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A QUANTITATIVE AND QUALITATIVE
INVESTIGATION OF THE MICROFAUNA
COMMUNITIES OF THE SOIL AT ANG-
MAGSSALIK AND IN MIKIS FJORD

BY

MARIE HAMMER

WITH 17 FIGURES IN THE TEXT

KØBENHAVN

C. A. REITZELS FORLAG

BIANCO LUNOS BOGTRYKKERI A/S

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INTRODUCTION

When "A Quantitative Investigation of the Microfauna Communities of the Soil in East Greenland" appeared in 1934, it was merely in the form of a preliminary report. Plans had been made for a more thorough investigation of the soil fauna on Ella Island, particularly in respect of its wintering, awakening, breeding season and vertical distribution; but as the work of collecting became rather protracted, and as very complete collections had already been made at Angmagssalik, Atingat (Angmagssalik Fjord) and Mikis Fjord by Dr. Knud Rasmussen's 7th Thule Expedition, the examination of the microfauna of these more southerly regions was completed first. For practical reasons this material has been treated separately in the present paper. Later on Scoresby Sound and the regions more to the north round about Ella Island will be made the subject of research.

In Southeast Greenland collections were made in Lindenow Fjord by E. BERTELSEN on Dr. Alf. Trolle's expedition in 1935; as a consequence, we now have a rather homogeneous material from the greater part of Greenland's east coast, which should make it possible to obtain an impression of the composition of the microfauna and the conditions governing it. Later on this material will be treated and take part in the investigation of the microfauna in East Greenland.

The collection and treatment of the material on which the present paper is based are the work of the writer when on Dr. Knud Rasmussen's 7th Thule Expedition in the summer of 1933. I would take this opportunity of thanking Mr. SØGAARD ANDERSEN for his determination of the Diptera, and Mr. S. L. TUXEN for his efficient assistance in determining the Collembola and for his readiness to help. And finally, I would not omit to thank all the members of the 7th Thule Expedition, particularly Captain A. VEDEL, who by their helpfulness and interest facilitated me in my collecting work.

My greatest debt of gratitude is due to the late Dr. KNUD RASMUSSEN, who permitted me to take part in the expedition and, while in Greenland, made it possible for me to undertake investigations at various places on the east coast.

The paper has been translated by Mr. W. E. CALVERT.

THE MATERIAL

The present work, which forms a part of the investigation of the microfauna of East Greenland, aims at contributing towards our knowledge of the microfauna of the soil in the region of Angmagssalik and Mikis Fjord, both qualitative and quantitative, in line with the earlier work on the Ella Island region. Investigations of this kind, having as their object the investigating of the forms of animals associated with a certain area, are very greatly facilitated in Greenland, where several of the groups, the number of which within a given area is difficult to arrive at, are completely lacking or do not commonly occur on account of the very low vegetation. This applies to all flying or jumping forms such as *Orthoptera*, *Hemiptera*, *Lepidoptera*, *Hymenoptera*, *Diptera*, etc. Practically all that remain are *Collembola*, *Acarina*, spiders and a few others such as *Diptera* larvae and *Aphidae*, all of which can be taken in the Berlese funnel.

There has been no investigation of the vertical distribution of the animals. By means of an investigation of this kind at the river Kama in East Russia, BASKINA and FRIEDMANN found that the communities were largest from 0 to 2 cm below the surface of the soil, but this was due more than anything to the large number of *Lumbricidae*, *Enchytraeidae*, *Nematodea* and *Mollusca*, whereas for *Araneida*, *Acarina* and *Collembola* there seemed to be an even distribution from the moss layer at the top to a depth of 0—2 cm under the surface. Thus there is a chance that my samples, 5—7 cm thick, will contain the greater part of the individuals living in the area marked out.

The samples were taken in July, August and September, 1933. There are in all 91 soil samples from Angmagssalik, 6 from Atingat (the inner part of Angmagssalik Fjord) and 19 from Mikis Fjord. The samples are of $\frac{1}{100}$ sq.m and about 5—7 cm thick. Specially constructed zinc funnels were made for the expedition; unlike the Berlese funnel proper, they had not to be heated for forcing the animals out, this being secured solely by natural desiccation, which almost invariably gives the best

results. As the funnels are very simple and have no nozzle, they can be placed one within the other and therefore take up hardly any room, a matter of immense importance on an expedition. The funnels were placed in wooden stands, five in each; the stands can be taken down and assembled in a moment.

The samples were dealt with on the spot in a loft where the temperature was fairly high. Desiccation took from 8 to 10 days, all according to the moisture in the samples. The material from Atingat was treated in warm water funnels (Berlese funnels), whereas, owing to the difficulty of obtaining a suitable place to work, the greater part of that from Mikis Fjord was brought home to Copenhagen, in tin boxes with tight-fitting lids. A few of the Angmagssalik samples were also brought to Copenhagen in the same manner. This was done in order to compare the material coming from them with material from the same kind of samples but treated in warm water funnels as soon as they were taken, in order to see whether the samples changed during transport.

In the earlier paper on Ella Island the disadvantages of carrying samples in tins for any length of time were explained. "Quantitatively the latter samples can hardly be considered quite reliable. It must be assumed that during the long voyage to Copenhagen the temperature and moisture in the tins in which they were conveyed were too favourable. Usually it may be taken for granted that a large number of ova and quite young individuals succumb to the unfavourable conditions to which they are exposed in nature. It looks as if an enormous development has taken place in the tins, and this seems a natural explanation of the abundance of animals"; and further, "nor can they be relied upon qualitatively, there being a possibility that some young have developed from ova that have been carried, for instance by the wind, from another plant community than that from which the sample was taken, and which might perhaps not have developed in this place in nature."

For the purpose of ascertaining whether carrying in tins could cause such quantitative and qualitative changes in the contents of the samples, 10 samples from the same plant community (lake bank) were taken on Sept. 12th; three of them were treated in warm water funnels for the following three days till Sept. 16th, the other 7 were brought to Copenhagen in tins and there treated in funnels without heating from about Oct. 20th to Nov. 4th, i. e. after about 6 weeks in the tins.

In the table the three warm water samples are separated from the other seven by a line. It appears that the samples are reliable in every respect. No extraneous ova have developed, nor have certain species tolerated transportation and the presumably more favourable conditions better than others which may have perished on the way. Both qualitatively and quantitatively the samples agree very well.

Table of 10 samples from lake bank, treated variously: No. 17, 18 and 19 were treated immediately in the warm water funnel, No. 20—26 in funnels without heating after 6 weeks in tins.

Lake bank	¹² / ₉	¹⁴ / ₉	¹⁶ / ₉	No. 20—26 from ²⁰ / ₁₀ — ⁴ / ₁₁						
	17	18	19	20	21	22	23	24	25	26
<i>Polyacanthella quinquespinos</i> ...	1	..	..	..	1	..	1	..	..	1
<i>Onychiurus armatus</i>	5	..	..	1	1	10	5	4	2	3
<i>Tetracanthella wahlgreni</i>	1	2	2	..	1	2	2	4	..	4
<i>Proisotoma tenella</i>	1	..	7	12	17	6	11	9	16	9
<i>Folsomia sexoculata</i>	2	..	..	..	..	..	1	..	..	..
— <i>quadrioculata</i>	4	4	2	17	41	33	89	28	35	25
<i>Isotoma viridis</i>	2	..	..	2	..	..	1	..	..	..
— <i>violacea</i>	7	8	5	..	13	6	..	9	2	6
<i>Sminthurides malmgreni</i>	2	1	..	..	..	4	..	..	..	..
undetermined <i>Collembola</i>	..	..	1	..	..	..	..	..	..	..
<i>Camptocladius hexatomus</i> -group ..	27	19	3	10	4	11	4	17	4	2
<i>Orthocladius</i> II ¹⁾	2	3	..	1	2	..	..	7	1	1
<i>Phaenocladius</i> sp.	2	2	8	7	4	4	..	8	5	2
<i>Phoridae</i>	..	..	..	..	..	..	..	..	1	..
<i>Araneida</i>	2	..	..	..	..	..	..	..	..	..
<i>Brachychthonius brevis</i>	c.25	..	..	..	..	..	..	..	2	8
<i>Platynothrurus peltifer</i>	125	341	58	137	141	172	168	223	146	272
— <i>lapponicus</i>	5	42	18	..	3	..	1	..	..	4
<i>Oppia neerlandica</i>	..	3	..	1	1	2	1	11	..	1
<i>Tectocephus velatus</i>	3	30	..	10	18	12	15	14	7	25
<i>Oribatula exilis</i>	1	..	..	..	..	..	..	..	..	..
<i>Melanozetes mollicomus</i>	10	1	..	..	11	4	13	7	1	12
<i>Trichoribates trimaculatus</i>	2	..	..	..	..	..	..	..	..	..
<i>Calyptozetes sarekensis</i>	3	..	..	..	..	1	..	1	..	..
undetermined <i>Oribatidae</i>	10	13	11	3	25	11	87	14	19	57
<i>Zercon curiosus</i>	..	..	..	..	..	..	1	..	..	..
undetermined <i>Parasitidae</i>	..	2	..	5	2	..	..	3	3	1
<i>Eupodes clavifrons</i>	..	..	..	..	..	..	..	..	3	..
<i>Penthaleus arcticus</i>	1	..	..	..	..	..	..	..	..	..
<i>Rhagidia gelida</i>	1	..	..	..	..	..	..	..	..	..
<i>Raphignathus patrius</i>	c.10	c.150	33	105	56	67	164	271	25	61
<i>Cyta latirostris</i>	..	..	..	..	..	..	..	1	..	..
undetermined nymphs	c.30	c.90	..	..	..	..	..	7	..	..
Total ...	284	711	148	311	341	345	564	638	272	494

¹⁾ I or II means: determined only as to type.

As regards the *Collembola*, it looks as if there had been an increase in number; possibly this is accidental. See, however, later the samples from Mikis Fjord.

What gave rise to the idea of an increase of the community during transportation in tins was the very large numbers of the Oribatid *Platynothrus peltifer* contained in these samples from Ella Island. These figures no longer seem to be so disproportionately high, if we take it that they represent the maximum reproduction. It was indicated in the former publication that this may just be the reason for the large number of individuals. The probability of this being so will be discussed in a subsequent chapter on the breeding season.

Plant Communities and their Associated Fauna.

As was the case with the microfauna on Ella Island, the samples were taken in known plant communities, despite the fact that the animal communities do not seem to depend on the plant communities as such, but on the humidity and bottom vegetation of lower plants dependent on it. The reason why the samples were nevertheless taken in the plant communities, and not sporadically over a stretch of land, or some in low, others in high vegetation, some on a wet bottom, others on dry, etc., is that in the known plant communities one is already familiar with certain factors, such as soil, moisture, period under snow, vegetation, and so on, with which one can work without more ado, whereas casually taken samples require the establishment of these factors on the spot, with the result that the work becomes much greater.

In describing the various plant communities I have in all cases accounted for the principal higher plants and for any bottom vegetation of lichen, moss and fungi, as well as for humidity, as these two factors: bottom vegetation and water content, seem to play the vital part in the thriving of the animals. The description of the plant communities has been made on the basis of own observations supplemented by the works of KRUSE and BÖCHER on the flora of East Greenland. The following plant communities were examined:

Angmagssalik: Fjeldmark (fell-field)
 Lichen heath
 Grassy slope
 Salix-herbacea vegetation
 Grass-*salix* snow bed
 Moss vegetation
 Bog
 Lake bank.

Atingat:	<i>Lichen</i> heath
	<i>Salix-herbacea</i> vegetation
	Moss vegetation
	Bog.
Mikis Fjord:	<i>Lichen</i> heath
	<i>Empetrum</i> vegetation
	<i>Salix-herbacea</i> vegetation
	Moss vegetation.

I have set up the plant communities according to moisture, fell-field having the lowest water content, lake bank the highest. The water content was not measured, being merely judged according to the water in the soil and the plant species prevailing on the spot. In the following the various plant communities are dealt with more in detail in conjunction with the animal forms associated with them.

Only the following animal groups have been considered in the course of the investigation: *Collembola*, *Diptera* larvae, *Aphidae*, *Araneida*¹⁾ and *Acarina*, the other groups such as *Coleoptera*, *Lepidoptera*, *Hymenoptera*, etc. being totally absent from the samples or occurring only individually, and therefore being of no interest as a part of the microfauna.

When describing the animal community within an individual plant community, I have employed KROGERUS' terms for the frequency of individuals in a species; species representing more than 5 per cent. of the total number of individuals are called *dominant*, those representing from 5 to 2 per cent. are *influent*, and those less than 2 per cent. are *recedent*. In order to designate the "distribution" of the species within a particular plant community the term "*constant*" is employed of species occurring in more than 50 per cent. of the samples, "*accessory*" of those occurring in 25 to 50 per cent., "*accidental*" of those occurring in fewer than 25 per cent. Still following KROGERUS, "biotope" is used of a well-defined area which, with regard to the most essential conditions of life, differs from others. "Biochorion" is a small area within the biotope, where a single species occurs regularly, finding in it the most essential, indispensable conditions of life. Of the entire animal community within the biotope the term "zoocoenosis" is employed, and "connex" of the animal community in the biochorion.

¹⁾ Not otherwise determined.

List of the *Collembola* and *Acarina* found in this investigation.

(The species marked with an asterisk are species new to Greenland).

Collembola.

- Hypogastrura armata* NICOLET
Xenylla humicola FABRICIUS
 **Willemia anophthalma* BÖRNER
Polyacanthella quinquespina WAHLGREN
Achorutes muscorum TEMPLETON. New to East Greenland.
Onychiurus grönlandicus TULLBERG
 — *armatus* TULLBERG
Tetracanthella wahlgreni AXELSON
Folsomia sexoculata TULLBERG
 — *quadrioculata* TULLBERG
 — *diplophthalma* AXELSON. New to East Greenland.
 — *fimetaria* LINNÉ
 **Proisotoma tenella* REUTER
Pseudisotoma sensibilis TULLBERG
 **Isotoma minor* SCHÄFFER
 * — n. sp.¹⁾
 * — *bipunctata* AXELSON²⁾
 — *viridis* BOURLET
 — *violacea* TULLBERG. New to East Greenland.
Sminthurides malmgreni TULLBERG
 **Arrhopalites pygmaeus* WANKEL
Sminthurinus concolor MEINERT

Acarina.

- Brachychthonius brevis* (MICH.)
Trhypochthonius tectorum (BERL.)
Trimalaconothrus sp.
Camisia horrida (HERM.)
Nothrus silvestris NIC.
Platynothrus peltifer (C. L. KOCH)
 * — *lapponicus* TRÄG.
 **Suctobelba cornigera* (BERL.)
Oppia quadricarinata (MICH.)
 — *neerlandica* (OUDMS.)

¹⁾ Seems to be a new species, to be described shortly.

²⁾ The specimens have been compared with the type specimens by Prof. Dr. W. M. LINNANIEMI, Åbo, Finland, and the correctness of the determinations confirmed, for which I beg Prof. LINNANIEMI to accept my best thanks.

- Oppia ornata* (OUDMS.)
 * — *splendens* (C. L. KOCH)
Ameronothrus lineatus (THORELL)
Tectocephus velatus (MICH.)
 **Liebstadia similis* (MICH.)
Oribatula exitis (NIC.)
 **Edwardzetes edwardsii* (NIC.)
 **Chamobates cuspidatus* (MICH.)
Sphaerozetes piriformis (NIC.)
 **Melanozetes mollicomus* (C. L. KOCH)
Trichoribates trimaculatus (C. L. KOCH)
 **Calyptozetes sarekensis* TRÄG.
 **Pelops ?septentrionalis* TRÄG.

 **Pergamasus lapponicus* TRÄG.
Cyrtolaelaps Kochi TRÄG.
 **Gamasellus spiricornis* (G. & R. CAN.)
Zercon triangularis C. L. KOCH
 — *curiosus* TRÄG.
 — *?ornatus* BERL.

Eupodes clavifrons R. CAN.
 **Penthaleus arcticus* TRÄG.
 — *insulanus* THORELL
Rhagidia gelida THORELL
Bryobia prætiosa C. L. KOCH
Raphignathus patrius BERL.
Bdella littoralis (L.)
 — *semiscutata* SIG THOR
Cyta latirostris (HERM.)
Podothrombium bicolor C. L. KOCH
Erythraeus miniatus (HERM.)
 — *vertex* (KRAM.)
 — *phalangioides* D. GEER v. *gracilipes* TRÄG.
Glyciphagus sp.

1. Fell-Field.

The very sparse, scattered vegetation of the fell-field, having no quantity of bottom vegetation of moss or lichens, to some extent is the result of the low supply of water, which decreases early in summer. As the soil consists of loose sand and gravel overlying rock, from which water rapidly runs away, any richer vegetation is impossible. The covering of snow is usually thin and is often removed by the strong gales; this again tends to destroy the vegetation. No mull; only extremely

	Average No. of individuals per sample	No. of samples containing the species
<i>Xenylla humicola</i>	.. ¹⁾	2
<i>Willemia anophthalma</i>	3	5
<i>Folsomia quadrioculata</i>	16	5
<i>Oppia neerlandica</i>	..	1
— <i>splendens</i>	7	2
<i>Tectocephus velatus</i>	8	5
<i>Oribatula exilis</i>	5	5
<i>Melanozetes mollicornis</i>	..	1
<i>Trichoribates trimaculatus</i>	1	3
<i>Calyptozetes sarekensis</i>	6	5
<i>Pelops ?septentrionalis</i>	..	1
undetermined <i>Oribatidae</i>	5	..
<i>Zercon ?ornatus</i>	4	4
<i>Eupodes clavifrons</i>	..	1
<i>Rhagidia gelida</i>	1	2
<i>Bdella semiscutata</i>	3	5
<i>Cyta latirostris</i>	3	4
<i>Erythraeus miniatus</i>	..	1
undetermined <i>Trombidiidae</i>	1	..
<i>Glyciphagidae</i>	1	3
Total...	64	5

¹⁾ Means that less than one individual per sample was found on an average.

Dominant	Influent
<i>Folsomia quadrioculata</i> 25.0 %	<i>Willemia anophthalma</i> 4.7 %
<i>Tectocephus velatus</i> 12.5 %	<i>Bdella semiscutata</i> 4.7 %
<i>Oppia splendens</i> 10.9 %	<i>Cyta latirostris</i> 4.7 %
<i>Calyptozetes sarekensis</i> 9.4 %	
<i>Oribatula exilis</i> 7.8 %	
<i>Zercon ?ornatus</i> 6.3 %	

small quantities of organic remains. Samples taken about 75 metres above sea level on 28th July.

The principal plants are *Empetrum nigrum*, *Silene acaulis*, *Cerastium alpinum*, *Ranunculus glacialis*, *Vaccinium uliginosum*, *Salix glauca*, *Polygonum viviparum*, *Carex* and grasses.

The table shows that the fauna of the fell-field is very poor; this applies to all the groups, both qualitatively and quantitatively. As often is the case in such poor localities, no species is particularly outstanding; none of them have favourable conditions to live in, owing to the very sparse or completely lacking bottom vegetation of mosses, lichens or decaying vegetable matter on which most of these animals feed. How-

ever, there is reason for singling out the Collembolus *Folsomia quadrioculata*, the Oribatids *Tectocephus velatus*, *Calypozetes sarekensis* and *Oribatula exilis*, all of which have a very wide distribution and will always be found in this type of vegetation. *Oppia splendens* occupies a position of its own; it is not evenly distributed over the fell-field. *Zercon ?ornatus* is the sole representative of the *Parasitidae*, which in individual number is also poorly represented. The Trombidiid *Bdella semiscutata* occurs everywhere, though in small numbers only.

Of the other animal groups which one might have expected to find, there is a total absence of *Aphidae*, *Diptera* and spiders. As regards the latter this must be purely accidental, for spiders are often found on the fell-field. Dominant and influent species have been tabulated, whereas recedent species are so unimportant that they are ignored. Whether the species is constant, accessory or accidental may be read almost direct from the right-hand column of the table.

2. Lichen Heath.

Lichen heath is often met with on fairly steep sandy surfaces with no constant supply of running water, but with deep ground water. The snow covering is thin, but is not torn away by the wind. Lichen heath, however, often occurs on patches that are not snow-covered in winter. It is a type of vegetation that is mostly found in the form of small islands on grassy slopes (see later). The rather sporadic vegetation consists of i. a. *Betula nana*, *Juniperus communis*, *Cerastium alpinum*, *Carex* and grasses. Various shrub-formed lichens and fungi grow everywhere, like a dense carpet between the scattered plants. It is the lichens which most of all characterize this type of vegetation. The samples were taken from pure lichen vegetation about 50—75 metres above sea level, and on the following dates: 18th July 4 samples, 7th August 5, 3rd September 5. Only the samples taken on the first two days are included in the calculations in the table of the average number of individuals per sample. As there are not samples of all the plant communities taken on the same day, the samples cannot be compared direct when calculating the number of individuals on a certain date, and therefore it was necessary to make the calculation on the basis of all samples from one vegetation type at the time when hatching is proceeding rapidly; later samples, for example that for the 3rd September, are omitted here, as the very small number of animals in them would greatly reduce the total average, which would mean a disproportion between types of vegetation where samples had been taken throughout the summer and into the autumn, and others taken only once that summer and perhaps in a period when the community had reached its maximum of reproduction. (On the number of individuals in the later samples see the chapter on the breeding season.)

	Average No. of individuals per sample	No. of samples containing the species
<i>Willemia anophthalma</i>	81	6
<i>Tetracanthella wahlgreni</i>	340	9
<i>Folsomia quadrioculata</i>	1629	9
<i>Pseudisotoma sensibilis</i>	2	1
<i>Isotoma minor</i>	416	6
— <i>n. sp.</i>	218	9
— <i>viridis</i>	..	2
— <i>violacea</i> ¹⁾	34	8
<i>Sminthurinus concolor</i>	..	1
<i>Aphidae</i>	13	7
<i>Araneida</i>	1	5
<i>Brachychthonius brevis</i>	..	1
<i>Trhypochthonius tectorum</i>	1	2
<i>Trimalacothonrus sp.</i>	..	1
<i>Camisia horrida</i>	13	7
<i>Nothrus silvestris</i>	2	5
<i>Platynothonrus peltifer</i>	..	1
— <i>lapponicus</i>	..	2
<i>Oppia quadricarinata</i>	3	5
— <i>ornata</i>	1	2
— <i>splendens</i>	..	1
<i>Tectocephus velatus</i>	96	9
<i>Oribatula exilis</i>	24	9
<i>Chamobates cuspidatus</i>	9	4
<i>Sphaerozetes piriformis</i>	..	2
<i>Melanozetes mollicomus</i>	..	1
<i>Calyptozetes sarekensis</i>	138	9
<i>Pelops ?septentrionalis</i>	3	4
undetermined <i>Oribatidae</i>	22	..
<i>Zercon curiosus</i>	2	5
— <i>?ornatus</i>	4	7
undetermined <i>Parasitidae</i>	6	..
<i>Eupodes clavifrons</i>	4	6
<i>Rhagidia gelida</i>	6	8
<i>Bdella semiscutata</i>	7	8
<i>Cyta latirostris</i>	3	8
<i>Erythraeus miniatus</i>	3	7
— <i>vertex</i>	..	1
— <i>phalangioides v. gracilipes</i>	1	1
undetermined <i>Trombidiidae</i>	2	..
<i>Glyciphagidae</i>	25	9
Total...	3109	9

¹⁾ Since the tables were drawn up, Agrell in a small publication: «Zwei systematische Fragen betreffs der Collembolenfamilie Isotomidae» has put *Isotoma violacea* and *I. olivacea* together into one species.

Dominant		Influent	
<i>Folsomia quadrioculata</i>	52.4 %	<i>Calyptozetes sarekensis</i>	4.4 %
<i>Isotoma minor</i>	13.4 %	<i>Tectocephus velatus</i>	3.1 %
<i>Tetracanthella wahlgreni</i>	10.9 %	<i>Willemia anophthalma</i>	2.6 %
<i>Isotoma</i> n. sp.	7.0 %		

The table reveals the peculiar circumstance that, despite the very dry conditions under which they live, the Collembolae greatly exceed the mites in individual density. *Folsomia quadrioculata* are extremely numerous, about 160,000 per sq.m, and *Tetracanthella wahlgreni*, *Isotoma minor* and *I. n. sp.* are also present in large numbers. The effect is that against these myriads of Collembolae the mites are unable to assert themselves. Of Oribatids, *Calyptozetes sarekensis* is very common, both numerically and in distribution, as also *Tectocephus velatus*. Like the two first named, *Oribatula exilis* is constant and relatively numerous.

Aphidae occur almost everywhere, *Araneidae* sporadically.

On the whole the lichen heath stands out by its very rich fauna; this holds good as to both density of species and density of individuals, and beyond comparison it is the type of vegetation that shelters the richest fauna.

3. Grassy Slopes.

Grassy slopes occur in localities similar to lichen heaths, which must be regarded as small islands in the grass. Accordingly, what was said as to soil and water-supply under lichen heath applies to the grassy slope. The vegetation consists preponderantly of grasslike plants such as *Luzula spicata*, *Carex nigrida*, *Poa pratensis*, etc. (according to KRUSE). A number of other species also occur, but in smaller quantities. The bottom vegetation consists of lichens, less so of mosses. The samples were taken about 50 metres above sea level, all on the 7th August.

Grassy slopes occur in localities similar to herbaceous slopes (see later), but the lower water supply from fell-fields above is responsible for the occurrence of grassy slopes here.

As on the lichen heath, the Collembolae *Folsomia quadrioculata*, and the Oribatid *Calyptozetes sarekensis* again predominate. *Willemia anophthalma* and *Isotoma violacea* are numerous everywhere, as also the Oribatid *Oribatula exilis* and *Glyciphagidae*. In this type of vegetation *Liebstadia similis* has found favourable conditions of life and occurs in rather large numbers; otherwise it was not commonly found elsewhere, though it often occurs individually.

All in all, the fauna of the grassy slope is very like that of the lichen heath, but not so rich in either species or individuals. The bottom vegetation of lichens stamps its character, with the effect that, from a vegetation point of view, this plant community closely approaches that of the lichen heath.

	Average No. of individuals per sample	No. of samples containing the species
<i>Willemia anophthalma</i>	97	5
<i>Folsomia quadrioculata</i>	275	5
<i>Isotoma viridis</i>	2	4
— <i>violacea</i>	70	5
<i>Aphidae</i>	1	2
<i>Araneida</i>	1	5
<i>Brachychthonius brevis</i>	2	3
<i>Camisia horrida</i>	2	3
<i>Nothrus silvestris</i>	10	4
<i>Oppia neerlandica</i>	..	1
— <i>ornata</i>	14	4
<i>Tectocephus velatus</i>	5	5
<i>Liebstadia similis</i>	34	5
<i>Oribatula exilis</i>	91	5
<i>Edwardzetes edwardsii</i>	..	2
<i>Chamobates cuspidatus</i>	..	1
<i>Sphaerozetes piriformis</i>	2	3
<i>Melanozetes mollicornus</i>	..	2
<i>Trichoribates trimaculatus</i>	5	5
<i>Calyptozetes sarekensis</i>	172	5
<i>Pelops ?septentrionalis</i>	19	5
undetermined <i>Oribatidae</i>	4	..
<i>Cyrtolaelaps Kochi</i>	1	4
<i>Zercon triangularis</i>	10	4
— <i>?ornatus</i>	2	4
undetermined <i>Parasitidae</i>	1	..
<i>Eupodes clavifrons</i>	20	5
<i>Penthaleus insulanus</i>	2	2
<i>Rhagidia gelida</i>	3	5
<i>Bdella semiscutata</i>	3	5
<i>Cyta latirostris</i>	3	5
<i>Erythraeus</i> sp.	2	4
undetermined <i>Trombidiidae</i>	110	..
<i>Glyciphagidae</i>	62	5
Total...	1025	5

Dominant	
<i>Folsomia quadrioculata</i>	26.8 %
<i>Calyptozetes sarekensis</i>	16.8 %
<i>Willemia anophthalma</i>	9.5 %
<i>Oribatula exilis</i>	8.9 %
<i>Isotoma violacea</i>	6.8 %
<i>Glyciphagidae</i>	6.1 %

Influent	
<i>Liebstadia similis</i>	3.3 %

4. Salix-herbacea Vegetation.

According to KRUUSE, *Salix-herbacea* vegetation may be taken to be a special form of herbaceous bank, which arises when the bank reaches down to a valley bottom having a slight dip and with running water. He characterises the herbaceous bank as a complete carpet, mostly

	Average No. of individuals per sample	No. of samples containing the species
<i>Xenylla humicola</i>	..	1
<i>Polyacanthella quinquespinos</i>	..	1
<i>Tetracanthella wahlgreni</i>	1	6
<i>Folsomia quadrioculata</i>	13	1
<i>Isotoma n. sp.</i>	..	1
— <i>viridis</i>	1	4
<i>Araneida</i>	..	1
<i>Camisia horrida</i>	..	1
<i>Platynothrus lapponicus</i>	..	1
<i>Tectocepheus velatus</i>	56	10
<i>Oribatula exilis</i>	46	10
<i>Chamobates cuspidatus</i>	..	1
<i>Sphaerozetes piriformis</i>	52	10
<i>Melanozetes mollicomus</i>	3	3
<i>Trichoribates trimaculatus</i>	11	10
<i>Calyptozetes sarekensis</i>	16	8
<i>Pelops ?septentrionalis</i>	3	5
undetermined <i>Oribatidae</i>	75	..
<i>Zereon ?ornatus</i>	..	1
undetermined <i>Parasitidae</i>	1	..
<i>Eupodes clavifrons</i>	2	3
<i>Penthaleus insulanus</i>	..	1
<i>Rhagidia gelida</i>	..	2
<i>Bryobia praetiosa</i>	..	1
<i>Bdella semiscutata</i>	3	9
<i>Cyta latirostris</i>	1	3
<i>Erythraeus miniatus</i>	..	1
undetermined <i>Trombididae</i>	3	..
Total...	287	10

Dominant	Influent
<i>Tectocepheus velatus</i> 19.5 %	<i>Folsomia quadrioculata</i> 4.5 %
<i>Sphaerozetes piriformis</i>	<i>Trichoribates trimaculatus</i> 3.8 %
<i>Oribatula exilis</i> 16.0 %	
<i>Calyptozetes sarekensis</i> 5.6 %	

composed of perennial herbs on a sloping bottom. It is the richest plant formation, in both species and individuals, in the whole region. This is due almost exclusively to the water supply. Water runs or seeps down almost continuously from the hills above, from which there is an abundance of meltwater. The thickness of snow is considerable. *Salix-herbacea* vegetation being a special form of herbaceous bank, comprising this one species alone with a slight bottom vegetation of lichens, there is no reason for naming the many species which characterize the herbaceous bank proper. Some mull is formed. At the time of taking the samples, as early that summer as on the 18th July, the soil was already dry. The samples were taken at about 50 metres above sea level.

Compared with the fauna of the previously described plant communities, this fauna has changed completely in appearance. The *Collembola* are present in very small numbers, but, as was also the case above, the most numerous is *Folsomia quadrioculata*; nevertheless, it occurs in one sample only. The sole animal group of any importance here is *Oribatidae*, of which several species are common in all samples, e. g. *Tectocephus velatus*, *Oribatula exilis*, *Sphaerozetes piriformis* and *Trichoribates trimaculatus*. *Calyptozetes sarekensis* also occurs almost always. *Parasitidae* and *Trombidiidae* are practically absent.

Here it is the same species that predominate as on the vegetation types first described; but whereas the fauna on them was more or less evenly divided between *Collembola*, *Oribatidae*, *Parasitidae* and *Trombidiidae*, it is here concentrated within the *Oribatidae* group.

5. Grass-Salix Snow Bed.

This type of vegetation must also be classed with the herbaceous bank. It is found on rather steep slopes some distance below the mountain or hill top, where the snow lies till well into the summer. In spring and early summer the water supply is plentiful on account of the thawing of the snow. Later in summer, when the snow has gone, this type of vegetation is very like *Salix-herbacea* vegetation, except that it is mingled with some grasses.

The samples were taken about 25 metres above sea level at one to three metres from the snow margin. On 28th July, when the samples were taken, the vegetation was mostly still withered, though with fresh shoots on the surface of the ground.

Here again the similarity to the plant communities already described was so great that there is no reason for dwelling upon the fauna except for one species, *Brachychthonius brevis*, which occurs only sparsely in the plant communities previously described, but here is fairly general in distribution. Undoubtedly this is owing to the greater humidity. There is also reason for noticing the relatively rich fauna so early in summer,

	Average No. of individuals per sample	No. of samples containing the species
<i>Willemia anophthalma</i>	16	4
<i>Folsomia quadrioculata</i>	186	5
<i>Isotoma n. sp.</i>	16	5
— <i>viridis</i>	2	2
<i>Aphidae</i>	1	1
<i>Phoride</i> II.....	—	1
<i>Araneida</i>	—	1
<i>Brachychthonius brevis</i>	17	2
<i>Oppia ornata</i>	8	2
<i>Tectocephus velatus</i>	9	4
<i>Liebstadia similis</i>	..	1
<i>Oribatula exilis</i>	38	5
<i>Trichoribates trimaculatus</i>	2	2
<i>Calyptozetes sarekensis</i>	2	3
<i>Pelops ?septentrionalis</i>	5	2
undetermined <i>Oribatidae</i>	22	..
<i>Gamasellus spiricornis</i>	3	1
undetermined <i>Parasitidae</i>	1	..
<i>Eupodes clavifrons</i>	6	5
<i>Bryobia praetiosa</i>	..	1
<i>Bdella semiscutata</i>	2	4
<i>Cyta latirostris</i>	1	3
<i>Erythraeus miniatus</i>	1	2
undetermined <i>Trombididae</i>	14	..
Total...	352	5

Dominant		Influent	
<i>Folsomia quadrioculata</i>	52.8 %	<i>Brachychthonius brevis</i>	4.8 %
<i>Oribatula exilis</i>	10.8 %	<i>Willemia anophthalma</i>	4.6 %
		<i>Isotoma n. sp.</i>	4.6 %
		<i>Tectocephus velatus</i>	2.6 %
		<i>Oppia ornata</i>	2.3 %

only few metres from the snow line, where the ground can have been free of snow only a very short time. As the great majority of the animals were mature (which cannot be seen from the table), the assumption is that they have just appeared after wintering under the snow and scarcely commenced breeding as yet. For this reason the number found in this type of vegetation is doubtless too small compared with the previous samples, some of which at any rate were taken during the breeding period.

6. Moss Vegetation.

	Average No. of individuals per sample	No. of samples containing the species
<i>Polyacanthella quinquespinosa</i>	..	3
<i>Achorutes muscorum</i>	1	2
<i>Onychiurus armatus</i>	6	6
<i>Folsomia quadrioculata</i>	60	7
<i>Isotoma viridis</i>	6	6
— <i>violacea</i>	4	6
<i>Sminthurides malmgreni</i>	..	1
<i>Arrhopalites pygmaeus</i>	1	2
<i>Sminthurinus concolor</i>	..	1
undetermined <i>Collembola</i> (<i>Isotom.</i>)	120	..
<i>Aphidae</i>	..	1
<i>Orthocladius</i> I.	1	3
<i>Regionidae</i>	..	1
<i>Phoridae</i>	..	1
<i>Araneida</i>	1	3
<i>Brachychthonius brevis</i>	54	4
<i>Camisia horrida</i>	3	4
<i>Nothrus silvestris</i>	14	3
<i>Platynothrus peltifer</i>	50	7
— <i>lapponicus</i>	2	3
<i>Oppia neerlandica</i>	2	4
— <i>ornata</i>	1	3
<i>Tectocephus velatus</i>	21	7
<i>Liebstadia similis</i>	3	4
<i>Oribatula exilis</i>	..	2
<i>Edwardzetes edwardsii</i>	13	5
<i>Chamobates cuspidatus</i>	..	2
<i>Melanozetes mollicomus</i>	5	7
<i>Trichoribates trimaculatus</i>	16	5
<i>Calypozetes sarekensis</i>	1	3
<i>Pelops ?septentrionalis</i>	1	2
undetermined <i>Oribatidae</i>	105	..
<i>Cyrtolaelaps Kochi</i>	3	5
<i>Gamasellus spiricornis</i>	1	3
<i>Zercon curiosus</i>	1	4
— <i>?ornatus</i>	41	3
undetermined <i>Parasitidae</i>	2	..
<i>Eupodes clavifrons</i>	2	3
<i>Penthaleus insulanus</i>	..	1
<i>Rhagidia gelida</i>	3	5
<i>Raphignathus patrius</i>	13	5
Total...	557	7

Dominant		Influent	
<i>Folsomia quadrioculata</i>	10.8 %	<i>Tectocepheus velatus</i>	3.8 %
<i>Brachychthonius brevis</i>	9.7 %	<i>Trichoribates trimaculatus</i>	2.9 %
<i>Platynothrus peltifer</i>	9.0 %	<i>Nothrus silvestris</i>	2.5 %
<i>Zercon ?ornatus</i>	7.4 %	<i>Edwardzetes edwardsii</i>	2.3 %
		<i>Raphignathus patrius</i>	2.3 %

This vegetation, which occurred both near the shore of an open mountain lake and near rushing streams, consists of a thick, luxurious layer of various mosses, mostly *Sphagnum*. The layer is about 20 cm thick, very wet. Water supply abundant the whole summer. The samples were taken about 20 metres above sea level: July 28th 5 samples, August 7th 2 samples.

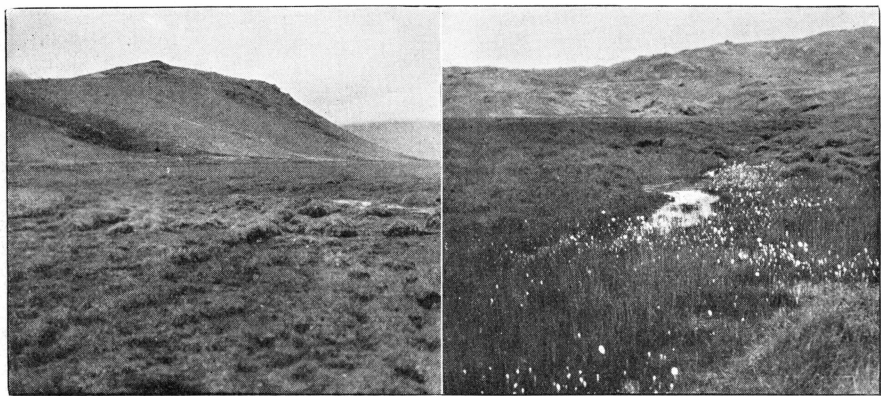
However homogeneous this type of vegetation may be as to flora, it contains a large number of different animal species, of both *Collembola* and *Acarina*. As everywhere, *Folsomia quadrioculata* is the dominating Collembole, but in most samples several other species occur in very small numbers. *Aphidae* are rare. *Diptera* larvae, on the other hand, find tolerable conditions of life in the wet moss cushions with decaying plant remains, and occur here and there.

Oribatidae are the most numerous by far, represented by species already found in the previously described plant communities, such as *Brachychthonius brevis*, which as already stated prefers wet ground, *Tectocepheus velatus*, which occurs everywhere, and *Trichoribates trimaculatus*. *Platynothrus peltifer* occurs now for the first time in any large number; one specimen was found in a sample from the lichen heath; but as this is essentially a moisture-loving species, it is possible that this one individual got down into another sample in the laboratory. *Nothrus silvestris* and *Edwardzetes edwardsii* are frequent. Of *Parasitidae*, *Zercon ?ornatus* is rather common; the same applies to the Trombidiid *Raphignathus patrius*.

7. Bog.

The supply of water is plentiful. The water is stagnant. The snow covers everything and lies till well into the summer. The bog generally dries up in the latter half of August. The vegetation consists of *Eriophorum Scheuchzeri*, *Carex*, grasses, and, between the scattered plants, lichens and a thick carpet of various mosses. There is often open water between the plants. The samples were taken from moss cushions. Height above sea level about 50 metres. The collections were made at the following dates: July 18th 10 samples, August 7th 5, and September 3rd 5. Only the first two batches were employed when calculating the individual density per sample, whereas all three batches were used for determining when hatching reaches its maximum (see later).

	Average No. of individuals per sample	No. of samples containing the species
<i>Xenylla humicola</i>	5	7
<i>Polyacanthella quinquespinos</i>	12	5
<i>Achorutes muscorum</i>	..	1
<i>Onychiurus armatus</i>	2	6
<i>Tetracanthella wahlgreni</i>	5	3
<i>Proisotoma tenella</i>	6	9
<i>Folsomia quadrioculata</i>	96	10
<i>Isotoma viridis</i>	3	12
— <i>violacea</i>	1	3
<i>Sminthurides malmgreni</i>	1	4
<i>Arrhopalites pygmaeus</i>	..	2
undetermined <i>Collembola</i>	1	..
<i>Aphidae</i>	22	9
<i>Camptocladius hexatomus</i> -group	1	5
<i>Phaenocladus</i> sp.	..	4
<i>Araneida</i>	..	5
<i>Brachychthonius brevis</i>	2	5
<i>Trimalacothonrus</i> sp.	93	15
<i>Camisia horrida</i>	..	1
<i>Nothrus silvestris</i>	9	5
<i>Platynothonrus peltifer</i>	253	15
— <i>lapponicus</i>	..	1
<i>Oppia neerlandica</i>	36	6
<i>Tectocephus velatus</i>	2	6
<i>Oribatula exilis</i>	1	4
<i>Edwardzetes edwardsii</i>	..	2
<i>Chamobates cuspidatus</i>	..	2
<i>Sphaerozetes piriformis</i>	..	2
<i>Melanozetes mollicomus</i>	21	13
<i>Trichoribates trimaculatus</i>	9	12
<i>Pelops ?septentrionalis</i>	5	8
undetermined <i>Oribatidae</i>	36	..
<i>Pergamasus lapponicus</i>	..	1
<i>Cyrtolaelaps Kochi</i>	1	10
undetermined <i>Parasitidae</i>	2	..
<i>Eupodes clavifrons</i>	1	7
<i>Penthaleus insulanus</i>	1	1
<i>Rhagidia gelida</i>	..	3
<i>Bryobia praetiosa</i>	2	10
<i>Raphignathus patrius</i>	2	4
<i>Bdella</i> sp.	..	2
<i>Cyta latirostris</i>	..	1
<i>Erythraeus</i> sp.	1	4
undetermined <i>Trombidiidae</i>	..	..
Total . . .	632	15



Tyge Böcher phot.

Fig. 1. Two views across the bog behind the Angmagssalik Settlement.

Dominant		Influent	
<i>Platynothrus peltifer</i>	40.0 %	<i>Aphidae</i>	3.5 %
<i>Folsomia quadrioculata</i>	15.2 %	<i>Melanozetes mollicomus</i>	3.3 %
<i>Trimalaconothrus</i> sp.	14.7 %		
<i>Oppia neerlandica</i>	5.7 %		

As always, *Folsomia quadrioculata* is the most numerous Collembola; many other species occur, often singly, in the bog, but on the whole the number of Collembola is small compared with that of Oribatidae, of which *Platynothrus peltifer* is much the commonest; conditions here are so favourable for it that it has almost entirely superseded all other species; the only other species occurring in any large number in all the samples is *Trimalaconothrus*, which occurs exclusively on wet ground. *Oppia neerlandica* and *Melanozetes mollicomus* are rather common, as also Aphidae. Diptera larvae and spiders occur now and then.

8. Lake Bank.

The lake bank is a flat, sandy or gravelly surface lying at one end of a fairly large and deep lake, which is almost devoid of vegetation and on all other sides is surrounded by stones or fairly steep rock faces. The vegetation at this lake is extremely sparse and consists of a little low, scattered moss and a few *Carex* plants. Soil wet, washed by the larger waves. The samples were taken about 20 metres above sea level, on July 28th 10 samples, August 7th 5 and September 12th 10. Only the two latter batches were used in calculating the individual density per sample, whereas all three are dealt with in a later chapter on the breeding season.

The fauna here does not differ essentially from that in bog and in moss vegetation. *Collembola* are present in relatively small numbers, the most frequent being *Folsomia quadrioculata*. Of *Oribatidae*, *Platynothrus*

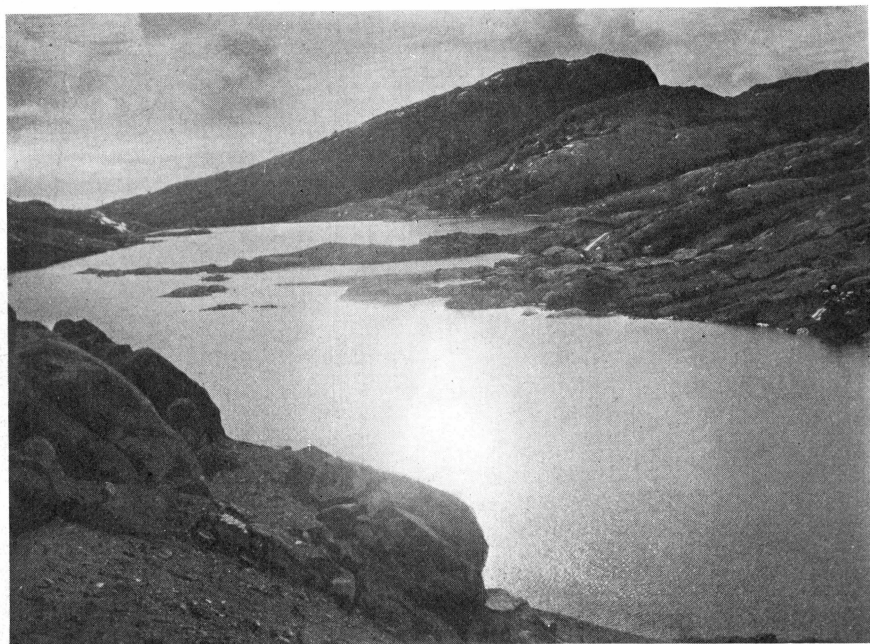
	Average No. of individuals per sample	No. of samples containing the species
<i>Polyacanthella quinquespino</i>	1	6
<i>Onychiurus armatus</i>	4	13
<i>Tetracanthella wahlgreni</i>	2	12
<i>Proisotoma tenella</i>	..	2
<i>Folsomia sexoculata</i>	6	9
— <i>quadrioculata</i>	28	15
<i>Isotoma minor</i>	..	1
— <i>n. sp.</i>	..	1
— <i>viridis</i>	5	7
— <i>violacea</i>	8	9
<i>Sminthurides malmgreni</i>	1	6
undetermined <i>Collembola</i>	1	..
<i>Camptocladius hexatomus</i> -group	10	15
<i>Orthocladius</i> II.	1	8
<i>Phaenocladius</i> sp.	4	11
<i>Phoridae</i>	..	2
<i>Araneida</i>	..	2
<i>Brachychthonius brevis</i>	4	4
<i>Nothrus silvestris</i>	..	1
<i>Platymothrus peltifer</i>	174	15
— <i>lapponicus</i>	5	9
<i>Oppia neerlandica</i>	2	8
<i>Tectocephus velatus</i>	15	13
<i>Ameronothrus lineatus</i> ¹⁾	..	1
<i>Oribatula exilis</i>	..	2
<i>Edwardzetes edwardsii</i>	..	1
<i>Chamobates cuspidatus</i>	..	1
<i>Melanozetes mollicomus</i>	7	12
<i>Trichoribates trimaculatus</i>	1	3
<i>Calypozetes sarekensis</i>	1	6
<i>Pelops ?septentrionalis</i>	..	2
undetermined <i>Oribatidae</i>	34	..
<i>Cyrtolaelaps Kochi</i>	..	2
<i>Zercon curiosus</i>	..	1
— <i>?ornatus</i>	..	1
undetermined <i>Parasitidae</i>	3	..
<i>Eupodes clavifrons</i>	..	3
<i>Penthaleus arcticus</i>	..	2
<i>Rhagidia gelida</i>	..	2
<i>Bryobia praetiosa</i>	..	1
<i>Raphignathus patrius</i>	90	15
<i>Bdella littoralis</i>	..	1
— <i>semiscutata</i>	..	1
<i>Cyta latirostris</i>	..	1
<i>Erythraeus miniatus</i>	..	1
undetermined <i>Trombidiidae</i>	..	..
Total . . .	407	15

¹⁾ A pronouncedly littoral form, taken only in 1 specimen on lake bank, possibly carried by a bird from the beach not far away.

Dominant		Influent	
<i>Platynothrus peltifer</i>	42.7 %	<i>Tectocephus velatus</i>	3.7 %
<i>Raphignathus patrius</i>	22.1 %		
<i>Folsomia quadrioculata</i>	6.9 %		

peltifer is numerous, of *Trombidiidae*, *Raphignathus patrius*, whereas all other *Trombidiidae* are very sporadic in their occurrence; the same applies to the *Parasitidae*. *Tectocephus velatus* is common.

As in the bog, certain species have gained the ascendancy over the



M. Hammer phot.

Fig. 2. A view over the lake, near the Angmagssalik Settlement.

others. Here, however, the fauna is not so rich, due no doubt to the poor nutrition on the barren, almost bare gravel surface. Nevertheless, *Diptera* larvae are present in relatively large numbers.

The Animal Communities at Angmagssalik.

If after this examination of the composition of the fauna in the different plant communities, we compare them all one with the other, one cannot help noticing that they bear a great resemblance to one another. Apart from the many recedent species, which occur only in small numbers and shall not be discussed here, there are some which are common to all plant communities, e. g. the Collembola *Folsomia*

quadrioculata, and of the *Acarina Tectocephus velatus*. The effect of this is that at first glance it is difficult to see any difference in the fauna of the eight different plant communities; on closer examination, however, the presence or absence of certain species opens our eyes to the differences. This is true, for example, of the *Oribatidae Oribatula exilis*, *Calypozetes sarekensis* and *Platynothrus peltifer*. According to their presence or absence it is possible to differentiate between two types: those in which *Oribatula exilis* and *Calypozetes sarekensis* find conditions favour-

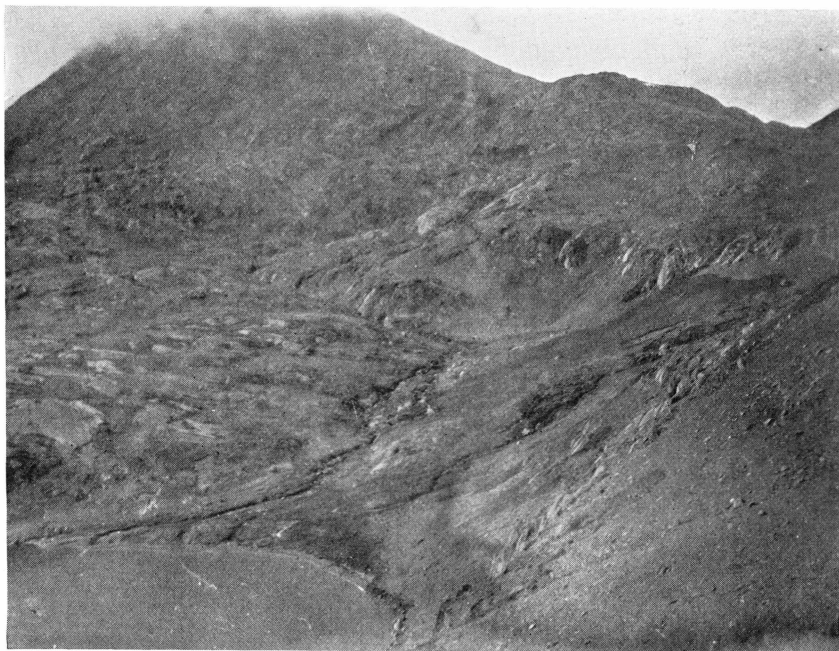


Fig. 3.

M. Hammer phot.

The lake near the Settlement. The samples were taken on the narrow sandbank.

able and occur generally, and those which contain *Platynothrus peltifer*. The former type includes the five plant communities first described, all of which are more or less dry throughout the greater part of the year, while the latter includes the last three, all very wet for the greater part or all through the year.

In order to make the position more comprehensible, all dominant and influent species in the five dry plant communities have been set up in the following table. From this it appears that in all essentials they must be regarded as forming one animal community; only on less important points do the animal communities in the different plant communities differ from one another, as a consequence of the fact that each plant community will always have its own particular characteristics,

the result of the factors prevailing on the spot, and thus will offer certain species especially good conditions of life, whereby they will occur numerously there, but often occur in smaller numbers elsewhere too.

Table of dominant and influent species in dry plant communities.

D = dominant I = influent	Fell-field		Lichen heath		Grassy bank		Salix herbacea vegetation		Grass-salix snow bed		No. of samples containing the species
	D	I	D	I	D	I	D	I	D	I	
<i>Willemia anophthalma</i>	..	..	..	×	×	..	..	..	..	×	20
<i>Tetracanthella wahlgreni</i>	..	..	×	..	..	..	..	..	..	..	15
<i>Folsomia quadrioculata</i>	×	..	×	..	×	..	×	×	×	..	26
<i>Isotoma minor</i>	..	..	×	..	..	..	..	..	..	..	6
— <i>n. sp.</i>	..	..	×	..	..	..	..	..	×	..	15
— <i>violacea</i>	..	..	..	..	×	..	..	..	..	..	13
<i>Brachychthonius brevis</i>	..	..	..	..	..	..	..	..	×	..	6
<i>Oppia ornata</i>	..	..	..	..	..	..	..	..	×	..	8
— <i>splendens</i>	×	..	..	..	..	..	..	..	..	..	3
<i>Tectocephus velatus</i>	×	..	..	×	..	×	..	..	×	..	33
<i>Liebstadia similis</i>	..	..	..	..	×	..	..	..	..	..	6
<i>Oribatula exilis</i>	×	..	..	..	×	..	×	×	×	..	34
<i>Sphaerozetes piriformis</i>	..	..	..	..	..	×	..	..	..	..	15
<i>Trichoribates trimaculatus</i>	..	..	..	..	..	..	×	..	..	..	20
<i>Calyptozetes sarekensis</i>	×	..	..	×	×	..	×	..	..	..	30
<i>Zercon ?ornatus</i>	×	..	..	..	..	..	..	..	..	..	16
<i>Bdella semiscutata</i>	..	×	..	..	..	..	..	..	..	..	31
<i>Cyta latirostris</i>	..	×	..	..	..	..	..	..	..	..	23
<i>Glyciphagidae</i>	..	..	..	..	×	..	..	..	..	..	17
Total samples...											34

As the table will show, *Folsomia quadrioculata* occur in all five plant communities and dominate four of these; *Tectocephus velatus*, *Oribatula exilis* and *Calyptozetes sarekensis* are present in four plant communities, in most cases predominantly. As regards the lichen heath, the position is rather unusual on account of the great preponderance of *Collembola*. For this reason *Oribatula exilis* is not among the species which numerically characterize the lichen heath, and *Tectocephus velatus* and *Calyptozetes sarekensis* are influent, despite the fact that they occur in an average quantity of 96 and 138 respectively per sample — i. e. much more numerously than they occur in *Salix-herbacea* vegetation, where the two species occur in numbers of 56 and 16, or on fell-field, which has 8 and 6. *Willemia anophthalma* occurs in three and *Isotoma n. sp.* in two plant communities.

For the purpose of gaining some impression of how the various species — apart from their quantitative distribution — are distributed

over the five different plant communities, the right-hand column of the table indicates in how many out of all the samples the particular species occurs. In all there are 34 samples. It will be seen that also in regard to distribution *Folsomia quadrioculata*, *Tectocepheus velatus*, *Oribatula exilis* and *Calypozetes sarekensis* are commonest in occurrence. *Oribatula exilis* was found in all samples, *Tectocepheus velatus* in 33, *Calypozetes sarekensis* in 30 and *Folsomia quadrioculata* in 26. Only one of all the other species has anything like the same distribution: *Bdella semiscutata*, which was found in 31 samples.

In the table below the dominant and influent species in the three plant communities last described are set up in the same manner as in the previous table. *Platynothrus peltifer* is dominating in its occurrence in all three plant communities, and simply by the occurrence of this species in all the samples in large numbers the three plant communities are united into one whole, the wet animal community, which is distinct from the dry one.

Table of dominant and influent species in the wet communities.

D = dominant. I = influent.	Moss		Bog		Lake bank		No. of samples containing the species
	D	I	D	I	D	I	
<i>Folsomia quadrioculata</i>	×	..	×	..	×	..	32
<i>Aphidae</i>	..	..	..	×	..	..	10
<i>Brachychthonius brevis</i>	×	..	..	..	..	..	13
<i>Trimalaconothrus</i> sp.	..	..	×	..	..	..	15
<i>Nothrus silvestris</i>	..	×	..	..	..	..	9
<i>Platynothrus peltifer</i>	×	..	×	..	×	..	37
<i>Oppia neerlandica</i>	..	..	×	..	..	..	18
<i>Tectocepheus velatus</i>	..	×	..	..	..	×	26
<i>Edwardzetes edwardsii</i>	..	×	..	..	..	..	8
<i>Melanozetes mollicornis</i>	..	..	..	×	..	..	32
<i>Trichoribates trimaculatus</i>	..	×	..	..	..	..	20
<i>Zercon ?ornatus</i>	×	..	..	..	..	..	4
<i>Raphignathus patrius</i>	..	×	..	..	×	..	24
Total samples...							37

If this is compared with the table for the dry community, the small role played by the *Collembola* will be observed. *Folsomia quadrioculata* is alone in representing this group; it predominates in all three plant communities and is generally distributed everywhere. Of the *Acarina*, *Platynothrus peltifer* likewise predominates in all plant communities. Of the other *Acarina*, *Tectocepheus velatus* and *Raphignathus patrius* are generally distributed and fairly numerous. The remainder play an inferior

part; but it holds good of several of them that they are typical moisture-lovers, for example *Trimalaconothrus*, *Oppia neerlandica*, *Edwardzetes edwardsii* and *Melanozetes mollicomus*. None of these species occur in large numbers in dry localities.

If we compare the dry community with the wet community again, we shall see that some species are present in practically all samples, for example *Folsomia quadrioculata* and *Tectocephus velatus*. When working with ecology, it is almost always to be seen that one and the

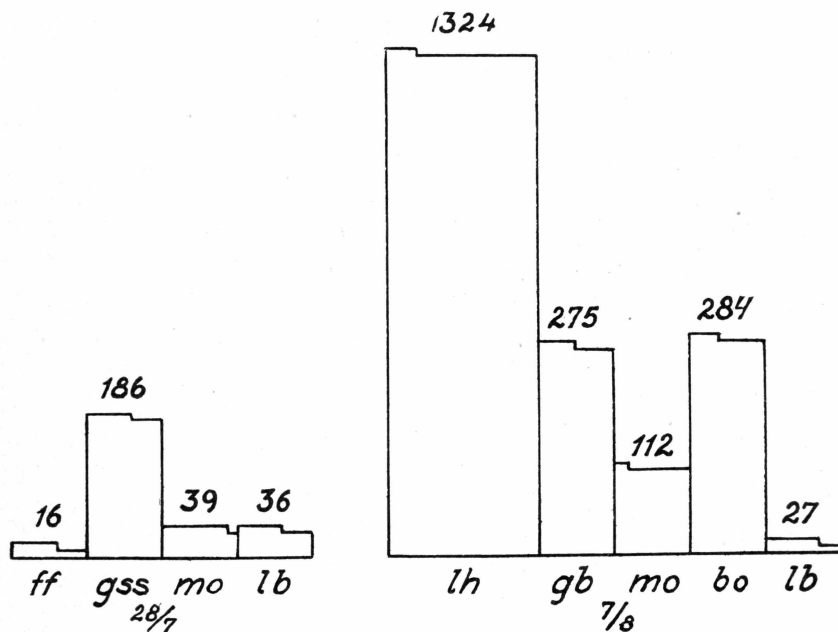


Fig. 4. Diagram of average number of *Folsomia quadrioculata* per sample taken July 28th and August 7th from various plant communities.

The following abbreviations are employed here and in subsequent diagrams: fell-field = ff; lichen-heath = lh; grassy bank = gb; salix herbacea vegetation = sh; grass-salix snow bed = gss; moss vegetation = mo; bog = bo; lake bank = lb.

same species occurs in several different animal communities. This particular species, however, is much the more numerous within its own domain, where the conditions favourable to the species have caused a mass occurrence; but in return it has to yield pride of place, or it is less dominant, in adjoining localities where other conditions favour other species.

The two tables do not show where *Folsomia quadrioculata* and *Tectocephus velatus* find their most favourable conditions, but it will appear from the following. For the purpose of forming an idea of under what conditions *Folsomia quadrioculata* occurs most numerous, and

therefore may be assumed to find the best conditions of life, a calculation has been made in the diagram above of how many individuals on an average per sample were found in the different plant communities on the same day. Unfortunately, we have not got samples from all plant communities for the same day. For July 28th there are samples from fell-field, grass-salix snow bed, moss vegetation and lake bank; for August 7th from lichen heath, grassy bank, moss vegetation, bog, and lake bank.

It becomes clear from the diagram that *Folsomia quadrioculata* is much the most numerous on lichen heath; on the whole it seems to prefer the dry plant communities for the wet ones. Fell-field seems to form an exception. Without doubt this is due to the very poor possibilities of nutrition for all species; *Folsomia quadrioculata*, however, is the most frequently occurring Collembola on fell-field. In the moist or wet plant communities this species is only numerous on the bog.

Regarding the liking of this species for dry, lichen-grown localities, AGRELL (1934) came to the same conclusion. He found it in moss, humus, conifer-needle carpet and lichen vegetation, and says: "Besonders häufig ist die Art in der nicht sonnenexponierten Flechtenvegetation." At present it cannot be decided whether it is lichens which determine its existence or perhaps more likely the many fungi growing among them.

As *Folsomia quadrioculata*, despite its preference for dry, lichen-grown localities, is so common everywhere that it is dominant in seven of the eight plant communities examined, it is not a type-animal of any community.

Tectocepheus velatus seems to be almost just as common in dry as in wet localities, so that for this reason it is not typical of any community either.

Folsomia quadrioculata and *Tectocepheus velatus* thus being precluded as type-animals, the fauna in dry localities may be characterised by the *Oribatidae* *Oribatula exilis* and *Calypozetes sarenkensis*; from the first form the community is called the *Oribatula-exilis-community*. The fauna on wet ground is characterised by the Oribatid *Platynothrus peltifer* and is accordingly called the *Platynothrus-peltifer-community*.

In fig. 5 the average number of individuals per sample is plotted on the ordinate, and on the abscisse the eight plant communities according to degree of humidity, commencing with the least moist, fell-field, and concluding with the wettest, lake bank.

Oribatula exilis is not particularly common in fell-field (5 per sample); on lichen heath it is common (24 per sample), numerous on grassy bank (91 per sample), whilst in *Salix-herbacea* vegetation and grass-salix snow bed it is very common and occurs in totals of 46 and 38 respectively

per sample. In the wet plant communities it is almost entirely absent; on bog an average of one per sample was found.

Calyptozetes sarekensis occurs numerously on lichen heath and grassy bank, commonly (16 per sample) in *Salix-herbacea* vegetation, in very

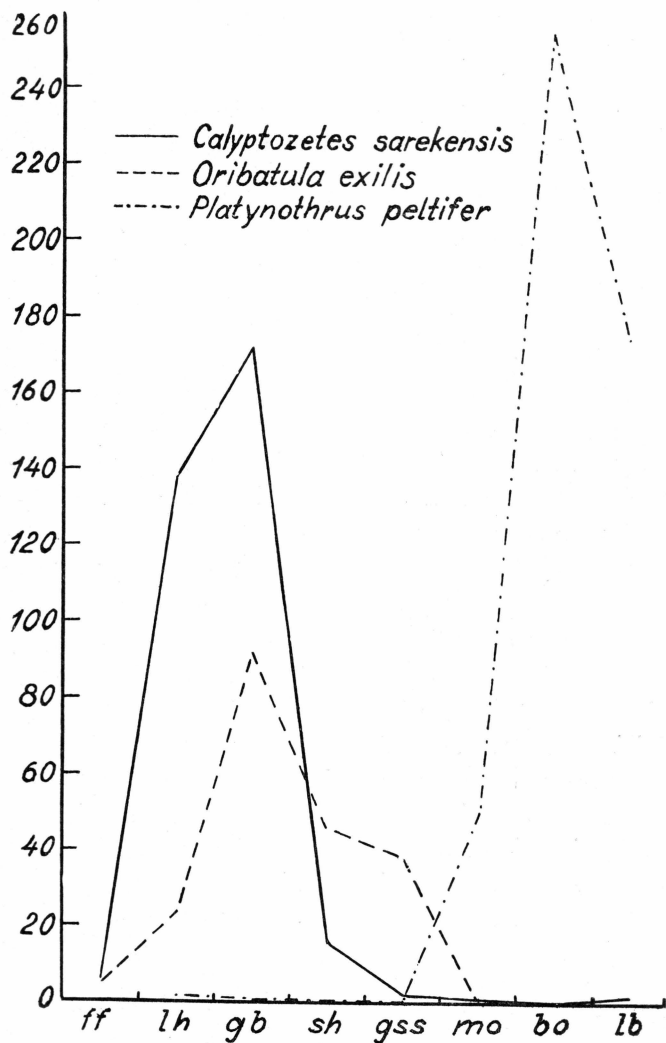


Fig. 5. Diagram showing the distribution of the Oribatidae *Oribatula exilis*, *Calyptozetes sarekensis* and *Platynothrus peltifer* over the 8 plant communities examined.

small numbers (2 per sample) on grass-salix snow bed. In the wet plant communities the number falls still lower; it does not occur at all on bog.

The position is almost reversed for *Platynothrus peltifer*. It is very common on lake bank and bog, less so in moss vegetation, though to a total of 50 per sample. A single individual was found on lichen heath

but undoubtedly had strayed there. This species never occurs on dry ground.

The animal communities here coordinated are very comprehensive. With almost just as much reason it might be preferred to give the name of community to each of the fauna associations in the plant communities examined; but as they have much in common, as already stated, the present arrangement with only two animal communities is preferred. The other would lead too far and would involve a huge number of animal communities, viz. not only one for each plant community, but possibly one for each plant-species or for each growth of a single species, whether high or low. As in the tables the fauna associated with the various plant communities are kept separate, it is always possible to account for whatever fauna may be expected to be found at a given place, as long as it does not differ too much from the plant communities subjected to examination here.

The *Oribatula-exilis*-Community and the *Platynothrus-peltifer*-Community at Angmagssalik compared with the dry and the wet Communities on Ella Island.

If a comparison is made between the animal community in dry localities at Angmagssalik, characterized by the *Oribatidae* *Oribatula exilis* and *Calypozetes sarekensis*, and the dry community on Ella Island, very good conformity will be found. On Ella Island the dry community was characterized by the Oribatid *Oribatula exilis*, the Gamasid *Zercon triangularis* and the Trombidiid *Bdella longicornis*. The Collembol *Onychiurus sibiricus* occurs rather numerously, whereas all other *Collembola* are sparsely represented. *Pseudococcinae* are common. Of the 42 samples examined, *Oribatula exilis* was found in 31, *Zercon triangularis* in 22 and *Bdella longicornis* in 32.

At Angmagssalik, *Zercon triangularis* is replaced by *Zercon ?ornatus*, which has a fairly general distribution (16 samples), *Bdella longicornis*¹⁾ by *Bdella semiscutata*, which likewise is generally distributed (31 samples).

One curious feature is the great difference in the composition of the Collembol fauna. On Ella Island *Onychiurus sibiricus* occurred in 31 samples, whereas at Angmagssalik *Onychiurus* has not been found at all. Of *Folsomia quadrioculata*, which exceeds all other species in number at Angmagssalik, there are barely 3 individuals per sample on an average; and it occurred in only 12 samples.

On the whole the fauna in the soil is much richer at Angmagssalik than on Ella Island; this applies both to number of species and to number of individuals.

¹⁾ Hitherto not found south of Scoresby Sound.

At Angmagssalik the fauna on wet ground is characterized by the Oribatid *Platynothrus peltifer* and the Trombidiid *Raphignathus patrius*.

On Ella Island two animal communities were set up: 1. lake bank, wet all the year round, and 2. bog, moist all the year round or, at the most, dry for a short period, and on the basis of the composition of the fauna a distinct difference was shown between the two communities. There is no doubt that a closer examination of conditions will give another result and throw the two communities into one, the wet community. The investigation of micro-communities and what governs them is fairly new as yet, and, as long as we have no thorough knowledge of the biology of the various species, it will be difficult to determine what is their proper habitat and in what connection they stand with other species, as well as why just these species occur together. Until that happens, one material may lead to conclusions which, on being compared with those drawn from a larger material, may prove to be wrong. Thus it now seems that the two animal communities on bog and lake bank on Ella Island may be regarded as one.

The bog consists of large tufts built up of fibrous raw humus, with water between the tufts in spring and the greater part of summer. Moss vegetation on the bottom. The vegetation is rich, consisting of dwarf plants such as *Dryas octopetala*, *Betula nana*, *Vaccinium uliginosum*, *Salix arctica* and *Cassiope tetragona*, as well as grass-like plants such as *Eriophorum polystachium*, *Carex parallela*, *Equisetum variegatum*, etc. The fauna is very rich both in species and in individuals. Of *Collembola*, *Hypogastrura armata*¹⁾, *Onychiurus sibiricus*, *Pseudisotoma sensibilis*, *Folsomia quadrioculata* and *Sminthurinus concolor* are common; of *Oribatidae*, *Heminothrus thori*, *Tectocephus velatus*, *Trichoribates trimaculatus*; of *Parasitidae*, several species, and of *Trombidiidae*, *Bdella longicornis*, *Cyta latirostris* and *Erythraeus miniatus* are likewise common. *Diptera* larvae and *Araneidae* are rare.

Lake bank: flat, saturated stretches, mostly with a thick, swampy moss carpet at the bottom and a relatively rich vegetation consisting of *Equisetum variegatum*, *Eriophorum Scheuchzeri*, *Carex*, etc. Is abundantly manured by the excrement of water-fowl. As regards the fauna, only few species are numerous or common. The *Collembola* *Onychiurus sibiricus*, *Pseudisotoma sensibilis* and *Folsomia quadrioculata* are worth noting. Of *Acarina* only *Platynothrus peltifer*, and the Trombidiid *Raphignathus sicculus*, are present in large numbers. *Diptera* larvae occur numerously.

If these two plant communities are compared with the corresponding

¹⁾ In my paper of 1934 this species was determined as *H. longispina* but since then Mr. J. AGRELL, Lund has made it clear to me that in reality it is *H. armata*.

communities at Angmagssalik, it will be seen that with regard to vegetation and water-content they are all very much alike; the principal variant is the lake bank at Angmagssalik, with its barren gravel surfaces, almost devoid of vegetation and washed by the waves. As regards the fauna, there is some difference in the composition, partly due to the different geographical distribution of the species, partly to the mass-occurrence of certain species on patches where the conditions are especially favourable for them, such as *Heminothrus thori* on bog. The bog must be regarded as a biochorion within the biotope, the wet community; to this biochorion *Heminothrus thori* has accommodated itself to such a degree that no kindred species (between which competition is always keen) has gained a footing or been able to adapt itself to the conditions. The fauna on the bog, however, cannot be regarded as a separate animal community solely on account of the mass occurrence of *Heminothrus thori*, no more than the fauna on the grassy bank, with its abundance of *Liebstadia similis*, is to be regarded as a separate community, but as a connex within the zoocoenosis. Apart from the presence of *Heminothrus thori* in the bog, but not on the lake bank, the great difference between the two wet animal communities lies in the fact that the fauna of the bog is much richer than that of the lake bank, where only certain species like *Platynothrus peltifer* and *Raphignathus sicculus*, both typical representatives of the wet community, have been able to thrive in large numbers. Apparently, bog and lake bank form the two extremes within the same community.

Having regard to these facts and comparisons, the fauna on bog and lake banks on Ella Island and at Angmagssalik are considered as belonging to the same community, the wet animal community, characterised by the Oribatid *Platynothrus peltifer*, and Trombidiids of the genus *Raphignathus*. These typical characteristic animals will, of course, not be so prominent in localities which, as regards soil, moisture, vegetation, etc., lie on the border of the wet community and thus form the transition to a conterminous community with other index animals.

Animal Communities at Atingat.

Atingat lies in the inner part of Angmagssalik Fjord in Ikerasaussaq, one of its innermost branches. The samples were all taken in a small, sheltered, sunny valley a few metres above sea level. There are only six samples, all treated in warm water funnels on the spot; as far as possible they were taken from plant communities similar to those at Angmagssalik, though the latter are not all represented at Atingat. The samples taken from lichen vegetation, *Salix-herbacea* vegetation, moss and bog are distinctly groupable in two well-marked communities, dry

and wet, as at Angmagssalik. In the following table, which comprises the samples from the dry plant communities, each sample is shown in a separate column to facilitate comparison between the fauna of the various samples.

In contrast to what conditions were at Angmagssalik in dry plant communities, the number of *Collembola* is very small. Whether or not this is due to the collecting technique, i. e. so much heat that the majority of these soft-cuticled animals were killed, is impossible to say, though



M. Hammer phot.

Fig. 6. Atingat. In the foreground *Empetrum* and lichens in which some of the samples were taken.

a comparison with the next table does not indicate it. Otherwise conditions are about the same as at Angmagssalik. As is the case there, the lichen vegetation has the richest fauna, but here it consists mainly of *Oribatidae*. Of the index animals in the dry community, or the *Oribatula-exilis*-community, *Oribatula exilis* predominates, whereas *Calypozetes sarekensis* is merely influent, due to its complete absence in the *Salix-herbacea* vegetation. *Pelops ?septentrionalis* occurs in larger numbers than were met with previously. The complete absence of parasites is remarkable. Of *Trombidiidae*, however, several species are common. On the whole, this group of mites is represented at Atingat by more species (often very large species, but unfortunately not all identified) than at

Oribatula-exilis-community. Atingat.	Salix 1 31/7 1933	Salix 2 13/8 1933	Lichen- vegetation 5/8 1933
<i>Willemia anophthalma</i>	..	2	..
<i>Onychiurus</i> sp.....	..	1	2
<i>Folsomia quadrioculata</i>	14	1	9
<i>Pseudisotoma sensibilis</i>	..	..	1
<i>Isotoma n. sp.</i>	..	9	1
— <i>violacea</i>	..	2	..
<i>Phoridae</i> I.....	..	2	..
<i>Araneida</i>	..	1	..
<i>Camisia horrida</i>	4	1	2
<i>Nothrus silvestris</i>	..	..	11
<i>Oppia neerlandica</i>	1	..	1
<i>Tectocephus velatus</i>	1	10	73
<i>Oribatula exilis</i>	9	2	33
<i>Chamobates cuspidatus</i>	..	..	2
<i>Sphaerozetes piriformis</i>	1	..	..
<i>Melanozetes mollicomus</i>	1	..	..
<i>Trichoribates trimaculatus</i>	1	22	..
<i>Calyptozetes sarekensis</i>	..	..	14
<i>Pelops ?septentrionalis</i>	11	62	..
undetermined <i>Oribatidae</i>	..	..	6
<i>Rhagidia gelida</i>	3	..	..
<i>Bryobia praetiosa</i>	..	1	..
<i>Cyta latirostris</i>	4	1	12
<i>Erythraeus miniatus</i>	1	..	12
— sp.	..	6	30
undetermined <i>Trombidiidae</i>	..	40	..

Total average per sample 141

Dominant		Influent	
<i>Tectocephus velatus</i>	19.9 %	<i>Cyta latirostris</i>	4.3 %
<i>Pelops ?septentrionalis</i>	17.0 %	<i>Calyptozetes sarekensis</i>	3.5 %
<i>Oribatula exilis</i>	10.6 %	<i>Nothrus silvestris</i>	2.8 %
<i>Erythraeus</i> sp.	8.5 %	<i>Erythraeus miniatus</i>	2.8 %
<i>Folsomia quadrioculata</i>	5.7 %	<i>Isotoma n. sp.</i>	2.1 %
<i>Trichoribates trimaculatus</i>	5.7 %		

Angmagssalik. This may be due to the position of the locality in a sheltered, sunny valley.

In the following table the samples from wet ground, moss and bog, are shown separately in the same manner as the dry-ground samples.

Here we find a complete similarity with the wet-ground animal community at Angmagssalik, and its index animals: the Oribatid *Platyno-
nothrus peltifer* and the Trombidiid *Raphignathus patrius*, predominate.

Platynothrus-peltifer-community. Atingat.	Bog 2 3/8 1933	Bog 9/8 1933	Sphagnum 2/8 1933
<i>Willemia anophthalma</i>	1	..	1
<i>Polyacanthella quinquespinosa</i>	14	14	..
<i>Onychiurus grönlandicus</i>	..	12	..
— sp.....	3		1
<i>Tetracanthella wahlgreni</i>	10	..	..
<i>Folsomia sexoculata</i>	..	1	..
— <i>quadrioculata</i>	120	100	1
<i>Isotoma n. sp.</i>	7	10	..
— <i>bipunctata</i>	..	50	7
— <i>viridis</i>	2	3	..
<i>Araneida</i>	..	2	..
<i>Nothrus silvestris</i>	..	..	2
<i>Platynothrus peltifer</i>	103	318	..
— <i>lapponicus</i>	2	..	2
<i>Oppia neerlandica</i>	54	38	..
<i>Tectocephus velatus</i>	7	206	7
<i>Oribatula exilis</i>	4	2	..
<i>Edwardzetes edwardsii</i>	..	5	3
<i>Melanozetes mollicomus</i>	2	13	4
<i>Trichoribates trimaculatus</i>	2	40	..
<i>Pelops ?septentrionalis</i>	6	19	4
undetermined <i>Oribatidae</i>	30	20	3
<i>Zercon ?ornatus</i>	..	13	..
undetermined <i>Parasitidae</i>	28	20	4
<i>Eupodes</i> sp.....	1	14	..
<i>Rhagidia gelida</i>	2	2	4
<i>Bryobia practiosa</i>	8	18	..
<i>Raphignathus patrius</i>	..	76	..
<i>Bdella</i> sp.....	1	7	1
<i>Cyta latirostris</i>	2	..	..
<i>Podothrombium bicolor</i>	1	..	..
<i>Erythraeus</i> sp.....	9	11	4
undetermined <i>Trombididae</i>	11	..	10
Total average per sample 501			

Dominant	Influent
<i>Platynothrus</i> 27.9 %	<i>Isotoma bipunctata</i> 3.8 %
<i>Folsomia quadrioculata</i> 14.8 %	<i>Trichoribates trimaculatus</i> 2.8 %
<i>Tectocephus velatus</i> 14.6 %	<i>Pelops ?septentrionalis</i> 2.0 %
<i>Oppia neerlandica</i> 6.2 %	
<i>Raphignathus patrius</i> 5.0 %	

Folsomia quadrioculata, *Tectocepheus velatus* and *Oppia neerlandica* are also dominant. Finally, mention should be made of the Collembolus *Onychiurus grönlandicus* and *Isotoma bipunctata*, two species that were not found at Angmagssalik. Besides at Atingat, *Onychiurus grönlandicus* lives in Mikis Fjord and at all stations examined north of there; *Isotoma bipunctata* occurs only in Mikis Fjord apart from at Atingat; so far it has not been found anywhere else in Greenland. Without doubt these are two northern forms which, as BÖCHER has shown as regards the plants, in these southerly latitudes prefer the interior of the country to the oceanic coastal regions. He writes: "Both northerly and southerly species show, at the margin of their area of distribution, a tendency to seek the interior of the country. The reason is surely that the southerly species towards the north prefer the warmer inland, and that the northerly ones towards the south avoid the oceanic coast land."

Animal Communities in Mikis Fjord.

Mikis Fjord, which lies in lat. $68^{\circ}10' N.$, of course has a fauna that differs somewhat from that at Angmagssalik and Atingat in approximately lat. $65^{\circ} N.$ Here again the samples are groupable about two distinct communities, the dry and the wet, but the commonest animals at Angmagssalik have to some extent been replaced by other, more northerly forms; for example, *Folsomia quadrioculata* is rare, its place being taken by *Folsomia diplophthalma* and *Folsomia fimetaria*, two species not met with farther south on the east coast. Some of the samples, like those already referred to, were treated on the spot with the warm water funnel; the remainder, taken on September 8th, were brought to Copenhagen in tins, and the animals driven out into funnels without heat after having remained six weeks in the tins. The great difference between the two sets of samples cannot be overlooked. Whether it is due to the different methods is not easy to say; but in Mikis Fjord conditions on the ship were not of the best for working, and the warm water funnel toppled over time after time; this, combined with too much heat, may explain the poor result. Though it has been proved that samples from lake bank at Angmagssalik do not change in transit in tins, I would not venture to assert that there is no change in the direction of an increased total of animals under these conditions. All the samples were taken on an eastern slope above the marginal moraine at the head of Mikis Fjord (see illustration), at a height of about 20 metres above sea level. In the following table the samples from dry ground are shown.

The samples are shown separately in the table, and in the right-hand column the average number of individuals per sample for each species. These figures, however, do not even approximately reflect the



Fig. 7. Terrace vegetation in Mikis Fjord. Tyge Böcker phot.



Fig. 8. View from the interior of Mikis Fjord. Tyge Böcker phot.

Oribatula-exilis-community Mikis Fjord	Salix-herbacea vegetation				Pure Empetrum vegetation				Lichen heath with slight salix-herbacea vegetation						Average number of individuals per sample
	21/8	8/9	8/9	8/9	26/8	8/9	8/9	8/9	20/8	8/9	8/9	8/9	8/9	8/9	
	1	2	3	4	1	2	3	4	1	2	3	4	5	6	
<i>Hypogastrura armata</i>	..	1	..	..	..	16	32	15	..	5	3	14	1	..	6
<i>Willemia anophthalma</i>	..	..	24	23	..	..	375	..	..	2	1	22	26	3	34
<i>Onychiurus grönlandicus</i>	..	27	..	..	..	26	20	16	..	..	..	..	..	..	6
<i>Folsomia sexoculata</i>	..	13	..	..	..	..	..	4	..	..	..	..	..	..	1
— <i>fimetaria</i>	..	..	..	..	..	..	c.600	7	..	5	4	23	9	10	47
<i>Pseudisotoma sensibilis</i>	2	5	5	3	..	1	6	6	31	2	5	1	3	3	5
<i>Isotoma minor</i>	..	..	..	..	..	2	170	20	..	..	..	..	..	..	14
— <i>bipunctata</i>	..	..	..	..	..	1	..	4	..	..	..	..	..	..	..
<i>Sminthurinus concolor</i>	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
undetermined <i>Collembola</i>	..	..	..	..	..	10	..	..	..	..	..	..	..	..	1
<i>Camptocladius hexatomus</i> -group ..	..	..	..	..	..	..	..	10	..	..	..	..	..	..	1
<i>Phaenocladus</i> sp.	..	5	..	4	..	..	1	14	..	..	..	..	..	..	2
<i>Rhamphomyia</i> sp.	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..
<i>Phoridae</i>	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Araneida</i>	..	1	..	..	..	5	11	2	1	..	..	..	..	..	1
<i>Brachychthonius brevis</i>	..	..	..	..	..	..	164	..	7	9	2	4	1	4	14
<i>Trhypochthonius tectorum</i>	..	..	..	..	..	1	..	1	..	1	5	6	..	2	1
<i>Camisia horrida</i>	..	..	..	..	..	..	..	7	..	3	1	23	2	11	3
<i>Nothrus silvestris</i>	..	..	..	..	..	512	549	251	..	19	4	48	14	32	102
<i>Platynocheilus peltifer</i>	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
<i>Suctobelba cornigera</i>	..	..	..	..	..	..	6	..	..	..	c.20	..	20	6	4
<i>Oppia quadricarinata</i>	..	..	..	..	..	..	..	..	..	7	c.20	18	5	6	4
<i>Tectocephus velatus</i>	..	33	70	5	..	55	101	85	13	17	64	52	27	29	39
<i>Oribatula exilis</i>	..	24	35	72	..	18	4	12	1	17	10	15	19	21	18
<i>Calyptozetes sarekensis</i>	..	..	1	1	..	2	6	18	68	6	6	5	22	24	11
<i>Chamobates cuspidatus</i>	..	..	..	..	..	..	..	..	..	7	2	4	2	20	3
<i>Melanozetes mollicomus</i>	..	..	..	..	..	..	1	21	..	..	..	..	..	..	2
<i>Sphaerozetes piriformis</i>	..	..	9	..	..	..	..	..	..	..	..	..	..	..	1
<i>Trichoribates trimaculatus</i>	..	2	7	9	..	..	2	15	..	..	..	..	..	..	3
undetermined <i>Oribatidae</i>	..	..	1	..	..	2	..	63	1	15	42	10	15	10	11
<i>Zercon triangularis</i>	..	..	..	..	..	..	..	..	..	8	5	5	..	7	2
— <i>curiosus</i>	..	..	..	..	..	3	21	20	..	..	..	..	..	..	3
— <i>?ornatus</i>	..	22	22	2	..	..	..	2	1	1	1	10	..	1	4
undetermined <i>Parasitidae</i>	10	10	..	12	..	..	..	..	5	..	..	..	53	3	7
<i>Eupodes clavifrons</i>	2	..	..	7	..	..	16	1	12	7	8	9	3	4	5
<i>Rhagidia gelida</i>	1	..	..	..	..	..	6	2	9	1	2	1	..	2	2
<i>Raphignathus patrius</i>	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..
<i>Bdella semiscutata</i>	..	..	1	..	1	11	11	1	..	3	3	3	2	2	3
<i>Cyta latirostris</i>	1	2	3	8	..	..	12	11	5	4	3	6	10	7	5
<i>Erythraeus miniatus</i>	..	..	..	..	..	..	..	..	..	2	..	1	1	5	1
undetermined <i>Trombidiidae</i>	2	..	..	..	..	..	..	..	..	32	20	84	53	46	17
Total average per sample...															338

Dominant		Influent	
<i>Nothrus silvestris</i>	26.6 %	<i>Oribatula exilis</i>	4.7 %
<i>Folsomia fimetaria</i>	12.3 %	<i>Isotoma minor</i>	3.7 %
<i>Tectocephus velatus</i>	10.2 %	<i>Brachychthonius brevis</i>	3.7 %
<i>Willemia anophthalma</i>	8.9 %	<i>Calypozetes sarekensis</i>	2.9 %

true picture of the fauna in a sample from the dry community, when the fauna in the various plant communities varies so pronouncedly as it does here. In particular, the fauna in *Empetrum* vegetation, which was not previously examined, is extremely rich in both *Collembola* and mites; but in spite of the difference in number of species and individuals

The Platynothrus-community Mikisfjord	Moss Vegetation, % 1933					Average number of individuals per sample
	1	2	3	4	5	
<i>Hypogastrura armata</i>	..	1	..	..	..	..
<i>Onychiurus grönlandicus</i>	171	105	101	59	56	98
<i>Folsomia quadrioculata</i>	3	2	..	1	..	1
— <i>diplophthalma</i>	57	7	16	29	20	26
<i>Pseudisotoma sensibilis</i>	84	75	83	20	40	60
<i>Camptocladius hexatomus</i> -group	16	2	29	5	5	11
— <i>vitellinus</i> - —	1	3	16	2	7	6
<i>Orthocladius</i> II	2	3	14	2	3	5
<i>Araneida</i>	1	..	..	..	..	..
<i>Platynothrus lapponicus</i>	24	112	127	26	21	62
<i>Tectocephus velatus</i>	43	147	110	49	39	78
<i>Oribatula exilis</i>	..	1	..	..	..	..
<i>Melanozetes mollicomus</i>	..	..	1	..	..	..
<i>Trichoribates trimaculatus</i>	..	1	..	..	..	..
undetermined <i>Oribatidae</i>	..	..	1	..	..	..
<i>Zercon ?ornatus</i>	..	..	1	..	..	..
<i>Eupodes clavifrons</i>	..	3	..	..	..	1
<i>Raphignathus patrius</i>	23	35	54	10	62	37
<i>Cyta latirostris</i>	4	1	..	..	..	1
Total average per sample...						386

Dominant		Influent	
<i>Onychiurus grönlandicus</i>	25.4 %	<i>Camptocladius hexatomus</i> -group ...	2.9 %
<i>Tectocephus velatus</i>	20.2 %		
<i>Platynothrus lapponicus</i>	16.1 %		
<i>Pseudisotoma sensibilis</i>	15.5 %		
<i>Raphignathus patrius</i>	9.6 %		
<i>Folsomia diplophthalma</i>	6.7 %		

in the different plant communities, they all are of the forms characteristic of the dry community. In addition, *Willemia anophthalma* and *Pseudisotoma sensibilis* are of fairly frequent occurrence in all types of vegetation, as also the northern form *Hypogastrura armata*. Of mites, the two index forms *Oribatula exilis* and *Calyptozetes sarekensis* are numerous everywhere. *Nothrus silvestris* attains to very marked density in *Empetrum* vegetation, and is also common on lichen heath. This species occurs sometimes on dry, sometimes on wet ground, but seems to prefer a plant formation that is not too dry or barren.

All in all, the dry-ground fauna in Mikis Fjord does not differ much from that at Angmagssalik, except for the presence of a few northern forms.

In the table of wet-ground samples taken in Mikis Fjord the arrangement is the same as in the foregoing table; the few samples are from wet, luxuriant moss at a small brook about 20 metres above sea level. The table provides an excellent illustration of the fauna under very wet conditions; it bears an extraordinary resemblance to conditions at the lake bank on Ella Island, with the very large total of *Diptera* larvae of the *Camptocladus hexatomus* and *C. vittellinus* groups, and the small number of mite species, some of which are very numerous. Here, however, the *Collembola* are more numerous, individually, than on Ella Island, but poorer as to species. All through the species are the same as those of the lake bank on Ella Island, except for *Folsomia diplophthalma*, which hitherto has been found nowhere else in Greenland than in Mikis Fjord.

Of the *Collembola* the most frequent are *Onychiurus grønlændicus* and *Pseudisotoma sensibilis*. *Folsomia quadrioculata* is rare, as on dry ground, but its place is taken by *F. diplophthalma*, which is very common. The mite that occurs most frequently of all on wet ground, *Platynothrus peltifer*, is totally absent, but the closely related species, *P. lapponicus*, is as prominent here as the former is on wet ground elsewhere. Hitherto it has occurred together with *Platynothrus peltifer*, but seems to have supplanted it entirely here. *Tectocepheus velatus* is very numerous, as also the typical mite of wet ground, the Trombidiid *Raphignathus patrius*. All others are extremely few in number.

Accordingly, the fauna in wet or moist surroundings in Mikis Fjord does not differ from that in other latitudes, any more than is necessitated by the different geographical distribution of the characteristic species.

Collemboles and Mites in Relation to Moisture and Drought.

For the purpose of examining the reaction of *Collembola* and mites generally to moisture and drought, the individual density and the species density of the animal groups in the eight plant communities at Angmagssalik have been plotted out in the following diagrams.

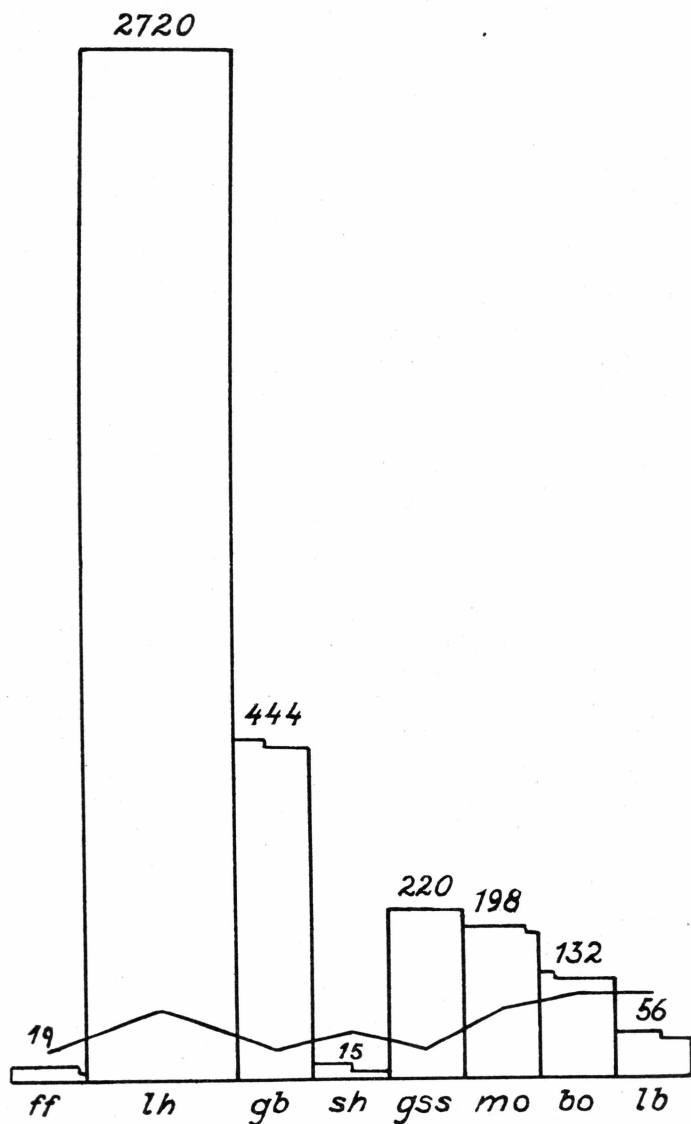


Fig. 9. The average number of Collembola per sample on the eight plant communities.

The columns in fig. 9 indicate the average number of *Collembola* per sample on the basis of the samples included in the tables; the eight plant communities are arranged according to water content, beginning at the left with the driest, fell-field. A priori it might have been expected that with their thin cuticle the *Collembola* would thrive best in more moist places, but this is not the case. The diagram shows a distinct

decrease in number from dry to wet bottom. Fell-field and *Salix-herbacea* vegetation alone form gaps in the series, undoubtedly, as far as the fell-field is concerned, on account of the almost complete absence of bottom vegetation, which inhibits the development of any fauna. The results arrived at seem to agree very little with those of AGRELL. He finds that *Cladonia* vegetation without a layer of raw humus has a low individual total, the lowest of the six biochoria he examined; lichen vegetation with a raw humus layer also has a low individual total.

HANDSCHIN says, "dass die Anwesenheit der Collembolen durch genügende Luftfeuchtigkeit garantiert sein muss. Je trockener der Standort, desto ärmer ist er an Collembolen." "Anderseits wird aber auch zu starke Durchnässung gemieden." At Angmagssalik there is apparently everywhere sufficient humidity for the thriving of Collembolids and in this case they prefer dry localities for too moist places such as bog and lake banks.

It might be thought that this difference in quantity from dry to wet bottom, as shown by the diagram, was the result of the great preponderance of a single species, *Folsomia quadrioculata*, in dry localities; but even when this species is removed from all plant communities, there is the same decrease in quantity from lichen heath to lake bank. The lichen heath has four species in common with bog and lake bank, viz. *Tetracanthella wahlgreni*, *Folsomia quadrioculata*, *Isotoma viridis* and *I. violacea*. Of these, *Isotoma viridis* alone is more frequent on wet bottom than on dry, though present in only small numbers on both.

The picture is quite a different one when we consider the curve for the species density. The number of species is almost twice as high on wet bottom as on dry, with the exception of lichen heath, where it closely approaches the same dimensions as in the moist localities. It is highest in lake bank and bog which have 11 species, lowest in fell-field, with only 3 species and grassy bank and grass-*salix* snow bed, with 4 species.

As regards the mites the position is somewhat different. Just as one might have expected that *Collembola* would prefer moisture to drought on account of their thin cuticle, the mites, or at any rate the *Oribatidae*, with their thick chitin armour, would seemingly have adapted themselves to drier environment. Fig. 10, showing the average number of individuals per sample, illustrates the quantitative distribution of mites over the eight plant communities. Similarly, fig. 11 shows the quantitative distribution of *Oribatidae* alone.

The two diagrams are very like each other indeed. The curves of the number of species are plotted on the figures; they describe very nearly the same course in both diagrams. This means that it is particularly the number of Oribatid species that varies, whereas the number of

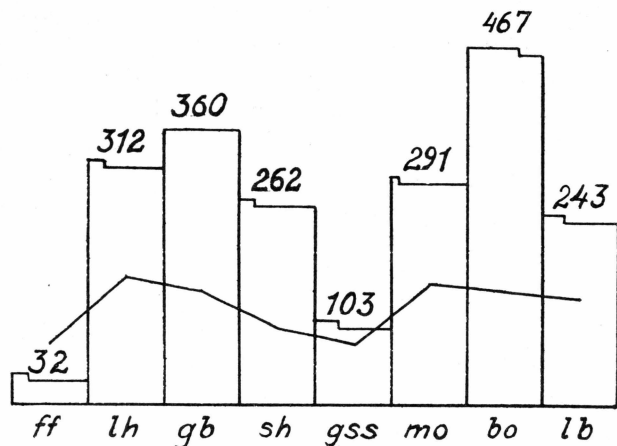


Fig. 10. The average number of Oribatids per sample on the eight plant communities.

parasite and Trombidiid species is almost the same in the various plant communities. Grassy bank alone has a disproportionately large number of individuals of the latter groups, mostly *Trombidiidae*. The curve of species-totals shows a maximum on both dry and wet bottom, a minimum at the transitional type, grass-salix snow bed. Despite the small number of individuals, fell-field has a relatively large number of species. There seems to be a fairly even distribution of the number of both *Oribatidae* and mites on the whole over all plant communities. At any rate, the dry communities are not preferred for the more moist ones. Some species prefer moisture, others more dry localities. The fell-field always forms an exception, doubtless as the result of lacking or slight bottom vege-

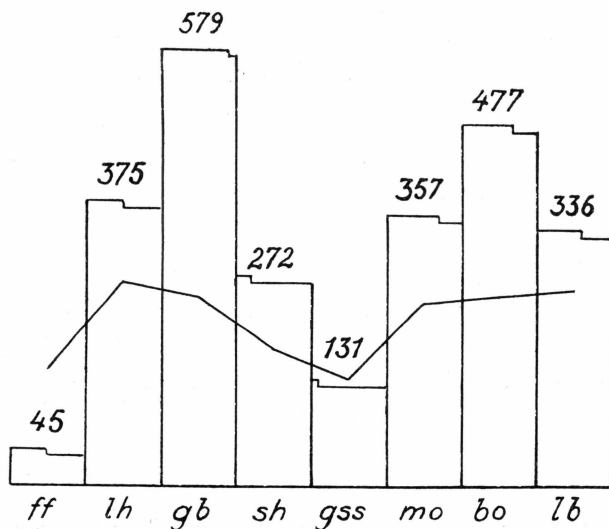


Fig. 11. The average number of mites per sample on the eight plant communities.

tation. Grass-*salix* snow bed also forms a gap in the series, both as to individual density and species density; this is probably due to the fact that the samples were taken only a metre or two from the snow margin. At that particular time the fauna doubtless had not reached its maximum.

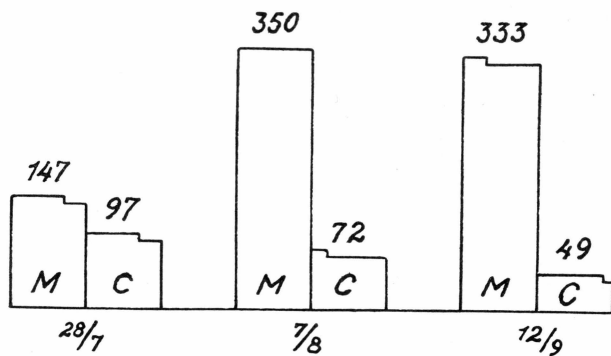


Fig. 12. Lake bank. The average number of mites (*M*) and Collembolus (*C*) per sample at different dates.

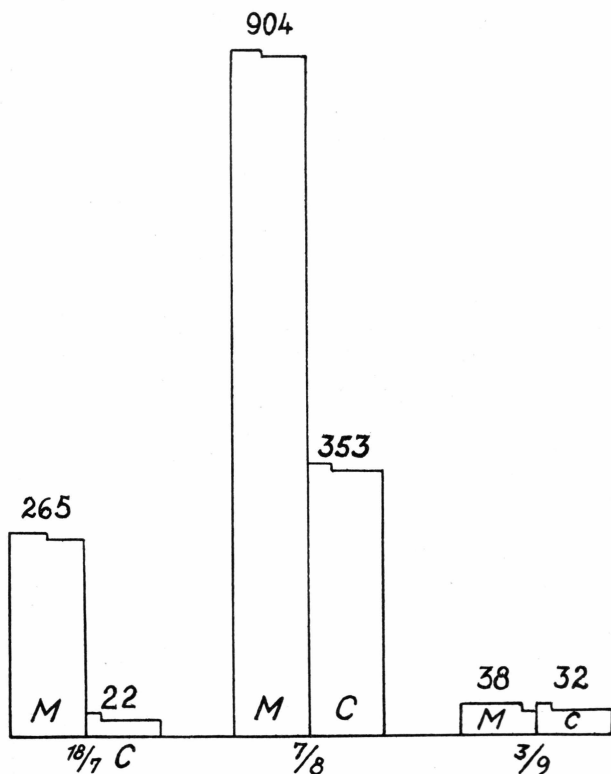


Fig. 13. Bog. The average number of mites (*M*) and Collembolus (*C*) per sample at different dates.

Breeding Season.

As was stated previously, samples from a few of the plant communities were taken at different times during the summer, with a view to forming an idea of the breeding season for this microfauna. From the following plant communities samples were taken:

Lake bank: July 28th, August 7th and September 12th.

Bog: July 18th, August 7th and September 3rd.

Lichen heath: July 18th, August 7th and September 3rd.

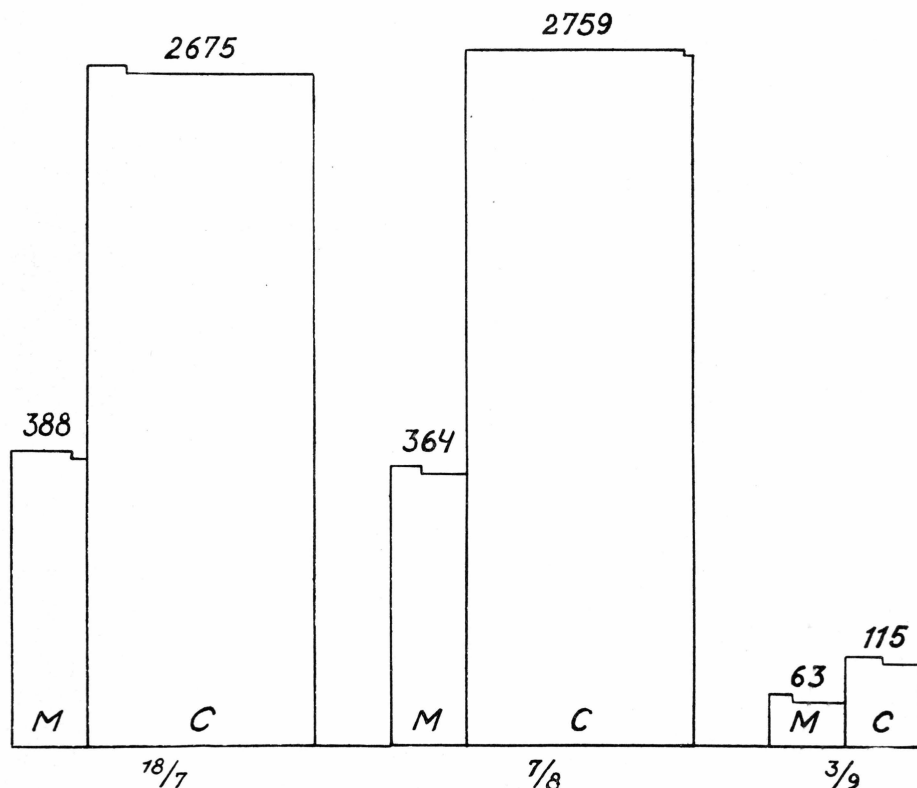


Fig. 14. Lichen heath. The average number of mites (*M*) and Collembolus (*C*) per sample at different dates.

The average number of individuals per sample was calculated for each of these dates, for both mites and *Collembola*. The diagrams in figs. 12, 13 and 14 give the results. Mites are indicated by *M*, Collembolus by *C*.

These three diagrams reveal very marked differences. On lake bank, where the soil is uniformly wet throughout the summer, the animals hatch out over a long period; as late as on September 12th the production still seems to be at its highest. Apparently there is no sudden maximum.

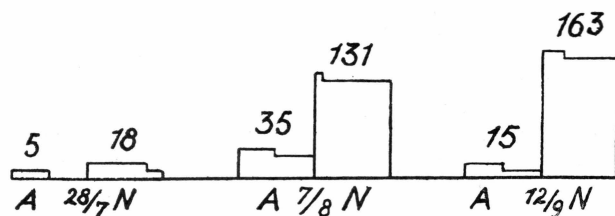


Fig. 15. Lake bank, Angmagssalik. The average number of *Platynothrus peltifer*, adults (A) and nymphs (N) per sample at different dates.

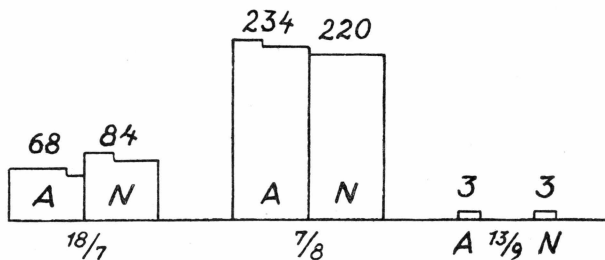


Fig. 16. Bog, Angmagssalik. The average number of *Platynothrus peltifer*, adults (A) and nymphs (N) per sample at different dates.

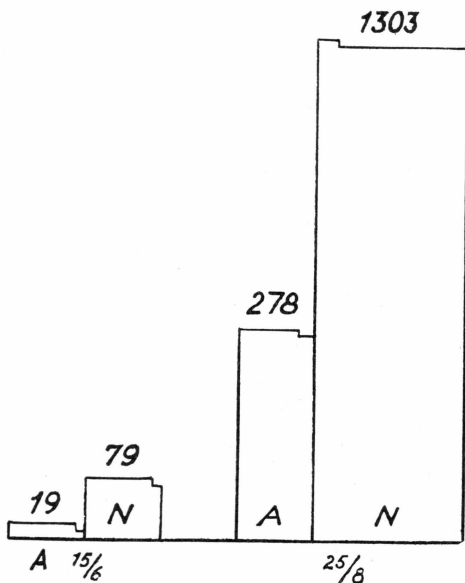


Fig. 17. Lake bank, Ella Island. The average number of *Platynothrus peltifer*, adults (A) and nymphs (N) per sample at different dates.

The explanation is doubtless that conditions do not alter much throughout the summer.

On bog the position is quite different. On July 18th the numbers are small as yet; by August 7th there has been an enormous increase,

but the present material does not permit of determining whether the maximum lies at that date or perhaps later. On September 3rd, i. e. a week earlier than the last samples were taken on lake bank, the number has fallen off very considerably. No doubt this is due to the fact that the bog is now almost dried up, so that the necessary conditions for continued hatching are no longer present. On the other hand the season cannot begin too early, on account of the heavy flow of meltwater in spring and early summer.

On lichen heath we find still more possibilities. Here, where the soil is not incessantly washed or covered by meltwater, and therefore becomes warmed up rather quickly, the breeding season begins very early. On July 18th the maximum seems already to have been reached. On August 7th conditions are still the same. It may be that the maximum lies still later, though that is not very probable, judging from the very small numbers on September 3rd. Conditions all the summer are favourable for reproducing and thriving. Here, where lichens and fungi are the principal food factors, the moisture, and the flora depending on it, are of no great importance in the matter of nutrition. But there must be some degree of humidity for ova and newly-hatched young. Then towards the end of summer there is a natural decrease in the number of individuals after the long breeding period. Possibly the cold is the main cause of this falling off.

A study of *Platynothrus peltifer*, the most characteristic representative of lake bank and bog, with regard to breeding season gives the same result as that found for mites and *Collembola*. In figs. 15 and 16 the columns indicate the average number of individuals per sample taken on the particular date. To the left are the adults (A), to the right the nymphs (N).

On lake bank the breeding season is still at its highest on September 12th; on September 3rd it is over on bog. If this is compared with conditions on Ella Island (fig. 17) (where on June 15th there was an average of 19 adults and 79 nymphs per sample, and on August 25th 278 adults and 1303 nymphs, a figure so disproportionately high that no confidence could be placed in its correctness), the number does not seem to be so much too large as one would at first be inclined to think, when it is considered that lake bank on Ella Island does not correspond to the barren, almost completely bare lake bank at Angmagssalik, but more nearly to bog. It has a fairly luxuriant vegetation of *Equisetum*, *Eriophorum*, *Carex*, with a close bottom growth of mosses and — which is of great importance — an abundance of manure consisting of goose and wading-bird excrement. In addition, lake bank has the advantage that it does not dry up like bog at the end of summer. Accordingly, all the conditions necessary for the proper thriving of the species seem

to be present. Nor does the date, August 25th, seem to be later in summer than that the maximum might very well lie there, considering that it was still at its highest on September 12th at Angmagssalik. It is true that Ella Island is much farther north than Angmagssalik, and on many points the conditions are quite different, so possibly it is not always feasible to make direct comparisons between Angmagssalik and Ella Island.

The great average number of *Platynothrus peltifer* per sample, 1581, is not at all improbable when we see what large numbers of individuals occur in a similar area of soil elsewhere. In bog, on one of the extremely small islets in the skerries of Finland, at Tvärminne, on $\frac{1}{100}$ sq. metre I have found 7613 individuals of the genus *Trimalaconothrus*, i. e. five times as many individuals as of *Platynothrus peltifer* on Ella Island. In all, this sample of bog from Tvärminne yielded 8693 individuals. The sample was treated in a warm water funnel two days after it was taken, so there was no possibility of reproduction after collection. No sample with so many individuals has so far been taken in Greenland. The largest number was found on lichen heath, from which a sample contained about 7800 individuals; the lowest number was on fell-field, about 30 individuals.

SUMMARY

The present work discusses the fauna at Angmagssalik on 8 different plant communities; a distinct difference was ascertained in the fauna on dry and on wet bottom. On this basis a dry-bottom animal community is set up, the *Oribatula-exilis-community*, characterized by the Oribatidae *Oribatula exilis* and *Calyptozetes sarekensis*, and a wet-bottom community, the *Platynothrus-peltifer-community*, characterized by the Oribatid *Platynothrus peltifer* and *Trombidiidae* of the genus *Raphignathus*. After comparison with conditions at Angmagssalik, the two wet-bottom animal communities set up for Ella Island in 1934: for bog and for lake bank, are regarded as forming only one community corresponding to the wet-bottom community found at Angmagssalik. The presence of the dry and the wet-bottom communities was also established at Atingat, in the inner part of Angmagssalik Fjord, and in Mikis Fjord. On less essential points, however, they differ from the communities at Angmagssalik as a consequence of the presence of northerly forms.

A study is made of the behaviour of Collembolles and mites in moisture and in drought. In point of individuals the Collembolles are most numerous on dry bottom, but have more species on wet bottom. Mites seem to be fairly evenly distributed over dry and wet bottom; some prefer dry conditions, others moisture, and others again seem to be indifferent.

Of some of the plant communities samples were taken at intervals throughout the summer, and from these it has been possible to form an estimate of when the breeding season occurs. On lake bank, where as regards humidity the conditions are uniform all the summer, the breeding period is late and apparently still at its highest on September 12th. On bog it is somewhat earlier, being over, and the fauna greatly reduced in numbers, on September 3rd; this is doubtless due to the fact that the bog desiccates at the end of August. On lichen heath the breeding season begins earlier than on bog, as the ground is not flooded by meltwater as on bog; apparently the maximum is reached on July 18th; on August 7th conditions are the same, but on September 3rd the numbers are greatly reduced — due in all probability to the fall in the temperature. The richest fauna occurs on lichen heath, where there are about 7800 individuals on $\frac{1}{100}$ sq. metre, the poorest on fell-field, with about 30 individuals.

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