

Myxomycetes (Myxogastria) of Nampo Shoto (Bonin & Volcano Islands) (3)

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Abstract In an exploration of Nampo Shoto (Southern Islands, consisting of the Ogasawara and Volcano islands) in June 2009, 22 myxomycete taxa were documented based on 44 specimens. Of these, *Fuligo candida* and *Stemonitis pallida* were newly documented.

Key words: Kita-Iwojima Island, taxonomy.

Introduction

To date, approximately 1000 taxa of myxomycetes have been described worldwide, with some 400 taxa being recorded in Japan (Yamamoto, 1998). The majority of the Japanese records are based on Japan's main islands, whereas smaller islands have not been well surveyed, with the exception some areas that have been surveyed with special attention (e.g., the islands of Yakushima and Iriomote).

Located in the mid-Pacific Ocean, the so-called "Nampo Shoto" (Southern Islands), comprising the Ogasawara (Bonin) Islands and Volcano Islands, consist of approximately 30 islands. The Ogasawara Islands are located some 1000 km south of Tokyo. They are volcanic islands, formed by mid-ocean volcanic eruptions. Although surveys have been conducted on the flora, fauna, and mycobiota from the perspective of the origin of these islands, few investigations have been carried out on the myxomycetes.

The Volcano Islands, which are under the jurisdiction of the Ogasawara Islands, are composed of three islands, namely, Kita-Iwojima, Minami-Iwojima, and Iwojima, that lie approxi-

mately 200 km south of the Ogasawara Islands. Although Minami-Iwojima has been uninhabited since recorded history, Kita-Iwojima was colonized in 1899, but has been uninhabited since 1944 when the inhabitants were forced to evacuate the island during the war. Because of their geographical isolation and the relative lack of human activity, the natural life on both islands has been receiving attention from researchers. However, because of severe geographical and environmental conditions, approaching these islands is generally extremely difficult.

Fortunately, the authors of this paper were able to accompany one such biota assessment exploration team to Kita-Iwojima Island. Kita-Iwojima (25°26'N, 141°17'E) has an area of 5.57 km², a periphery of 8 km, and extends 3.3 km from south to north and 2.1 km from east to west. Prior to the end of the 20th century, there had been no attempts to assess the biological resources on the Volcano Islands. However, since 2000, researchers have begun visiting the islands to examine the vegetation, insects, bats, and birds. Nevertheless, to date, there have been no explorations specifically for myxomycetes. Because the mycobiota (particularly the smaller fungi and

myxomycetes) on the Volcano Islands is scarcely known, the authors mainly collected microfungi, ascomycetes, and myxomycetes. Preliminary lists of the former fungi have been published previously (Hosoya *et al.*, 2011). In the present paper, the authors documented the myxomycetes of Kita-Iwojima Island based on collected specimens, in addition to specimens collected in subsequent investigations on the Ogasawara Islands (Chichijima and Hahajima islands).

Materials and Methods

Explorations were carried out from June 17 to 19, 23 to 24, and 26 to 27, 2009, on Kita-Iwojima, Hahajima, and Chichijima, respectively. The collection sites are listed with their Site Code, cited in the list of collected specimens and geographical information (Table 1). Because of the severe environmental conditions, the collecting sites were relatively limited, only along with the exploratory line and its adjacent areas in Kita-Iwojima Isl. We searched for myxomycetes using the naked eye and hand lens. The collected materials were directly glued to the bottom of small paper boxes ($7 \times 5 \times 2.5$ cm) on-site immediately after collection, and then brought back to the base camp where they were air-dried. Subsequently (5–10 days after the date of collection), the collected material was heat-dried at a research facility.

A total of 44 specimens were examined. All collections examined are housed in National Museum of Nature and Science (TNS). Morphological observations were made using Olympus BX-51 microscope and Olympus SZ-61 dissecting microscope equipped with Nikon DS-L4 microscope camera.

Enumeration of Species

In the following list, sites are indicated by an alphabetical code (see Table 1), and representative specimens are shown in Fig. 1.

Order Ceratiomyxales

Family Ceariomyxaceae

Ceratiomyxa fruticulosa (O.F. Müll.) T. Macbr.

TNS-M-X-74943 (B1); TNS-M-X-74961 (C2);

Ceratiomyxa fruticulosa (O.F. Müll.) T. Macbr.
var. *flexuosa* (Lister) G. Lister

TNS-M-X-74952 (B3); TNS-M-X-74975 (B3); TNS-M-X-74966 (C2); TNS-M-X-74949 (arbuscular type) (B2)

Order Echinosteliales

Family Clastodermataceae

Clastoderma debaryanum A. Blytt

TNS-M-X-74955 (C1); TNS-M-X-74970 (C3)

Table 1. Collection sites

SiteCode	Day	Latitude	Longitude	Elevation	Site Name	Specimens
A1	17	25.437	141.2873889	186	Kita-Iwo Isl.	2
A2	17	26.43727777	141.2892778	149	Kita-Iwo Isl.	2
A3	18	25.43877778	141.2833056	451	Kita-Iwo Isl.	6
A4	19				Kita-Iwo Isl.	1
B1	23	26.6435	142.1612778	8	Chibusa-yama, Hahajima Isl.	4
B2	24	26.66668611	142.1522222	264	Chibusa-yama, Hahajima Isl.	4
B3	24	26.67936111	142.1538611	322	Chibusa-yama, Hahajima Isl.	3
C1	26	27.06663889	142.2146944	157	Nagatani, Chichijima Isl.	6
C2	27	27.0884	142.217257		Yoakedaira, Chichijima Isl.	8
C3	27	27.06063889	142.2216389	269	Higashidaira, Chichijima Isl.	6

Day represents June of 2009. Latitude and Longitudes are indicated in decimals. Elevation indicated in meters. Specimens represents number of specimens collected in each site. In total 42 specimens were collected.

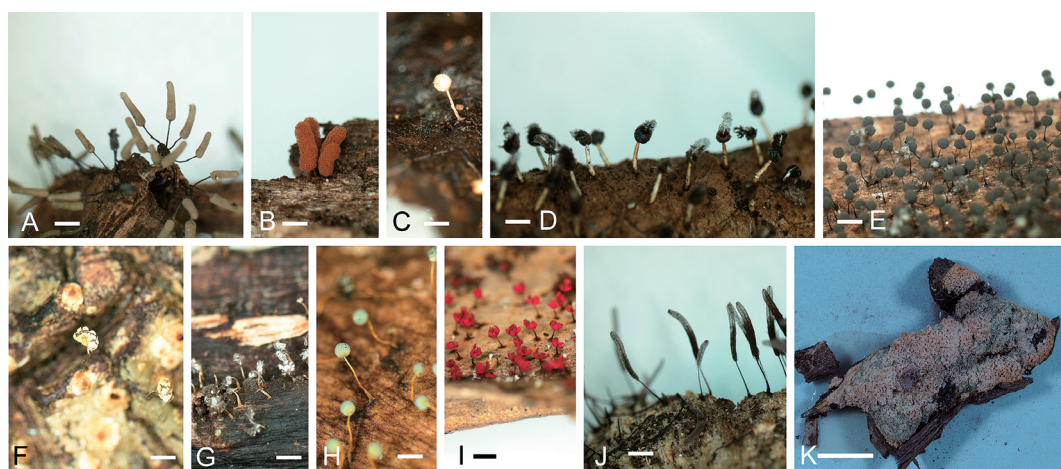


Fig. 1. Some myxomycetes collected in the present study.

A, *Arcyria cinerea* TNS-M-X-74962. B, *Arcyria denudata* TNS-M-X-74954. C, *Arcyria globosa* TNS-M-X-74935. D, *Diachea leucopodia* TNS-M-X-74939. E, *Lamproderma arcyrionema* TNS-M-X-74942. F, *Physarum album* TNS-M-X-74934. G, *Physarum nucleatum* TNS-M-X-74933. H, *Physarum tenerum* TNS-M-X-74951. I, *Physarum roseum* TNS-M-X-74938. J, *Stemonitis pallida* TNS-M-X-74967. K, *Fuligo candida* TNS-M-X-74946. Scales. A, B, E, G, I, J: 10 μ m. C, D, F, H: 5 μ m. K: 10 mm.

Order Liceales

Family Cribrariaceae

Cribraria intricata Schrad.

TNS-M-X-74941 (A3)

Cribraria intricata Schrad. var. *dictydioides* Schrad.

TNS-M-X-74963 (C2)

Cribraria microcarpa (Schrad.) Pers.

TNS-M-X-74956 (with *Physarum album*) (C1)

Cribraria piriformis Schrad. var. *notabilis* Rex

TNS-M-X-74969 (C3)

Family Reticulariaceae

Lycogala epidendrum (J.C. Buxb. ex L.) Fr.

TNS-M-X-74948 (B2); TNS-M-X-74953 (C1)

Tubifera microsperma (Berk. & M.A. Curtis)

G.W. Martin

TNS-M-X-74960 (C2)

Didymium iridis (Ditmar) Fr.

TNS-M-X-74950 (B2)

Family Physaraceae

Fuligo candida Pers.

TNS-M-X-74946 (B1)

Physarum album (Bull.) Chevall.

TNS-M-X-74934 (A1); TNS-M-X-74956 (with

Cribraria microcarpa) (C1)

Physarum nucleatum Rex

TNS-M-X-74933 (A1)

Physarum roseum Berk. & Broome

TNS-M-X-74937 (A3); TNS-M-X-74938 (A3);

TNS-M-X-74959 (C2); TNS-M-X-74965 (C2)

Physarum tenerum Rex

TNS-M-X-74936 (A2); TNS-M-X-74951 (B3)

Lamproderma arcyrionema Rostaf.

TNS-M-X-74942 (A3)

Order Stemonitidales

Family Stemonitidaceae

Stemonitis pallida Wingate

TNS-M-X-74967 (C3)

Order Physarales

Family Didymiaceae

Diachea leucopodia (Bull.) Rostaf.

TNS-M-X-74939 (A3)

Order Trichiales

Family Arcyriaceae

Arcyria cinerea (Bull.) Pers.

TNS-M-X-74944 (B1); TNS-M-X-74945 (B1);
TNS-M-X-74947 (B2); TNS-M-X-74958 (C1);
TNS-M-X-74962, 74964 (C2); TNS-M-X-
74968 (C3); TNS-M-X-74971 (C3)

Arcyria denudata (L.) Wettst.

TNS-M-X-74954 (C1)

Arcyria globosa Schwein.

TNS-M-X-74935 (A2); TNS-M-X-74940 (A3)

Family Trichiaceae

Hemitrichia clavata (Pers.) Rostaf. var. *calyculata* (Speg.) Y. Yamam.

TNS-M-X-74957 (C1); TNS-M-X-74972 (C3)

Trichia favoginea (Batsch) Pers. var. *persimilis* (P. Karst.) Y. Yamam.

TNS-M-X-74973 (A4)

Discussion

In the present exploration, 22 taxa, distributed among 14 genera, nine families, and six orders, were documented, including Ceratiomyxomycetes. Two taxa (*Fuligo candida* and *Stemonitis pallida*) were newly added to the list of myxomycetes collected in the Nampo Islands. *Arcyria cinerea* was collected seven times from two islands, and *Physarum roseum* was collected six times from three islands, suggesting the wide distribution of these myxomycetes in this area. Because most of the other taxa were collected only once, it would be premature to speculate on the distribution of these myxomycetes. However, reference to a database that has compiled the distribution of previously collected specimens, indicates that all of these taxa have wide distributions in Japan.

The first record of Myxomycetes in Japan was documented on October 25, 1854, from the Ogasawara Islands (Chichijima Island) during the northern Pacific explorations of Charles Wright (Emoto, 1965). The myxomycete collection resulting from this exploration was reviewed by Pfister and Sayre (1978) who identified five taxa,

including a new species, *Licea stipitata* Berk. & Raven. (Berkeley and Curtis, 1860), currently known as a synonymy of *Tubifera microsperma* (Berk. & M.A. Curtis) G.W. Martin. Of the remaining four species, two species, *Physarum nutans* Pers. and *Trichia serpula* (Scop.) Pers., have been applied to *P. album* (Bull.) Chevall. and *Hemitrichia serpula* (Scop.) Rostaf. ex Lister, respectively. However, in the light of present-day taxonomy, it is possible that *Didymium farina-ceum* may have been *Didymium minus* (Lister) Morgan., and that *Trichia clavata* Pers. may have been *Hemitrichia clavata* (Pers.) Rostaf. var. *calyculata* (Speg.) Y. Yamam. Only *H. clavata* var. *calyculata* was collected in three recent surveys (Yamamoto and Nagao, 1998; Degawa, 2009).

In previous explorations of Chichi-jima, Haha-jima, Ani-jima, Muko-jima, and Minami-iwojima islands, 25 taxa were documented (Yamamoto and Nagao, 1998). Later, Yamamoto and Degawa (2009) documented 42 taxa from Chichi-jima and Haha-jima islands. Together with the current study, 59 taxa (including Ceratiomyxomycetes) have been reported from the Southern Islands to date (Table 2).

Only six taxa have been recorded in all the recent surveys, and 42 taxa were collected only once in one of the previous surveys, suggesting the occasional distribution of these taxa.

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Table 2. Comparisons of myxomycetes collected in 1998, 2005 and 2009

No	Species	Early Survey	1998	2005	2009
1	<i>Arcyria cinerea</i>		●	●	●
2	<i>Arcyria denudata</i>		●		●
3	<i>Arcyria globosa</i>			●	●
4	<i>Ceratiomyxa fruticulosa</i>			●	●
5	<i>Ceratiomyxa fruticulosa</i> var. <i>flexuosa</i>		●		●
6	<i>Clastoderma debaryanum</i>			●	●
7	<i>Craterium concinnum</i>			●	
8	<i>Craterium leucocephalum</i>			●	
9	<i>Craterium leucocephalum</i> var. <i>scyphoides</i>		●		
10	<i>Cribraria intricata</i>		●		●
11	<i>Cribraria intricata</i> var. <i>dictydioides</i>			●	●
12	<i>Cribraria languescens</i>			●	
13	<i>Cribraria microcarpa</i>			●	●
14	<i>Cribraria piriformis</i> var. <i>notabilis</i>		●		●
15	<i>Cribraria tenella</i>			●	
16	<i>Diachea leucopodia</i>			●	●
17	<i>Diderma effusum</i>			●	
18	<i>Diderma hemisphaericum</i>		●		
19	<i>Diderma saundersii</i>		● ^d	●	
20	<i>Didymium clavus</i>		●	●	
21	<i>Didymium iridis</i>			●	●
22	<i>Didymium minus</i>	●			
23	<i>Didymium</i> cf. <i>minus</i>		●		
24	<i>Didymium nigripes</i>		●		
25	<i>Fuligo candida</i>				●
26	<i>Fuligo septica</i>		●		
27	<i>Fuligo septica</i> f. <i>flava</i>			●	
28	<i>Hemitrichia clavata</i> var. <i>calyculata</i>	●	●	●	●
29	<i>Hemitrichia serpula</i>	● ^a	●	●	
30	<i>Lamproderma arcyronema</i>		●	●	●
31	<i>Lamproderma scinitillans</i>		●		
32	<i>Lindbladia tubulina</i>			●	
33	<i>Lycogala conicum</i>			●	
34	<i>Lycogala epidendrum</i>		●		●
35	<i>Lycogala exiguum</i>			●	
36	<i>Lycogala flavofuscum</i>			●	
37	<i>Metatrichia vesparium</i>			●	
38	<i>Perichaena depressa</i>			●	
39	<i>Physarum album</i>	● ^b		●	●
40	<i>Physarum bogoriense</i>			●	
41	<i>Physarum cinereum</i>		●	●	
42	<i>Physarum compressum</i>		●		
43	<i>Physarum javanicum</i>		●		
44	<i>Physarum melleum</i>		●	●	
45	<i>Physarum nucleatum</i>			●	●
46	<i>Physarum roseum</i>			●	●
47	<i>Physarum superbum</i>			●	
48	<i>Physarum tenerum</i>			●	
49	<i>Physarum viride</i>		●		
50	<i>Physarum viride</i> f. <i>aurantium</i>			●	
51	<i>Stemonaria longa</i>			●	
52	<i>Stemonitis fusca</i>			●	
53	<i>Stemonitis pallida</i>				●
54	<i>Stemonitis splendens</i>		●		
55	<i>Stemonitopsis gracilis</i>			●	
56	<i>Stemonitopsis typhina</i> var. <i>similis</i>		●	●	
57	<i>Trichia favoginea</i> var. <i>persimilis</i>		● ^e	●	●
58	<i>Tubifera dimorphotheca</i>		●		
59	<i>Tubifera microsperma</i>	● ^c		●	●

a–c: listed as *Trichia serpula* (Scop.) Pers., *Physarum nutans* Pers., and *Licea stipitata* Berk. & Ravenel respectively in Pfister and Sayre (1978). d: listed as *Diderma platycarpum* Nann.-Bremek. var. *berkeleyanum* Nann.-Bremek. e: listed as *Trichia persimilis* P. Karst.

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