

On the terrestrial microfauna of Surtsey during the summer of 1976 with special reference to the Ciliates

Håkan Hedin

Institute of Zoology, Uppsala University
Box 561, 75122 Uppsala, Sweden

ABSTRACT

The number of ciliate species on Surtsey has increased considerably during recent years. In this study 11 species, belonging to 2 orders and 3 sub-orders, were observed in cultures on material collected on Surtsey in August 1976. The most frequent genus was *Holosticha*. The other components of the terrestrial microfauna were amoebae, rotifers and nematodes. No predators were found and the ecological pyramid therefore still consists of only the two first levels.

INTRODUCTION

The Surtsey eruption ceased in June 1967, after having continued for more than three and a half years. Among the first pioneers on the island were bacteria (Kolbeinsson and Fridriksson 1968), blue-green algae (Behre and Schwabe 1970, Schwabe 1974) and flagellates (Smith 1968). In earlier studies of the terrestrial microfauna, Holmberg and Pejler (1972, 1974) mainly dealt with the rhizopods and rotifers. Only one species of ciliate, *Cyclidium citrullus*, was identified. A few species of nematodes were reported by Sohlenius (1972, 1974).

A new expedition to Surtsey took place in August 1976. As regards the microfauna, the investigations this time were principally focused on the ciliates.

METHODS

The soil samples were stored in sterilized plastic capsules (Cerbo, Sweden, No. 18010) of 20 ml volume equipped with sample spoons inside the screwcaps. On arrival at Uppsala they were inoculated either to agar substrates (localities A, F, U, V and X) or to a liquid nutrient solution (localities A, B, C, E, F, G, I, K, M, N, O, R, S, T, U, V and X). The composition of this medium is described

in Henriksson et al. (1972). The positions of the localities are shown in Fig. 1. Descriptions of the sampling locations are given in Henriksson et al. (1978). The cultures were kept under controlled conditions at +20°C and approximately 3000 Lux with the humidity balanced in order to avoid exsiccation. The prevalent standards when working with sterilized material were followed.

As pointed out by Fenchel (1969), fully satisfactory identifications are often difficult to obtain when working with microfauna. Many groups still lack sufficient taxonomic treatment. In this study the ciliates were mainly determined according to Kahl (1930—35), the amoebae to Hoogenraad and de Groot (1940), Harnisch (1960) and Grospietsch (1965) and the rotifers according to Donner (1965). The nematodes were determined by Dr. B. Sohlenius.

RESULTS

The material investigated was inoculated both to firm substrates (agar) and to liquid nutrient solutions. Microzoa developed in all agar cultures (Table I) and in 8 of the liquid nutrient solution cultures (Table II). Altogether at least 11 species of ciliates, 5 species of amoebae, 2 species of rotifers and 1 species of nematodes were encountered. According to Grell (1973) the ciliates would represent 2 orders, Holotricha and Spirotricha, and 3 sub-orders, Gymnostomata, Hymenostomata (holotrichs) and Hypotricha (spirotrich). The most frequent genus was *Holosticha*, which was found in cultures from 5 different localities. As for the amoebae, the most common forms were small specimens of *Vahlkampfia*, which were observed in cultures from 4 different localities. The rotifers, which in some cultures developed in masses, were *Philodina acuticornis* and *Habrotrocha constricta*. The nematodes were identified to the genus *Monhystera*.

SURTSEY

PROVISIONAL MAP BY JOHN O. NORRMAN
Based of air photographs of 11 July, 1975

0 500 m

Contour interval 2 m, heights in metres above mean sea level
Photogrammetric construction - Geographical Survey of Sweden.
Air photographs and coordinates - Landmaelningar Islands.



Fig. 1. Sampling locations on Surtsey during the summer of 1976. No samples were collected from the locations D, H, Q and Ø in this study. Map of Surtsey by John O. Norman, Uppsala.

There were some differences in the species spectrum between the agar cultures and the liquid nutrient solution cultures. However, the ciliates dominated both kinds of cultures.

DISCUSSION

Earlier investigations of the terrestrial microfauna of Surtsey have reported very few ciliates. Smith (1968) found nothing but flagellates, and Holmberg and Pejler (1972, 1974) could only determine 1 species, *Cyclidium citrullus*. According to Holmberg (pers. comm.) there might also have been a further 2 or 3 very infrequent species. Although these studies were not primarily concerned with the ciliates, it is fairly clear that the ciliate fauna has become more diversified in recent years. The number of species had increased considerably, and the abundance of individuals in the cultures was much greater now than during the investigations by Holmberg and Pejler, using the same culturing methods. An indication of this development of ciliates in terrestrial habitats can be discerned already in Maguire Jr (1970), who found numbers of ciliate species in aquatic traps left in the field for 14 months during 1967—68.

Compared with the above reports by Holmberg and Pejler, no increase in the number of species of amoebae and rotifers could be detected. In fact, there seem to be somewhat fewer amoebae now.

All the forms observed are widespread and with the ability to reproduce asexually or parthenogenetically. No predators were found and the ecological pyramid is probably still formed by only two trophic levels, the photoautotrophs and those microzoa feeding on algae and bacteria/detritus.

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TABLE I

Occurrence of microzoa in the different localities during the summer of 1976. Agar cultures.

Locality	A	F	U	V	X
RHIZOPODA, AMOEBINA					
<i>Vahlkampfia</i>	x		x		
RHIZOPODA, TESTACEA					
<i>Euglypha</i>	x				x
CILIATA, HOLOTRICHA					
Gymnostomata					
<i>Chilodonella</i>		x			
Hymenostomata					
<i>Glaucoma</i>	x				
<i>Paramecium</i>				x	
CILIATA, SPIROTRICHA					
Hypotricha					
<i>Holosticha</i>	x		x	x	x
hypotrich I			x		
hypotrich II				x	
ROTATORIA, BDELLOIDEA					
<i>Habrotrocha constricta</i> Dujardin			x		
NEMATODA					
<i>Monhystera</i>				x	x

TABLE II
Occurrence of microzoa in the different localities during the summer
of 1976. Liquid nutrient solution cultures.

Locality	B	E	K	M	N	U	V	X
RHIZOPODA, AMOEBINA								
<i>"Astramoeba" x)</i>			x					
<i>Thecamoeba</i>	x							
<i>Vahlkampffia</i>	x		x					
<i>Vexillifera</i>			x					
CILIATA, HOLOTRICHA								
Gymnostomata								
<i>Chilodonella</i>				x			x	
<i>Nassula</i>								x
Hymenostomata								
<i>Cyclidium citrullus</i> Cohn			x					
<i>Cinetochilum margaritaceum</i>								
Perty			x					
CILIATA, SPIROTRICHA								
Hypotricha								
<i>Stylonychia curvata</i> Kahl				x				
<i>Euplotes</i>				x				
<i>Holosticha</i>				x				
ROTATORIA, BDELLOIDEA								
<i>Philodina acuticornis</i>								
<i>odiosa</i> Milne		x						
<i>Habrotrocha constricta</i>								
Dujardin								x
NEMATODA								
<i>Monhystera</i>			x		x			x

x) The genus *Astramoeba* has been shown to constitute merely a form which can appear in many groups of Amoebina under certain environmental conditions.