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Studies on Freshwater Entomostraca in Greenland VI

The Entomostraca of the Kap Farvel Area, Southernmost Greenland

Ulrik Røen



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Scientific editor – Botany

Gert Steen Mogensen, Botanical Museum, Gothersgade 130, DK-1123 Copenhagen K. Telephone +45 35 32 26 26.

Scientific editor – Zoology

G. Høpner Petersen, Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen Ø. Telephone +45 35 32 10 00.

This volume edited by G. Høpner Petersen.

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Studies on Freshwater
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The Entomostraca of the Kap Farvel
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Contents

Introduction	3	Discussion	17
Field methods	3	Environmental conditions	17
Localities	3	1. Waterbody type	17
Chemical analysis of some of the freshwaters ..	7	2. Chemistry	17
Remarks on the freshwater bodies	7	Zoogeography	18
Systematic part	7	Acknowledgements	21
Remarks on the species	7	References	21

Studies on Freshwater Entomostraca in Greenland VI

The Entomostraca of the Kap Farvel Area, Southernmost Greenland

ULRIK RØEN

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Freshwater crustaceans of the groups Cladocera, Ostracoda and Copepoda were investigated in the Kap Farvel area, the southernmost part of Greenland. Collections were made at 158 freshwater localities, and 42 species were found. Maps of the distribution of the species in the area are given. On the basis of distribution, number of species and specimens per locality, and the water chemistry and temperature, a zoogeographical boundary is suggested between the eastern and the western parts of the area.

Key words: Southernmost Greenland, freshwater, Crustacea, zoogeography.

Ulrik Røen, Zoological Museum, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen Ø, Denmark.

Introduction

The freshwaters of the Kap Farvel area, the southernmost part of Greenland, and the fauna of Entomostraca (Cladocera, Ostracoda and Copepoda) in these waters were practically unknown up to 1970.

During the summer of 1970 (10 July to 1 September) I investigated the freshwaters of this area, with financial support from the Danish National Science Research Council and the Ministry of Greenland. The Danish Navy and the Danish Arctic Institute provided most of the equipment.

The Kap Farvel area covers about 50 × 80 km and comprises a large number of smaller and larger islands separated by sounds. Most of the islands have steep mountains of granite, and the sounds are often packed by drift ice.

Due to conditions of ice, investigations in the eastern part were only made towards the end of the investigation period, and are therefore less intensive than those in the western part.

A total of 167 waterbodies were visited, but only samples from 158 of these, 154 lentic and 4 lotic, contained Entomostraca.

The Kap Farvel area was by me divided into 24 localities (sampling areas, Fig. 2), each with a different number of freshwaters.

Chemical analyses of the water were made by the Chemical Department of the Geological Survey of Denmark. Water for analysis was collected from altogether 50

freshwaters during the investigation, but unfortunately one of the boxes with samples was broken during transport, and a number of samples were lost.

Field methods

The animals were collected by means of a plankton net, with a diameter of 25 cm and mesh of 80 µm. All samples were made as horizontal hauls on ca. 12 m and through vegetation if any. The samples were immediately transferred to 2% formalin.

The water for analysis was taken in "Pyrex" bottles, and kept as cool as possible until arrival at Copenhagen.

Localities

The 167 localities have been grouped into the following 24 localities (Fig. 2):

1. Anordliutsoq. Northeastern coast of island of Pamiagdlok. 60°04'N, 44°15'W. 32 freshwaters.
2. Sagdlatsiag. About 3 km SE of (1.) 60°03'N, 44°13'W. 10 freshwaters.
3. Island in Anordliuitsup ima. 1 km NE of (1.), 60°05'N, 44°14'W. 4 freshwaters.
4. Utorqamiut. Southern part of island of Pamiagdlok. 59°58'N, 44°22'W. 24 freshwaters.

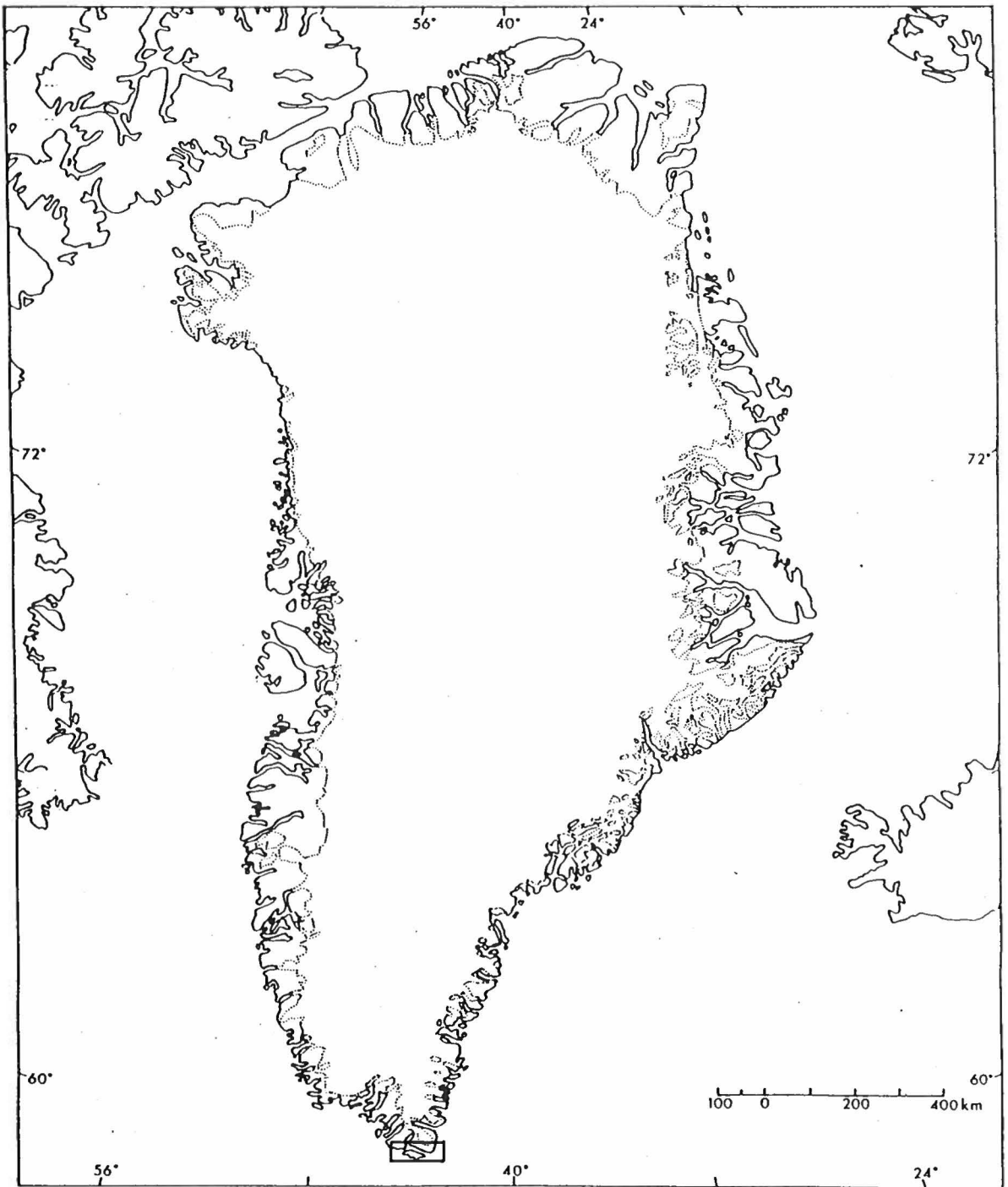


Fig. 1. Greenland and surrounding areas, and the Kap Farvel area indicated.

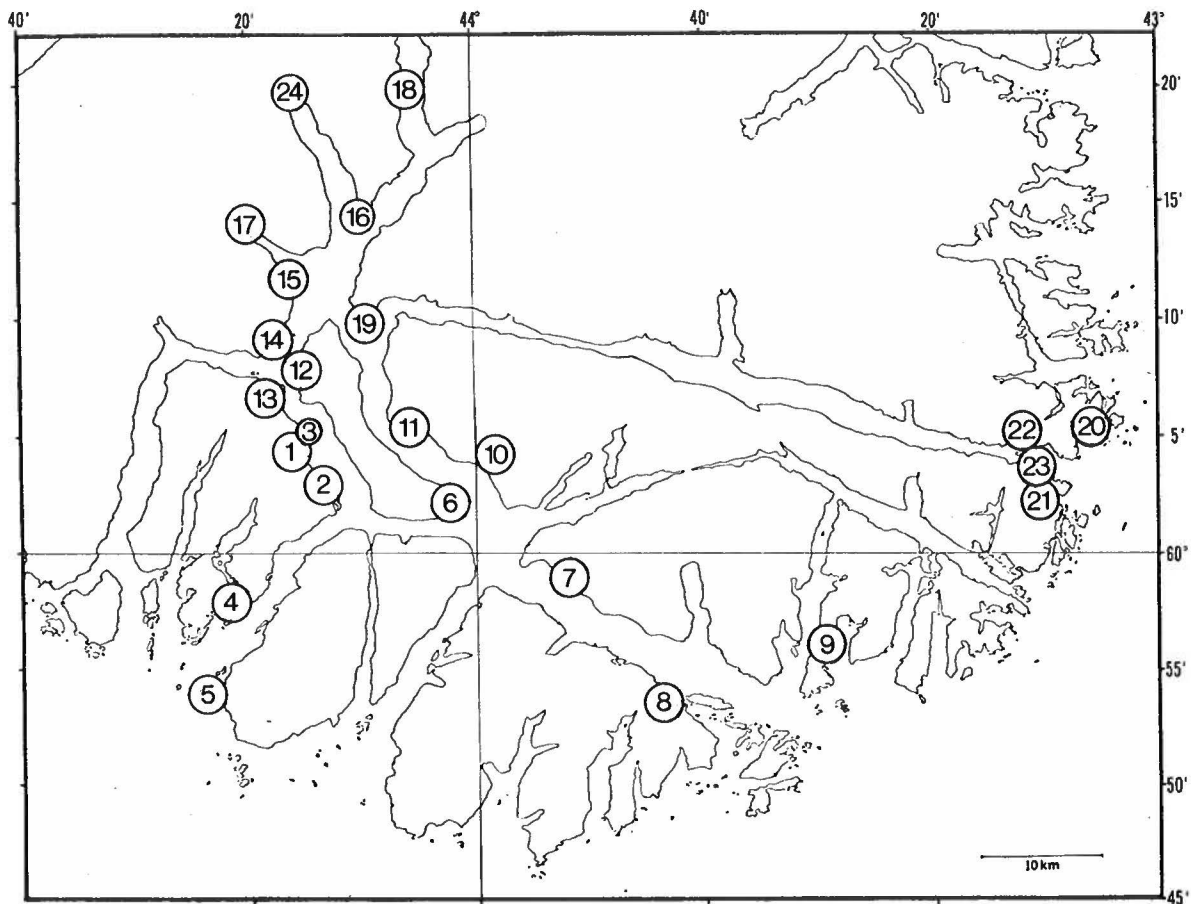


Fig. 2. The Kap Farvel area with indication of the localities.

- | | |
|--|--|
| 5. Kangeq. Southwestern peninsula of island of Tornarsuk. 59°52'N, 44°24'W. 14 freshwaters. | 16. Nuk. Peninsula in Ilua. 60°14'N, 44°10'W. 2 freshwaters. |
| 6. Angnikitsup nua. Southeastern part of island of Angnikitsoq. 60°02'N, 44°02'W. 2 freshwaters. | 17. Head of Kangersluk. 60°14'N, 44°19'W. 1 freshwater. |
| 7. Southwestern part of island of Sangmissoq. 59°56'N, 43°39'W. 3 freshwaters. | 18. Inip nua. Peninsula in Kangersuneq qingordleq. 60°19'N, 44°19'W. 2 freshwaters. |
| 8. Itivdleq. Northeastern part of Eggers Ø. 59°54'N, 43°44'W. 17 freshwaters. | 19. Imerdlugtoq. Peninsula between Ilua and Prins Christians Sund. 60°11'N, 44°10'W. 3 freshwaters. |
| 9. Southwestern peninsula of island of Qernertoq. 59°55'N, 43°41'W. 8 freshwaters. | 20. Nunato. Peninsula N of E mouth of Prins Christians Sund. 60°05'N, 43°05'W. 4 freshwaters. |
| 10. Qardlut. Bay on SE coast of Christian IV's Ø. 60°04'N, 43°58'W. 1 freshwater. | 21. Head of Naujat Kangerluat. Fjord S of E mouth of Prins Christians Sund. 60°02'N, 43°11'W. 2 freshwaters. |
| 11. Qasigíssat. Peninsula on NW part of Christian IV's Ø. 60°06'N, 44°15'W. 5 freshwaters. | 22. Aqigssiát. Bay on N coast of Prins Christians Sund. 60°05'N, 43°11'W. 4 freshwaters. |
| 12. Peninsula on NW coast of Island of Angnikitsoq. 60°08'N, 44°15'W. 3 freshwaters. | 23. Prins Christians Sund. Area around weather station. 60°04'N, 43°09'W. 3 freshwaters. |
| 13. Niaqornaq. Northern part of island of Pamiagdruk. 60°06'N, 44°19'W. 3 freshwaters. | 24. Head of Kangikitsoq. 60°21'N, 44°16'W. 5 freshwaters. |
| 14. Augpilateq. 60°09'N, 44°16'W. 2 freshwaters. | |
| 15. Ivssortussut. Peninsula in Ilua. 60°11'N, 44°16'W. 4 freshwaters. | |

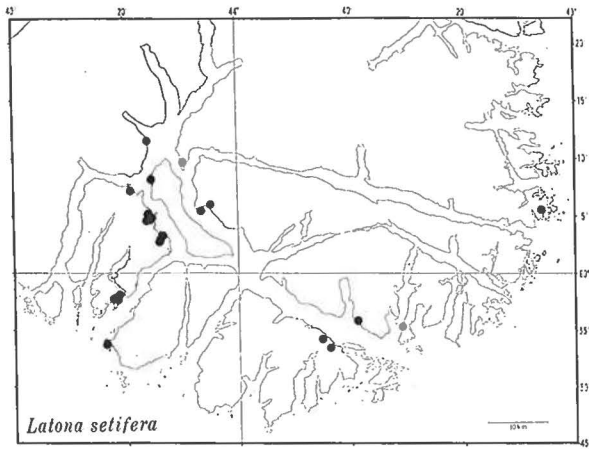


Fig. 3. The distribution of *Latona setifera*.

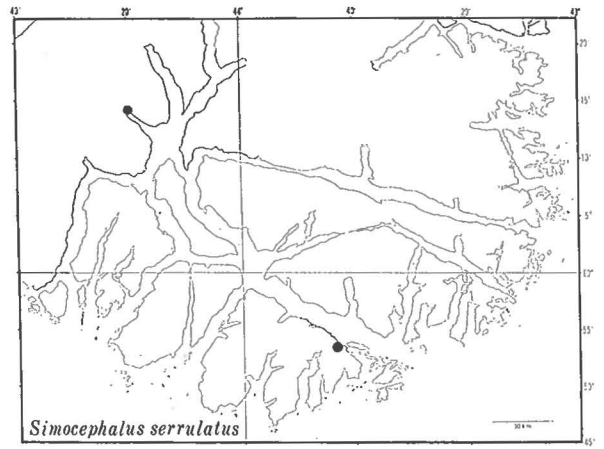


Fig. 6. The distribution of *Simocephalus serrulatus*.

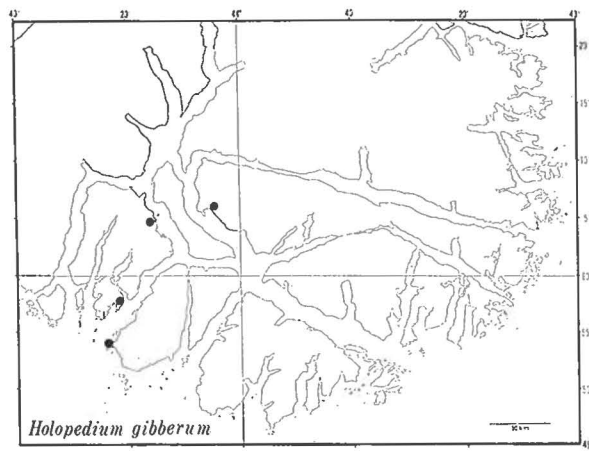


Fig. 4. The distribution of *Holopedium gibberum*.

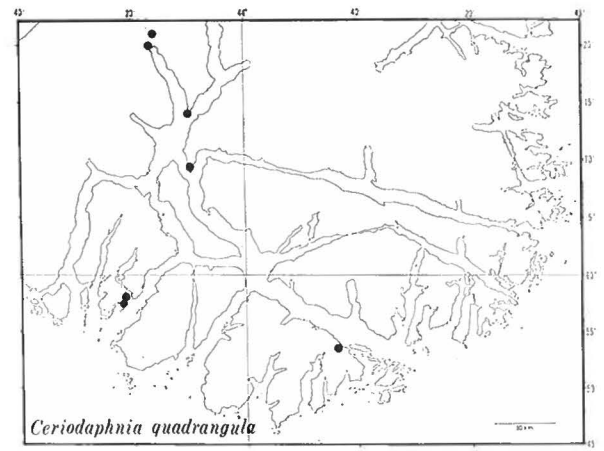


Fig. 7. The distribution of *Ceriodaphnia quadrangula*.

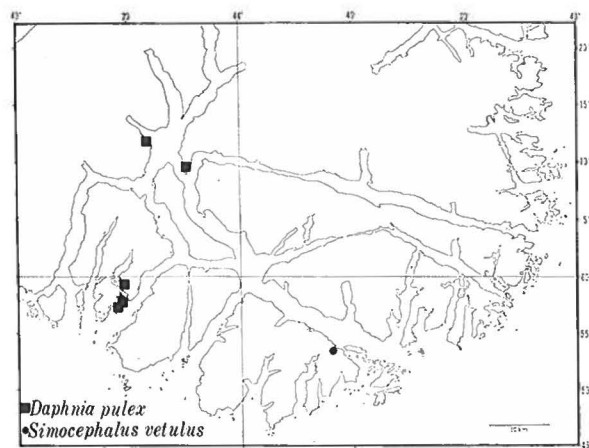


Fig. 5. The distributions of *Daphnia pulex* and *Simocephalus vetulus*.

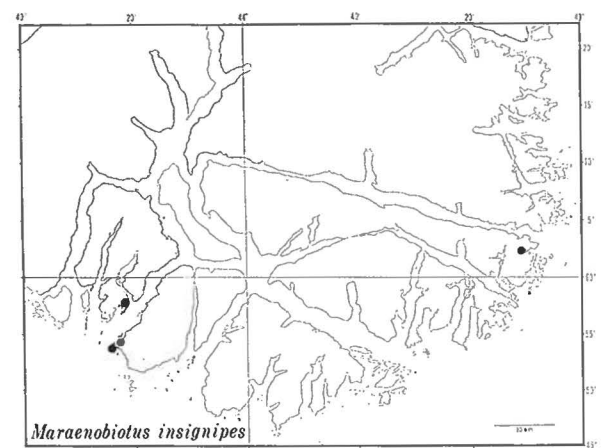


Fig. 8. The distribution of *Bosmina longispina obtusirostris*.

Chemical analysis of some of the freshwaters

Water for analysis was available from only 24 freshwaters, viz. 6 larger and 6 smaller lakes and 12 ponds. The results are shown below (p. 18, Table 1).

Phosphate (PO_4^{--}) was in all samples found in amounts smaller than 0.02 mg/l; ferrous ions (Fe^{++}) and fluor (F^-) could not be shown in any pond.

Remarks on the freshwater bodies

Compared with other areas in Greenland, the freshwater localities in the Kap Farvel area show a characteristic uniformity. I have previously investigated 231 freshwaters in Greenland, viz. 75 lakes, 117 ponds and 39 temporary waters (Røen 1962, 1968). In the Kap Farvel area the 154 lentic freshwaters with Entomostraca comprised 29 lakes, 123 ponds and 2 temporary pools. Temporary waters are scarce in the Kap Farvel area, 1.3% of the total number of freshwaters against 16.9% in the rest of the investigated part of Greenland. This is probably due to the high and equally distributed precipitation in the Kap Farvel area. Therefore, nearly all depressions which in other areas might develop into temporary waters become permanent waters in this area. Temporary waters exist in the Kap Farvel area, but most are of too short duration for Entomostraca to survive.

All the lakes should be classified as clearwater lakes with a low ion content (Røen 1962: 69). Of 29 lakes, 16 were fairly small and shallow with a rich vegetation, while 13 were larger (diameter > 200 m), deep-water lakes.

Most of the ponds had a low content of salts (Røen 1962: 110), with two exceptions: polluted ponds, and ponds which were influenced by seawater. Polluted ponds occur near recent or abandoned dwelling places, e.g., in subareas 8, 14, 16. Subarea 14 is around the village Augpilatoq and the localities there were recently polluted, while the localities in the other subareas were situated near abandoned places, which in 1970 were almost self-restored. Localities 9 and 24 each had a seawater-influenced pond. The pond in locality 24 was more saline, being now and then reached by seawater.

The two temporary pools were small, with sandy bottom and no vegetation.

Four running waters were very different. Two of them are situated in subarea 1. One of these was about 1 m wide and ran through dense mosses, while the other was a rapid brook with stones. In locality 4 a brook from a ridge made an expansion with sandy bottom without vegetation, and in locality 11 a little river had a similar expansion.

There are no water analyses from running waters.

Water temperature differed considerably from the western part of the area to the eastern part, and from the coastal part to the head of the fjords. The surface temperature of the big, deep lakes was about 9°C in the eastern part, in the western part 11–13°C, except in a lake in locality 1, situated 310 m a.s.l. On 29 July 1970 part of this lake was covered with ice, and the temperature near the bank was 6°C.

The smaller lakes had a surface temperature of 12–14.5°C in the western part, and about 9°C in the eastern part.

The ponds had a greater range of temperature. Temperatures in the eastern and southern coastal parts were about 7–8°C, in the interior part usually between 12° and 20°C. The highest temperature (22.5°C) was found in a pond in locality 1 on 27 July and is the highest temperature ever registered in normal Greenland freshwater.

The banks of the freshwaters in the Kap Farvel area were influenced by ice. Ice-ramparts were common and strongly developed. Most of the smaller freshwaters had soft banks vertically planed off to a depth of about 40 cm, and vegetation seldom occurred in freshwaters less than 30 cm deep.

The material used in this investigation has been deposited in the Zoological Museum, University of Copenhagen. Lists and descriptions of the localities and the occurrence of the species are in the archives of the Museum.

Systematic part

The species in the Kap Farvel area are listed according to normal systematics (Wagler, 1937). Their distribution throughout Greenland is taken from the following papers: Haberbosch (1920), and Røen (1962, 1968, 1970, 1973, 1975, 1977, 1981, 1992).

Identification of the species is based on: Brooks (1966), Flössner (1972), Gurney (1931–33), Lang (1948), Lilljeborg (1900), Smirnov (1971, 1976), Wagler (1937) and Wilson & Yeatman (1966).

Remarks on the species

Cladocera

Sididae

Latona setifera (O.F. Müller, 1785)

Fig. 3

The species has previously been found in Greenland only on the west coast south of 67°N; it is rare in the northern parts, but extremely common in the southern parts.

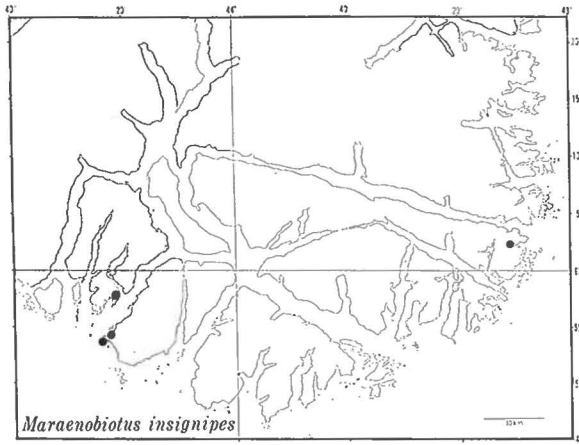


Fig. 9. The distribution of *Macrothrix hirsuticornis*.

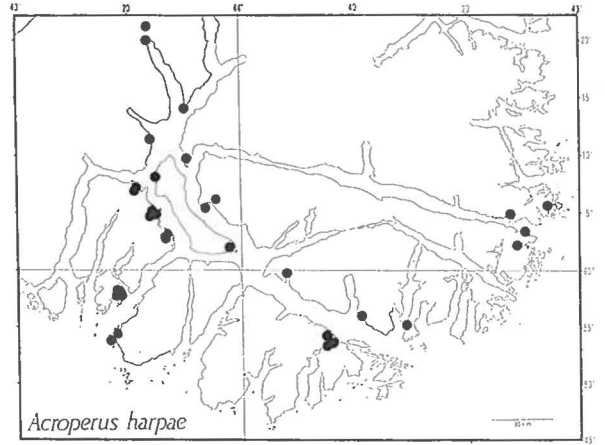


Fig. 12. The distribution of *Acroperus harpae*.

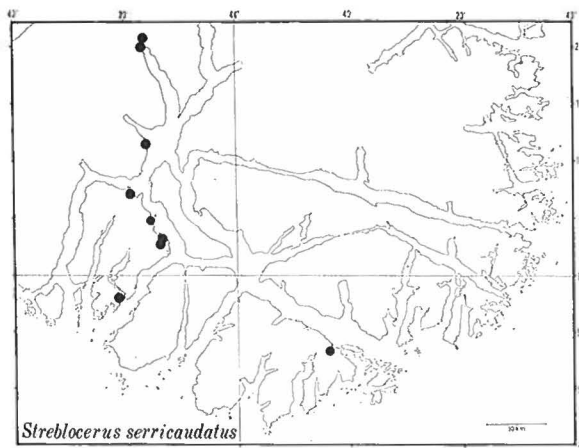


Fig. 10. The distribution of *Streblocerus serricaudatus*.

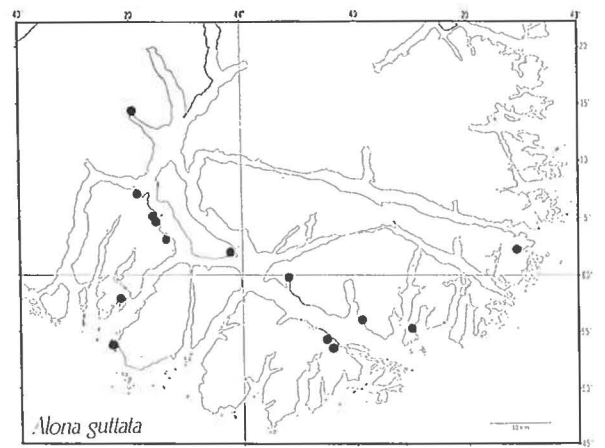


Fig. 13. The distribution of *Alona guttata*.

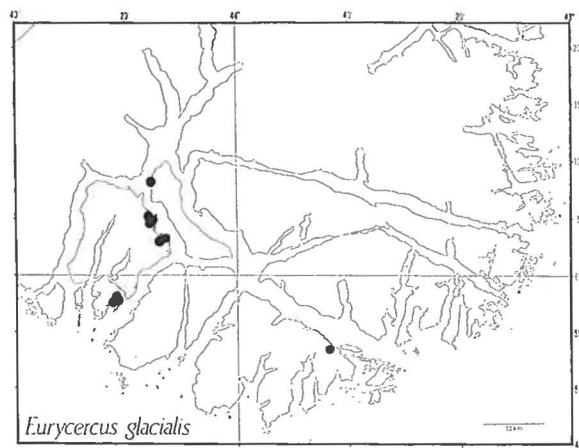


Fig. 11. The distribution of *Eurycerus glacialis*.

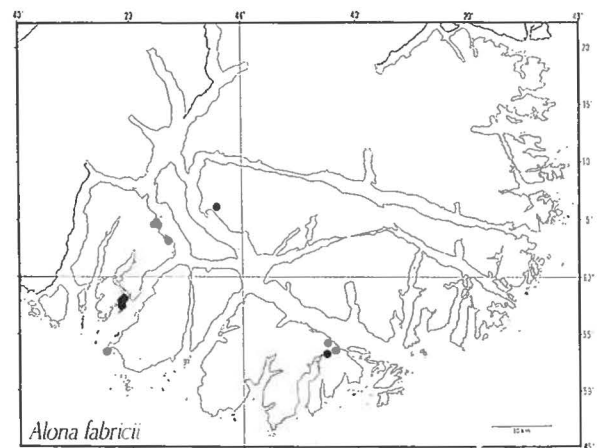


Fig. 14. The distribution of *Alona fabricii*.

It was found in the Kap Farvel area at 55 freshwaters. It occurs in lakes and ponds but is absent in pools and running waters. The species is closely associated with vegetation and does not dominate any locality.

The species is common in the western part of the Kap Farvel area, but occurs only in few freshwaters in the eastern part.

Holopedium gibberum Zaddach, 1855

Fig. 4

Recorded both from West Greenland and from East Greenland south of 72°N. In the Kap Farvel area the species was found at 5 freshwaters: 1 large clearwater lake, 2 small lakes, 1 pond, and 1 river expansion, similar to a lake. All are situated in the western part of the area.

Daphniidae

Daphnia pulex Leydig, 1860

Fig. 5

The species is known all over Greenland, except from the southern east coast. In the Kap Farvel area it occurred at 6 localities only: 1 large clearwater lake, 4 small lakes, and 1 pond, all in the western part of the area.

Besides the recent distribution, the species was found as a subfossil at 4 lakes, and was absent only in 1 of 5 cores taken in the western part of the area (Fredskild et al. 1975: 28–30. There was no trace of it in a core from Eggers Ø, in the southern part, unpublished core).

The subfossil finds in 4 out of 5 localities indicate more favourable ecological conditions than today, where the species is found in only 6 out of 158 freshwaters. The cores show that it disappeared from the area between 7200 and 6500 years B.P., and reappeared about 3600 years B.P. This may suggest that the species survived in the area during the last glaciation, but became extinct 2000–3000 years later. A new population from the north then invaded the area after a period of about 3000 years (Røen 1981: 333).

Simocephalus vetulus (O.F. Müller, 1776)

Fig. 5

Previously known from Greenland south of 73°30'N. Found in the Kap Farvel area only at 1 freshwater, a pond on Eggers Ø. Previously (7200–2400 years B.P.), it seems to have been more common in the area, since remains were found in core samples from 3 out of 5 localities (Fredskild et al. 1975: 30). Like *Daphnia pulex*, this species apparently now has less favourable conditions in the area than earlier.

Simocephalus serrulatus (Koch, 1841)

Fig. 6

The species was found in 2 ponds. These are the only records from Greenland.

Ceriodaphnia quadrangula (O.F. Müller, 1785)

Fig. 7

Previously known from West Greenland south of 70°30'N. In the Kap Farvel area it was found in 9 ponds, all in the western part.

Bosminidae

Bosmina (*Eubosmina*) *longispina obtusirostris*

G.O. Sars, 1862

Fig. 8

Common in West Greenland, rare in East Greenland south of 73°N.

In the Kap Farvel area the species was found in 3 large clearwater lakes, 3 small lakes and 13 ponds; it is far more frequent in the western part of the area than in the eastern part. This agrees with its occurrence in the southern part of Greenland (Røen 1970: 15). It is rather rare in the Kap Farvel area compared with its occurrence in other parts of Greenland.

Macrothricidae

Macrothrix hirsuticornis Norman & Brady, 1867

Fig. 9

Found throughout Greenland. In the Kap Farvel area it was present in 1 small lake, 7 ponds and 1 temporary locality. The subspecies *groenlandica* Lilljeborg was not found.

Streblocerus serricaudatus (Fischer, 1849)

Fig. 10

Previously found in ponds on the Island of Disko and near Narssaq. In the Kap Farvel area it occurred in 2 small lakes and 16 ponds, all freshwaters situated in the western part.

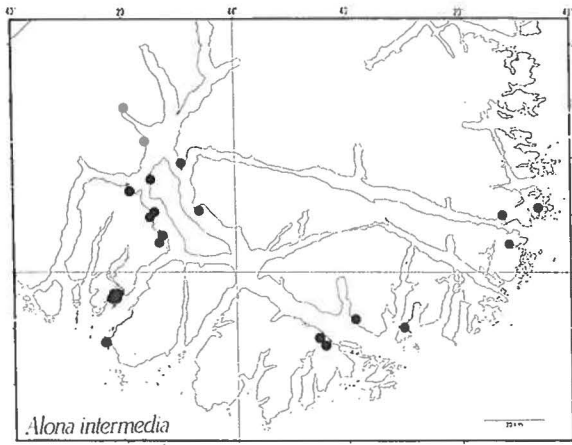


Fig. 15. The distribution of *Alona intermedia*.

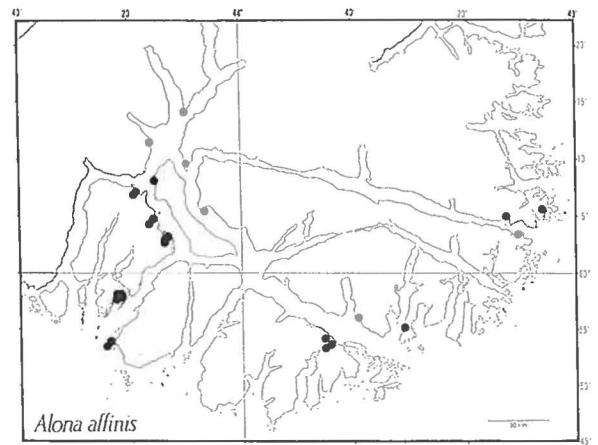


Fig. 18. The distribution of *Alona affinis*.

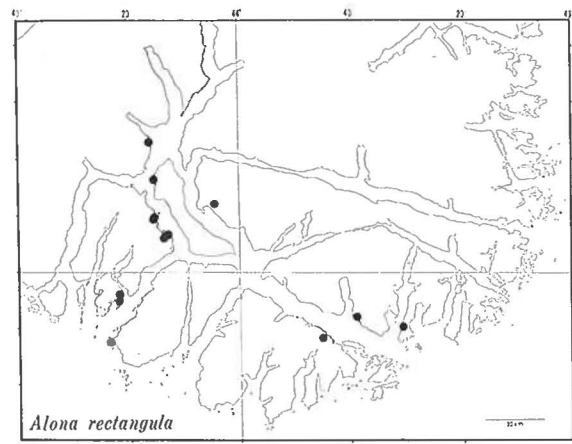


Fig. 16. The distribution of *Alona rectangularis*.

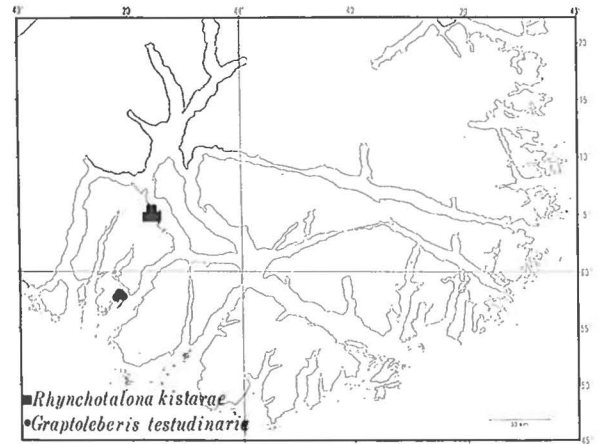


Fig. 19. The distributions of *Rhynchotalona kistarae* and *Graptoleberis testudinaria*.

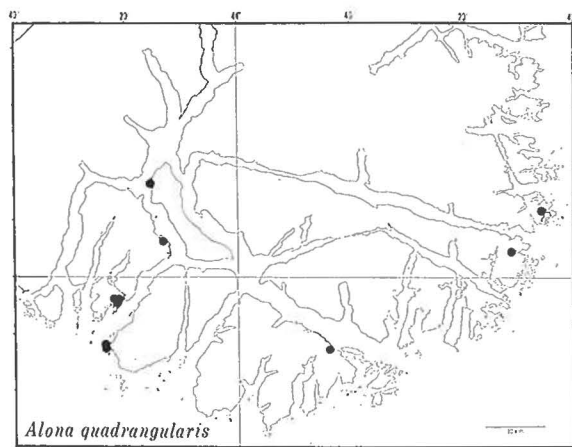


Fig. 17. The distribution of *Alona quadrangularis*.

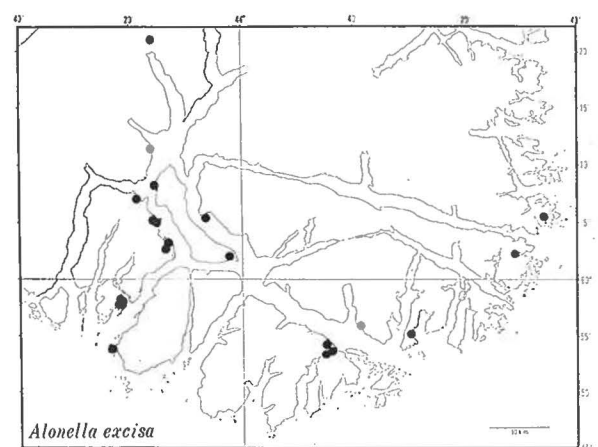


Fig. 20. The distribution of *Alonella excisa*.

Chydoridae

Eurycercus glacialis Lilljeborg, 1887

Fig. 11

The species is common in West Greenland south of 72°N, and scattered in East Greenland south of 70°30'N. In the Kap Farvel area the species was rare in 8 ponds, abundant in 9 ponds and 4 small lakes, and common in 2 ponds. All the freshwaters are in the western part of the area. The species was taken as subfossils in 3 lakes (Fredskild et al. 1975: 33). The earliest occurrence is 7400 years B.P. Apparently the species is as abundant today as at the time of its first occurrence, and has also been so in the time in between.

Acroperus harpae (Baird, 1835)

Fig. 12

Common in West Greenland south of 74°30'N, with a single freshwater at 76°N and a few freshwaters in East Greenland south of 72°N. Found in the Kap Farvel area in 90 freshwaters: 8 large lakes, 15 small lakes, 64 ponds and 3 running waters. Although it occurred in comparatively more lakes than ponds, the latter seem to be preferred, since the species was most abundant there.

Abundance is apparently greater in the area today than earlier.

The species seems to be equally common in the western and the eastern parts of the area.

Alona guttata G.O. Sars, 1862

Fig. 13

Scattered distribution in West Greenland south of 72°N, and in East Greenland south of 77°N. In the Kap Farvel area it was found in 4 large lakes, 3 small lakes, 11 ponds and 1 running water.

The subspecies *tuberculata* Kurz, 1874 occurred in 1 large lake, 1 small lake and 1 lotic locality. This subspecies is new to Greenland.

The species is found all over the area.

Alona fabricii Røen, 1992

Fig. 14

Found as new to science during this investigation (Røen 1992: 103). The presumably closely related *A. rustica* Scott, 1895 was found in small numbers in a core in Spongilla Lake from 5500 years B.P. (Fredskild et al. 1975: 30). It differs from *A. fabricii* by having a striated carapace without protuberances.

In the Kap Farvel area *A. fabricii* was found at 27 freshwaters: 1 large lake, 3 small lakes, 20 ponds and 3 lotic localities. All freshwaters are in the western part of the area and on Eggers Ø.

Alona intermedia G.O. Sars, 1862

Fig. 15

Fairly rare in Greenland. On the east coast it has been found in 1 freshwater at 68°N, and on the west coast in a few freshwaters south of 73°N.

Common in the Kap Farvel area, occurring in 2 larger lakes, 9 small lakes, 40 ponds and 1 lotic locality. The species was found throughout the area.

Alona rectangula G.O. Sars, 1862

Fig. 16

Previously known from West Greenland south of 73°30'N, and from East Greenland south of 77°N. Present in the Kap Farvel area in 19 freshwaters: 1 large lake, 2 small lakes and 16 ponds. The freshwaters are mainly in the western parts of the area.

Alona quadrangularis (O.F. Müller, 1785)

Fig. 17

Found in West Greenland south of 70°30'N. In East Greenland in a lake in the Scoresby Sund area (72°N).

In the Kap Farvel area it was found at 17 freshwaters: 8 lakes and 9 ponds. The freshwaters are distributed all over the area, but the species is most common in the western part.

Alona affinis (Leydig, 1860)

Fig. 18

Found in Greenland south of 73°N. Common in West Greenland, rare in East Greenland. It was found in the western part of the Kap Farvel area in 5 large and 11 small lakes and 46 ponds.

Core samples showed that the species has occurred in the area since 6500 B.P. (Fredskild et al. 1975: 30).

Rhynchotalona kistaræ Røen, 1973

Fig. 19

Found as new to science during this investigation (Røen 1973). It was taken in 3 neighbouring ponds on the island of Pamiagdhluk, near Anordliuitsoq, in the western part of the area.

Graptoleberis testudinaria (Fischer, 1848)

Fig. 19

Previously found at 6 freshwaters in West Greenland south of 70°N. In the Kap Farvel area it was found in 1 large and 2 small lakes, and 1 pond. All freshwaters are in the southern part of the island of Pamiagdhluk.

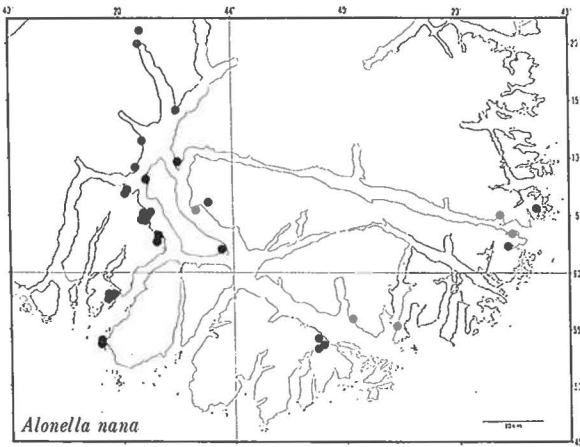


Fig. 21. The distribution of *Alonella nana*.

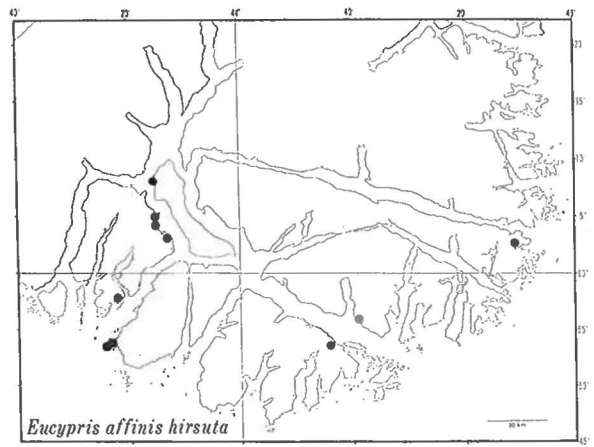


Fig. 24. The distribution of *Eucypris affinis hirsuta*.

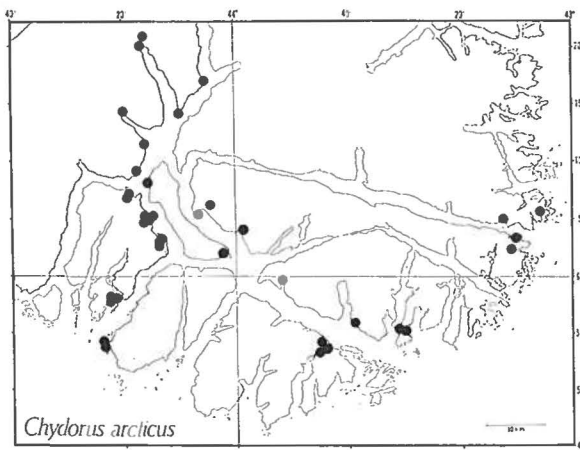


Fig. 22. The distribution of *Chydorus arcticus*.

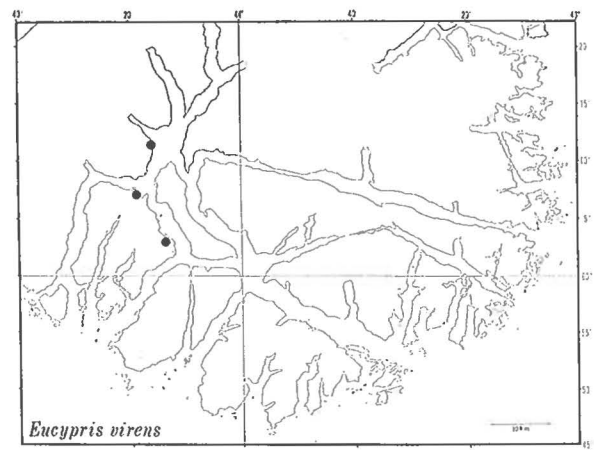


Fig. 25. The distribution of *Eucypris virens*.

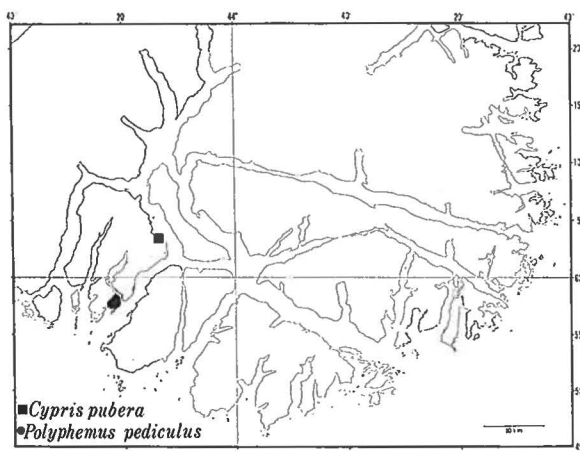


Fig. 23. The distributions of *Cypris pubera* and *Polyphemus pediculus*.

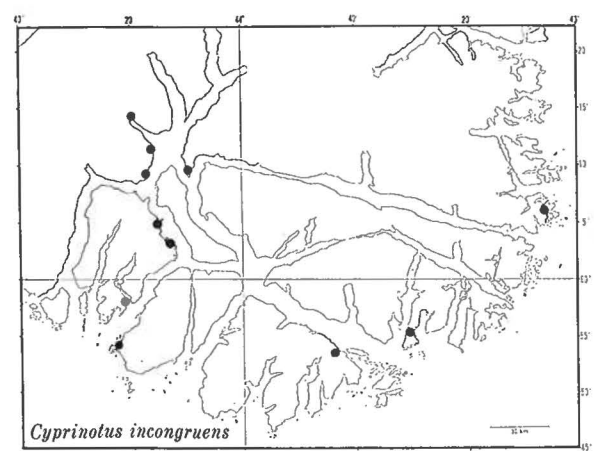


Fig. 26. The distribution of *Cyprinotus incongruens*.

Alonella excisa (Fischer, 1854)

Fig. 20

Known from West Greenland south of 73°N, and from East Greenland south of 71°N. Common in the Kap Farvel area, present at 64 freshwaters: 5 large and 10 small lakes, and 49 ponds. The freshwaters are distributed all over the area. The species is relatively more common in lakes than in ponds. In the rest of Greenland it is more frequent in small bodies of water.

Alonella nana (Baird, 1843)

Fig. 21

Common in West Greenland south of 73°N, in East Greenland only found once, near Angmagssalik. Very common in the Kap Farvel area in 10 big and 10 small lakes and 85 ponds, distributed all over the area.

Chydorus arcticus Røen, 1987

Fig. 22

Previously confused with *C. sphaericus* (O.F. Müller, 1785) and thought to be common throughout Greenland. Very common all over the Kap Farvel area: 9 large lakes, 11 small lakes, 100 ponds and 4 lotic freshwaters.

Core samples showed that the species has occurred in the area since 5500 years B.P. (Fredskild et al. 1975: 30).

Polyphemidae

Polyphemus pediculus (Linné, 1761)

Fig. 23

Found in Greenland south of 73°N. Common on the west coast south of 70°N, and on the east coast in the Scoresby Sund area. In the Kap Farvel area it was found in 8 neighbouring freshwaters: 2 small lakes and 6 ponds, all in the southern part of the island of Pamiagdruk.

Ostracoda

Cypris pubera O.F. Müller, 1776

Fig. 23

Found in a few freshwaters in West Greenland south of 71°N. In the Kap Farvel area it was found only in 1 pond in the eastern part of the island of Pamiagdruk.

Eucypris affinis hirsuta (Fischer, 1851)

Fig. 24

Previously known from West Greenland south of 71°N and from East Greenland between 70°N and 73°N. Taken in 18 freshwaters in the Kap Farvel area: 17 ponds and 1 lotic freshwater, distributed all over the Kap Farvel area.

Eucypris virens (Jurine, 1820)

Fig. 25

Previously known from West Greenland in few freshwaters south of 73°N, and from one freshwater in East Greenland at 73°N. In the Kap Farvel area found in 3 ponds in the western part, rare at all localities.

Cyprinotus incongruens (Ramdohr, 1808)

Fig. 26

Probably distributed throughout Greenland except the northernmost part (Peary Land). In the Kap Farvel area found in 11 ponds and 1 temporary pool. The species occurs all over the area.

Candona candida (O.F. Müller, 1776)

Fig. 27

Distributed throughout Greenland. Found all over the Kap Farvel area in 1 small lake, 19 ponds, 1 temporary pool and 1 lotic freshwater.

Candona lapponica Ekman, 1908

Fig. 28

Previously found in Greenland in areas around Disko Bay (West Greenland), Scoresby Sund (East Greenland), and in Peary Land (North Greenland). In the Kap Farvel area the species was found in 3 ponds, all in the western part.

Candona rectangula Alm, 1914

Fig. 28

In West Greenland and East Greenland distributed as *C. lapponica*. In the Kap Farvel area taken in 2 ponds, both in the western part.

Cypridopsis vidua (O.F. Müller, 1785)

Fig. 29

The species has hitherto been recorded twice in Greenland, in West Greenland near Holsteinsborg and Narssaq. In the Kap Farvel area it was found in 1 pond and 1 lotic freshwater, both in the western part.

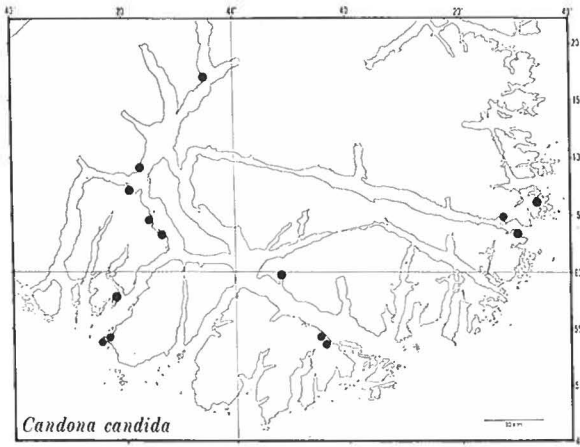


Fig. 27. The distribution of *Candona candida*.

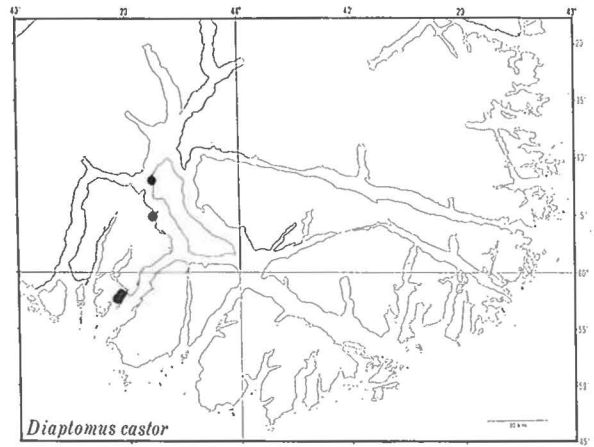


Fig. 30. The distribution of *Diaptomus castor*.

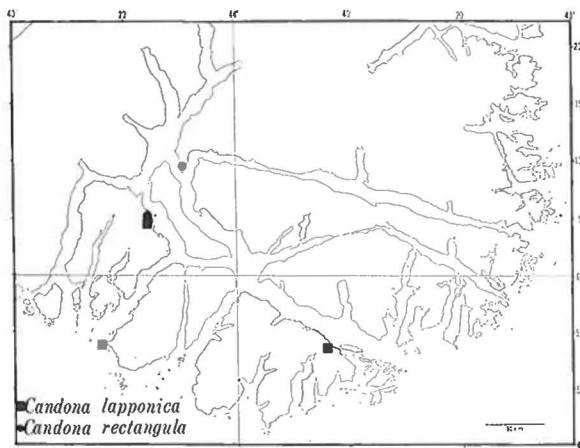


Fig. 28. The distributions of *Candona lapponica* and *Candona rectangula*.

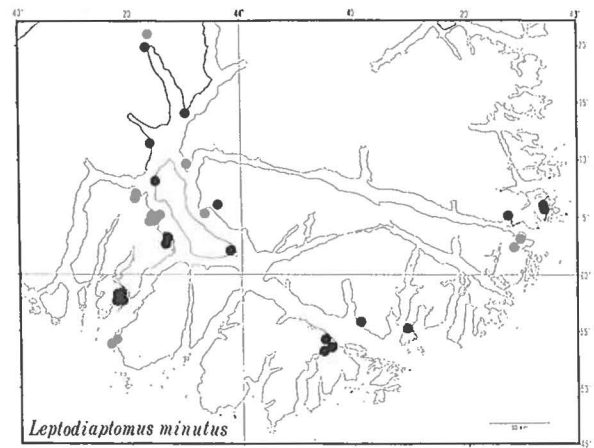


Fig. 31. The distribution of *Leptodiaptomus minutus*.

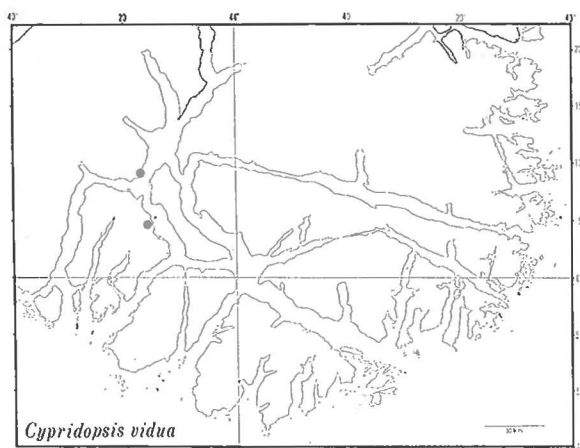


Fig. 29. The distribution of *Cypridopsis vidua*.

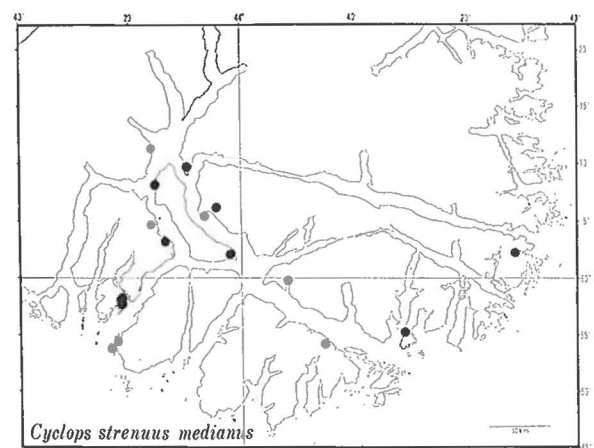


Fig. 32. The distribution of *Cyclops strenuus medianus*.

Copepoda

Diaptomus castor (Jurine, 1820)

Fig. 30

Previously known from West Greenland south of 70°N. In the Kap Farvel area it was taken in 1 lake and 6 ponds, all in the western part.

Leptodiaptomus minutus (Lilljeborg, 1889)

Fig. 31

Very common in West Greenland south of 74°N, and found in 5 localities near Angmagssalik. The species was extremely common all over the Kap Farvel area: 13 large lakes, 13 small lakes, 87 ponds, 2 temporary pools and 2 lotic freshwaters.

Specimens in running water do not belong to local populations, but are probably swept out from stagnant water, as the species never has permanent populations in running water.

Cyclops strenuus medianus Lindberg, 1957

Fig. 32

The name *C. scutifer* has erroneously been used for this species (Røen 1962: 158; 1970: 12), but it has been reidentified by Elgmork & Halvorsen (1971). It has been found in West Greenland south of 74°N and in East Greenland south of 77°N. Found all over the Kap Farvel area in 5 large lakes, 5 small lakes, 20 ponds and 1 lotic freshwater.

Like *Leptodiaptomus minutus*, the present species never lives permanently in running water.

Megacyclops viridis (Jurine, 1820)

Fig. 33

New to Greenland. Two earlier records from Greenland, de Guerne & Richard (1889) and Stephensen (1916), are based on misidentifications, as they refer to *Acanthocyclops vernalis* (Røen 1962: 162).

In the Kap Farvel area this species was found in 1 small lake and 2 ponds, all situated near each other in the southern part of the island of Pamiagdluq.

Acanthocyclops vernalis (Fischer, 1861)

Fig. 34

Previously recorded from West Greenland south of 70°N. In the Kap Farvel area it was found in 1 small lake and 4 ponds, all situated in the western part.

Thersitina gasterostei (Pagenstecher, 1861)

Figs. 34 and 35

Previously recorded from Greenland by Krøyer (1863: 233), who only had adult females from the stickleback *Gasterosteus aculeatus* (L.). The material from the Kap Farvel area was all from one pond and contained free-living specimens of copepodites stages III, IV and V. They were common in a pond with a fairly high content of NaCl, probably due to influence of seawater.

I have examined the collections of *Gasterosteus aculeatus* from Greenland in the Zoological Museum, University of Copenhagen, for this parasite, and found it on hosts from 7 places, but only on 5% of the total number of specimens. Six of these places: Godhavn, Egedesminde, Kapisigdlig, Frederikshåb, Julianehåb, and Ilua are shown on the map, but the 7th, Kakilisak, Nussak found 1880 could not be found on any map.

Indication of the type of locality was given only for specimens from Julianehåb (freshwater) and Godhavn (the harbour, marine).

Bryocamptus (Arcticocamptus) arcticus

(Lilljeborg, 1902)

Fig. 36

Rather rare in the rest of Greenland. Found in West Greenland at 6 freshwaters south of 74°N, and 1 freshwater in East Greenland at 66°N.

Found all over the Kap Farvel area in 3 large and 6 small lakes, 74 ponds and 1 temporary pool. The species was only found in small numbers at each locality.

Bryocamptus (Arcticocamptus) tikchikensis

M.S. Wilson, 1958

Fig. 37

Found all over Greenland except in the southern part of East Greenland. In the Kap Farvel area found in 1 large lake, 1 small lake, 1 temporary pool and 1 lotic freshwater. The freshwaters are scattered throughout the area.

Moraria mrazeki Scott, 1903

Fig. 37

Found in West Greenland in 8 freshwaters, all south of 70°N; a doubtful record exists from East Greenland at 77°N (Brehm 1911). Found in the Kap Farvel area in 3 ponds scattered throughout the area.

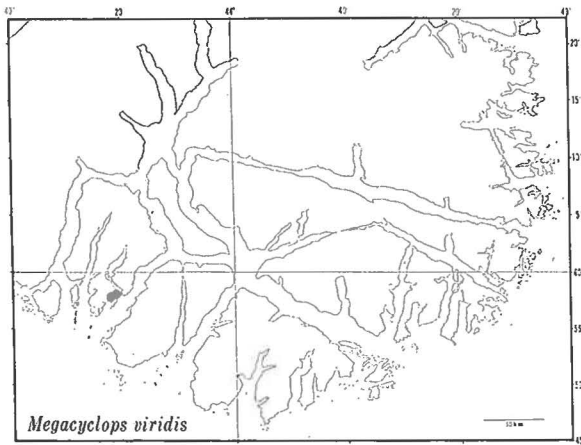


Fig. 33. The distribution of *Megacyclops viridis*.

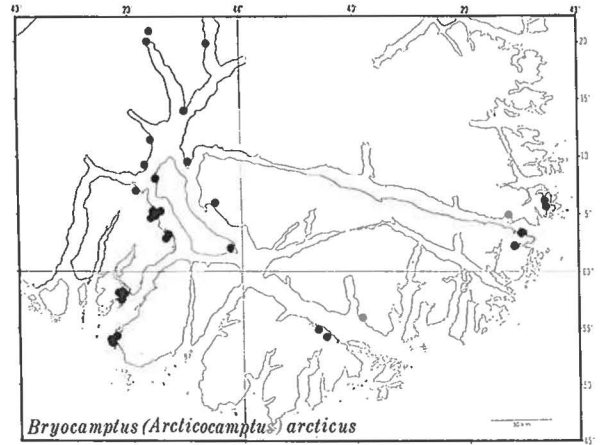


Fig. 36. The distribution of *Bryocamptus (Arcticocamptus) arcticus*.

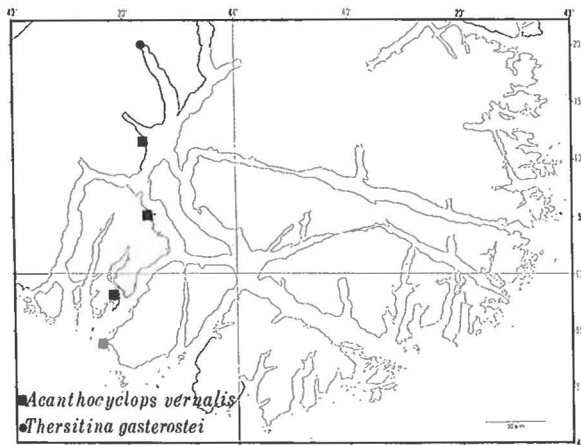


Fig. 34. The distributions of *Acanthocyclops vernalis* and *Thersitina gasterostei*.

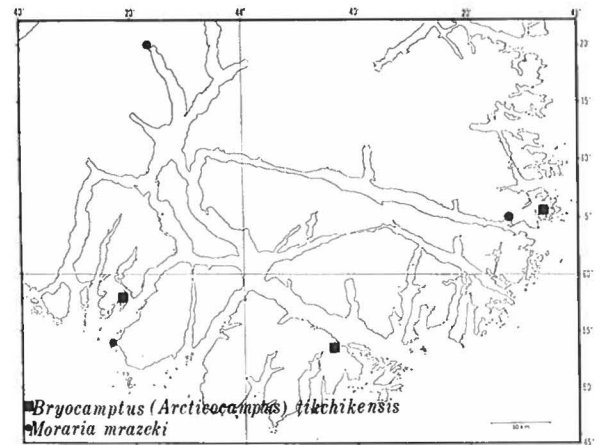


Fig. 37. The distributions of *Bryocamptus (Arcticocamptus) tikchikensis* and *Moraria mrazeki*.

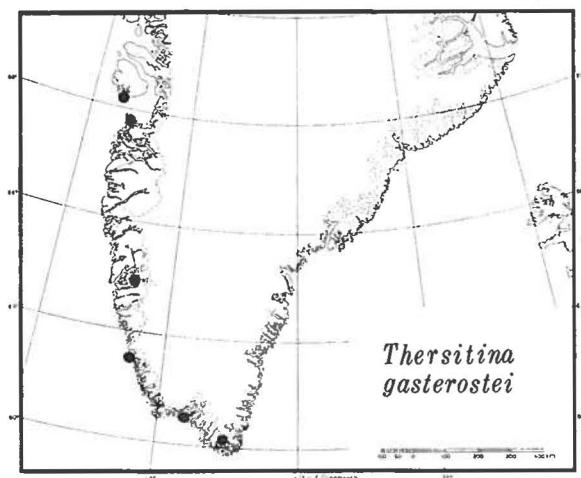


Fig. 35. The distribution in Greenland of *Thersitina gasterostei*.

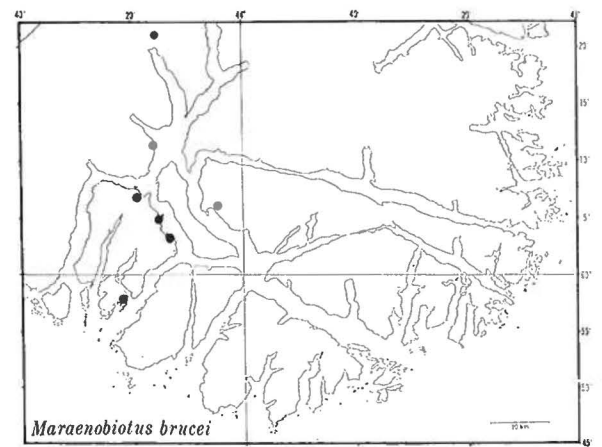


Fig. 38. The distribution of *Maraenobiotus brucei*.

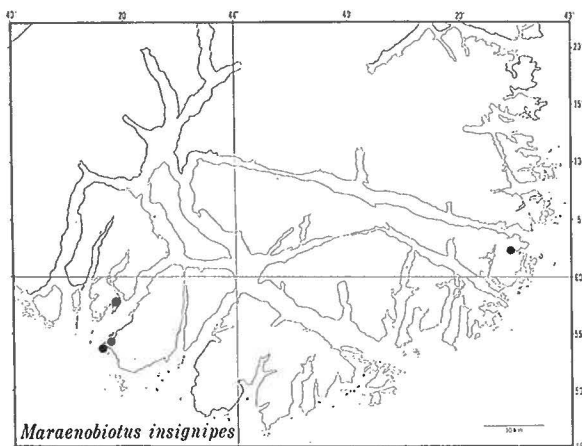


Fig. 39. The distribution of *Maraenobiotus insignipes*.

Maraenobiotus brucei (Richard, 1898)

Fig. 38

Found throughout Greenland except the southern part of West Greenland. In the Kap Farvel area it was found in 1 large lake, 5 ponds and 1 lotic freshwater, all situated in the western part.

Maraenobiotus insignipes (Lilljeborg, 1902)

Fig. 39

Previously found in 5 freshwaters in West Greenland south of 70°30'N. Found in the Kap Farvel area in 1 large lake and 5 ponds. Only 1 of the freshwaters is in the eastern part; the rest are in the western part.

Discussion

Environmental conditions

1. Waterbody type

In the Kap Farvel area 158 freshwaters containing Entomostraca were investigated. These comprised 13 large lakes (biggest diameter >200 m), 16 small lakes, 123 ponds, 2 temporary pools and 4 lotic localities.

A total of 42 species was found in the 123 ponds, with an average of 6.8 species per pond.

In the 13 big lakes were found 22 species (average 5.9 species). In the 16 smaller lakes 29 species were found (average 8.9 species). *Streblocerus serricaudatus* and *Diaptomus castor* were found in lakes for the first time in Greenland.

Only 5 of the 42 species: *Macrothrix hirsuticornis*, *Cyprinotus incongruens*, *Candona candida*, *Leptodiptomus minutus* and *Bryocamptus (Arcticocamptus) arcticus*

also were found in the 2 temporary freshwaters. They have all been found previously in this type of locality in Greenland.

Eight of the 42 species also occurred in the 4 lotic freshwaters. Of these, *Leptodiptomus minutus* and *Cyclops strenuus medianus* (in 2 and 1 stream, respectively) were found only as single specimens, probably washed out from lentic freshwaters. The remaining species, *Alona fabricii*, *Chydorus arcticus*, *Candona candida*, *Cypridopsis vidua*, *Bryocamptus (Arcticocamptus) tikchikensis*, and *Maraenobiotus brucei*, are found in lotic freshwaters in Greenland, but not restricted to these.

2. Chemistry

Table 1 gives analyses of water from some of the freshwaters. Previously (Røen 1962: 178–182, plates 2–7) I related the distribution of Greenlandic Entomostraca to some chemical factors. The following applies to the Kap Farvel species.

pH. The investigated waters were usually fairly acid, with pH ranging from 5.8 to 7.2, and variations between the freshwaters were less than normally in Greenland, (5.5 to 9.8. Røen 1962: plates 2–3). Two species, *Latona setifera* and *Alona fabricii*, have not been dealt with previously. They were found at pH 5.8–7.2 and 5.9–6.8, respectively.

Five species: *Alona quadrangularis*, *A. affinis*, *A. intermedia*, *Alonella excisa*, and *A. nana*, occurred in more acid water than previously found, whereas *Streblocerus serricaudatus* was found in less acid water.

Conductivity. Conductivity was usually low, with only 3 freshwaters showing more than 100 μ mho. One of the waterbodies was a seawater-influenced pond with a conductivity of 1128 μ mho. At this high conductivity only 3 species were found: *Leptodiptomus minutus*, *Thersitina gasterostei* (juv.), and *Moraria mrazeki*. Of these, *M. mrazeki* has previously been found only at conductivity lower than 70 μ mho. The remaining species were found at conductivities similar to those observed earlier.

Content of Cl⁻. The usually low content of Cl⁻ in the Kap Farvel area is not very informative as to the tolerance of the species. The most important information is that *Moraria mrazeki* occurs at 323 mg Cl⁻/l, which is higher than previously found.

Content of Ca⁺⁺. The average content of Ca⁺⁺ is lower in the Kap Farvel area than in the rest of Greenland. A number of species: *Alona guttata*, *A. quadrangularis*, *A. affinis*, *Alonella excisa*, and *A. nana*, proved to tolerate lower Ca⁺⁺ content than previously found. Only 2 species, *Bryocamptus (Arcticocamptus) arcticus* and *Moraria mrazeki*, proved to have a higher tolerance.

Content of Mg⁺⁺. Like other components, the content of Mg⁺⁺ in the freshwaters of the Kap Farvel area is generally low compared to other Greenlandic freshwaters. There is only a single deviation from what has been found earlier: *Moraria mrazeki* was found at 20 mg

Table 1. Chemical analysis of water from lakes and ponds.

Sub-area	Conductivity mho	HCO ₃ ⁻ mg/l	SO ₄ ⁻² mg/l	Cl ⁻ mg/l	Fe ⁺⁺ mg/l	Ca ⁺⁺ mg/l	Mg ⁺⁺ mg/l	Zn ⁺⁺ mg/l	Na ⁺ mg/l	K ⁺ mg/l	SiO ₂ mg/l	NaCHO ₃ mg/l	Total	Hardness Permanent	pH
Large lakes															
1	24	0.6	1.0	11.0	-	1.2	0.51	-	4.8	0.60	1.4	3.4	0.28	-	6.6
1	29	3.0	2.0	3.8	-	0.95	0.34	0.02	2.4	0.25	0.8	13.0	0.22	-	6.8
8	100	3.1	2.0	1.1	-	0.56	0.15	-	0.47	0.1	0.2	0.8	0.11	-	5.7
13	58	9.0	2.0	5.0	-	1.4	0.49	0.21	4.4	0.40	2.6	29.0	0.31	-	6.7
19	95	2.4	3.0	6.2	-	1.8	0.63	0.01	2.8	0.60	1.2	41.0	0.39	-	7.2
20	47	9.2	4.0	12.0	-	3.9	1.1	0.01	6.7	0.60	0.6	-	0.79	0.37	6.6
Small lakes															
2	28	7.3	3.0	4.2	-	1.8	0.75	0.11	3.0	0.50	1.1	-	0.42	0.08	5.8
4	62	6.5	4.0	14.0	-	1.6	0.83	-	9.5	0.7	1.4	5.9	0.42	-	6.7
4	71	0.6	3.0	11.0	-	1.2	0.64	0.04	5.4	0.8	0.3	24.0	0.31	-	6.9
4	110	15.0	4.0	26.0	0.21	1.58	1.25	0.08	19.0	1.30	1.2	5.9	0.51	-	6.6
8	99	10.0	8.0	22.0	-	1.9	1.6	1.4	15.0	0.90	1.5	-	0.62	0.14	6.4
15	51	1.8	1.0	4.6	-	0.89	0.37	-	3.0	0.40	0.6	14.0	0.20	-	6.8
Ponds															
1	27	4.3	1.0	6.0	0.05	1.4	0.47	0.01	3.8	0.2	0.3	-	0.31	0.11	5.9
1	48	5.0	3.0	11.0	0.05	6.1	0.62	0.04	4.8	0.7	0.6	-	0.98	0.31	6.8
2	30	9.8	3.0	5.0	0.05	2.8	0.68	0.02	4.1	0.4	3.9	-	0.56	0.11	6.6
2	48	7.9	3.0	9.0	0.07	2.0	0.73	0.18	6.8	0.6	0.8	-	0.45	0.09	6.1
3	66	3.0	3.0	13.0	0.05	1.1	0.69	0.01	7.9	0.5	0.9	12.0	0.31	-	6.2
5	70	4.2	4.0	13.0	0.05	1.3	0.68	0.01	9.5	0.6	1.2	5.0	0.34	-	6.3
5	41	4.2	3.0	5.0	0.05	1.2	0.42	0.15	4.2	0.4	0.6	8.4	0.25	-	6.6
9	140	1.8	6.0	24.0	0.06	1.6	0.86	0.01	14.0	1.3	0.3	10.0	0.42	-	6.3
18	58	5.4	2.0	8.9	0.12	1.2	0.73	0.04	6.3	0.4	2.4	13.0	0.34	-	6.1
23	25	5.5	3.0	5.0	0.06	1.8	0.46	0.02	3.6	0.3	1.2	-	0.36	0.11	5.8
24	38	3.0	2.0	2.8	0.05	0.99	0.36	-	1.9	0.4	0.3	16.0	0.22	-	6.7
24	1128	5.4	44.0	323.0	0.05	8.5	20.0	0.03	181.1	8.0	0.6	-	5.8	4.6	7.0

Mg⁺⁺/l, while the previous tolerance was found to be 0.82–2.0 mg Mg⁺⁺/l.

Content of Na⁺ and K⁺. In freshwaters not influenced by seawater the content of Na⁺ varied from 0.47 to 19.0 mg/l, and of K⁺ from 0.1 to 1.3 mg/l. In the marine-

influenced pond the figures were 181.1 mg Na⁺/l and 8.0 mg K⁺/l.

For most species the usual content of these components seems to be unimportant, but *Eurycerus glacialis*, *Alona fabricii*, *A. quadrangularis*, and *Candona candida* apparently require a certain amount of Na⁺, since they are absent when the water contains less than 3.5 mg/l.

Table 2. Number of species of freshwater Entomostraca at investigated localities in the Kap Farvel area, southernmost Greenland.

Locality No.	No. of freshwaters	Total no. of species	No. of species per freshwater Average	(Min.-Max.)
1	32	29	9.9	(1–11)
2	10	22	9.3	(5–13)
3	4	5	3.5	(3– 4)
4	24	33	8.5	(1–15)
5	14	24	8.2	(4–13)
6	2	9	5.5	(2– 9)
7	3	15	8.7	(6– 8)
8	17	24	6.8	(1–12)
9	8	13	5.0	(1– 7)
10–11	6	15	5.8	(1–10)
12–14	8	23	7.5	(2–12)
15–17	7	20	7.7	(5–15)
18	2	3	2.0	(2– 2)
19	3	13	7.7	(7– 8)
20–23	13	20	5.3	(2– 9)
24	5	12	5.6	(3– 8)

Zoogeography

In a previous paper (Røen 1962) I divided Greenland into 11 coastal areas from north to south: areas I–VII in West Greenland, and areas VIII–XI in East Greenland. The Kap Farvel area was divided between areas VII and XI (Røen 1962: plate 8). The number of freshwater Entomostraca in each area was given by Røen (1962: table 6).

Outside the Kap Farvel area the greatest number of species (47) is found in area IV, the Disko Bugt area. However, this area was previously also the one with the greatest number of investigated freshwaters (66), and for freshwaters localities it is still (1993) by far the best investigated area in Greenland, as many of the freshwaters were visited several times.

The Kap Farvel area is comprised of the southern parts of areas VII and XI, and its freshwaters have not previously been studied. In the present investigation, although

Table 3. Species of freshwater Clacocera, Ostracoda and Copepoda reported from Greenland showing occurrence in different major areas.

	Area VII SW Greenland	Kap Farvel Area		Area XI SE Greenland
		W part	E part	
<i>Latona setifera</i>	×	×	×	
<i>Holopedium gibberum</i>		×		
<i>Daphnia pulex</i>	×	×		
<i>Simocephalus vetulus</i>	×		×	×
<i>Simocephalus serrulatus</i>		×	×	
<i>Ceriodaphnia quadrangula</i>	×	×	×	
<i>Bosmina longispina</i>				
<i>obtusirostris</i>	×	×	×	×
<i>Macrothrix hirsuticornis</i>	×	×	×	×
<i>Streblocerus serricaudatus</i>	×	×	×	
<i>Eurycercus glacialis</i>	×	×	×	×
<i>Acroperus harpae</i>	×	×	×	×
<i>Alona guttata</i>	×	×	×	
<i>Alona fabricii</i>		×	×	
<i>Alona intermedia</i>		×	×	×
<i>Alona rectangula</i>	×	×	×	
<i>Alona quadrangularis</i>	×	×	×	
<i>Alona affinis</i>	×	×	×	×
<i>Rhynchotalona kistarae</i>		×		
<i>Graptoleberis testudinaria</i>	×	×		
<i>Alonella excisa</i>	×	×	×	×
<i>Alonella nana</i>	×	×	×	×
<i>Chydorus arcticus</i>	×	×	×	×
<i>Polyphemus pediculus</i>	×	×		×
<i>Cypris pubera</i>		×		
<i>Eucypris affinis hirsuta</i>	×	×	×	
<i>Eucypris virens</i>		×		
<i>Cyprinotus incongruens</i>	×	×	×	×
<i>Candona candida</i>	×	×	×	
<i>Candona lapponica</i>		×	×	
<i>Candona rectangula</i>		×		×
<i>Cypridopsis vidua</i>		×		
<i>Diaptomus castor</i>	×	×		
<i>Leptodiaptomus minutus</i>	×	×	×	×
<i>Cyclops strenuus medianus</i>	×	×	×	×
<i>Megacyclops viridis</i>		×		
<i>Acanthocyclops vernalis</i>	×	×		
<i>Thersitina gasterostei</i>	×	×		
<i>Bryocamptus arcticus</i>		×	×	×
<i>Bryocamptus tikchikensis</i>	×	×	×	
<i>Moraria mrazeki</i>	×	×	×	
<i>Maraenobiotus brucei</i>		×		×
<i>Maraenobiotus insignipes</i>	×	×	×	
Total number of species	29	41	28	17

167 freshwaters were investigated, 9 of which yielded no Entomostraca, only 42 species were found. On the list (pp. xx), all the 24 collection localities within the Kap Farvel area are shown with the number of freshwaters investigated in each locality. Table 2 shows the number of species found in each locality and the average number of species per freshwater. Some of the localities are treated together, because they are situated close to each other and have very similar physiological conditions.

In localities 8, 9, and 20–23, in the eastern part of the Kap Farvel area, the average number of species per freshwater for all 6 localities is 5.9, while for localities 1–7, 10–19, and 24 in the western part of the area, the corresponding average is 7.0. Even though fewer freshwaters

were investigated in the eastern part of the area, the figures show that there is a decline in the number of species per freshwater from west to east. The total number of species in the western part is 41, while in the eastern part it is only 28 (Table 3).

Based on known distributions of freshwater Entomostraca in Greenland and surrounding areas, 5 faunal elements can be recognized: 1) species occurring throughout Greenland, 2) species of the northwestern faunal element, 3) species occurring in the southern parts (southern faunal element), 4) species present only in the southernmost part, and 5) species of marine-brackish origin.

Species found throughout Greenland include seven species found in the Kap Farvel area: *Macrothrix hirsut-*

icornis, *Chydorus arcticus*, *Cyprinotus incongruens*, *Candona candida*, *Moraria mrazeki*, and *Maraenobiotus brucei*. The seventh, *Daphnia pulex*, is rather difficult to place in one of the faunal elements. Originally (Røen 1962: 217) this species was referred to the northwestern element, but in a later paper (Røen 1981: 333) I referred the species to the element found throughout Greenland.

The northwestern element has only one representative in the area: *Bryocamptus (Arcticocamptus) tikchikensis*.

Twenty-five species found in the Kap Farvel area belong to the southern element: *Latona setifera*, *Simocephalus vetulus*, *Ceriodaphnia quadrangula*, *Bosmina longispina obtusirostris*, *Streblocerus serricaudatus*, *Eurycercus glacialis*, *Acroperus harpae*, *Alona guttata*, *A. quadrangularis*, *A. affinis*, *A. intermedia*, *A. rectangula*, *Graptoleberis testudinaria*, *Alonella excisa*, *A. nana*, *Polyphemus pediculus*, *Eucypris affinis hirsuta*, *Candona rectangula*, *Diaptomus castor*, *Leptodiaptomus minutus*, *Cyclops strenuus medianus*, *Acanthocyclops vernalis*, *Thersitina gasterostei*, *Bryocamptus (Arcticocamptus) arcticus*, and *Maraenobiotus insignipes*.

Besides these species, five others occurring in the Kap Farvel area are found neither in Southwest Greenland nor in Southeast Greenland, but of them *Holopedium gibberum*, *Eucypris virens* and *Candona lapponica* are found farther north in both West and East Greenland, and *Cypris pubera* and *Cypridopsis vidua* are found in single localities farther north in West Greenland. These species also belong to the southern faunal element (Røen 1962: 219); in all 30 species can thus be referred to the southern element.

Four species are only found in the Kap Farvel area, and these belong to the southernmost faunal element (Røen 1975). Two of them, *Rhynchotalona kistarae* and *Alona fabricii*, have not yet (1993) been found outside Greenland, while the two others, *Simocephalus serrulatus* and *Megacyclops viridis*, are fairly common in freshwaters south of Greenland.

The brackish-water faunal element has no adult, free-living representatives; the copepodites of the parasitic *Thersitina gasterostei* should perhaps be referred here, but I have preferred, on account of the distribution in Greenland as a whole, to consider the species part of the southern faunal element.

Scapholeberis mucronata is the only species which has not been found in the Kap Farvel area, even though it is known from both Southwest and Southeast Greenland.

Of the 4 species of the southernmost faunal element all have been found in the western part of the Kap Farvel area, while 2 are also known from the eastern part.

The 30 species which belong to the southern faunal element have rather different distribution patterns. Eight species are found both throughout the Kap Farvel area and in Southwest and Southeast Greenland; 8 are found all over the Kap Farvel area and in Southwest Greenland; 4 are found in Southwest Greenland and the western part of the Kap Farvel area, and 4 are found only in the western part of the Kap Farvel area. The remaining 6

species are all found only in few localities and are absent in one or two of the four areas. The most remarkable of these species is *Polyphemus pediculus*, which is common in Southwest and Southeast Greenland, but is only found in 8 neighbouring localities on the island of Pamiagdluq in the western part of the Kap Farvel area. Of these 30 species, 29 are found in the western part of the Kap Farvel area, while 20 are found in the eastern part, and only 13 are found in Southeast Greenland.

The 7 species belonging to the faunal element found all over Greenland also have different distribution patterns in the Kap Farvel area. Three species are found in both parts of the Kap Farvel area as well as in Southwest and Southeast Greenland, 2 are found in the whole Kap Farvel area and in Southwest Greenland, 1 is found in the western part of the Kap Farvel area and in South Greenland, and 1 is found in the western part of the Kap Farvel area and in Southeast Greenland.

The only species of the northwestern faunal element, *Bryocamptus tikchikensis*, is found in the entire Kap Farvel area and in Southwest Greenland.

The distribution of the species supports the boundary between the western and eastern parts of the Kap Farvel area as suggested by Røen (1962: plate 8), partly because the number of individuals of Entomostraca per collection (ca. 25 m³ water filtered) was much smaller in the eastern part than in the western part (on an average only about 1/3 as many), and partly because a number of species are missing in the eastern part, and others are rare in the eastern part in comparison with the western part.

The explanation for such a boundary, which appears to go through the eastern part of Eggers Ø, near the sound Ikeq, may be found in the climatic conditions, as the water analyses do not show any differences between the two areas. Temperatures in the eastern part are generally lower than those in the western part, and while all the localities (except a single large lake 310 m a.s.l.) were ice-free at the beginning of July, there was still some ice on the large lakes in the eastern part in the beginning of August.

The conclusion of this investigation must be that with respect to the freshwater Entomostraca, the eastern part of the Kap Farvel area forms a part of the southern east coast, while the western part is a relatively independent zoogeographical area. It contains partly species distributed on the southern west coast, partly species that appear to be relicts from the warm period. Typical representatives of this element are: *Simocephalus serrulatus*, *Rhynchotalona kistarae*, *Alona fabricii*, and *Megacyclops viridis*, since these were not taken in Greenland outside the Kap Farvel area, but the distribution of *Latona setifera*, *Streblocerus serricaudatus* and *Cypridopsis vidua* indicates that they may belong to this group.

Apart from these Entomostraca, a number of other freshwater animals may be regarded as survivors from the warm period, since they occur only in favourable localities: e.g. the salmon *Salmo salar* (L.), which in Greenland spawns only in the river of Kapissigdlit in Godt-

håbsfjord; the leech *Theromyzon garjawi* (Livanow), found only at Quagssarsuk in SW Greenland and at the head of Søndre Strømfjord (Bennike 1939); the poriferan *Spongilla lacustris* (L.) (Røen 1975), taken in a number of localities in Southwest Greenland and the Kap Farvel area, and the amphipod *Gammarus duebeni* (Lilljeborg) (Røen 1975).

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The benthos zonation of the Disko Fjord, West Greenland

MICHAEL K. SCHMID and DIETER PIEPENBURG

Schmid, M. K. & Piepenburg, D. 1993. The benthos zonation of the Disko Fjord, West Greenland. – Meddr Grønland, Biosci. 37, 21 pp. Copenhagen 1993-6-3.

Whereas faunistic knowledge of the Greenland benthos is quite complete on the larger scale, more detailed community studies of the bottom fauna in the numerous Greenlandic fjords are relatively scarce. The benthos of the Disko Fjord on the west coast of Disko Island (West Greenland) was sampled using a van-Veen grab. Benthos communities were distinguished by cluster analysis and multidimensional scaling. The zonation pattern mainly reflects a bathymetrical gradient, but the spatial distribution of the fauna is also influenced by the strong aestival river runoff at the origin of the fjord. The resemblances between zones in terms of diversity, abundance, biomass, and faunistic composition were related to possible causes in terms of hydrography, sediment heterogeneity, and temporal patterns of ice cover and primary production. Aspects of zoogeography, trophic structure, and reproduction ecology were also considered in the discussion of community distribution and composition.

Key words:

benthos, Disko Fjord, community, zonation.

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Michael K. Schmid and Dieter Piepenburg, Institut für Polarökologie, University of Kiel, Wischhofstr. 1-3, Building 12, D-2300 Kiel 14, Germany.

An annotated checklist to the birds of Greenland

DAVID BOERTMANN

Boertmann, D. 1994. An annotated checklist to the birds of Greenland. – Meddr Grønland, Biosci. 38, 63 pp. Copenhagen 1994-03-28.

The most recent total account of the birds of Greenland was published in the late sixties (Salomonsen 1967). Since that, major changes have been recorded in the status and occurrence of several species. One species have disappeared (Barrow's Golden eye) and 28 new vagrants have been added to the list.

This checklist gives a current account on the birds occurring in Greenland. 235 species have been recorded. About 58 are well established breeders, c. 17 are regular (some numerous) visitors and the rest are more or less rare vagrants. Some of the visitors may breed occasionally and some are probably in the initiating phase of an immigration to Greenland. Although many vagrants have only been recorded once, some of them may occur more commonly or even annually.

The present status is described for each species and if possible also population numbers and trends. When relevant, issues as subspecies, habitats and migration are discussed or described briefly.

Keywords: birds, Greenland, status, distribution, population trends, population numbers, phenology.

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David Boertmann, Greenland Environmental Research Institute, Tagensvej 135, 4., DK-2200 Copenhagen N, Denmark.

Overview of the special issue “Studies of white whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in Greenland and adjacent waters”

RANDALL R. REEVES, RUNE DIETZ and ERIK W. BORN

Reeves, R. R., Dietz, R. & Born, E. W. 1994. Overview of the special issue “Studies of white whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in Greenland and adjacent waters”. – Meddr Grønland, Biosci. 39: 3–11. Copenhagen 1994-04-22.

This overview introduces the collection of papers on the Distribution and abundance; Exploitation and status; Habitat use and behaviour; and Life history, stock identity and toxicology of white whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in Greenland and adjacent waters. It includes brief summaries of the 19 included papers and calls attention to ongoing and future studies on the same or related subjects.

Key Words:

White whale, beluga, *Delphinapterus leucas*, narwhal, *Monodon monoceros*, Greenland, eastern Canadian Arctic, Svalbard.

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Randall R. Reeves, Okapi Wildlife Associates, 27 Chandler Lane, Hudson, Québec, J0P 1H0 Canada. Rune Dietz, Greenland Environmental Research Institute, Tagensvej 135, DK-2200, Copenhagen N, Denmark. Erik W. Born, Marine Mammal Section, Greenland Fisheries Research Institute, Tagensvej 135, DK-2200, Copenhagen N, Denmark.

The Atlantic walrus (*Odobenus rosmarus rosmarus*) in West Greenland

ERIK W. BORN, MADS P. HEIDE-JØRGENSEN and ROLPH A. DAVIS

Born, E. W., Heide-Jørgensen M. P. & Davis, R. A. 1994. The Atlantic walrus (*Odobenus rosmarus rosmarus*) in West Greenland. – Meddr Grønland, Biosci. 40: 3-33. Copenhagen 1994-05-30.

In the early part of the 20th century Atlantic walrus (*Odobenus rosmarus rosmarus*) occurred abundantly between approximately 66°N and 70°45'N in Central West Greenland from September until mid June. Between September and December several hundred walrus were hauled out on small islands and promontories between the entrance to Nassuttooq (Nordre Strømfjord, approx. 67°30'N) and approximately 67°45'N, south of the settlement of Attu. From 1911, the hunt for walrus at terrestrial haul out sites was intensified, and by the late 1930s the walrus had abandoned the terrestrial haul outs in this area. Between 1911 and the early 1940s, the catches of walrus in western Greenland (excluding the Avanersuaq/Thule area) increased rapidly, reaching a maximum of more than 600 animals reported for 1938 and 1940. Mainly reproductive females were caught and the proportion of unretrieved kills was high. Between the early 1940s and the mid 1960s catches decreased rapidly, apparently reflecting a decrease in the stock of walrus wintering off Central West Greenland. Between 1965 and 1987, the recorded annual catch in western Greenland south of 76°N averaged 56 walrus (SD = 19.7; range 19–101 animals). It is estimated that during this period the total number of walrus removed by hunting was about 100 per year. Comparisons of the results of systematic aerial surveys conducted in early spring of 1981, 1982, 1984, 1990 and 1991 over the walrus wintering grounds at Central West Greenland revealed no trend in abundance. The line transect methods used in the 1990 and 1991 surveys gave higher and more robust estimates of abundance than the strip censuses used in the previous surveys, and resulted in estimates of abundance of about 500 walrus (not corrected for submerged animals). The stock structure of the total walrus population in the Baffin Bay and Davis Strait regions is obscure. However, this study has shown that the numbers of walrus in Central West Greenland are much lower than historical levels, and that walrus in this area are vulnerable.

Key words:

Atlantic walrus, *Odobenus rosmarus*, West Greenland, distribution, catch, aerial surveys, line transect.

Erik W. Born and Mads P. Heide-Jørgensen, Greenland Fisheries Research Institute, Marine Mammal Section, Tagensvej 135, DK-2200 Copenhagen N, Denmark. Rolph A. Davis, LGL Ltd. Environmental Research Associates, 22 Fisher Street, P.O. Box 280, King City, Ontario, L0G 1K0 Canada.

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