

Occurrence of fungi on the volcanic island of Surtsey, Iceland.

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ABSTRACT: Ten terrestrial fungi have been isolated from soil samples collected from 21 localities on the volcanic island of Surtsey, Iceland, in 1972. They belong to the genera *Absidia*, *Epicoccum*, *Fusarium*, *Mucor*, *Penicillium*, *Phialophora* and *Ulocladium*.

As soon as the first autotrophic plants had colonized the lava sand and tephra of the volcanic island Surtsey, the soil became a substratum for bacteria, actinomycetes and fungi because of the addition of organic matter. Organic material was also added to the soil by visiting birds and windblown insects and by plants and wood drifted ashore. Especially on the shores and in the lowlands, these drift materials provide conditions for heterotrophic life.

Fungal propagules can be transported together with the organic matter supplied to the island. It has been shown that moulds can also be dispersed by air to Surtsey. In three localities, KOLBEINSSON and FRIDRIKSSON (1968), using the open Petri dish method, found a microbial fallout amounting to 0.0–1.8 colonies per plate and hour; fewer microorganisms were found at higher localities than at sea level; the organisms belonged to various groups of saprophytic bacteria, and a few species of moulds. None of them was identified.

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Received April 1974

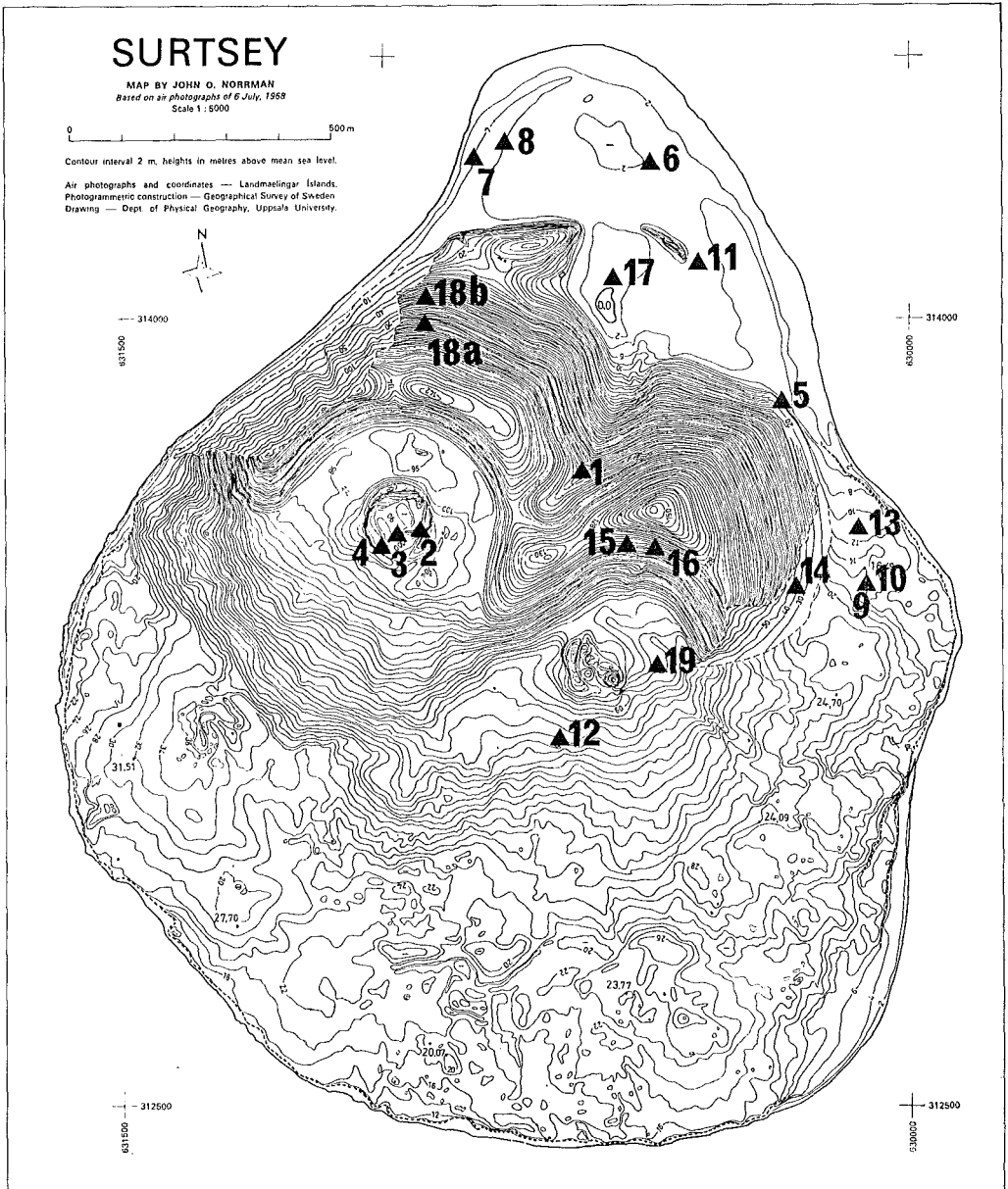


FIGURE 1. Map of Surtsey showing the localities from which the samples were taken. The locations no. 14, 15, 16, 20 and 21 are not included in this investigation. Studies of the nitrogen cycle of Surtsey in 1972 are reported by the authors in Surtsey Res. Progr. Rep. VII: 1975.

Since March 1964, the occurrence of aquatic fungi of Iceland, including Surtsey, has been studied (JOHNSON JR. & CAVALIER 1968, JOHNSON JR. 1968, 1970, 1972, CAVALIER & MARKHART 1972). However, in the published reports no soil-inhabiting fungi have yet been recorded.

The occurrence of heterotrophic microorganisms in soil samples from 21 localities was tested. The locations are numbered and plotted on a map of Surtsey (Fig. 1), and a short description of the localities is given in Table 1.

In this paper we wish to give a taxonomic list of terrestrial fungi isolated in 1972, as a basis for further investigations of fungal colonization. We also provide some data about the frequency of bacteria and actinomycetes. However, between the latter was not distinguished.

SOIL-SAMPLING

Small, aseptic plastic bottles of 20 ml, with a spoon fastened in each screw cap (Manufacturer Cerbo, Trollhättan, Sweden, art. n:o 18010) were used to take samples of soil under sterile conditions. Similar bottles are commonly used in hospital laboratories.

From each locality samples were taken aseptically from 5 points within an area of about 1 m² and mixed together in one bottle. Only soil from the surface layer (0–20 mm) was investigated in this study, with the exception of the samples from the rhizosphere of *Honkenya peploides* ssp. *diffusa* (Hernedm.) A. Löwe, where deeper layers of the soil were sampled.

The collection was made on July 6–9, 1972.

ISOLATION TECHNIQUES

Attempts to culture and isolate fungi began one week after sampling.

In this paper the results from dilution plates (A) and Warcup's soil plates (B) are presented.

Method A. The soil dilution plate method. The technique of preparation of the soil solutions and the dilutions followed the recommendations made by JENSEN (1963).

Method B. The soil plate method as described by WARCUP (1950), in which small quantities of soil were dispersed upon the agar-surface in Petri-dishes.

In Method A the following two nutrient media (GEBHARDT & ANDERSON 1958) were used: a) sodium-caseinate-glucose-agar, pH about 6.8 and b) glucose-peptone-acid-agar, pH about 4.0. In Method B only medium b), which is selective for fungi, was used.

Incubation was at 25°C. All isolates were made in triplicates.

Only fungal colonies which were found regularly in the plates were isolated, since the few colonies which grew out only occasionally might be regarded as contaminations. It is possible that air-borne propagules, which do not belong to the flora of the soil of Surtsey, appear as well as contaminations which may occur during the experimental work even if the best possible care is taken.

The numbers of colonies of bacteria and actinomycetes were recorded in the studies using Method A on plates containing medium a).

RESULTS

The fungal species isolated are listed in Table 1 in association with a short description of the 21 localities studied in 1972. This list would probably be longer if more localities had been tested, and if isolation techniques favouring fungi with special demands had been included.

The same table also shows the numbers of bacteria and actinomycetes found in 1 g of soil, since this may give an indication of the microbiological activity of the soil. Some of the localities investigated showed no microbial life at all in our tests.

The fungi identified belong to the commonly occurring terrestrial species; none is known to be thermophilic, but some are thermotolerant.

The fungi studied were probably carried to Surtsey by air and by sea with seeds and driftwood.

This investigation has confirmed the presence of various fungi and shown that fungi can exist under the conditions of low organic nutrient content which still prevail on Surtsey.

ACKNOWLEDGEMENTS

The cultures of fungi are identified by the mycologists of the *Centraal-bureau voor Schimmelcultures* at Baarn (the Netherlands) and we would like to express our gratitude to Dr. J. A. VON ARX and his staff.

We also wish to thank the Head of the *Swedish Biological Surtsey*

TABLE 1. Fungi, bacteria and ascomycetes found in soil samples taken on Surtsey, Iceland, in July 1972.

Sample locations No.	Description of locations	Occurrence of fungi	Fungal propagules per g soil (no. of colonies)	Bacteria and actinomycetes per g soil (no. of colonies)
1	Light-coloured tephra, green-coloured surface. Soil temp. 42°C.	<i>Epicoccum purpurascens</i> Ehrenb. ex Schlecht.	<50	1.2×10^7
2	Crater border. Sparsely moss-covered. Black soil. Rather moist. Soil temp. 42°C.	<i>Trichoderma harzianum</i> Rifai, <i>Trichoderma viride</i> Pers. ex S. F. Gray	<50	1.5×10^5
3	Crater border. Sparsely moss-covered. Salt crystals. Rather moist. Steam. Soil temp. 32°C.	Lost, not identified	<50	1.1×10^5
4	Crater border. Sparsely moss-covered. Black soil. Rather moist. Steam. Soil temp. 24°C.	<i>Absidia corymbifera</i> (Cohn) Sacc. & Trott.	50	3.9×10^5
5	Rock wall. Light-coloured tephra. Soil temp. 14°C.	<i>Verticillium psalliotae</i> Treschow, <i>Cladosporium macrocarpum</i> Preuss.	<1	0
6	Sand, sampled closed to a bit of drifted wood. Soil temp. 14°C.	<i>Ulocladium botrytis</i> Preuss, <i>Phialophora fastigiata</i> (Lagerb. & Melin) Conant	6.5×10^2	1.3×10^3
7	Black sand. Traces of bird excrements. Soil temp. 14°C.		0	0
8	Black sand. Near an old bit of drifted wood. Soil temp. 14°C.	<i>Phialophora malorum</i> (Kidd & Beaum.) McColl.	4.0×10^4	1.9×10^4

9	Cave ceiling. Temp. 11°C.	A non-sporulating culture.	<1	—
10	Light-coloured tephra. The bottom of a cave. Soil temp. 12° C.	Atypical, may belong to <i>Fusarium</i> (but no macroconidia are developed)	1	1.2 × 10 ³
11	Driftwood.	<i>Trichoderma viride</i> Pers. ex S.F. Gray	—	—
12 A	Moss-covered gray lava stones. Ground temp. 21°C.	Lost, not identified.	1	2.0 × 10 ⁶
12 B	Moss-covered red lava stones. Ground temp. 24°C.	<i>Mucor hiemalis</i> Wehmer (+), <i>Trichoderma harzianum</i> Rifai	<50	1.4 × 10 ³
12 C	Rather moist soil without moss. Soil temp. 12°C.	Atypical, may belong to <i>Fusarium</i> (but no macroconidia are developed)	100	1.3 × 10 ⁵
13	Rhizosphere of <i>Honkenya peploides</i> (L.) Ehrh. ssp. <i>diffusa</i> (Hernem) A. Löve.	A non-sporulating culture, not identified.	7 × 10 ⁴	7.6 × 10 ⁶
17	Former old lagoon. Moist. Soil temp. 17°C.	<i>Penicillium palitans</i> Westling, and a sterile mycelium, probably of a discomycete.	50	4.2 × 10 ³
18	Tephra. Soil temp. 22°C.	<i>Phialophora fastigiata</i> (Lagerb. & Melin) Conant	<50	8.3 × 10 ²
19 A	Light-coloured tephra, sampled near steam-hole. Soil temp. 45°C.		0	6.4 × 10 ⁵
19 B	Light-coloured tephra, sampled 30 cm from steam-hole. Soil temp. 28°C.		0	1.1 × 10 ⁵
19 C	Light-coloured tephra, sampled 60 cm from steam-hole. Soil temp. 22°C.		0	6.4 × 10 ⁴

Expedition 1972, Prof. Carl H. LINDROTH, University of Lund, for stimulating discussions. The map was kindly made available by Prof. John O. NORRMAN, University of Uppsala.

Support for travel to Surtsey was provided by the *Swedish Natural Research Council* and accomodation on Surtsey by the *Surtsey Research Society*.

ÚTDRÁTTUR

Jarðvegssýnum var safnað á ýmsum stöðum í Surtsey í júlí 1972. Úr þessum sýnum voru sveppir einangraðir á næringaragar. Niðurstöður sýna, að nokkuð þrífst af sveppum og gerlum í jarðvegi Surtseyjar, þótt snauður sé af lífrænum efnum. Allir sveppir, er fundust, eru algengir jarðvegssveppir.

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Received Oct. 1973