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# Soil Protists and Soil Animals on Daikokujima

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## ABSTRACT

The soil protist and animal fauna of Daikoku-jima Island, North Japan, were surveyed. Testate amoebae, ciliates and flagellates (Protist) were isolated and sequenced for identification. Oribatid mites, collembolans and earthworms were identified under light microscopy. Thirty-five families and 57 species of oribatid mites were recorded. One species and one subspecies were described. Three species were newly recorded from Japan. Seven families and 45 species of collembola were collected from 12 stations. Two families and two species of earthworm were collected and one species of them was redescribed.

**Keywords:** Ciliates, Collembola, Earthworms, Flagellates, Oribatida, Soil animals, Soil protists, Testate amoebae

## INTRODUCTION

Daikoku-jima is a tiny island, however, we can easily find a large diversity of species that live in the soil habitat. We focused on the protist as micro-fauna-flora, arthropod (mesofauna) and earthworm (macro-megafauna) taxonomic groups. As far as we are aware of, no taxonomic works on soil protists and earthworms have been undertaken for the island. In general, hundreds of thousands of protists live in any one-gram of soil. In this study, we investigated several groups of soil protists from the Daikoku-jima.

The oribatid fauna, which belongs to the mesofauna of Daikoku-jima, comprises 56 species reported from 17 sampling points [1]. The collembolan fauna, another mesofauna, has been known to consist of 25 species from 17 sampling points, based on an initial study undertaken in 1981 [2]. A recent faunal study, which was conducted under the COE program at Hokkaido University during 2004-2006,

has yielded numerous groups of soil organisms from the soil samples.

## MATERIALS AND METHODS

In Daikoku-jima (42°57'N, 144°52'E), more than fifty soil samples were collected during 5 excursions from 2004 to 2006. Soil protists (testate amoebae, ciliates and flagellates) were isolated and sequenced with single cell PCR technique for identification [3]. The oribatid mite and collembora were extracted by Tullgren funnels, and immediately fixed and preserved in 70–80% ethanol. After this procedure, the mites were mounted on slides and studied under light microscope. Earthworm specimens were collected by hand from litter and soil, and immediately fixed and preserved in 70–80% ethanol. After observation in Yokohama National University, these specimens were substituted with formaldehyde.

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## RESULTS AND DISCUSSION

### Soil testate amoebae (: Protist)

A species of the genus *Cyclopyxis* (Testate amoeba) was collected from soil of coastal vegetation at Daikoku-jima. These specimens, approximately 50 individuals, were studied by light microscopy and scanning electron microscopy. They belonged to *Cyclopyxis* (Deflandre, 1929) according to some morphological characters. [Because of their very small size, these specimens, they were compared with species of *Cyclopyxis* and with those of other genera of similar size. The specimens did not fit any described species.

### Soil ciliates (Protist: Ciliophora)

The study was done in 2005. Some strains of ciliate were isolated and successfully cultured. We tried to identify these with impregnations and sequence analysis of SSU rDNA by single-cell PCR. For instance, five strains from soil of coastal vegetation same as testate amoeba were identified as class Spirotrichea, subclass Stichotrichia, and considered to belong to four species in three genera.

### Soil Flagellates (: Protist)

As to the soil flagellates living in Daikoku-jima, so far we have established one culture strain of *Goniomonas*, four strains of cercozoans, 38 strains of stramenopiles (class Chrysophyceae) and 34 strains of kinetoplastids. We have examined morphology and phylogenetic affinities of these flagellates using the culture strains obtained. For phylogenetic analyses, we used SSU rDNA sequences. Many of the strains from same locality turned out to be the same species. In the cercozoans, we recognized 1 species of the genus *Cercomonas* and 1 species of *Thaumatomonas*. In the study of the stramenopiles, we recognized three species, all of which possess *Spumella*-like morphology. However, molecular phylogenetic study revealed that these three species are in fact only distantly related.

### Oribatid mites (Chelicerata: Acari: Oribatida) and Springtails (Apterigota: Collembola)

From twelve stations, 58 species of oribatid mites representing 35 families and forty five species of collembola were collected. The samples of oribatid mites included a new species and a new subspecies [4].

### Earthworms (Annelida: Clitellata)

Two species (*Dendrobaena octaedra* (Savigny, 1826) and *Eisenia japonica* (Michaelsen, 1892)) of the family Lumbricidae and a species of the family Megascolecidae were recorded. Of these, the latter species, i.e. *Amyntas yunoshimensis* (Hatai, 1930) was studied in detail [5].

In this survey, we have investigated various groups of soil protists and animals. Although it is clear that the island's surface soil holds rich fauna, our understanding of these organisms is still limited. Many of the species have been identified only up to generic rank. Therefore, more detailed studies on these soil organisms are seriously needed.

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