ORIBATID MITES IN THE LAKE MÄTÄJÄRVI

R. NIEMI

Zoological Museum, Department of Biology, University of Turku
SF-20500 Turku

Abstract

Three different periods can be separated in the development of the Lake Mätäjärvi. The first period is a sea phase. At that time the research area was a bay of the sea and the living conditions for the mites were impossible. In the second phase the lake had turned into some kind of waterside or swampy meadow with a high number of oribatid species and individuals. Human activities in the lake and in its environment make it difficult to interpret the biotope exactly. The low numbers of species and individuals as well as the appearance of certain compost species in the soil in the third phase indicate that the Lake Mätäjärvi is characterized by compost-like soil.

Introduction

Oribatid mites are small, usually less than 1 mm long arthropods, which almost without exception appear in the soil. Their habitats vary from low shores of the water systems to very dry lichen moors. The species composition of each habitat is regulated by physical, chemical, and biological factors of the soil. Oribatids are covered by hard chitin scale that remains in the soil after the animal has died and in suitable conditions stays determinable hundreds of thousands, even hundreds of millions of years. Krivolutsky (1973) has identified oribatids of Upper Jurassic deposits in the USSR. By now the oldest find is probably from Early Jurassic deposits in southern Sweden (Sivhed and Wallwork 1978). The oldest mites of this study, however, are only about two thousand years old.

Material and methods

Five 0.5 kg samples of soil were taken from the research area. Their location in the sediment column can be seen in fig. 1. The samples were cooked in the laboratory in diluted KOH-solution and afterwards sifted under tap water. The smallest aperture in the sieve was 0.125 mm. Mites were separated from different fractions by the aid of the paraffin/acetone method (Kenward 1974) and identified. Balogh's (1972) system was used to list the oribatid species (Table 1).

Results

22 oribatid families, 35 genera and 49 species were found in the Lake Mätäjärvi (Table 1). The total number of individuals was 343. The numbers of individuals and species are shown in fig. 2.

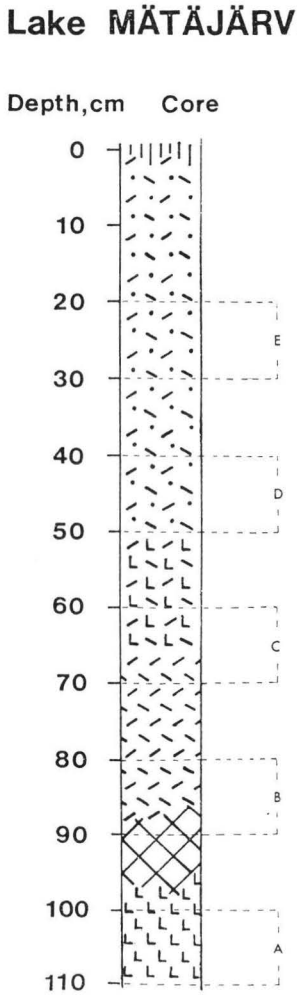


Fig. 1. The Oribatid samples in the sediment column.

Sample A (depth 110—100 cm) (figs 1 and 2) is from a very early period (from the beginning of our calendar). At that time Mätäjärvi still was a bay of the sea. The sediment was composed only of clay, so the sample must originate from relatively great depth and far away from the coast. The number of oribatid mites was three.

Sample B (depth 90—80 cm) can be dated back to the years 1260—1300. Just before this period the lake had become isolated from the sea. Besides the clay the sediment contained detritus mud and fragments of plants. The number of individuals was 113 and that of the species 17. The number of individuals belonging to the family Scutoverticidae was highest (60 %). Other remarkable families were Oppiidae, Tectocepheidae, and Oribatulidae. The species of wet meadows were the most common. In addition some so called general and cultural species also existed.

Sample C (depth 70—80 cm) is dated back to the 15th century. In addition to the clay the sediment consisted of rough detritus mud and rubbish. The number of individuals was the highest (134) as well as that of the species (34). The most remarkable changes were a decrease in the number of individuals in the family Scutoverticidae and

Table 1.

MALACONOTHRIDAE

Trimalaconothrus sp. Berlese, 1916

DAMAEIDAE

Epidamaeus sp. Bulanova-Zachvatkina, 1957

BELBODAMAEIDAE

Porobelba spinosa (Sellnick, 1920)

EREMAIDAE

Eremaeus oblongus C. L. Koch, 1836

ASTEGISTIDAE

Cultroribula dentata Willmann, 1950
Furcoribula furcillata (Nordenskiöld, 1901)

CARABODIDAE

Carabodes marginatus (Michael, 1884)
C. subarcticus Trägårdh, 1902
C. areolatus Berlese, 1923
C. labyrinthicus (Michael, 1879)
C. tenuis Forsslund, 1953

TECTOCEPHEIDAE

Tectocepheus velatus (Michael, 1879)
T. sarekensis Trägårdh, 1910

OPPIIDAE

Oppia unicarinata (Paoli, 1908)
O. ornata (Oudemans, 1900)
O. maritima (Willmann, 1929)
O. minus (Paoli, 1908)
O. sexmaculata Dalenius, 1950
O. nitens C. L. Koch, 1836
O. quadrimaculata Evans, 1952
Oppiella nova Oudemans, 1902
Quadroppia quadricarinata (Michael, 1885)

SUCTOBELBIDAE

Allosuctobelba grandis (Paoli, 1908)
Suctobelbella sp. Jacot, 1937

AUTOGNETIDAE

Autogneta longilamellata (Michael, 1885)

THYRISOMIDAE

Oribella pectinata (Michael, 1885)

CYMBAEREMAEIDAE

Cymbaeremaeus cymba (Nicolet, 1855)

MICREREMIDAE

Micreremus gracilior Willmann, 1931

SCUTOVERTICIDAE

Scutovertex minutus (C. L. Koch, 1836)

ORIBATULIDAE

Dometorina plantivaga Berlese, 1896
Eporibatula rauschenensis Sellnick, 1928
Oribata geniculatus (Linne, 1758)
Oribatula tibialis (Nicolet, 1855)

Paraleius leontonychus Berlese, 1910
Scheloribates laevigatus (C. L. Koch, 1836)
S. latipes (C. L. Koch, 1844)
S. pallidulus (C. L. Koch, 1840)
Zygoribatula exilis (Nicolet, 1855)
Z. propinquus (Oudemans, 1902)

CHAMOBATIDAE

Chamobates cuspidatus (Michael, 1884)

CERATOZETIDAE

Ceratozetella thienemanni (Willmann, 1943)
C. minimus (Sellnick, 1928)
Ceratozetes gracilis (Michael, 1884)
Trichoribates trimaculatus (C. L. Koch, 1836)
T. numerosus (Sellnick, 1924)
T. incisellus (Kramer, 1897)

MYCOBATIDAE

Punctoribates hexagonus Berlese, 1908
P. sellnicki (Willmann, 1928)

PELOPIDAE

Peloptulus phaenotus (C. L. Koch, 1844)

ORIBATELLIDAE

Oribatella calcarata (C. L. Koch, 1836)

ACHIPTHERIIDAE

Achipteria sp. Berlese, 1885
Parachiptheria punctata (Nicolet, 1855)

GALUMNIDAE

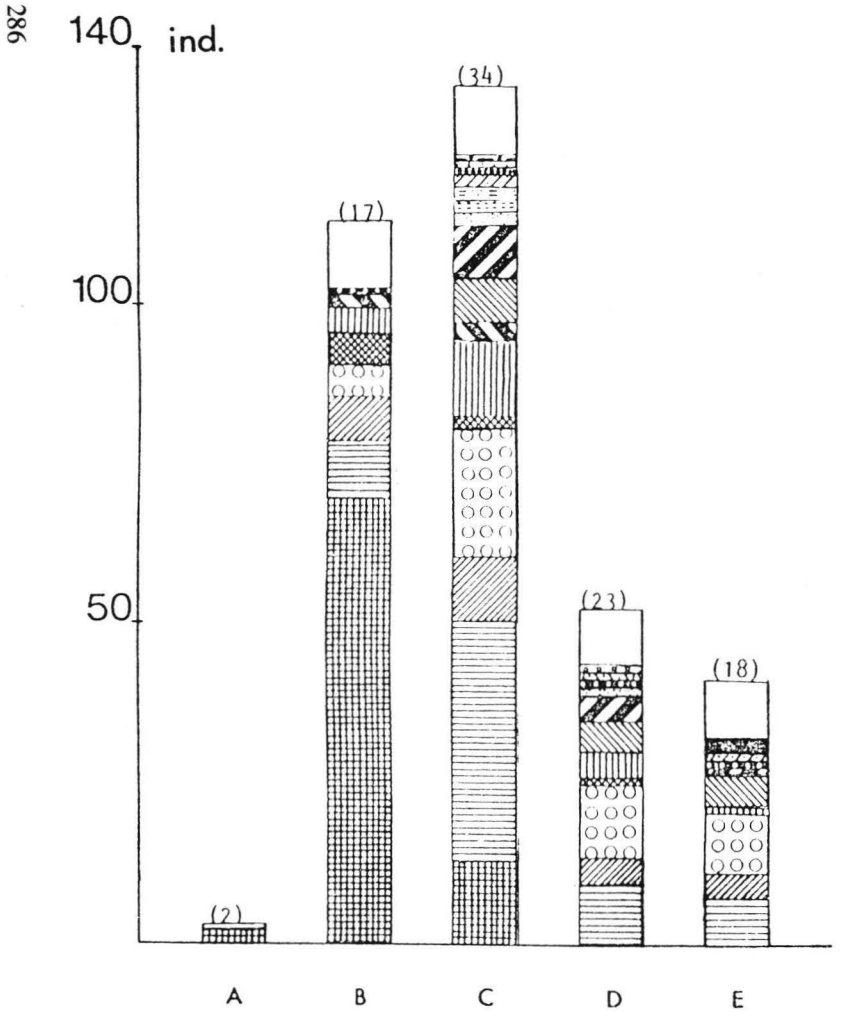
Galumna obvius (Berlese, 1913)

an increase in other families and also the migration of new mites to the research area. Twenty-eight per cent (28 %) of the number of individuals belonged to the family Oppiidae (figs 3 and 4). *Oppia nitens* and *O. sexmaculata* as so called cultural and compost species, as well as *Oppia ornata* and *Oppiella nova* as general species, were the most remarkable ones. Fauna of wet habitats increased e.g. *Scheloribates laevigatus, S. latipes, Zygoribatula exilis,* and *Z. propinquus.* New families were Micreremidae (fig. 5) and Carabodidae.

Samples D (depth 50—60 cm) and E (depth 30—20 cm) are dated back to the years 1500—1700. The sediment included clay, sand, gravel, and rough detritus mud. The numbers of individuals and species decreased remarkably. The species consisted mainly of the compost and general species but also of the species of wet habitats such as *Zygoribatula exilis, Oribata geniculatus,* and *Eporibatula rauschenensis.*

Discussion

Considering the numbers of species and individuals in the samples it can be clearly noticed that the living conditions of the oribatids have varied at different times. At first stage (sample A) the research area was a bay of the sea and the conditions were unsuitable for life. Those few oribatids found in this sample have probably drifted from the litoral and sunk to the bottom.



- Scutoverticidae
- Oppiidae
- Tectocepheidae
- Oribatulidae
- Mycobatidae
- Ceratozetidae
- Achipteridae
- Chamobatidae
- Micreremidae
- Carabodidae
- Eremaeidae
- Astegistidae
- Suctobelbidae
- Autognetidae
- Cymbaeremaeidae
- Pelopidae
- Oribatellidae
- Thyrisomidae
- Galumnidae
- Malaconothridae
  Damaeidae
  Belbodamaeidae
- Orib. sp. & juv.

( ) - Number of species in brackets

Fig. 2. Numbers of individuals and species/0.5 kg.

Fig. 3. Oppia ornata (Oudemans, 1900).

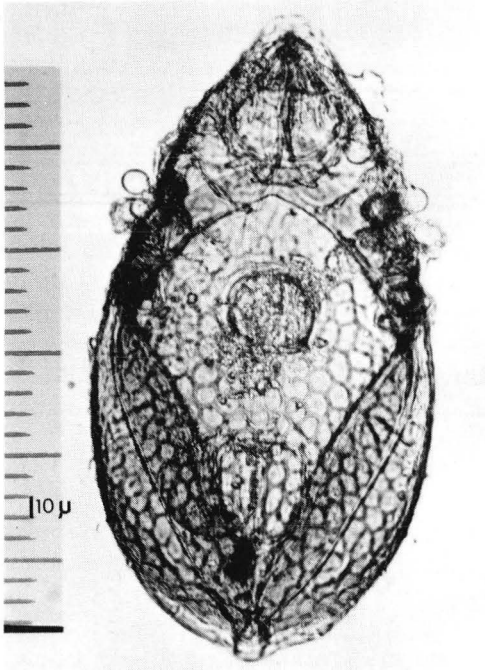


Fig. 5. Micreremus gracilior (Willmann, 1931).

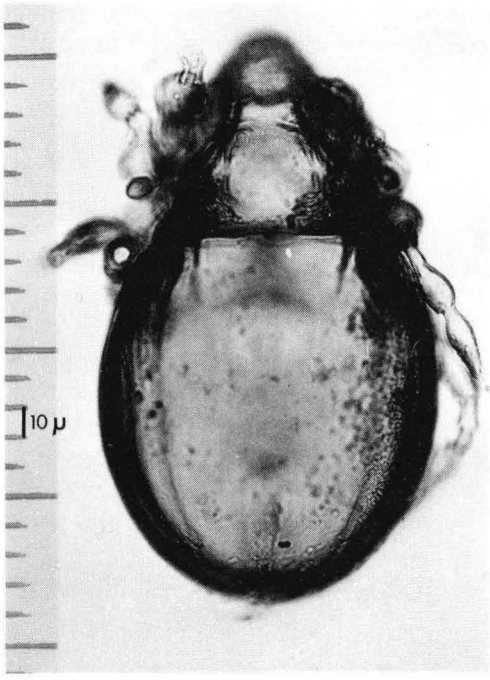


Fig. 4. Quadroppia quadricarinata (Michael, 1885).

After the lake had become isolated from the sea the moving and drying out of the shores happened. The digging of »krooppi» at the end of the 15th century further contributed to the drying out of the lake. For this reason the living conditions were favourable which is reflected in the numbers of individuals and species (samples B and C). The great majority of the species were those of moist habitats like waterside meadows becoming swampy. The high number of individuals and species of the family Oppiidae is due to the great amount of wood rubbish in the soil. The appearance of species belonging to the family Carabodidae indicates dryer conditions. The critical examination of the number of species in sample B shows a complete lack of the most typical shore species such as *Hydrozetes-, Limnozetes-,* and *Heterozetes-* species that usually are found in shore soil of sweet waters. The reason for this is probably hiatus or complete lack of the deposits between the years 660 and 1260 (see Räsänen et al., this volume). The species in sample B were representative of some kind of waterside meadow. The number of species in sample C was not the same any more because of human activities.

The number of individuals and species in samples D and E were considerably smaller than in the previous samples. The species consisted mainly of general species living in a variety of habitats as well as of species of compost heap and wet habitats. The alkalization of the soil due to human activities had reduced the living conditions by inhibiting the growth of mycelium, the nutrition of oribatid mites (Karppinen 1957). An increased speed of sedimentation also caused the low number of individuals.

It is difficult to construct the exact development of the lake because the information associated with the origin of the lake is missing due to the hiatus and the lack of the continuous series of samples (especially that of 100—90 cm). On the other hand, in the upper deposits the continuous series of samples is not as important because of gradual changes in the species. The small size of the samples also makes it difficult to explain the results.

REFERENCES

Balogh, J., 1972. The oribatid Genera of the world. 188 p. Budapest.

Karppinen, E., 1957. Die Oribatiden-Fauna einiger Schlag- und Brandflächen. Ann. Entomol. Fenn. 23: 181—203.

Kenward, H., 1974. Methods for palaeo-entomology on site and in the laboratory. Science and Archaeology no. 13: 16—24.

Krivolutsky, D., 1973. The evolutionary ecology trends and tempo of evolution in Palaearctic Oribatei. Proc. 3rd. Int. Congr. Acarology, Prague 1971, 91—94.

Sivhed, U. and Wallwork, J., 1978. An Early Jurassic oribatid from southern Sweden. Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100: 65—70.