Oribatid mites of Daikoku-Jima Island of Hokkaido, northern Japan

(Acari: Oribatida)

Jun-ichi Aoki and Satoshi Shimano

1 Nishi-Azabu, Minato-ku, Tokyo, 106-0031 Japan
2 Environmental Education Center, Miyagi University of Education, Aramaki Aza-Aoba, Aoba-ku, Sendai city, Miyagi, 980-0845 Japan

Abstract — The oribatid mite fauna of Daikoku-Jima Island, northern Japan, was surveyed. Thirty-four families, 45 genera and 56 species of oribatid mites were recorded there. Three of these species, Hafenrefferia gilvipes (C.L. Koch, 1839), Oribella pectinata (Michael, 1885), and Eupelops curtipilus (Berlese, 1916), are newly recorded from Japan.

Key words — Daikoku-Jima Island, Hokkaido, new record in Japan, oribatid mites

Introduction

Daikoku-Jima Island is a small island, 1.08 km² in area, and the highest point is 105 m above sea level. It is located about 3 km from Akkeshi Town, Hokkaido, northern Japan, on the Pacific Ocean. The surrounding cliffs give the island a trapezoid cross-section with sandy beach. The island has some flat parts containing wooded areas and grass fields. Many kinds of birds live there, including Leach’s storm-petrel (Oceanodroma leucorhoa) a migrant bird that creates nesting-burrows in the ground of grassy fields.

The oribatid mite fauna of Daikoku-Jima was investigated initially by Ohnishi (1981), who reported 56 species from 17 sampling points. Some were not fully identified: for instance, Liacarus chiebunensis akkeshi Aoki, 2006 was mentioned as Liacarus sp. in his report (Ohnishi, pers. comm.). Later, in 2004, the second faunal study was started in Hokkaido University’s COE program (e.g. Ito et al., 2007), and many oribatid specimens were obtained from soil samples collected during 2004–2006. Among them, Hermannia shimanoi was recently described as a new species from Daikoku-Jima (Aoki, 2006). Our purpose is to clarify the fauna of oribatid mites collected from various environments in the Daikoku-Jima as a part of the program.

Materials and methods

In Daikoku-Jima (42°57’N, 144°52’E: Fig. 1), 16 soil samples were taken at several different times (Table 1). Oribatid mites and soil arthropods 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 a light microscope.

Species in Daikoku-Jima

Thirty-four families, 45 genera and 56 species of oribatid mites recorded from Daikoku-Jima are listed below. The sample code in this survey (Table 1) is shown for each species. [***: species new to Japan, **: species new to Hokkaido, *: species not recorded by Ohnishi (1981). †: Ohnishi (2010) recorded from Hokkaido after submission of this manuscript.]

HYPOCHTONIIDAE BERLESE, 1910
Hypochthonius nufulus C.L. Koch, 1836 01-002, 01-004, 02-001, 02-003, 02-004, 02-005, 02-006.
*Hypochthonius luteus Oudemans, 1917 02-005.

ENIOCHTHONIIDAE GRANDJEAN, 1947
Hypochthoniella minutissima (Berlase, 1904) 02-005.

EULOHMANNIIDAE GRANDJEAN, 1931
*Eulohmannia ribigai (Berlase, 1910) 01-002, 01-004.

ORIBOTRITIIDAE GRANDJEAN, 1954

EUPHITHIRACARIDAE JACOT, 1930
Acrotritia ardua (C.L. Koch, 1841) 01-005, 01-013, 02-001.

PHTHIRACARIDAE PERTY, 1841
*Phthiracarus setosus (Banks, 1895) 02-001, 02-005. Atropacarus strigulus (C.L. Koch, 1836) 02-004, 02-005, 02-012.

MALACONOTHRIDAE BERLESE, 1916
Malacothorbus sp. 02-005, 02-012.
Fig. 1. The sampling points on Daikoku-Jima Island, Hokkaido. A sample code (Table 1) is given to each sampling point. Arrow: location of Daikoku-Jima Island.

NOTHRIDAE BERLESE, 1896
Notthus palustris C.L. Koch, 1839 02-001, 02-003, 02-004, 02-005.
*Notthus ezoensis* Fujikawa, 1999 01-013, 02-002.
**Notthus sadoensis** Fujikawa, 1999 02-006, 02-009.

CAMISIIDAEOUDEMANS, 1900
Heminothrus yamasakii Aoki, 1958 02-001, 02-003, 02-004, 02-005.

NANHERMANNIIDAESELLNICK, 1928
Nanhermannia nana (Nicolet, 1855) 01-004, 02-004, 02-009, 02-012.
Nippohermannia parallela (Aoki, 1961) 02-002, 02-004.

HERMANNIIDAESELLNICK, 1928
Hermannia shimanoi Aoki, 2006 01-018, 02-008.

DAMAEDAEBERLESE, 1896
Damaeidae sp. 02-001, 02-012.

CEPHEIDAEBERLESE, 1896
*Cepheus cepheiformis* (Nicolet, 1855) 02-001, 02-004, 02-005.
*Cepheus hokkaiensis* Fujikawa, 1992 02-005.

NODOCEPHEIDAEPIFL, 1972
*Nemacepheus dentatus* Aoki, 1968 02-012.

LIACARIDAESELLNICK, 1928
Liacarvs acutidens Aoki, 1965 02-004.
*Liacarvs chiebunensis akkeshi* Aoki, 2006 01-012, 02-001, 02-002, 02-003, 02-004, 02-005, 02-006, 02-007, 02-009.

XENILLIDAEWOOLLEY and HIGGINS, 1966
*Xenillus tegeocranus* (Hermann, 1804) 02-005.
Table 1. The sampling points for oribatid mites on Daikoku-Jima Island, Hokkaido.

<table>
<thead>
<tr>
<th>Sample code</th>
<th>Location</th>
<th>Date</th>
<th>Collector*</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-002</td>
<td>Grassy field</td>
<td>15-18-VI-2004</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>01-004</td>
<td>Small wooded area</td>
<td>15-18-VI-2004</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>01-005</td>
<td>Grassy field</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>01-009</td>
<td>Beach</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>01-012</td>
<td>Beach</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and sand</td>
</tr>
<tr>
<td>01-013</td>
<td>Beach</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and sand</td>
</tr>
<tr>
<td>01-018</td>
<td>Beside pond</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>01-019</td>
<td>Beside pond</td>
<td>11-14-VII-2005</td>
<td>C-S-I</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-001</td>
<td>Small wooded area</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-002</td>
<td>Small wooded area</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-003</td>
<td>Petrel burrow in soil</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-004</td>
<td>Grassy field</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-005</td>
<td>Grassy field</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-006</td>
<td>Grassy field</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-007</td>
<td>Sea gull's nest (grass)</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Soil and litter</td>
</tr>
<tr>
<td>02-008</td>
<td>Coastal vegetation</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Sand</td>
</tr>
<tr>
<td>02-009</td>
<td>Japanese butterbur field on beach</td>
<td>15-VII-2006</td>
<td>S</td>
<td>Sand</td>
</tr>
<tr>
<td>02-012</td>
<td>Kelp mass washed onto beach</td>
<td>15-VII-2006</td>
<td>S</td>
<td>decaying kelp</td>
</tr>
</tbody>
</table>

* C-S-I: A.R. Chittenden, Y. Saito and K. Ito; S: S. Shimano (the author).

Table 2. Comparison of some characters of *Oribella pectinata* (Michael, 1885) among three papers.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamella</td>
<td>long, slender ridge</td>
<td>long, slender ridge</td>
</tr>
<tr>
<td>Sensillus (not illustrated)</td>
<td>long, gently with a distinct and swollen portion</td>
<td>with short swollen portion</td>
</tr>
<tr>
<td>Ventral setae all distinctly</td>
<td>?</td>
<td>only aggenital setae pectinate and a part of epimeral setae pectinate</td>
</tr>
<tr>
<td>Notogastral setae densely pectinate</td>
<td>moderately barbed</td>
<td>minute barbed</td>
</tr>
</tbody>
</table>

**TENUIALIDAE JACOT, 1929**

***Hafenrefferia gigipes*** (C.L. Koch, 1839) 01-012, 02-005.

*Tenuialoides fusiformis* Aoki, 1969 02-005.

**EREMOBELIDAE BALOGH, 1961**

*Eremobelba japonica* Aoki, 1959 02-004, 02-005, 02-006.

**ORIBELLIDAE KUNST, 1971**

***Oribella pectinata*** (Michael, 1885) 02-003.

*Oribellopsis kushiroensis* Aoki, 1992 01-009.

**OPPIIDAE GRANDJEAN, 1951**

*Oppiella nova* (Oudemans, 1902) 02-004, 02-008, 02-012.

*Neotrichoppia zushi* (Aoki, 1984) 01-019.

*Multioppia brevipectinata* Suzuki, 1975 02-001.

*Brachioptia* sp. 02-005.

Oppiidae sp. 02-002.

**SUCTOBELIDAE JACOT, 1938**

*Suctobelbella* sp. 02-005, 02-009.

**TECTOCEPHEIDAE GRANDJEAN, 1954**

*TECTORIBATIDAE GRANDJEAN, 1954* 004, 02-005.

*LEPIDOZETIDAE GRANDJEAN, 1954* 02-001, 02-002, 02-005, 02-007.

***TEGORIBATIDAE GRANDJEAN, 1954***

*Lepidozetes dashidorzsi* Balogh & Mahuncia, 1965 02-001, 02-002, 02-005, 02-007.

***ORIBATELLIDAE JACOT, 1925***

*Oribatella* sp. 02-004, 02-005, 02-006.

**CERATOZETIDAE GRANDJEAN, 1925**

* Ceratozetes gracilis * (Michael, 1884) 02-001, 02-003, 02-004, 02-005, 02-007.

*Melanozetes meridianus* Sellunick, 1928 02-007.

†*Ghilaroviczetes maruyamae* Hirauchi, 1999 02-007.

Ceratozettidae sp. 02-004.

*Trichoribates* sp. 01-002, 01-004, 01-009, 02-001, 02-002, 02-006, 02-007.

**CHAMOBATIDAE GRANDJEAN, 1954**

*Chamobates geminus* Fujikawa, 1997 02-012.

**LIEBSTADIIDAE BALOGH & BALOGH, 1984**

*Liebstadia similis* (Michael, 1888) 02-003, 02-004, 02-006.

**SCHELORIBATIDAE GRANDJEAN, 1933**

*Scheloribates pallidulus* (C.L. Koch, 1841) 02-001, 02-005,
02-006.
(=S. latipes (C.L. Koch, 1844))
Scheloribates sp. 02-002, 02-003, 02-005, 02-007, 02-009.

HAPLOZETIDAE GRANDJEAN, 1936
Lauritzenia sp. 02-005.

PROTORIBATIDAE BALOGH & BALOGH, 1984
Protoribates sp. 02-005.

MOCHLOZETIDAE GRANDJEAN, 1960
Unguizetes sp. 02-001, 02-002, 02-003, 02-005, 02-006.

ORIBATULIDAE THOR, 1929
*Oribatula sakamorii (Aoki, 1970) 02-007.
(=Eporibatula sakamorii (Aoki, 1970))
*Phaulopria tuberosa (Fujikawa, 1972) 02-001.
(=Eporibatula tuberosa Fujikawa, 1972)

PARAKALUMMIDAE GRANDJEAN, 1936
Neoribates roubali (Berlese, 1910) 02-001, 02-004.
*Neoribates parvisetiger (Aoki, 1965) 02-001, 02-005.
(=Protokalumma parvisetigerum Aoki, 1965)

Species Newly Recorded from Japan

Oribella pectinata (Michael, 1885)
[Japanese name: Kenaga-oona-dani]
(Figs. 2A-C)

Notaspis pectinata Michael, 1885; 1888.
Dameosoma crinitum Berlese, 1916.
Oribella pectinata: Berlese, 1908; Willmann, 1931; van der Hammen, 1952; Fujikawa, 1978; Bernini, 1980.
Xenillus pectinatus: Oudemans, 1913; Sellnick, 1928.
Xenillus limburgensis: Oudemans, 1912.

Sample code. 02-003.
Measurement. Body length 294-330 (av. 308) μm. width 165-192 (av. 175) μm.
Distribution. Europe, USA and Japan (new record).

Remarks. We are confident that the specimens from N. Japan represent Oribella pectinata (Michael), although some differences can be detected among the detailed redescriptions of European specimens by Fujikawa (1978) and Bernini (1980) and the Japanese materials as mentioned below (Table 2). Lamella are drawn by these authors as slender ridges, but in the Japanese materials they each consist of a basal short strong ridge with fine striation and an anterior row of several light spots connecting the ridge and insertion of lamella seta. In the figures of Bernini (1980) the sensillus seems to have a long, gently swollen portion, while in the Japanese specimens it has a more distinct and short swollen portion. Fujikawa (1978) illustrated all ventral setae of the Oudemans’s collection as being distinctly pectinate, while in the Japanese materials only aggenital setae, and a part of the epimeral setae are distinctly pectinate (Fig. 2C). The notogastal setae of the Japanese specimens are not so densely barbed as in Fujikawa’s figure of the Michael’s type specimen. However, specimens were not compared directly, and because we are uncertain if these differences are real, the Japanese specimens are determined at the present moment as belonging to the European species, O. pectinata.

Eupelops curtipilus (Berlese, 1916)
[Japanese name: Chibige-enma-dani]
(Fig. 2D)

Pelops curtipilus Berlese, 1916.

Sample code. 02-001, 02-003, 02-004, 02-005.
Measurement. Body length 545-595 (av. 553) μm. width 410-475 (av. 444) μm.
Distribution. Europe, South Africa and Japan (new record).

Remarks. The characteristic features of this species are (1) strongly barbed interlamellar setae, (2) clavate sensilli, (3) short notogastral setae, (4) the anterior median projection of notogaster with a flat margin or with a very weak swelling, and (5) body surface minutely granulate.

Hafenrefferia gilvipes (C.L. Koch, 1839)
[Kombou-marutusuya-dani]
(Fig. 2E)

Oribata gilvipes C.L. Koch, 1839.
Liacerus auritus Nordenskiöld, 1901.
Liacerus pterotus Coggi, 1900.

Sample code. 01-012, 02-005.
Measurement. Body length approximately 900 μm; unfortunately, the specimens were broken before we could observe them.
Distribution. Palaearctic region: Japan (new record).

Remarks. The characteristic features of the species are (1) lamella connecting with short interlamella at a level slightly anterior to their middle, (2) lamellar cusps projecting forward in parallel, (3) sensilli nearly setiform, (4) pteromorpha sharply pointed anteriorly, and weakly bending outward.

**Species Newly Recorded from Hokkaido**

*Nothrus sadoensis* Fujikawa, 1999

*(Fig. 2F)*

*Nothrus sadoensis* Fujikawa, 1999.


**Sample code.** 02-006, 02-009.

**Measurement.** Body length 745-780 (av. 756) μm, width 370-395 (av. 383) μm.

**Distribution.** Japan (Sado Island as the type locality and Daikoku-Jima, new record from Hokkaido).
Remarks. The species has been known only from the type locality, Sado Island, Japan (Fujikawa 1999). It is reported from Hokkaido for the first time. The specimens of Sado Island are slightly larger (body length 785-857 (av. 821) μm, width 428-485 (av. 457) μm).

Discussion

The faunistic data in this paper do not indicate any remarkable tendencies between distributions of oribatid mites and environments in Daikoku-Jima Island. The species number, 56 species, is similar to that of Ohnishi (1981), however, the appearances of some particular species are notable.

Two of the three species newly recorded from Japan—Oribella pectinata and Eupelops curtipilus—were found in the soil sample (sample code, 02-003 in Table 1) from the opening of a nest burrow of a migrant petrel (O. leucorhoa). In particular, O. pectinata was found only from this sample. Krivolutsky and Lebedeva (2004) recorded 146 species of living oribatid mites from feathers of 150 bird species. In their report, Oribella castanea, O. paoli, Eupelops torulosus and E. sp. were found from the plumage of some bird species (not including O. leucorhoa). Lebedeva and Krivolutsky (2003) reported living oribatid mites from birds’ bodies; they found 44 out of 64 species from soils in Arctic islands. They discussed that oribatid mites and other microarthropods that were found in soil covered with ice under severe climatic conditions of Arctic islands were probably spread to the islands by birds. Although the list of Lebedeva and Krivolutsky (2003) did not include species of Oribella or Eupelops, it seems likely that the migration of birds could help to widen oribatid mite distributions in islands of the subarctic zone, including Daikoku-Jima Island.

Additionally, Ghiarorizetes mariyamai was found only from the nest of a sea gull (sample 02-007), Larus schistisagus. Several previous studies have shown that various oribatid mite species inhabit the nest of birds (e.g. Nordberg, 1936; Krivolutsky et al., 2001). O. pectinata was included in one such report (Nordberg, 1936).

To authors’ knowledge, the relationships between bird/bird-nest and oribatid mites still have not been studied in Japan. Thus, important ecological and biogeographical themes (e.g. do birds help dispersion of soil mites?) remain to be studied in several climate zones and archipelago areas of Japan.

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References


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