

COLLEMBOLLES
AND ORIBATIDS FROM PEARY LAND
(NORTH GREENLAND)

BY MARIE HAMMER

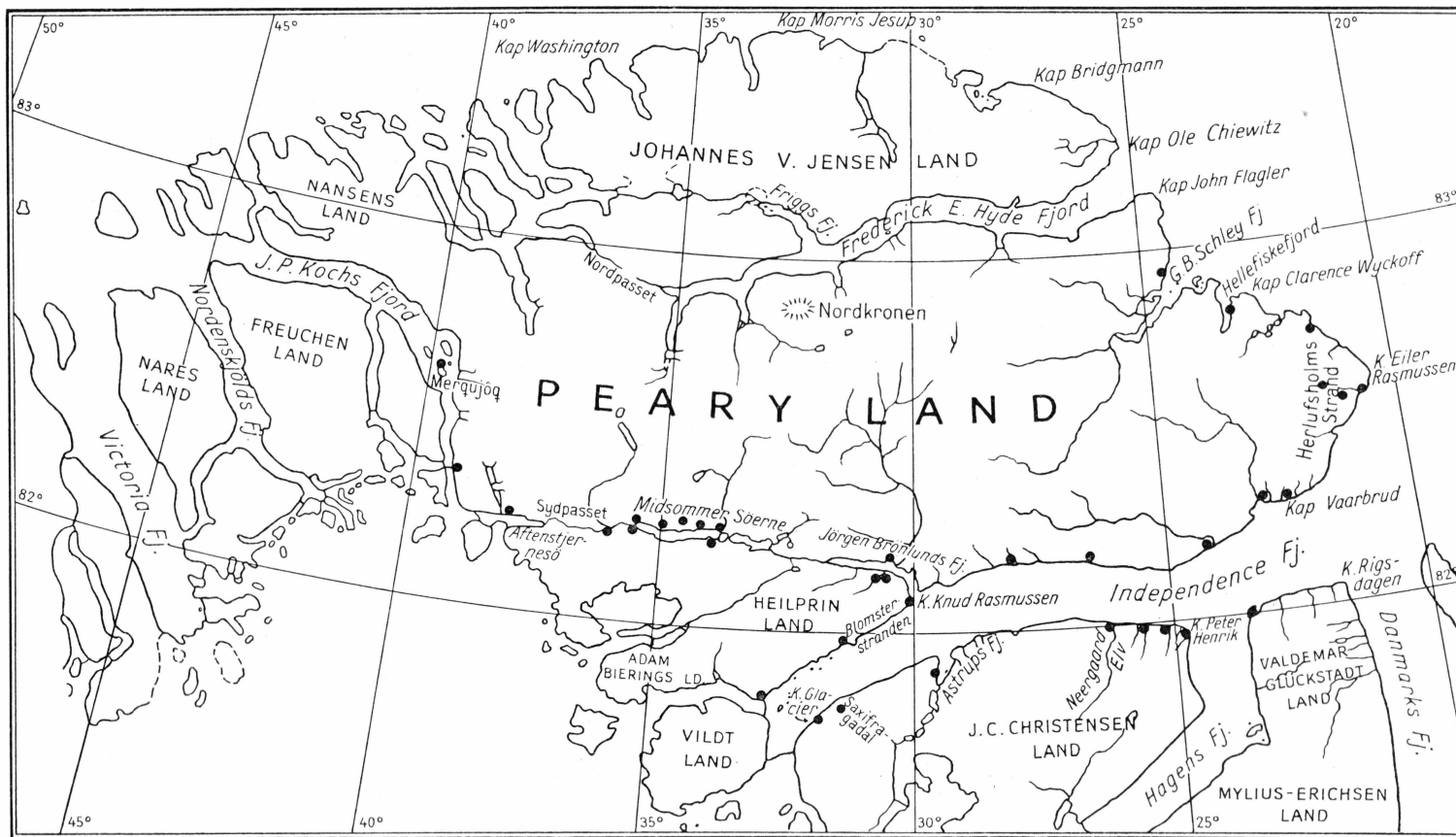


Fig. 1.

Peary Land, which constitutes the northernmost part of Greenland, is situated north of lat. 82° north, northwest of Independence Fjord and north of the inland ice. The greater part of the country is snow-free in summer; still, minor areas are covered by perpetual snow, and snow-patches which but slowly thaw away or last from year to year, are found in a number of places where the snow is swept together in sheltered valleys or on sheltered hillsides.

The climate is decidedly desert-like and high arctic with frequent and violent gales. The table below shows the monthly mean temperature on the basis of measurements during a single year (FRISTRUP 1948—49).

August 1948	3.7° C.	February 1949	— 26.6° C.
September —	— 5.1° -	March —	— 24.2° -
October —	— 19.4° -	April —	— 21.3° -
November —	— 24.5° -	May —	— 8.6° -
December —	— 31.3° -	June —	2.5° -
January 1949	— 31.3° -	July —	6.0° -

During the Danish Peary Land Expedition 1948—49 the first positive spring temperature was measured on May 28; still, melting snow had been observed previously (May 5; JOHNSON 1953). On June 21 the last night frost was recorded. After summer the first negative temperature was measured on August 20, i. e. the summer had a frost-free period of about two months. In the very dry climate relative air humidities of below 30 per cent. were frequently measured both in winter and in summer. Due to the dryness of the air the greater part of the snow has evaporated before the break of the frost sets in. Precipitation is extremely scarce. The material of observations from Chr. Erichsens Bræ (Glacier) in Heilprin Land shows about 125 mm precipitation; the greater part comes down as snow, a little as sleet. The snow is swept together in hard drifts by the violent gales. Locally deep snow may be found, e. g. in Astrups Fjord; soft snow is also found near Herlufsholms Strand. In summer drought is characteristic of the country. In many places there are thick salt crusts, which may colour the ground completely white over large stretches. At the drying-up fine polygons are formed;

on the clayey expanses this may be so violent that the surface even crumples up and peels off. In 1948—49 the heliograph registered 2232 hours of sunshine, i. e. somewhat more than the annual mean for Denmark. The largest monthly number of hours of sunshine was registered in May, viz. 634 hours of sunshine (FRISTRUP 1948—49).

Seen from the air the country looks barren; only along the rivers narrow streaks of vegetation are observed. Otherwise there is no connected plant-cover, and large areas are nearly completely bare of vegetation. Between the stones there are, however, some cushiony plants such as *Dryas* sp., *Papaver radicum*, and *Saxifraga oppositifolia*.

“Where the rivers run through lowlands with a moderate current there are on wet ground *Eriophorum Scheuchzeri*-meadows and on moist sandy soil *Carex aquatilis*-meadows. Mixed with the *Eriophorum* are e. g. *Carex* ssp., *Alopecurus*, *Equisetum*, white *Saxifraga*. Other places where the soil is covered with vegetation are snow-patches, where the slowly melting snow yields sufficient moisture throughout the summer. There are several types of vegetation there. According to HOLMEN (*l. c.*) the wet part of this biotope has an *Eriophorum polystachyum*-bog; on the dry slopes we find *Dryas punctata*-heath. Between these two types solifluctional soil results in a rather dry *Salix arctica*-vegetation and on somewhat moist soil is a *Carex misandra*-vegetation with *Oxyria digyna* and *Saxifraga oppositifolia*. In the highlands from 500 to 1000 metres a. s. l. there are patches with *Cassiope tetragona*. On dry stony ground there is fell-field vegetation with *Poa*, *Trisetum*, and species of *Saxifraga*.

On the east coast of Peary Land the continental *Dryas*-heath is almost lacking and substituted by a vegetation dominated by mosses and lichens such as *Rhacomitrium* and *Cetraria*” (Quot. from JOHNSEN 1953).

Fig. 2 “shows a typical aspect of Peary Land, the main part of which consists of mountains often with steep sides, both mostly flat on the top.—Along the coasts there are stretches of raised postglacial sea bottom forming systems of terraces. They consist of hard clay and as a result of the erosion now form hills with steep sides. Herlufsholms Strand is a huge plain consisting of former sea bottom, now relatively rich in vegetation” (JOHNSEN 1953).

The material for the present investigations consists of 122 Berlese samples of an accidental size, collected during the Danish Peary Land Expedition by Mr. Palle Johnsen, M. Sc., and others from August 1948 to July 1949. I am glad of the opportunity of thanking Mr. Johnsen for leaving the working up of the material of collemboles and oribatids to me.

From Peary Land only one Collembola species was previously known, viz. *Ágrenia bidenticulata* (Tullb.), which was found on the Second Thule Expedition. “The individuals were found in great num-



Fig. 2.

bers, either skipping about on the snow very close to the shore in sunshine, June 5th 1912 (Hagens Fjord), or skipping on the surface of the water in a small river bed and on the stones surrounding it, July 12th 1912 (Adam Bierings Land)" (HAMMER 1938, p. 27). Oribatids have never before been recorded from Peary Land.

Fig. 1 is a map of Peary Land on which the localities where the samples have been taken are indicated. The samples were mainly taken on biotopes where collemboles and oribatids might be expected to occur, e. g. beside river beds, on snow-patches, in bogs, and in similar places with a little moisture in the soil, but also in fell-fields, etc. In such places the collection was made exclusively in order to provide the greatest possible representation of these animals from Peary Land and without consideration to the ecological distribution of the animals, but in spite of this preselection of favourable biotopes the result was extremely poor, as the animals in question were completely missing from no less than 45 samples. Perhaps this should not, however, be attributed to the poor soil, only, but just as much to the fact that the winter samples were mainly taken on sledge journeys and in a frozen state transported in paper bags to the wintering house at the station on Jørgen Brønlunds

Fjord, where the samples were not until then treated in Berlese funnels. It has proved time and again that Berlese material collected in sand, earth, or stone will not stand any prolonged transport, the animals simply being crushed between the soil particles. They will stand lengthy transportation only in a light and airy vegetation such as moss and lichens, and then only in air-tight tins which will protect them from being dried up and from pressure from outside. The destructive effect of transportation appears most clearly from the fact that out of all the 30 samples taken west of the wintering house on Jørgen Brønlunds Fjord, i. e. on sledge journeys, partly in the autumn about the middle of October, partly in spring in March—April, 22 were empty in spite of their comparatively rich contents of vegetation; out of the other 8 samples only 3 contained oribatids (25 in all); 6 samples had 14 collemboles in all. In Heilprin Land and elsewhere as well, thus on Koralkysten, some samples without any animals at all were taken in winter as well as in spring, but then mostly in almost pure soil without vegetation.

A total of about 1100 collemboles (15 species) and about 550 oribatids (8 species) was collected.

Collembola.

1. *Neogastrura tullbergi* (Schäffer).

This is the commonest collembole by far in Peary Land, where it has been found from Aftenstjernesø in the west to Herlufsholms Strand in the east. By Aftenstjernesø one individual was found on a snow-patch about 20 cm deep on a south-facing mountain side about 30 m above sea level, overgrown with *Carex misandra*, *Luzula nivalis*, and mosses, 22/3. A single very small individual from Sydpasset has with some reservation been determined as belonging to the present species; it was found in mosses on a south-facing slope with a thin snow-cover, 16/10; one individual in the same locality, also on a south-facing slope in vegetation of *Dryas* sp., *Eriophorum polystachyum*, *Alopecurus alpinus*, *Timmia norvegica*, and mosses covered by thin snow, 16/10. In Heilprin Land 32 individuals were found south of the station on a snow-patch with *Saxifraga setigera*-*Ranunculus sulphureus* vegetation, 16/8; the same place with 80 cm snow, 8 individuals, 13/12; 6 individuals on snow-patch in the same place, 13/7; 11 individuals on very wet soil in river bed at the station, 14/5; 13 individuals in mosses on mountain side south of the station, about 600 m above sea level, 4/5; 33 individuals on snow-patch with *Eriophorum polystachyum* and moss saturated with water, 15/7. 15 animals on south-facing slope with *Dryas* sp., *Carex misandra*, *Salix arctica*, mosses, etc. at Kap Knud Rasmussen in Heilprin Land,

20/3. 5 individuals in stony, slightly moist fell-field with *Cassiope tetragona* vegetation in Saxifragadal, 29/10; one individual on an old caribou antler with moss in fell-field in the same locality, 7/6. One individual in *Luzula confusa* vegetation on slightly northern exposure on slightly moist slope, 5 m above sea level at Kap Glacier, 29/10. 9 individuals on coastal terrace, about 100 m above sea level, on the south coast of Peary Land (long. 24° W.), 1/10. One individual in moss on meadow 10 m above sea level at Kap Vaarbrud, 4/5. About 140 individuals in moist rills on 30° east exposed mountain slope on Herlufsholms Strand (lat. 82°40' N., long. 21° W.), 13/5; 45 individuals in moist depression without snow cover, 20 m above sea level, 12/5; 75 individuals on slightly moist fell-field, 75 m above sea level, May; 7 individuals in mosses by lake shore without snow cover, 75 m above sea level, 12/5; 6 individuals on dry stone fell-field, snow-free, 75 m above sea level, 14/5; 7 individuals in mosses by lake, 12/5; 15 individuals on stony, slightly moist fell-field with 10 cm snow-cover, 12/5; 2 individuals in small moist depression without snow, about 20 m above sea level, 12/5.

2. *Ceratophysella armata* (Nic.).

5 individuals on south-facing slope overgrown with *Dryas* sp., *Carex misandra*, *Salix arctica*, *Polygonum viviparum*, and mosses at Kap Knud Rasmussen, Heilprin Land, 20/3. One individual in *Silene acaulis* vegetation on Blomsterstranden, 19/6. Two individuals on moist *Eriophorum polystachyum* meadow with mosses, 5 m above sea level, 27/10.

3. *Willemia anophthalma* Börner.

60 individuals on snow-patch with *Salix arctica* vegetation in Heilprin Land, 15/7. 9 individuals on an old caribou antler with mosses in fell-field in the Saxifragadal, 7/6. 4 individuals in Astrups Fjord, on snow-patch grown with *Luzula confusa*, *Alopecurus alpinus*, mosses, etc., about 75 m above sea level, 27/10. One individual in *Luzula confusa* vegetation at Kap Glacier, 5 m above sea level, 29/10. One individual in *Silene acaulis* vegetation on Blomsterstranden, 16/6. Two individuals in Hellefiskefjord below an enormous, east-facing snow-patch grown with *Cassiope tetragona*, about 20 m above sea level, 28/5.

4. *Micranurida polaris* n. sp.

Entirely white. Size up to 0.65 mm. Eyes absent. Postantennal organ with 14—15 tubercles arranged in an oval (fig. 3). Antenna shorter

than the head, of almost equal thickness throughout, faintly tapering towards the tip.

Ratio between head and antenna: 4:3

— — Ant. I:II:III + IV: 15:12:23

— — body and head: 4:1.

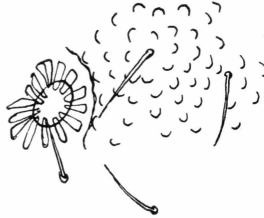


Fig. 3

Fig. 4 shows Ant. II and almost completely Ant. III + IV. Ant. II has a collar of long stiff setae. On Ant. III + IV the setae are irregularly scattered, with shorter ones between long stiff bristles. Ant. III has dorsally a long straight olfactory hair and ventrally an undulated one. In the slight depression on the lateral side a very tiny sense club is seen in profile. Ant. III and IV are faintly separated ventrally, but fused dorsally. Distally Ant. IV has about 5 short and thick, oblong olfactory hairs: 3 medially and dorsally, 2 laterally. At the tip there is a trilobed papilla.

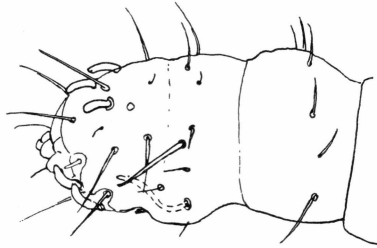


Fig. 4.

The mouth is conical. Each mandible has a long almost straight apical tooth, a strong antapical tooth, and two smaller ones, the proximal one being the smallest (fig. 5). The maxillae are hooklike (fig. 5). Attached to the shaft of the maxillae there is apparently a broad appendage or lobe with a few faintly chitinized teeth, but due to its minute size it is not possible to tell with certainty what it looks like. The claw is toothless. Empodial appendage and tenent hairs absent. No furca has been observed. The body segments have short thin curved hairs in two rows,

the posterior ones being the longest. Towards the posterior end the hairs become longer and thicker. All body segments are distinctly separated. The skin is moderately coarsely tuberculated; the tubercles or granules, which are all of the same size, are arranged in transverse rows. Medially to the postantennal organ the granules are placed irregularly in circles with a seta as the centre (fig. 3).

Micranurida polaris is distinct from *M. spirillifera* Hammer by its larger number of tubercles in the postantennal organ and by the different shape of the olfactory hairs on Ant. IV, which in *M. spirillifera* are like

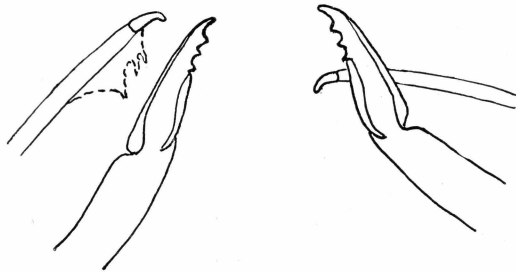


Fig. 5.

oval drops. From *M. forsslundi* Gisin (a specimen of which Dr. H. Gisin, Genève, most kindly lent me for comparison) it is distinct first of all by its much finer granulation, the granules being arranged in transverse rows and not in "fields" or "beds" with especially large granules. Moreover, *M. polaris* has somewhat shorter and thicker olfactory hairs on Ant. IV than *M. forsslundi* and not by far so many bristles on that segment.

A single individual was collected in the Saxifragadal in a stony river bed grown with *Orthothecium speciosum*, *Saxifraga oppositifolia*, *Luzula* sp., mosses and lichens, about 15 m above sea level, 29/10. One specimen in Heilprin Land on a snow-patch with *Ranunculus sulphureus* and *Saxifraga setigera* vegetation rich in mosses, 13/7.

5. *Onychiurus groenlandicus* (Tullb.).

16 individuals on a mountain side in Heilprin Land, about 600 m above sea level, in moss, 4/5; 5 individuals in snow-patch grown with *Luzula* sp. in the same locality, 15/7; in the same locality 4 individuals in wet clay with moss (springlike), 6/3; in Astrups Fjord 4 individuals in wet *Eriophorum polystachyum* bog with mosses, 5 m above sea level, 27/10; on the south coast of Peary Land (long. 24° W.) one individual on shore terrace, about 100 m above sea level, 1/10.

6. *Folsomia diplophthalma* (Axelson).

On Blomsterstranden 3 specimens in *Silene acaulis* vegetation together with *F. quadrioculata* and *F. fimetaria*, 16/6. In the Saxifragadal one specimen in stony river bed overgrown with *Orthothecium speciosum*, *Saxifraga oppositifolia*, mosses, etc., about 15 m above sea level, 29/10.

7. *Folsomia regularis* Hammer.

For completion of the original description it must be added that in Peary Land, from where the material is much greater than that from

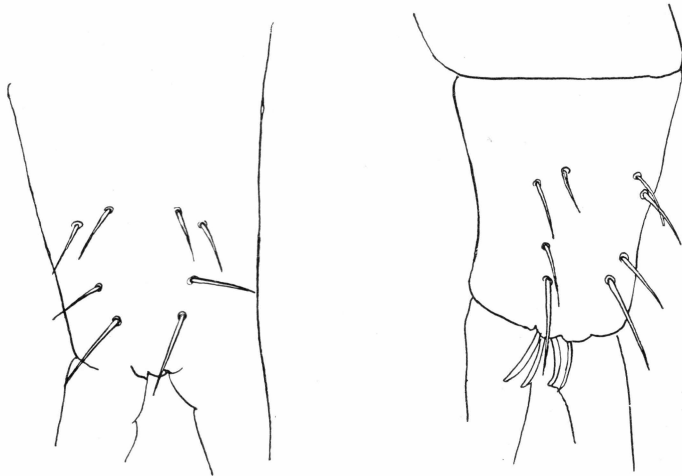


Fig. 6-7.

Ellesmere Island, the individuals from which were used as basis of the original description, large individuals with 4 + 4 hairs of the ventral side of the manubrium were found. A fourth pair (figs. 6—7) has been added medially and proximally to the three first pairs (see HAMMER 1953 a, figs. 4—5). The number of these hairs varies greatly according to the age of the animal and need not always be the same on the right and the left side. It is possible to find individuals with 2 + 1, 2 + 2, 3 + 2, 3 + 3, 4 + 2, 4 + 3, and 4 + 4. The length also seems to vary; still, the distal pair are always considerably longer than the others, which may be of the same length and thickness; sometimes the fourth pair or the pair last started is the smallest (see fig. 7). The number of hairs on the ventral side of the dens also varies, there are mostly 8, but 7 are frequently seen, sometimes only on one dens, where the other displays 8. For further supplementing it should be added that a slight blue-black pigmentation may occur on an oblong spot behind the eye.

Next to *Neogastrura tullbergi* this is by far the commonest collembole in Peary Land. In Heilprin Land 53 individuals on a snow-patch with *Carex misandra*, *Oxyria* sp. vegetation, 15/7; in the same locality 23 individuals on a snow-patch with *Saxifraga setigera*—*Ranunculus sulphureus* vegetation, 16/8; in the same biotope 3 individuals, 13/12; in the same biotope 19 individuals, 13/7; one individual in the same biotope, but with a lichen-*Cyanophysea* crust; in the same locality 4 individuals on a south-facing slope grown with *Dryas* sp. and *Carex nardina* vegetation, 16/8; at Kap Knud Rasmussen 3 individuals on a south-facing slope with *Dryas* sp., *Carex misandra*, and mosses, 20/3; in Astrups Fjord one individual on a steep south-facing slope in *Vaccinium* vegetation with admixture of mosses, 15—20 m above sea level, 9/6; on Herlufsholms Strand (lat. 82°40' N., long. 21°) 60 individuals, among them many small ones on slightly moist fell-field about 75 m above sea level, May; 52 individuals in moss on the shore of a small lake, 12/5; 9 individuals on south-facing moist ground with 10 cm deep snow sheltered by large boulders, 13/5.

8. *Folsomia quadrioculata* (Tullb.).

In Astrups Fjord 15 specimens in moist *Eriophorum polystachyum* bog rich in mosses about 5 m above sea level, 27/10; in the Saxifragadal 14 individuals on a very old fragment of a caribou antler overgrown with mosses, on fell-field, 7/6; on Blomsterstranden 7 specimens in *Silene acaulis* vegetation, 16/6; in Heilprin Land south of the station on a mountain slope about 600 m above sea level, 3 specimens in mosses, 4/5; at Kap Knud Rasmussen one specimen on a south-exposed slope overgrown with *Dryas* sp., *Carex misandra*, *Salix arctica*, and mosses, 20/3.

9. *Folsomia fimetaria* (L., Tullb.).

In Heilprin Land, about 40 small individuals on a snow-patch overgrown with *Salix arctica*, 15/7; at Kap Knud Rasmussen 4 specimens together with *F. quadrioculata* (*q. v.*). On Blomsterstranden 9 specimens in *Silene acaulis* vegetation, 16/6; in Astrups Fjord 9 specimens on a steep south-exposed mountain slope about 15—20 m above sea level in *Vaccinium* vegetation and mosses free of snow but surrounded by deep snow, 9/6; in the same locality one specimen on a west-facing snow-patch grown with *Luzula confusa*, *Alopecurus alpinus*, and mosses about 75 m above sea level, 27/10; in the Saxifragadal two specimens in a stony river-bed grown with *Orthothecium speciosum*, *Saxifraga oppositifolia*, and mosses 15 m above sea level, 29/10; in the same locality one specimen on a very old fragment of a caribou antler overgrown with mosses on fell-field, 7/6. Near the head of Hellefiskefjord on the outer

coast two specimens were collected on an east-facing slope below an enormous snow-patch about 20 m above sea level, grown with *Cassiope* vegetation, 28/5. One specimen in a large valley north of Herlufsholms Strand, on an east-facing slope with *Cassiope* vegetation and small snow-patches, 1/6.

10. *Ágrenia bidenticulata* (Tullb.).

At Sydpasset two individuals in south-facing moss carpet with thin snow cover, 16/10; one individual on south-facing slope with *Dryas* sp., *Eriophorum polystachyum*, *Alopecurus alpinus*, *Timmia norvegica*, mosses, etc., covered by a thin layer of snow, 16/10; in Heilprin Land 27 individuals near the station on Jørgen Brønlunds Fjord in very wet river bed, 14/5; seven individuals in mosses on mountain side south of the station about 600 m above sea level, 4/5; one individual on wet snow-patch with *Saxifraga setigera*—*Ranunculus sulphureus* vegetation 16/8; one individual in the Saxifragadal in dry, very wet fell-field with mosses, 10 m above sea level, 7/6; on the south coast of Peary Land (long. 24° W.) 21 individuals on shore terrace about 100 m above sea level, 1/10; at Kap Vaarbrud two individuals in a small bog with mosses, 10 m above sea level, 4/5; on Herlufsholms Strand 10 individuals in moss on the shore of a small lake, no snow cover, 12/5; 8 individuals in mosses without snow near lake shore, 75 m above sea level, 12/5; one individual on south-facing moist ground with 10 cm deep snow, 13/5; one individual at Kap Eiler Rasmussen in very old musk-ox dung on gravelly coastal plain 10 m above sea level, snow-free, 9/5.

11. *Vertagopus arborea* (L.).

On the Merqujôq Ø in J. P. Kochs Fjord one individual on north-east-facing mountain slope about 150 m above sea level, partly snow-covered and overgrown with *Dryas* sp., *Saxifraga oppositifolia*, lichens, and mosses, 31/3; on Herlufsholms Strand 4 specimens in dry stony fell-field with moss, about 75 m above sea level, 14/5; in the same locality one individual on south-facing moist soil covered with about 10 cm deep snow, 15/5.

12. *Isotoma notabilis* Schaffer var. *pallida* Agrell.

In Astrups Fjord two specimens on a moist *Eriophorum polystachyum* bog rich in mosses, 5 m above sea level, 27/10.

13. *Isotoma viridis* Bourlet.

The Merqujôq Ø in J. P. Kochs Fjord 5 specimens on a south-facing mountain slope, 15 m above sea level, partly snow-covered and overgrown with *Dryas* vegetation, 31/3; at Kap Knud Rasmussen one

individual on a south-facing slope overgrown with *Dryas* sp., *Carex misandra*, *Salix arctica*, *Polygonum viviparum*, *Saxifraga oppositifolia*, and mosses, 20/3; in Heilprin Land one individual in *Salix arctica* vegetation on a snow-patch, 15/7; in J. C. Christensen Land east of the Neergaard Elv two specimens in a dry place overgrown with *Dryas* sp., *Papaver radicum*, *Saxifraga oppositifolia*, mosses, and lichens, 8/3; on the south coast of Peary Land (long. 24° W.) one specimen on a shore terrace 100 m above sea level, 1/10; on the outer coast near the head of Hellefiskefjord 4 specimens on eastern exposure below an enormous snow-patch, about 20 m above sea level, and grown with *Cassiope tetragona* vegetation, 28/5.

14. *Megalothorax minimus* Willem.

In Astrups Fjord 16 specimens on a moist *Eriophorum polystachyum* bog rich in mosses, 5 m above sea level, 27/10; in Heilprin Land, at Kap Knud Rasmussen 3 specimens on a somewhat south-facing slope grown with *Dryas* sp., *Carex misandra*, and mosses, 20/3; in fell-field in the Saxifragadal 6 specimens on a fragment of an old caribou antler overgrown with mosses, 7/6; one individual in fell-field with *Cassiope*, *Luzula*, and lichens, 29/10; on the outer coast near the head of Hellefiskefjord 22 individuals on eastern exposure below an enormous snow-patch 20 m above sea level and grown with sparse *Cassiope tetragona* vegetation, 28/5.

15. *Sminthurides malmgreni* (Tullb.).

In the central part of Sydpasset one specimen on a south-facing slope covered with thin snow and grown with *Dryas* sp., *Eriophorum polystachyum*, *Alopecurus alpinus*, *Timmia norvegica*, and mosses, 16/10; in Heilprin Land 20 specimens on a snow-patch grown with *Luzula* vegetation, 15/7; in the same locality 5 individuals on a snow-patch with *Carex misandra*—*Oxyria* sp. vegetation, 15/7; on Okseslette, Heilprin Land 28 specimens in mosses on a meadow beside a river, 19/4; in the same locality 4 specimens on moist clayey soil with thick moss and furthermore overgrown with *Salix arctica* and *Alopecurus* sp., 8/3; one specimen in mosses on a mountain side south of the station, about 600 m above sea level, 4/5; in Astrups Fjord a single individual on a moist *Eriophorum polystachyum* bog rich in mosses, 5 m above sea level, 27/10; in J. C. Christensen Land one specimen in a dry place with *Dryas*, *Papaver*, *Saxifraga*, mosses, and lichens, 8/3; on the outer coast, Herlufsholms Strand (lat. 82°40' N., long. 21° W.) one specimen on the shore of a small lake with moss, no snow cover, 12/5.

0.23 mm has been measured (STRENZKE 1950); in Sweden 0.19—0.212 mm (FORSSLUND 1942).

2. *Brachychthonius perpusillus* Berl.

In J. C. Christensen Land east of the Neergaard Elv a single individual together with *B. scalaris* (*q. v.*).

0.22 mm long. In Canada 0.19 mm (HAMMER 1952); in Germany 0.188 mm (SELLNICK 1929); in Italy 0.180 mm (BERLESE 1910).

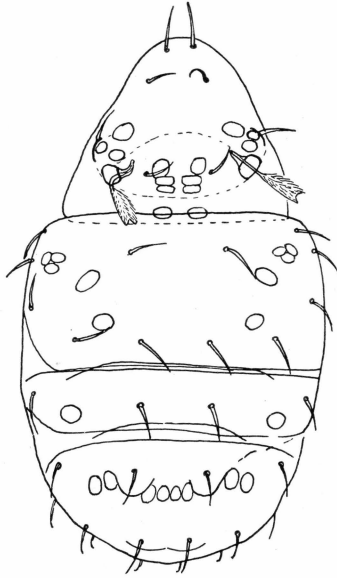


Fig. 8.

3. *Brachychthonius lapponicus* Trghd.

The specimens from Peary Land are characterized by great chitinization; the animals are of a yellow to brownish yellow colour. Consequently the spots on the propodosoma and hysterosoma stand out clearly (fig. 8). Dr. FORSSLUND, who has seen some of my specimens, has kindly informed me that the species in Sweden is a little smaller and colourless or very slightly yellowish, for which reason the spots on the propodosoma and hysterosoma cannot be seen. On a few individuals from Peary Land distinct "hills" are observed around C 1 (fig. 8), as drawn by STRENZKE in *B. sellnicki* (STRENZKE 1950, p. 236, fig. 1).

In the Saxifragadal 5 specimens on a fragment of a very old caribou antler overgrown with moss, in fell-field, 7/6; in Astrups Fjord 8 individuals in *Vaccinium* vegetation with mosses on a steep south-facing mountain slope 15—20 m above sea level, from a snow-free spot but surrounded by deep snow, 9/6; a single specimen in a large valley north of Herlufs-

holms Strand on an east-facing slope with small snow-patches and grown with *Cassiope* vegetation, 1/6; 45 specimens near the head of Hellefiskefjord on an east-facing slope below an enormous snow-patch grown with sparse *Cassiope* vegetation, 20 m above sea level, 28/5; one specimen on the north coast of G. B. Schley Fjord near the mouth, beside a river mouth, two m above sea level, 23/5.

The length varies between 0.20 and 0.225 mm. The following lengths were measured: 0.20, 0.21, 0.215, 0.215, 0.215, 0.215, 0.215, 0.215, 0.215, 0.22, 0.22, 0.22, 0.22, 0.22, 0.22, 0.22, 0.225, and 0.225.

In Canada 0.195 mm (HAMMER 1952); in Germany 0.21—0.215 mm (STRENZKE 1950); in Sweden 0.18 mm (TRÄGÅRDH 1910).

4. *Belba groenlandica* Hammer.

In the Saxifragadal one specimen on a fragment of a very old caribou antler overgrown with mosses, in fell-field, 7/6; the specimen is 0.83 mm long.

In Inglefield Land, Northwest Greenland 0.68—0.72 mm (HAMMER 1953 a).

5. *Oppia clavigera* Hammer.

Agrees with the original description (HAMMER 1952, fig. 45) apart from the fact that the "shoulder hairs", the hairs laterally on the anterior margin of the hysterosoma are considerably longer on the individuals from Peary Land.

At Kap Glacier one specimen in *Luzula confusa* vegetation on a slightly north-facing moist slope, 5 m above sea level, 29/10; in the Saxifragadal 22 individuals on a fragment of an old caribou antler overgrown with mosses, in fell-field, 7/6; in Astrups Fjord 34 specimens in *Vaccinium* vegetation with mosses on a snow-free spot, but surrounded by deep snow on a steep south-facing mountain slope, 15 m above sea level, 9/6; in Hellefiskefjord 6 specimens together with *Brachythonius lapponicus* (*q. v.*).

Length 0.27—0.30 mm. The following lengths were measured: 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.27, 0.28, 0.28, 0.28, 0.28, 0.29, 0.29, 0.30, 0.30, 0.30, and 0.30 mm. In Canada 0.29—0.30 mm (HAMMER 1952).

6. *Tectocephus velatus* (Mich.).

In Astrups Fjord a single nymph on a snow-free horizontal spot grown with *Vaccinium* sp. and mosses and surrounded by deep snow, 9/6.

7. *Trichoribates notatus* (Thorell).

In Heilprin Land south of the station in Jørgen Brønlunds Fjord 5 adults and 19 nymphs on a wet snow-patch grown with *Salix setigera*

and *Ranunculus sulphureus*, 16/8; in the same biotope, snow cover 80 cm deep, 12 nymphs, 13/12; in Heilprin Land, Arenaen, on a snow-patch with *Salix arctica* 9 adults and 14 nymphs, 15/7; in Arenaen on a south-facing slope with *Dryas* sp. and *Carex nardina* vegetation one adult, 16/8; in Astrups Fjord one nymph on a moist *Eriophorum polystachyum* bog rich in mosses, 5 m above sea level, 27/10; in the same locality one adult in a somewhat moist snow-patch of western exposure at the foot of basalt rocks, about 75 m above sea level, grown with *Luzula*

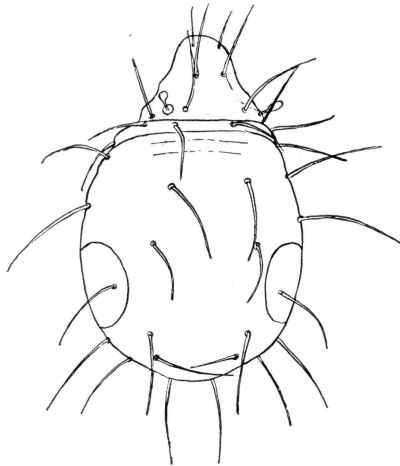


Fig. 9.

confusa, *Alopecurus*, *Timmia*, and mosses, 27/10; in a large valley north of Herlufsholms Strand one adult on an east-facing slope without any large snow-patches and grown with *Cassiope tetragona* vegetation, 1/6; near the head of Hellefiskefjord 4 adults and 80 nymphs on an east-facing slope below an enormous snow-patch about 20 m above sea level and grown with *Cassiope tetragona*, 28/5. Fig. 9 shows a nymph of *Trichoribates notatus*.

The adults are 0.65—0.76 mm long. The following lengths were measured:

0.65, 0.66, 0.67, 0.70, 0.70, 0.70, 0.72, 0.73, 0.74, and 0.76 mm.

In Canada 0.60—0.70 mm (HAMMER 1952); in Northeast Greenland (Scoreby Sound district) 0.64—0.768 mm (GRAVERSEN 1931 had the following measures: 0.64, 0.64, 0.656, 0.672, 0.688, 0.736, and 0.768 mm); Lapland 0.60 mm (TRÄGÅRDH 1904).

8. *Jugoribates gracilis* Sell.

Common everywhere in Peary Land from the Merqujôq Ø in the west in J. P. Kochs Fjord by the Independence Fjord area to the outer

coast in the east and north along the east coast to G. B. Schley Fjord. The adults were found in the greatest number in the Saxifragadal, Academy Land, in stony, slightly moist fell-field with *Cassiope tetragona*, mosses, and lichens, 29/10, and on Herlufsholms Strand (lat. 82°40' N., long. 21° W.) in moist rills on a mountain side with 30° east exposure, 13/5; in the same locality in moss in dry, stony fellfield about 25 m above sea level, 14/5 (see further Tables 1 and 2).

Fig. 10 shows a nymph of *Jugoribates gracilis*. It is very easily distinguished from the nymph of *Trichoribates notatus* by having only

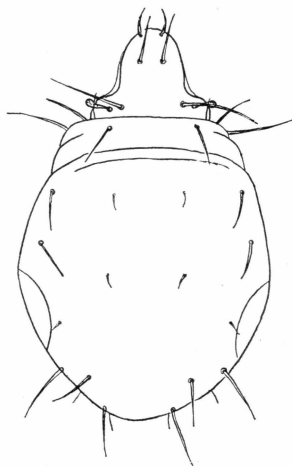


Fig. 10.

6 long hairs at the posterior end of the hysterosoma; the other hairs on the hysterosoma are comparatively short and, as seen from above, do not protrude beyond the sides of the animal apart from two pairs on the anterior margin. In the larvae the hairs dorsally on the hysterosoma are nearly as long as those found posteriorly. The nymph of *Trichoribates notatus* has numerous long hairs everywhere (see fig. 9).

The adults are 0.58—0.75 mm in length. The following lengths were measured:

0.58, 0.63, 0.63, 0.64, 0.64, 0.65, 0.65, 0.65, 0.67, 0.67, 0.67, 0.67, 0.68, 0.68, 0.68, 0.69, 0.69, 0.69, 0.69, 0.70, 0.70, 0.70, 0.73, 0.74, 0.75, and 0.75 mm.

In Inglefield Land (Northwest Greenland) 0.62 and 0.72 mm (HAMMER 1953 a); in West Greenland, Upernavik 0.594—0.638 (SELLNICK in HAMMER 1944); in West Greenland, Søndre Strømfjord 0.57 and 0.60 (the measures not published in HAMMER 1952 a).

Table 1 shows the occurrence of *Jugoribates gracilis* and *Trichoribates notatus* throughout the year on various biotopes.

Table 1.

Date	No.	Localities	Jug. gracilis		Trich. notatus		Biotope
			ad.	nph.	ad.	nph.	
16/8-1948	2	Heilprin Land ...	..	..	1	..	⊗ <i>Dryas</i> sp.— <i>Carex nardina</i> vegetation
— —	3	— — ...	..	..	4	..	≡ Snow-patch: <i>Saxifraga setigera</i> — <i>Ranunculus sulphureus</i> vegetation; wet
— —	4	— — ...	2	12	1	19	
1/10 —	92	South Coast of Peary Land (long. 24° W.)..	..	1	..	..	⊗ Dry clayey and gravelly plain; 2 m a.s.l.
— —							
27/10 —	121	Astrups Fjord ...	..	..	..	1	≡ Moist <i>Eriophorum polystachyum</i> bog with mosses; 5 m a.s.l.
— —	124	— — ...	..	1	1	1	≡ Snow-patch: <i>Luzula</i> , <i>Alopecurus</i> , mosses; 75 m a.s.l.
29/10 —	120	Kap Glacier.....	2	2	..	..	⊗ Fell-field: <i>Timmia</i> , mosses; 10 m a.s.l.
— —	122	Saxifragadal.....	7	..	..	..	⊗ Fell-field: <i>Cassiope</i> , mosses, and lichens
13/12 —	174	Heilprin Land ...	..	1	..	..	≡ Snow-patch: <i>Salix arctica</i> , mosses, and lichens
— —	175	— — ...	..	2	..	9	≡ Snow-patch: as nos. 3 and 4; 80 cm snow
— —	176	— — ...	..	13	..	3	
5/3-1949	336	I. C. Christensen Land, Kap Peter Henrik ....	..	1	..	..	⊗ <i>Saxifraga oppositifolia</i>
31/3 —	352	Merqujôq Ø	1	..	..	..	⊗ <i>Dryas</i> sp., <i>Saxifraga oppositifolia</i> , mosses, and lichens; 150 m a.s.l.
3/5 —	628	Kap Vaarbrud...	4	..	..	..	⊗ Clayey plain; 40 m a.s.l.
6/5 —	563	Herlufsholms Str.	..	2	..	..	⊗ Polygon soil with <i>Saxifraga setigera</i> , <i>Tortella fragilis</i> ; 10 m a.s.l.; no snow
12/5 —	498	— —	1	..	..	..	⊗ Fell-field; 10 cm snow
13/5 —	529	— —	9	..	..	..	⊗ Moist rills, 30° eastern exposure
14/5 —	496	— —	3	7	..	..	⊗ Dry fell-field with mosses; 75 m a.s.l.
?/5 —	534	— —	..	2	..	..	⊗ Moist fell-field; 75 m a.s.l.
19/5 —	569	Neergaard Elv ..	..	2	..	..	⊗ Wet north-facing clayey slope of solifuctional soil: <i>Saxifraga</i> , <i>Tortella fragilis</i> ; 30 m a.s.l.; no snow
— —	570	Asmild Elv	3	1	..	..	⊗ Slightly moist, stony river bed; 5 m a.s.l.; no snow
23/5 —	684	G. B. Schley Fjord	1	1	..	..	? Mouth of river; 2 m a.s.l.
28/5 —	711	Hellefiskefjord ...	..	..	..	10	≡ East-facing slope below enormous snow-patch with <i>Cassiope tetragona</i> vegetation; 20 m a.s.l.
— —	712	— ...	..	..	..	ca. 40	
— —	713	— ...	2	..	3	30	
1/6 —	686	Herlufsholms Str.	1	..	1	..	≡ East-facing slope with small snow-patches: <i>Cassiope tetragona</i>
7/6 —	665	Saxifragadal.....	..	2	..	..	⊗ Fell-field: caribou antler with mosses
15/7 —	1143	Heilprin Land ...	..	..	1	6	≡ Snow-patch: <i>Salix arctica</i>
— —	1147	— — ...	4	4	8	8	≡ Snow-patch: <i>Carex misandra</i> , <i>Oxyria digyna</i>

≡ wet biotopes, ⊗ dry biotopes (these designations apply to conditions in summer).

The two species of oribatids *Trichoribates notatus* and *Jugoribates gracilis*, the nymphs of which are known from Peary Land, show a very different occurrence throughout the year and, as regards humidity in the soil, prefer widely different biotopes. In Table 1 (p. 21) all samples containing the species in question have been arranged chronologically. As will be seen, adults as well as nymphs of *Jugoribates gracilis* occur all the year round and on nearly all biotopes, but especially in dry fell-fields and the like, whereas *Trichoribates notatus* during a very long period in spring does not occur at all (this may, however, be connected with the possibility that the localities in question represented within this space of time have no biotopes suitable for it). Furthermore, it is seen that the biotopes in which it is found, are very moist or wet—and are so during the whole of the summer: bog and snow-patches, mainly the latter. The snow there melts off very slowly or remains the whole of the year so that there is always sufficient humidity in these places for this species to breed and exist there. Apparently some of the nymphs hibernate below the snow.

Whereas *Jugoribates gracilis* is found nearly everywhere in the very dry Peary Land, the distribution of *Trichoribates notatus* suggests that it will not thrive in the desert-like climate. Except on the snow-patches in Heilprin Land and in Astrups Fjord, which is rich in snow, it has practically exclusively been found only on the outer coast, which has a somewhat moister climate than the inner fjords. *Trichoribates notatus* for that matter has a circumpolar distribution and is common in most arctic countries.

Jugoribates gracilis, which—judging from the biotopes in which it especially occurs—will apparently stand far more drought, outside Peary Land has a rather limited distribution and has hitherto been found only in Greenland. It has been found in Inglefield Land and at the previous Thule (both in Northwest Greenland), at Upernavik, in the Disko Bay area, and in the interior of the Søndre Strømfjord area. On the east coast¹ it has been found on Ymers Ø and Ella Ø (the Kejser Franz Josephs Fjord area). It has not been recorded from north of these localities, still, HAARLØV from Mørkefjord (about lat. 77° N.) has a photo of an undetermined nymph (1942, Plate I, fig. 2), which closely corresponds to the nymph of *Jugoribates gracilis* in fig. 10. In all these localities, which all have extraordinarily little precipitation and comparatively warm summers, it has been found everywhere in very dry biotopes, preferably in fell-fields. The predilection of this species

¹ In Investigations on the Microfauna of Northern Canada. Part I (HAMMER 1952, p. 53) and in Collemboles and Oribatids from the Thule District and Ellesmere Island (HAMMER 1953a, p. 15) it has been stated by mistake to be unknown from East Greenland.

for the very dry biotopes, besides its northern distribution, shows that it is a question of a "dry-soil form", which presumably properly belongs to the far north, from where it has spread southwards along the ice-free areas on the east and west coasts. In the south it can only have its demands for drought satisfied at the heads of the deeply penetrating fjord systems with a continental climate. There it should undoubtedly be considered a relic form.

As to the further distribution of the other six species the following information may be given: *Brachychthonius scalaris*, *B. perpusillus*, *B. lapponicus*, and *Tectocepheus velatus* have been found in Arctic Canada, Greenland, and Europe (*T. velatus* in Siberia as well); presumably they have a holartic distribution. *Belba groenlandica*, which has been described from Inglefield Land, Northwest Greenland, has not been found outside Greenland. Outside Greenland *Oppia clavigera* has been found only in Arctic Canada, where it has been reported from the delta of the Mackenzie River to Hudson Bay.

The remarkable size of the oribatids, which in the case of most species surpasses that in southern regions, may be connected with the great number of hours of sunshine in which these animals grow up; for the about two months which are frost-free are far from constituting the whole period in which the animals are active. From the time when the snow begins melting, i. e. from the beginning of May, perhaps even earlier—at a temperature a few degrees below zero—they are active, at any rate during some of the 24 hours. In late summer it will also be possible to find them active as long as there are positive day temperatures, i. e. until somewhat into the month of September (from 8/9 the temperature was constantly below zero centigrade (JOHNSON 1953)), which gives well over four months of activity with sunshine day and night, as the sun does not set between 9 April and 5 September. In this very long period of almost uninterrupted activity the animals presumably eat more than in zones farther south, for this reason presumably increase correspondingly in size, and thus have much more to live upon during the little active, cold period before they get completely inactive. If the comparatively long, very sunny period of activity in connexion with the severe winter is the cause of the extraordinary size of the oribatids, this means that the species in question in Peary Land presumably have reached the limits of what is possible, as a country with a higher number of hours of sunshine during the short summer hardly exists.

The oribatids not only seem to be larger in the north, but also to be more strongly chitinized. At any rate this applies to the *Brachychthonius* species, where the light spots on the propodosoma stand out clearly on a background of the almost brownish surrounding chitin.

Table 2.

Species	Localities										
	Merqujôq Ø	Aftenstjernesø	Sydpasset	Midsommersøer	Heilprin Land	Kap Knud Rasmussen	Blomsterstranden	Kap Glacier	Saxifragadal	Astrups Fjord	J. C. Christensen Land
<i>Neogastrura tullbergi</i> .....	..	1	2	..	103	15	..	1	6	..	..
<i>Ceratophysella armata</i> .....	..	..	..	..	..	5	1	..	..	2	..
<i>Willemia anophthalma</i> .....	..	..	..	..	60	..	1	1	9	4	..
<i>Micranurida polaris</i> .....	..	..	..	..	1	..	..	..	1	..	..
<i>Onychiurus groenlandicus</i> .....	..	..	..	..	25	..	..	..	..	4	..
<i>Folsomia diplophthalma</i> .....	..	..	..	..	..	..	3	..	1	..	..
<i>Folsomia regularis</i> .....	..	..	..	..	103	3	..	..	..	1	..
<i>Folsomia quadrioculata</i> .....	..	..	..	..	3	1	7	..	14	15	..
<i>Folsomia fimetaria</i> .....	..	..	..	..	40	4	9	..	3	10	..
<i>Agrenia bidenticulata</i> .....	..	..	3	..	37	..	..	..	1	..	..
<i>Vertagopus arborea</i>	1	..	..	..	..	..	..	..	..	..	..
<i>Isotoma notabilis</i> v. <i>pallida</i> .....	..	..	..	..	..	..	..	..	..	2	..
<i>Isotoma viridis</i>	5	..	..	..	1	1	..	..	..	..	2
<i>Megalothorax minimus</i> .....	..	..	..	..	..	3	..	..	7	16	1
<i>Sminthurides malmgreni</i> .....	..	..	1	..	58	..	..	..	..	1	..
<i>Brachychthonius scalaris</i> .....	..	..	2	23	125	..	..	1	3	3	20
<i>Brachychthonius perpusillus</i> .....	..	..	..	..	..	..	..	..	..	..	1
<i>Brachychthonius lapponicus</i> .....	..	..	..	..	..	..	..	1	6	8	..
<i>Belba groenlandica</i> .....	..	..	..	..	..	..	..	..	1	..	..
<i>Oppia clavigera</i> .....	..	..	..	..	..	..	..	1	22	34	..
<i>Tectocephus velatus</i> .....	..	..	..	..	..	..	..	..	..	1	..
<i>Trichoribates notatus</i> .....	..	..	..	..	60	..	..	..	..	2	..
<i>Jugoribates gracilis</i>	1	..	..	..	38	..	..	4	9	1	7
Total of individuals	7	1	8	23	654	32	21	9	83	104	31
Total of species	3	1	4	1	13	7	5	6	13	15	5
Number of samples	3	4	7	5	30	2	1	2	4	5	6
Average per sample .....	..	..	..	..	21.8	..	..	..	20.8	20.8	..

Because of the very northerly situation of Peary Land and especially because of its pronouncedly desert-like climate the microfauna must be expected to be very poor, but still it may be richer than ascertained by the present investigations. In spite of its northern situation Spitzbergen, which reaches north of the 80th degree of latitude, has about twice as many species of collembolids and oribatids as Peary Land, but then it has a moist oceanic climate. The very dry climate of Peary Land is

South coast of Peary Land (24° W.)	Kap Vaarbrud	Herlufsholms Strand	Kap Eiler Rasmussen	Hellefiskefjord	G. B. Schley Fjord
9	1	296	..	..	..
..
..	..	..	..	2	..
..
1	..	..	..	..	..
..
..	..	121	..	..	..
..
..	..	1	..	2	..
21	2	19	1	..	..
..	..	5	..	..	..
..
1	..	..	..	4	..
..	..	..	..	22	..
..	..	1	..	..	..
..	8	26	..	1	..
..
..	..	1	..	45	1
..
..	..	..	..	6	..
..	..	1	..	83	..
2	4	25	..	2	2
34	15	496	1	167	3
5	4	10	1	9	2
9	3	17	1	4	1
..	..	29.2	..	41.8	..

In Table 2 the occurrences of all species in the various localities are indicated. It appears that Heilprin Land, where the wintering station is situated and where consequently the largest number of collections have been made (30 samples), shows the largest number of individuals collected, but not the largest number of species: 13 out of the 23 species found. Considering that the samples from there were not exposed to the ruinous transport—a fact which may explain the large number of individuals—the comparatively small number of species may, in spite of everything, be expressive of a fairly uniform animal life in the sparse and poor vegetation. In comparison it is astonishing to see that Astrups Fjord, where only five samples have been taken, has 15 species and the Saxifragadal with four samples has 13 species, no less than 10 species of which were found in the moss cover on a very old caribou antler. It is difficult to decide whether it is the difficulty of finding conditions of life in the barren fell-field that has gathered so many species in the moss, which has functioned as an oasis, or whether the perhaps disintegrating caribou antler with its animal refuse products was particularly alluring to the animals. It is, however, strange that this very sample displayed the largest number of species by far of all samples. Herlufsholms Strand and Hellefiskefjord have 10 and 9 species, respectively; the other localities have all on an average much smaller numbers of species and of individuals per sample.

The astonishingly rich or comparatively rich fauna in Astrups Fjord is probably connected with the snow cover which is thick in winter and in the spring, until far into the summer, and which in the first instance creates conditions of a richer flora. The same seems to be the case on Herlufsholms Strand and in Hellefiskefjord. The more desert-like climate in the other localities, which not even in winter are covered by a protective layer of snow, leave only very small oases for animal life, such as on a lake shore, in a river bed, and the like, which often dry up in late summer. Under such conditions the number of species must be very considerably reduced.

no doubt the chief obstacle to a rich microfauna. It is interesting in this connexion to compare the representatives of the microfauna in Peary Land found with the corresponding fauna known from another very northerly desert area: the regions around Eureka Sound in Ellesmere Island, more especially on Slidre Fjord, where the annual precipitation is still lower than in Peary Land, only about 40 mm. 23 species of collemboles and 4 species of oribatids are known from this locality.

The collembolan fauna of Ellesmere Island has been arranged on the left in the table below, that of Peary Land on the right.

Ellesmere Island	Peary Land
Neogastrura tullbergi (Schäffer)	+
Neogastrura viatica (L.)	
Ceratophysella armata (Nic.)	+
Polyacanthella sp.	Willemia anophthalma Börner
Anurida granaria (Nic.)	Micranurida polaris n. sp.
Morulina? gigantea (Tullb.) ¹	
Onychiurus groenlandicus (Tullb.)	+
Onychiurus debilis (Moniez)	
Folsomia regularis Hammer	Folsomia diplophthalma (Axelson)
Folsomia quadrioculata (Tullb.)	+
Folsomia fimetaria (L.)	+
Ågrenia bidenticulata (Tullb.)	+
Proisotoma mackenziana Hammer	
Vertagopus arborea (L.)	+
	Isotoma notabilis Schäffer v. pallida Agrell
Isotoma viridis Bourlet	+
Isotoma violacea Tullb.	
Isotoma olivacea Tullb.	
Archisotoma besselsi (Packard)	
Isotomurus palustris (Müller)	
Entomobrya sp.	
Sira erudita Nic.	
Megalothorax minimus Willem	+
Sminthurides malmgreni (Tullb.)	+

There is hardly any doubt that out of the four species recorded from Peary Land, but not from Ellesmere Island, *Willemia anophthalma*, *Folsomia diplophthalma*, and *Isotoma notabilis* var. *pallida*, which are all widely distributed in Arctic Canada as well as in Greenland, also occur in Ellesmere Island if, indeed, the still lower precipitation there does not set a limit to their existence. On the other hand there are great chances of finding *Neogastrura viatica*, *Onychiurus debilis*, and *Archisotoma besselsi*, which are all shore forms, in Peary Land. *Neogastrura viatica* and *Archisotoma besselsi* are known from all other arctic countries. *Onychiurus debilis* was found in Ellesmere Island fairly far from the coast on raised sea bottom with secretions of salt crusts, a formation which is also found in several places in Peary Land.

¹ It is probably not *M. gigantea*, but a new-described *Morulina* species found in Canada (HAMMER 1953, p. 34).

Anurida granaria, *Isotoma violacea*, and *Isotoma olivacea* are very common everywhere in Greenland and in Arctic Canada, and are also found in Spitzbergen, for which reason they may presumably be found in Peary Land as well. Hence it may be expected that the collembolan fauna attains to a number of 21 species.

The other collembolan species from Ellesmere Island (apart from the undetermined species) have not been found in Greenland and hardly live there. These are: *Proisotoma mackenziana* (known from the delta of the Mackenzie River and Ellesmere Island), *Isotomurus palustris* (cosmopolitan), *Morulina ? gigantea* (? North America, Siberia), and *Sira erudita* (Europe). As these species are big and easily recognized, they cannot have been overlooked in Greenland, which in this respect is the arctic area best investigated. Their absence is probably due to difficulties of distribution; no other explanation seems acceptable,—or do they occur as relics in the interior, sheltered fjords of South Greenland?

The oribatid fauna in Ellesmere Island in contrast to the collembolan fauna is still poorer than that of Peary Land, as only the following four species are known from there: *Brachychthonius scalaris* Forssl., *Tectocephus velatus* (Mich.), *Fuscozetes sellnicki* Hammer, and *Trichoribates polaris* Hammer. The two first species also occur in Peary Land. They have both been found in many places in Greenland and presumably have a holartic distribution. *Fuscozetes sellnicki* is widely distributed in Arctic Canada from the Richardson Mountains west of the delta of the Mackenzie River to Churchill on Hudson Bay and to Ellesmere Island, but in Greenland it has so far only been recorded from Upernavik; it has not been found outside the area mentioned here. *Trichoribates polaris* has only been found in Ellesmere Island.

The extremely sparse oribatid fauna must be connected with the very dry climate, which is still drier than that in Peary Land. This is apparently much more dangerous to the oribatids than to the collemboles.

Both in Ellesmere Island and in Peary Land one might expect to find *Hammeria groenlandica* Sellnick, an arctic species which in Canada has been found only in purely arctic localities. Furthermore, it is known from Upernavik in West Greenland and from the interior of the Søndre Strømfjord area, which like Ellesmere Island and Peary Land has a desert-like climate with a very low precipitation; in the latter area it is presumably a relic form.

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