 1. List of records of *Austrotritia finlandica*. Coordinates are given in Finnish uniform Grid system (27°E). The sample codes are shown in square brackets, all are deposited in ZMUT.

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- Houtskari, Björkö, Sundholm, 669:318, decaying birch, 8.VII.1985, P. T. Lehtinen leg., 6 exx. [ACA.ORI.PAL 7.006]
- Houtskari, Fiskö, Sandskär – NW, 669:317, stumps of *Sorbus aucuparia* & *Pinus sylvestris*, 9.VII.1985, P. T. Lehtinen leg., 6 exx. [ACA.ORI.PAL 7.011]
- Houtskari, Hypeis, Rostmansskär, 669:318, litter of *Populus tremula*, 9.VII.1985, P. T. Lehtinen leg., 1 ex. [ACA.ORI.PAL 7.008]
- Houtskari, Kittuis, 668:319, alder (*Alnus glutinosa*) thicket, 3.VI.1994, P. T. Lehtinen leg., 2 exx. [ACA.ORI.PAL 7.009]
- Houtskari, Mossala, Fjärdskär, 670:318, under bark of decaying, fallen pines, 3.VIII.1984, P. T. Lehtinen leg., 3exx.[ACA.ORI.PAL 7.010]
- Houtskari, Näsby, 669:318, Among *Primula veris* and litter of aspen, 3.VI.1994, P. T. Lehtinen leg., 19 exx. [ACA.ORI.PAL 7.007]
- Korppoo, Aspö, Ormskär, 6665:3196-7, heap of reed (*Phragmites australis*) and kelp (*Fucus vesiculosus*), 1.VIII.1985, P. T. Lehtinen leg., 2 exx. [ACA.ORI.PAL 0.094]
- Korppoo, Aspö, Ormskär, 6665:3196-7, within stump of decaying alder (*Alnus glutinosa*), 1.VIII.1984, P. T. Lehtinen leg., 1 ex. [ACA.ORI.PAL 0.098]
- Korppoo, Ävensör, Hevoslot, 6707:3200, nests of *Camponotus* sp./spp., *Lasius* & *Formica sanguinea*, 12.VI.1983, P. T. Lehtinen leg., 2 exx. [ACA.ORI.PAL 0.099]
- Korppoo, Brunskär, Stora Hästö, 667:319, mix of *Fraxinus excelsior* – *Populus tremula* – grass, 30.VI.1985, P. T. Lehtinen leg., 4 exx. [ACA.ORI.PAL 0.097]
- Korppoo, Brunskär, Stora Hästö, 667:319, litter of *Viburnum opulus*, 30.VI.1985, P. T. Lehtinen leg., 6 exx. [ACA.ORI.PAL 0.095]
- Korppoo, Brunskär, Stora Hästö, 667:319, within decaying *Populus tremula*, 30.VI.1985, P. T. Lehtinen leg., 1 ex. [ACA.ORI.PAL 6.668]
- Korppoo, Kärvois, Koilot, 6696:3204, pile of reeds (*Ph. australis*), 14.VIII.1982, P. T. Lehtinen leg., 1 ex. [ACA.ORI.PAL 6.667]
- Korppoo, Vidskär, 665:319, shore meadow with *Filipendula ulmaria*, *Rubus idaeus*, *Alnus glutinosa* etc., 13.V.–29.VI.1993, S. Koponen leg., 1 ex. [ACA.ORI.PAL 0.096]
- Nauvo, Stora Styrholm, 6696:3213, *Alnus glutinosa*, *Prunus padus*, *Sorbus aucuparia* litter, 30 m from seashore, 23.V.2005, S. Koponen leg., 5 exx. [ACA.ORI.PAL 0.101]
- Turku, Ruissalo, 6712512:3233365, tree hole of *Sorbus aucuparia*, 21.VI.2011, Matti Landvik leg., 4 exx. [ACA.ORI.PAL 7.140]
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