

THE TERRESTRIAL PROTOZOA OF ELEPHANT ISLAND, SOUTH SHETLAND ISLANDS

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ABSTRACT. 54 species of Protozoa (17 Mastigophora, 19 Rhizopoda and 18 Ciliata) were observed in samples from five terrestrial habitats on Elephant Island, South Shetland Islands. Numbers of Testacida in vegetated habitats varied from 170 to 7,700/g. fresh weight. The protozoan faunas of the moss peats showed considerable similarity to those of the Signy Island reference sites.

The presence of terrestrial Protozoa on Elephant Island, South Shetland Islands, has been recorded by Sandon and Cutler (1924), who analysed a single sample of morainic material collected by the *Quest* expedition in 1922. They observed five commonly occurring species of flagellate and three amoeba species of uncertain identification.

The present report is based on 23 samples (Table I) collected by Lt E. C. Walshaw in February and March 1971 during the Joint Services Expedition to Elephant Island (Fig. 1). 18 of the samples came from the area of the expedition's base camp south of Endurance Glacier; the rest were from the west, east and north of the island.

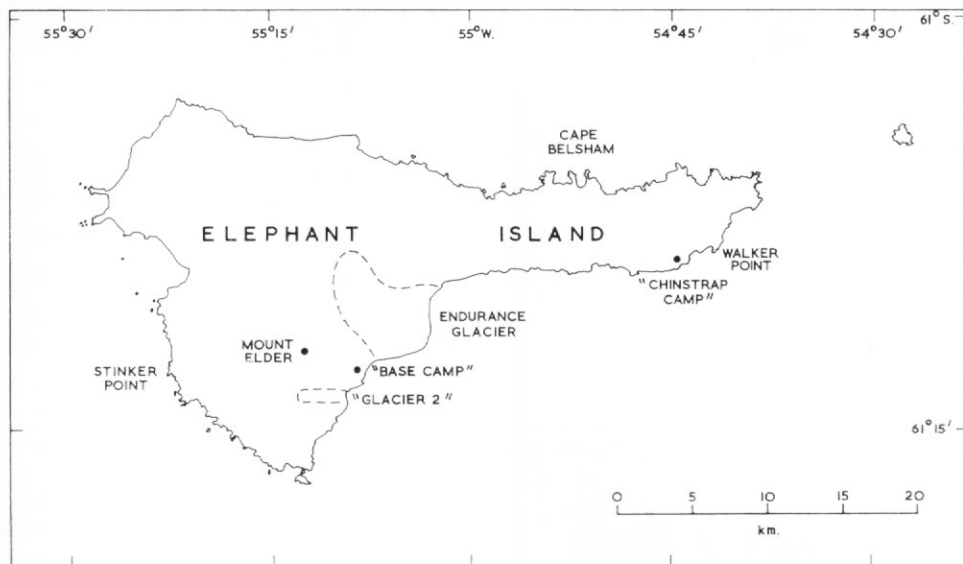


Fig. 1. Sketch map of Elephant Island, South Shetland Islands, showing place-names.

The samples are a comprehensive selection covering five terrestrial habitats:

Moss-turf peat (<i>Polytrichum-Chorisodontium</i>)	4 samples
Moss-carpet peat (<i>Brachythecium-Calliargon-Drepanocladus</i>)	5 samples
Grass soil (<i>Deschampsia antarctica</i>)	4 samples
Clay of glacial moraines	5 samples
Guano of chinstrap penguin rookeries	5 samples

The classification of the vegetated habitats follows the sub-formation classification of Longton (1967).

The fresh samples were stored at 0-4° C during transport to the United Kingdom for laboratory examination. A small portion of each sample was preserved in Bouin's fixative.

TABLE I. LIST OF SAMPLES EXAMINED

<i>Sample number</i>	<i>pH</i>	<i>L.O.I.</i>	<i>Nature of sample</i>	<i>Date of collection 1971</i>	<i>Locality</i>
1	4.5±0.3	58±11	Moss-turf peat	25 February	"Chinstrap camp"
2	5.9±0.2	47±8	Moss-turf peat	18 March	Southern flank of "Glacier 2"
3	5.4±0.1	42±5	Moss-turf peat	18 March	Southern flank of "Glacier 2"
4	5.6±0.1	62±4	Moss-turf peat	23 March	Bluff above "Base camp"
5	5.0±0.2	68±4	Moss-carpet peat	25 February	"Chinstrap camp"
6	4.9±0.1	36±5	Moss-carpet peat	4 March	Cape Belsham
7	3.9±0.1	40±5	Moss-carpet peat	13 March	South of Endurance Glacier
8	4.7±0.3	5.6±1.2	Moss-carpet peat	21 March	Stinker Point
9	4.7±0.1	44±13	Moss-carpet peat	23 March	Bluff above "Base camp"
10	4.4±0.4	6.5±1.3	Grass soil	13 March	South of Endurance Glacier
11	4.8±0.2	30±8	Grass soil	18 March	Southern flank of "Glacier 2"
12	4.6±0.2	30±4	Grass soil	18 March	Southern flank of "Glacier 2"
13	4.7±0.1	28±5	Grass soil	21 March	Stinker Point
14	8.0±0.1	4.1±1.6	Moraine clay	13 March	Southern moraine, Endurance Glacier (penguin moulting site)
15	7.1±0.1	1.5±0.2	Moraine clay	16 March	Northern moraine, "Glacier 2"
16	7.5±0.2	0.9±0.3	Moraine clay	16 March	Northern moraine, "Glacier 2"
17	7.0±0.6	1.6±0.6	Moraine clay	16 March	Southern moraine, Endurance Glacier
18	7.3±0.3	1.2±0.3	Moraine clay	16 March	Southern moraine, Endurance Glacier
19	6.8±0.1	49±2	Penguin guano	13 March	Penguin rookery north of "Glacier 2"
20	8.1±0.1	21±5	Penguin guano	13 March	Penguin rookery, headland between Endurance Glacier and "Glacier 2"
21	8.2±0.1	23±2	Penguin guano	13 March	Penguin rookery, southern moraine of Endurance Glacier
22	7.1±0.1	53±4	Penguin guano	16 March	Penguin rookery north of "Glacier 2"
23	8.2±0.1	39±2	Penguin guano	16 March	Penguin rookery, southern moraine of Endurance Glacier

L.O.I.

L.O.I. and pH

"Chinstrap camp"

"Base camp"

"Glacier 2"

Loss on ignition (per cent dry weight).

Figures are means ±95 per cent confidence limits (six replicates).

The expedition's camp site west of Walker Point.

The expedition's camp site below Mount Elder, south of Endurance Glacier.

The small east-flowing glacier south of Endurance Glacier.

TABLE II. COMPOSITION OF THE FAUNA: MASTIGOPHORA

Sample number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
<i>Oikomonas mutabilis</i> Kent	+	+
<i>Oikomonas termo</i> Ehrenberg	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Polypseudopodius bacterioides</i> Pusch	+	..	+	+	+	+
<i>Petalomonas angusta</i> Klebs	+
<i>Petalomonas mediocanellata</i> Stein	..	+
<i>Allantion tachyploon</i> Sandon	+	..
<i>Bodo saltans</i> Ehrenberg	+	+	+	+	+	+	+	+
<i>Bodo terricolus</i> Martin	+	+	+
<i>Cercobodo agilis</i> Moroff	+
<i>Cercobodo vibrans</i> Sandon	+	+	+	+	..	+	+	..	+	+
<i>Cercomonas crassicauda</i> Alexeieff	..	+	..	+	+	..	+
<i>Cercomonas longicauda</i> Stein	+	+	+	+	+	+	+	..	+	+
<i>Phalansterium solitarium</i> Sandon	+
<i>Pleuromonas jaculans</i> Perty	+	..	+
<i>Spongomonas uvella</i> Stein	+
<i>Tetramitus pyriformis</i> Klebs	+	+
<i>Tetramitus rostratus</i> Perty	+	+	+	+	+	+	+
NUMBER OF SPECIES (total 17)	2	4	3	3	6	4	3	5	3	4	2	3	3	3	3	2	3	3	3	3	4	4	4	4

TABLE IV. COMPOSITION OF THE FAUNA: CILIATA

<i>Sample number</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Choenia</i> sp. Quennerstedt	+
<i>Dileptus</i> sp. Dujardin	+
<i>Enchelys</i> sp. Hill	..	+	+	..	+	..	+	+	+	+	+
<i>Holophrya</i> sp. Ehrenberg	+	+
<i>Spathidium</i> sp. Dujardin	+	..	+
<i>Urotricha agilis</i> Stokes	+	+	+	+	+	..	+	+	+	+	..	+	+
<i>Leptopharynx sphagnetorum</i> (Levander) Mermod	+	+	..	+	+	..	+	+
<i>Microthorax simulans</i> (Kahl) Engelmann	+
<i>Cyclidium glaucoma</i> Muller	+	+	+
<i>Dichilium cuneiforme</i> Schewiakoff	+	+	+	+
<i>Philaster</i> sp. Fabre-Domergue	+
<i>Oxytricha fallax</i> Stein	+	..	+	..	+	+
<i>Oxytricha pellionella</i> (Muller) Ehrenberg	+	+	+	+
<i>Oxytricha setigera</i> Stokes	..	+	+	+
<i>Pleurotricha lanceolata</i> (Ehrenberg) Stein	+
<i>Uroleptus</i> sp. Ehrenberg	+
<i>Euplotes</i> sp. Ehrenberg	+
<i>Vorticella microstoma</i> Ehrenberg	+	+
NUMBER OF SPECIES (total 18)	2	3	3	2	2	6	7	4	2	6	5	5	5	3	0	0	0	0	0	1	0	0	0

TABLE V. NUMBERS OF TESTACIDA

<i>Number/g. fresh weight ± 95 per cent confidence limits</i>		
<i>Moss-turf peat</i>	<i>Moss-carpet peat</i>	<i>Grass soil</i>
1. 170 \pm 270	5. 2,900 \pm 580	10. 330 \pm 430
2. 830 \pm 430	6. 250 \pm 170	11. 670 \pm 430
3. 330 \pm 430	7. 500 \pm 470	12. 1,580 \pm 610
4. 4,500 \pm 1,480	8. 500 \pm 330	13. 1,170 \pm 920
	9. 7,700 \pm 1,200	
<i>Clay of glacial moraines</i>		<i>Guano of chinstrap penguin rookeries</i>
14. 0		19. 0
15. 0		20. 0
16. 0		21. 0
17. 0		22. 0
18. 0		23. 0

TABLE VI. COMPARISON OF SCREEN TEMPERATURES

<i>Monthly or part-monthly means during the period of the expedition ($^{\circ}$C)</i>		
	<i>Elephant Island</i>	<i>Signy Island</i>
10-31 December 1970	-1.4	+0.6
1-31 January 1971	-0.2	+1.6
1-28 February 1971	-0.5	+1.1
1-26 March 1971	-0.1	+0.9
<i>Weekly means during the period of sample collection ($^{\circ}$C)</i>		
	<i>Elephant Island</i>	<i>Signy Island</i>
25 February-3 March 1971	+2.7	+1.2
4-10 March 1971	+0.9	+0.7
11-17 March 1971	-2.2	+0.8
18-24 March 1971	+0.8	+2.0

METHODS

The Protozoa were cultured by inoculating about 2 g. of each fresh sample on to soil-extract agar seeded with *Aerobacter aerogenes* (NCIB strain 418) and moistened with sterile 0.5 per cent NaCl, in 10 ml. petri dishes. The cultures were examined for Protozoa at increasing intervals for up to 2 months; species were identified morphologically. A direct examination technique (Couteaux, 1967) was used for the identification and enumeration of Testacida in the preserved samples.

The pH of each sample was determined electrometrically; moisture by oven drying at 100° C for 48 hr.; loss on ignition—a crude estimate of organic matter—by ashing in a muffle furnace at 450–500° C for 10 hr.

RESULTS AND DISCUSSION

54 species of Protozoa were recorded from the samples: 17 flagellate, 4 naked amoeba, 15 testate amoeba and 18 ciliate species. The results are summarized in Tables II, III and IV. The grass soils and moss-carpet peats showed the greatest species diversity. The moraine clays were sparsely populated with Protozoa, the fauna being restricted to a few small flagellate species, except in sample 14 in which enrichment from moulting chinstrap penguins was evident; this sample contained three ciliate species and the "indicator" coprozoic flagellate species *Tetramitus rostratus*, which was also present in all the penguin guano samples.

The numbers of testate amoebae showed considerable variation (Table V). They were completely absent from the mineral moraine clays and from the alkaline guano samples, and varied in number from 170 to 7,700/g. in the grass soils and moss peats. Numbers below 500/g. are liable to large percentage errors in estimation.

The faunas of the moss habitats showed considerable similarity to those of the Signy Island reference sites (Smith, in press), which the author was investigating at the time of the Elephant Island expedition. Some comparisons of prevailing temperatures, species diversity and numbers of testate amoebae on Elephant Island with those on Signy Island can be made (Tables VI, VII

TABLE VII. COMPARISON OF NUMBERS OF TESTACIDA

<i>Numbers of Testacida/g. fresh weight ±95 per cent confidence limits</i>		
	<i>Elephant Island 23 March 1971</i>	<i>Signy Island 29 March 1971</i>
Moss-turf peat	4,500 ± 1,480 (moisture 129 per cent)	3,420 ± 650 (moisture 429 per cent)
Moss-carpet peat	7,700 ± 1,200 (moisture 254 per cent)	4,050 ± 780 (moisture 737 per cent)

TABLE VIII. COMPARISON OF NUMBERS OF SPECIES OF PROTOZOA

		<i>Elephant Island</i>	<i>Signy Island</i>
Moss-turf peat	Mastigophora	5	14
	Rhizopoda	9	13
	Ciliata	6	12
		20	40
Moss-carpet peat	Mastigophora	13	10
	Rhizopoda	11	10
	Ciliata	13	10
		37	30

and VIII). These suggest that Elephant Island had colder weather than Signy Island during the summer of 1970-71, but that in late March the Elephant Island peats contained greater numbers of testate amoebae per gram of peat *fresh weight*. The moss-turf peat on Elephant Island appears to be relatively species-poor in Protozoa, but the moss-carpet peat is relatively rich. The comparisons must be treated with caution for two reasons: the exposure of the meteorological screen on Elephant Island at 175 m. (O'Brien, 1971) must be very different from that on Signy Island at less than 10 m.; the Protozoa results for Signy Island refer to the 0-9 cm. horizon of peat, while those for Elephant Island are for peat of an unknown depth.

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