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KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND

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THE ZOOLOGY OF EAST GREENLAND

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MARINE GASTROPODA PROSOBRANCHIATA

BY

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WITH 28 FIGURES IN THE TEXT

KØBENHAVN

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BIANCO LUNOS BOGTRYKKERIAS

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East Greenland ranges among the most unapproachable areas of our globe. As to its invertebrate fauna it was a "terra incognita" as late as up to the last half of 19th century. While the first records on prosobranchs from Iceland date back to LINNÉ (1767), the first records on East Greenlandic prosobranchs were published in 1874—more than a hundred years later—by MÖBIUS, who worked up the collections of "Zweite Deutsche Nordpolarfahrt 1869—70". He mentions in all 8 species of marine prosobranchs from East Greenland, 4 of which are valid, while the other 4 are determined erroneously. The first Danish records are those of POSSELT (1895) who, on the basis of collections from RYDER's expedition 1891—92, and the Swedish "Sofia"-Expedition 1883 (leader: NORDENSKJÖLD), mentions 27 species of prosobranchs, 23 of which are valid, 19 of these being for the first time recorded from East Greenland. POSSELT & JENSEN 1898 in their "Conspectus" enumerate the same species without adding any new data. HÄGG (1905) worked up the collections from "The Swedish zoological Polar-expedition to Spitzbergen, NE. Greenland and Jan Mayen in the year 1900", and mentions 36 species of prosobranchs from East Greenland. Of these 33 are valid, and 19 of them were hitherto unknown from East Greenland. GRIEG (1909) mentions 6 species, one of them new to the area. ODHNER (1912 and 1913) enumerates the *Diotocardia* and the *Semiproboscidiifera* from all earlier publications and adds four new species to the East Greenlandic fauna. GRIEG (1914) mentions 7 species from a bottom-sample off the NE. coast; one of them is new to East Greenland. ODHNER (1915) in his paper on the prosobranch-fauna of Icefjord (Spitzbergen) gives the distribution of the species found, thus also East Greenland, and adds a new species to the East Greenlandic fauna.

Thus up to 1915 records were known of 49 species of prosobranchs from East Greenland.

In the following nineteen years no new information on East Greenland prosobranchs has been published, although large collections had been got together. The NATHORST-expedition, which collected in NE. Greenland in 1899, handed over a part of their excellent collections to

the Copenhagen Museum for classification; the zoologist SØREN JENSEN collected a large material of mollusca as a member of the AMDRUP-HARTZ-expedition 1900; the botanist CHR. KRUISE brought home a rather considerable collection of mollusca from his journey with AMDRUP's expedition along the NE. coast 1898—99, and from his stay in Angmagssalik 1901—02. The lamellibranchs from these collections (apart from the NATHORST-material) were published by AD. S. JENSEN (1905), who also gives a very useful list of all localities referred to, and a survey of the subfossil mollusk-fauna in East Greenland. The prosobranchs, however, were still unpublished. A few years later new large collections of East Greenland mollusca arrived at the Copenhagen Museum, viz. the material taken in the northernmost areas by the "Danmark"-expedition 1906—08 (zoologist FRITZ JOHANSEN). Prof. AD. S. JENSEN, in these years the keeper of the mollusc-department of the Copenhagen Museum, began to work up the extensive collections and left to his successors in the post incomplete manuscripts on the KRUISE-AMDRUP-HARTZ-collections as well as on the material from the "Danmark"-expedition. To these manuscripts were added a description of a new species, *Buccinum micropoma*, and a paper on the synonymy in Arctic species of *Onchidiopsis*. All these papers have been used by the present author for this paper, and I wish to express to Prof. AD. S. JENSEN my most sincere thanks for having entrusted me with this valuable material.

From 1908 no collections of prosobranchs were made in East Greenland until the botanist G. SEIDENFADEN in 1929 and the zoologist B. LØPPENTHIN in 1930 as members of LAUGE KOCH's expeditions brought home a few samples each. In 1931 to 1933 most extensive collections were made during "Treaarsekspeditionen" by SPÄRCK and THORSON in the Franz Joseph Fjord area 1931—32 (230 bottom samples and 280 dredge hauls), by HOLGER MADSEN (a few samples) from Eskimonæs 1932—33, and by THORSON in Scoresbysund 1933 (270 bottom samples and about 60 dredge hauls). Contemporaneously with the latter DEGERBØL brought home a smaller collection from the Kangerdlugssuak area (Scoresbysund Committees expedition 1932), and BERTELSEN collected a rather large material in the same area, and at Angmagssalik as a member of KNUD RASMUSSEN's expedition 1933. Finally BERTELSEN in 1935 (M/S "Thor's" Cruises) brought home very rich collections from the southeastern part of the coast, viz. Naparssarsuak to Kekertaksiak, with Lindenows' Fjord as the central area.

On the basis of these large collections of the last decennium the following papers have been published: THORSON (1934) worked up DEGERBØL's collections from Kangerdlugssuak, viz. 15 species of prosobranchs, 14 of which were valid, and all previously known from East Greenland. THORSON (1935) in a paper dealing with the egg-capsules of



marine prosobranchs from East Greenland mentions 37 species, 9 of which are "new" to the fauna. HOLGER MADSEN (1936) discussing the East Greenlandic tidal zone adds 2 further species of prosobranchs to those already known. The papers dealing with the animal communities of East Greenland, viz. the Franz Joseph Fjord area (SPÄRCK 1933, THORSON 1933), the Scoresbysund area (THORSON 1934), and the Kangerdlugssuak-Angmagssalik area (BERTELSEN 1937) also contain several enumerations of prosobranchs. As however, the identifications given here are often only provisional (thus often the genus, but not the species is mentioned), these papers have not been used among the "East Greenland records" on prosobranchs, but are discussed under the "animal communities" pp. 169—172.

Finally, this paper gives records of 24 further species till now unknown from East Greenland. The collections and publications (this paper included) procured during the last decennium have thus augmented the number of prosobranch-species known from East Greenland from 49 to 84! 79 of these are known in living specimens.

This detailed account on the collections and publications is given in order to show that the material used for the present paper is very extensive and covers all the five main-areas of the East Greenlandic coast—the outer coast as well as the large fjords. The large number of localities in which marine prosobranchs have been collected in East Greenland (fig. 1) is so equally distributed along the whole coast that only few additions to the fauna may be expected during future investigations. The constant use of the bottom-sampler ("the PETERSEN grab") has caused the capture of the tiny species as well. A small number of species typical of the deep-sea and known from the Greenland sea will probably now and then reach depths of less than 300 m (i. e. the limit along the outer coast used in this paper), and thus occur on the East Greenland shelf, and continued investigations in the transitional area between the shelf and the deep-sea, especially along the SE. coast of Greenland, will therefore be of interest.

In the following synopsis all the East Greenland localities are given in which each species has been found up to now. The coast is divided into five areas, which from earlier experience have proved to be the natural limits for the majority of the species, viz. Nordøstkyst Area, Franz Joseph Fjord Area, Scoresbysund Area, Kangerdlugssuak Area, and Sydøstkyst Area (cf. the map fig. 1). A special map over the large fjord areas is given in fig. 2. The spelling of the geographical names is in accordance with the maps and with the wishes of the editorial committee, and needs a few explanatory remarks: Sund = sound, Bugt = bay, Havn = harbour, Ø = island, Kap = cape, and Pynt = point.

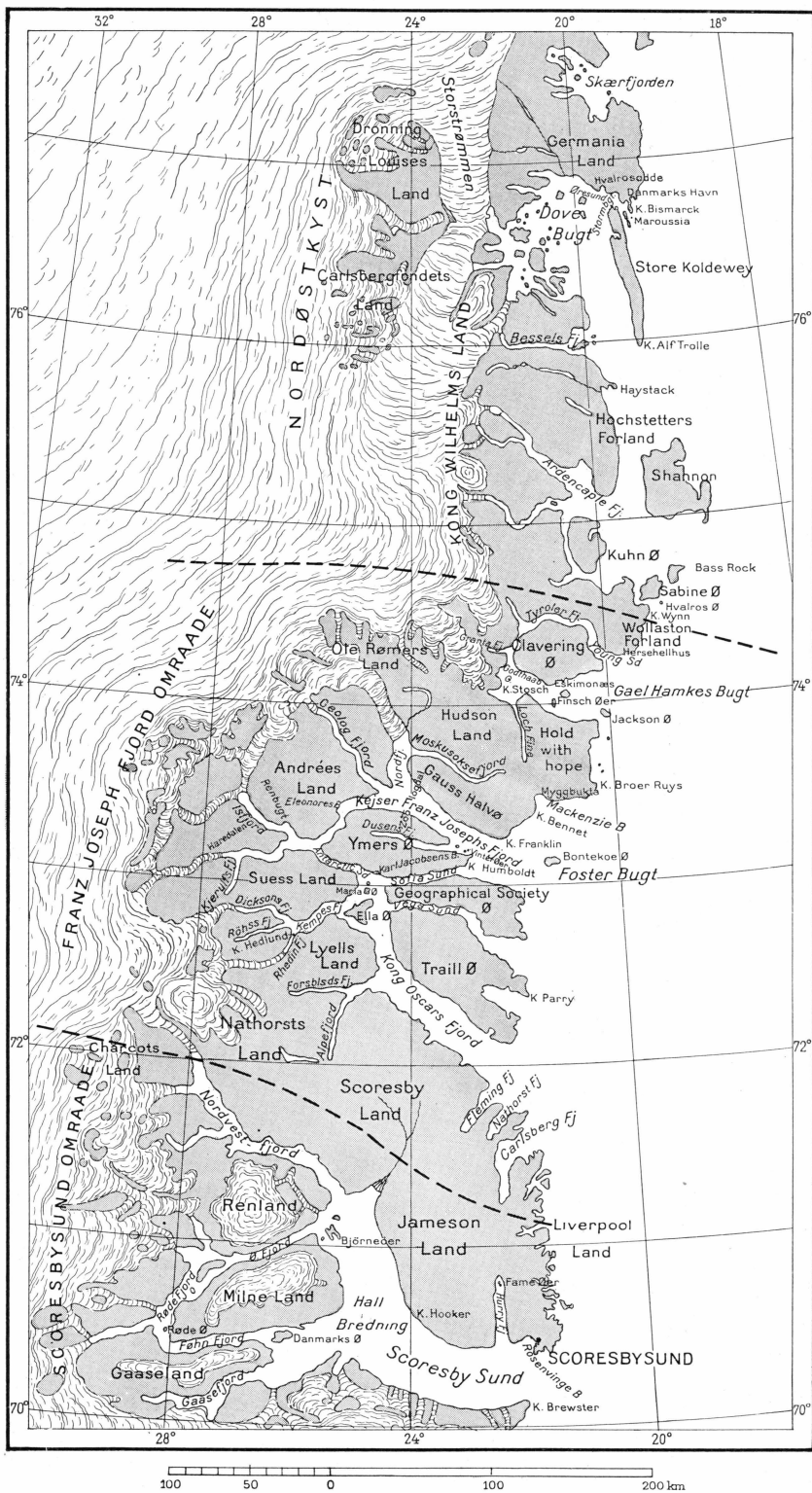


Fig. 2. Map of North-East Greenland, including the two large fjord complexes.

In the synopsis of the species the word "animal" is used when soft parts are preserved. When only empty shells are present, the term "shell" is employed.

The terms "panarctic", "boreo-arctic", "lusitanian" etc. used in the synopsis and in the general remarks refer to the definitions given by EKMAN (1935).

Figs. 4, 6, 10, 12, and 13, are drawn by POUL H. WINTHER, and figs. 8, and 11, are drawn by ERIK RASMUSSEN.

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## Synopsis of the Species.

### 1. *Scissurella crispata* (LINNÉ).

*Scissurella crispata* G. O. Sars 1878, pl. 8, fig. 7 a—b.

#### East Greenland record:

*Scissurella crispata* ODHNER 1912, p. 36—37.

Occurrence at East Greenland: *Nordøstkyst Area*: Danmarks Havn, 15—19 m, clay and *Delesseria*, 1 adult animal. *Franz Joseph Fjord Area*: Forsblads Fjord, 94—170 m, 3 young animals; E. of Kap Weber, 72°32' N. 24°35' W., 100—110 m, mud with stones and gravel (ODHNER). *Scoresbysund Area*: N. of Stewart Land, 297 m, clay with stones, 1 young animal.

The species is known only from the three northernmost areas of the East Greenlandic coast, but will undoubtedly occur in the southern areas as well.

Distribution: The whole Norwegian coast, Bohuslän, the British Isles, W. and S. of Ireland, Gulf of Gascogne, between the Faroes and the Hebrides, Iceland, S.W. Greenland, East Greenland, Spitzbergen, the Murman Coast, E. Canada, and New England. Towards the south it extends to the Mediterranean, Morocco, the Azores and the West Indies. Main distribution: Mediterranean and the lusitanian, boreal and sub-arctic parts of the N. Atlantic. Not in true arctic seas. Vertical range: from 8 m (Oslo Fjord) to 1919 m (Azores) and 2020 m (off France).

Remarks: The two largest East Greenlandic animals had a largest shell diameter of 2½ and 1¼ mm respectively.

Biology: Unknown.

### 2. *Puncturella noachina* (LINNÉ).

*Puncturella noachina* ODHNER 1912, pl. 2, figs. 28—41.

#### East Greenland records:

*Puncturella noachina* HÄGG 1905, p. 3.

*Puncturella noachina* ODHNER 1912, p. 39.

*Puncturella noachina* ODHNER 1915, p. 143.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: E. of East Greenland, 72°25' N. 17°56' W., 300 m, stones and sand, 1 shell

(HÄGG). *Scoresbysund Area*: Section from Kap Leslie to Jamesonland, 345—385 m, soft and hard clay, 2 adult shells (2 finds). *Sydøstkyst Area*: Tasiusak at Angmagssalik, 20—30 m, crusts of red algae, 1 adult shell; Angmagssalik, sublittoral zone, 1 adult animal; Angmagssalik Fjord, 19—47 m, 1 adult animal; Ingmikertok at Angmagssalik Fjord, 19—57 m, 1 young shell; Kap Tordenskjold, 4 m, laminarians, 1 young animal; off Lindenows Fjord, 400—600 m, clay with foraminifera, 1 adult animal.

Living specimens are thus known only from the Sydøstkyst Area, but if empty shells are included the species is found along the whole coast from 72°25' N. to Lindenows Fjord in the S. It seems, however, to be totally absent from the Franz Joseph Fjord proper.

**Distribution.** The whole Norwegian coast, Bohuslän, the Kattegat, the North Sea, France, Portugal, the British Isles, the Faroes, and Iceland. In the Arctic it is found along W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, the Kara Sea, the White Sea, Bering Sea, Sea of Okhotsk, Wellington Channel, and Jones Sound, here ranging over Eastern Canada and New England, southwards to Cape Cod. Its southern limit in E. Asia is Japan, and in W. America Vancouver. Further it is known in the Antarctic (Magellan's Strait, Patagonia, Falkland Isles). Main distribution: Widely distributed in the antarctic, arctic, and cold temperate areas of the Pacific and the Atlantic. Vertical range: From 19 m (N. Norway) to about 1100 m (off Portugal).

**Remarks.** The largest shell diameters of the four living East Greenlandic specimens were: 7.1—6.6—6.1 and 3.5 mm respectively. The largest adult shells measured: 11.0 (HÄGG)—10.1—7.2 and 7.0 mm respectively.

**Biology.** Unknown.

[*Acmaea testudinalis* (O. F. MÜLLER).

*Acmaea testudinalis* ODHNER 1912, pl. 1, figs. 1—7, pl. 6, fig. 1.

**East Greenland records:**

*Acmaea testudinalis* POSSELT 1895, p. 77.

*Acmaea testudinalis* POSSELT & JENSEN 1898, p. 114.

**Occurrence at East Greenland:**

The specimens of this species mentioned by POSSELT and later on cited by POSSELT and JENSEN were, according to these authors, taken at Hekla Havn in Scoresbysund. The specimens in question, however, are not present in the Copenhagen Museum nowadays, and in the journal, where POSSELT himself gave the list of mollusca brought home from Hekla Havn, *Acmaea rubella* is mentioned, but not *Acmaea testudinalis*. In the

large collection brought home from East Greenland during the last ten years there is not a single specimen of *Acmaea testudinalis*, which seems to be absent even from the southernmost part of the East coast (Lindenow's Fjord). According to this the above records must be due to a mistake, and it seems to me justifiable to disclaim the occurrence of this species at East Greenland].

### 3. *Acmaea rubella* (O. FABRICIUS).

*Acmaea rubella* ODHNER 1912, pl. 1, figs. 16—23.

#### East Greenland records:

*Tectura rubella* POSSELT 1895, p. 78.

*Tectura rubella* POSSELT & JENSEN 1898, p. 116.

*Acmaea rubella* THORSON 1935, p. 67—69, figs. 73—75.

Occurrence at East Greenland (cf. the map fig. 17, p. 130): *Nordøstkyst Area*: Danmarks Havn, 15—19 m, soft clay, *Delesseria*, 3 adult animals; Stormbugt at Danmarks Havn, 19—38 m, stones, shells, *Delesseria*, 5 adult and 1 young animal, 3 adult shells (3 finds); Öresund at Danmarks Havn, 28—57 m, hydroid-region, hard bottom, 1 adult animal, 1 adult shell (2 finds). *Franz Joseph Fjord Area*: Kap Broer Ruys, 73°30' N. 20°18' W., 25—27 m, gravel and red algae, 1 adult animal; Vinterøer in the mouth of Dusénfjord, 15—30 m, 1 adult animal; Solitærbugt, Ellaø, 11—14 m, 1 adult shell; ibidem, 20—35 m, stones, shells, red algae, laminarians, 4 adult and 2 young animals, 3 adult shells (8 finds); ibidem, 40—40 m, 1 adult animal; ibidem, 75—80 m, 1 adult shell. *Scoresbysund Area*: Off Kap Tobin, 123 m, gravel and clay, 1 adult shell; off Bjørneøer, 6—13 m, red algae, 2 adult and 1 young animals; ibidem, 18—28 m, gravel and stones, 8 adult animals; NE. of Danmarks Ø, 20 m, soft clay, 2 adult animals, 1 adult shell; Hekla Havn at Danmarks Ø, 3 adult and 1 young animal (POSSELT); "Scoresbysund", 3 young animals. *Sydøstkyst Area*: Tasiusak at Angmagssalik, 11—57 m, mud, 2 adult animals, 1 adult shell; ibidem, 10—36 m, stones, algae, 1 adult animal, 1 adult shell; ibidem, 20—30 m, red algae, 1 adult shell; Ingmikertok at Angmagssalik, 19—57 m, 13 adult and young animals and shells; Sermilik off Ikatek, 44 m, laminarians, 1 adult animal; off Kap Tordenskjold, 4 m, laminarians, 1 young animal; Narsak in Lindenows Fjord, 1 adult animal.

Living animals are thus known from Danmarks Havn in the north to Lindenows Fjord in the south and will probably prove to be common everywhere along the East Greenlandic coast, where the species also inhabits the large fjords far from the outer coast. The favourite depth is 20 to 35 m, e. g. the smallest depths in which water with constantly

negative temperatures is found, but living specimens occur from a depth of 4 m (Kap Tordenskjold) to 44—57 m. *Acmaea rubella* is a type species for the East Greenlandic red algae epifauna (cf. THORSON 1933, 1934b.).

Distribution: Norway from Tromsø in the S. to Varanger Fjord in the N. E., the Murman Coast, Novaya Zemlya, Spitzbergen, Jan Mayen, Iceland, W. og E. Greenland, Jones Sound, Parry Islands, E. Canada, Newfoundland. Main distribution: Panarctic, but only in the Atlantic. Vertical range: From 4 m (E. Greenland) to 565 m (off Norway).

Remarks. The largest living specimens had a largest diameter of shell of 7.8—7.5—6.5—6.1—5.2—5.0—4.9 and 4.8 mm respectively. The largest shell measured 6.8 mm. An animal from Hekla Havn had tubes of living *Spirorbis* attached to the outer surface of its shell.

Biology: The hermafroditism and viviparity have been studied in E. Greenland specimens (THORSON 1935). The young develop within the pallial cavity of the mother animal until the largest diameter of the shell is nearly 1 mm. When hatching (through the opening of the nuchal cavity of the mother) the velum is already reduced, the shell is formed like that of the adults, and the young specimens have no pelagic stage at all. In East Greenland animals with young in the pallial cavity are known from: Danmarks Havn, Solitærbugt at Ellaø, and off Bjerneøer in Scoresbysund.

#### 4. *Lepeta coeca* (O. F. MÜLLER).

*Lepeta coeca* ODHNER 1912, pl. 2, figs. 2—17.

##### East Greenland records:

*Lepeta cæca* MÖBIUS 1874, p. 248.

*Lepeta coeca* POSSELT 1895, p. 78.

*Lepeta caeca* POSSELT & JENSEN 1898, p. 118.

*Lepeta coeca* HÄGG 1905, p. 18.

*Lepeta cæca* GRIEG 1909, p. 35.

*Lepeta coeca* ODHNER 1912 p. 33.

*Lepeta coeca* GRIEG 1914, p. 8.

*Lepeta coeca* ODHNER 1915, p. 142.

*Lepeta coeca* THORSON 1934, p. 7.

Occurrence at East Greenland (cf. the map fig. 17, p. 130).

*Nordøstkyst Area*: 77°35' N. 18°12' W., 53 m, stones, "2 specimens" (GRIEG); Stormbugt at Danmarks Havn, 19—47 m, *Delesseria*, hard bottom, 9 adult and 3 young animals, 2 adult shells (3 finds); off the coast of N. E. Greenland, 75°58½' N. 14°08' W., 300 m, brown and grey clay, 1 fragmentary shell (GRIEG); S.E. of Shannon Ø, 74°52' N., 17°16'

W. 350 m, clay, sand, pebbles, 1 adult and 1 young animal; S.E. of Sabine Ø, 207 m, 1 adult shell; S.E. of Hvalros Ø, 74°30' N. 18°40' W., 80—100 m, mud, stones, 2 animals (HÄGG); Hvalros Ø, 47 m (MÖBIUS); S.E. of Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 2 adult animals (HÄGG).

*Franz Joseph Fjord Area:* Off Eskimonæs at Clavering Ø, 74°10' N. 20°08' W., 25—40 m, mud, shells, pebbles, 6 adult animals; Eskimonæs, 47—55 m, clay and gravel, 11 adult and 4 young animals (2 finds); E. of Jackson Ø, 73°55' N. 19°20' W., 150 m, mud, 1 animal, 1 shell (HÄGG); S.E. of Jackson Ø, 73°39' N. 18°14' W., 202 m, clay with large stones, 1 adult animal; E. of Jackson Ø, 73°50' N. 18°35' W., 170 m, clay, gravel, stones, 1 young animal; E. of Bontekoe Ø, 73°20' N. 21°20' W., 70 m, mud, shells, pebbles, 3 adult animals; Between Bontekoe Ø and Mackénsie Bugt, 250 m, mud, 1 adult animal (HÄGG); Eastern part of Vega Sund, 72°45' N. 22°56' W., 35—60 m, mud, stones, 1 adult animal; E. of Traill Ø, 72°28' N. 21°48' W., 180 m, mud, stones, 2 young animals; Kap Weber, 73°32' N. 24°38' W., 100—110 m, mud, gravel, stones, 5 adult animals; Mouth of Dusénfjord off Kap Graah, 26—40 m, clay, stones, 1 adult animal; Inner part of Dusénfjord, 57 m, hard clay, 3 adult shells; Between Maria Ø and Ella Ø, 250 m, 1 adult animal; Central part of Antarctic Sund, 540 m, hard clay with large stones, 1 adult and 1 young animal; Inner part of Franz Joseph Fjord, 73°06' N. 27°17' W., 40—70 m, mud, stones, 1 young animal; Kap Hedlund, 18—23 m, 1 adult animal; *ibidem*, 30—38 m, clay, stones, shells, red algae, 2 adult animals, 2 adult shells (3 finds); Solitærbugt, Ellaø, 20—30 m, clay, stones, shells, red algae, 19 adult and 1 young animals, 1 adult shell (11 finds); 30—40 m, stones, shells, gravel, clay, red algae, laminarians, *Fucus*, 29 adult and 6 young animals, 2 adult shells (16 finds); 40—50 m, clay, stones, 11 adult and 3 young animals (4 finds); 50—60 m, clay, stones, 11 adult animals (5 finds); 60—70 m, stones, 5 adult animals (2 finds); 70—80 m, clay, stones, 12 adult and 2 young animals (3 finds); 80—90 m, clay, shells, stones, red algae, 8 adult and 5 young animals, 3 adult shells (6 finds); 90—95 m, clay, stones, 1 adult and 5 young animals, 1 adult shell (2 finds); West of Kong Oscars Fjord, 71°59' N. 21°05' W., 235 m, 1 young shell.

*Scoresbysund Area:* Rathbone Ø, 177 m, stones, 1 adult animal; off Raffles Ø, 234 m, gravel, stones, 1 adult animal; off Kap Tobin, 123 m, gravel, stones, 2 adult animals; Rosenvinges Bugt, 70 m, 2 adult shells; off the mouth of Hurry Fjord, 84—88 m, clay, gravel, stones, 2 adult animals, 9 adult shells (2 finds); Hekla Havn, 1 "specimen" (POSSELT).

*Kangerdlugssuak Area:* Kangerdlugssuak, about 200 m, 1 adult animal.

*Sydøstkyst Area:* Tasiusak at Angmagssalik, 50—80 m, 1 adult shell; ibidem, 100 m, stones, 1 adult shell; ibidem, 57—94 m, 4 adult animals; Sermilik off Ikatek, 0—20 m, algae, 2 adult animals; Off the coast of S.E. Greenland, 65°40' N. 35°32' W., 47—75 m, clay with small stones, 12 "specimens" (POSSELT); Nanusik, off the mouth of Lindenows Fjord, 50—60 m, gravel, clay, 3 adult, and 1 young animal (2 finds); Outer part of Lindenows Fjord, 60—70 m, clay, gravel, 1 adult animal; ibidem, 100—150 m, gravel and clay, 1 adult animal; Middle part of Lindenows Fjord, 30 m, laminarians, bryozoans, 1 adult animal; ibidem, 40—50 m, clay, 5 adult animals; ibidem, 125—150 m, clay, 3 adult, 1 young animals; Inner part of Lindenows Fjord, 77 m, clay, 1 adult animal; ibidem, 82 m, clay, 1 adult animal; ibidem, 91 m, clay, 1 adult animal; Innermost part of Lindenows Fjord, 200—350 m, clay, 1 adult animal; Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 3 adult and 1 young animal (3 finds).

Living specimens are thus known from Île de France in the N. to Kekertaksiak in the S. The species seems to inhabit the whole of Franz Joseph Fjord but to be absent from the innermost parts of Scoresbysund. In East Greenland living specimens have never been taken at depths less than 20 m, e. g. the species lives in water with a temperature below zero the whole year round—a remarkable fact, as the species is an inhabitant of boreal seas too. *Lepeta coeca* is attached to the red algae epifauna, which is found at depths from 20 to 80—85 m.

**Distribution:** In boreal seas it is known from the whole Norwegian coast, Bohuslän, the Kattegat, the Sound, Shetland, the Faroes, Iceland, and from 1300 m in the N. Atlantic. In the Arctic it lives at W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, the White Sea, Novaya Zemlya, the Kara Sea, the Barent Sea, Franz Joseph Land, Jones Sound, the Parry Isles, Grinnell Land, E. Canada, and New England. Towards the south it extends to Japan, Amur, the West Indies and the Azores. **Main distribution:** Panarctic-boreal. **Vertical range:** From 3 m (Ireland) and 6 m (Jones Sound) to about 1300 m (N. Atlantic and the Azores).

**Remarks:** The 10 largest animals measured (length  $\times$  breadth of shell): 17.5  $\times$  13.4 — 16.9  $\times$  12.6 — 14.7  $\times$  10.9 — 14.6  $\times$  10.9 — 14.3  $\times$  10.8 — 14.0  $\times$  10.7 — 14.0  $\times$  10.3 — 14.0  $\times$  10.5 — 13.9  $\times$  10.2 and 13.8  $\times$  9.8 mm respectively. The largest empty shells measured: 15.7  $\times$  12.0 and 15.5  $\times$  12.0 mm.

**Biology:** Unknown.

5. *Margarita groenlandica* (CHEMNITZ).

*Margarita groenlandica* ODHNER 1912, pl. 4, figs. 4—27.

## East Greenland records:

*Trochus grænlandicus* MÖBIUS 1874, p. 248.

*Margarita umbilicalis* POSSELT 1895, p. 80.

*Margarita groenlandica* var. *umbilicalis* POSSELT & JENSEN 1898, p. 127—128.

*Margarita groenlandica* HÄGG 1905, p. 9.

*Margarita groenlandica* Var. *umbilicalis* HÄGG p. 10.

*Margarita groenlandica* ODHNER 1912, p. 56.

*Margarita groenlandica* ODHNER 1915, p. 149.

*Margarita groenlandica* THORSON 1934, p. 7.

*Margarita groenlandica* THORSON 1935, p. 60, 63—64, figs. 70 A.

Occurrence at East Greenland (cf. the map, fig. 18, p. 131).

*Nordøstkyst Area*: Danmarks Havn, 5—19 m, *Laminaria*, *Delesseria*, 85 adult and young animals (10 finds); Stormbugt at Danmarks Havn, 9½—19 m, laminarians, 1 adult animal; Ibidem, 19—28 m, *Delesseria*, 2 young animals; Ibidem, 19—38 m, *Delesseria*, stones, shells, 1 adult and 1 young animal (2 finds); Hvalrosodden at Danmarks Havn, 0—6 m, littoral and laminaria region, 31 adult and young animals (2 finds); “Øresund” at Danmarks Havn, 28—38 m, *Delesseria*, 1 adult animal; off the Eskimo-ruins at Danmarks Havn, 0—7½ m, mud and algae, 14 adult animals and shells; The sound between Kap Bismarck and “Maatten” at Danmarks Havn, depth?, *Laminaria*, *Delesseria*, 1 adult and 2 young animals; Off the mouth of Mørke Fjord, 2 m, stones, *Laminaria*, 2 adult animals; S. of Lille Pendulum Ø, 74°35' N. 18°23' W., 18—21 m, sandy mud, algae, 1 adult animal; Ibidem, 74°35' N. 18°15' W., 150 m, mud, stones, 5 animals (HÄGG); S.E. of Hvalros Ø, 74°30' N. 18°40' W., mud, stones, 80—100 m, 4 animals (HÄGG); Sabine Ø, 5½—9½ m, 11 adult and 1 young animal; Sabine Ø, about 74°30' N. and 19° W. (MÖBIUS); Shannon Ø, about 75°20' N. 18° W. (MÖBIUS); Germania Havn, 74°30' N. 18°50' W. (MÖBIUS). Kap Borlase Warren, 19 m, 9 adult animals.

*Franz Joseph Fjord Area*: S.E. of Clavering Ø, 74°10' N. 20°08' W., 25—40 m, mud, shells, pebbles, 3 adult animals; W. of Kap Mary at Clavering Ø, 21 m, stones, 5 adult and 8 young animals; Kap Mary at Clavering Ø, on the shore, 1 adult animal; Eskimonæs at Clavering Ø, 3½—6 m, gravel and algae, 7 adult and 4 young animals (2 finds); Ibidem, 6—10 m, algae, 4 adult and 3 young animals; Ibidem, 10—14 m, sand, clay, algae, 4 adult and 4 young animals; Ibidem, 18—22 m, algae, 1 adult animal; Ibidem, 50—55 m, gravel with mud, 1 adult animal; off Jackson Ø, 73°55' N. 20°10' W. (MÖBIUS); 73°55' N. 19°20' W., 150 m, mud, 2 animals, 1 shell (HÄGG); Kap Bennet, 73°26' N. 21°13' W.,

9—11 m, algae, 3 adult and 1 young animal; between Mackensie Bugt and Bontekoe Ø, 73°20' N. 21°20' W., 70 m, stones, shells, 1 adult animal; Mackensie Bugt, 3—10 m, mud, sand, laminarians, 6 animals (HÄGG); Ibidem, 12—18 m, mud, 1 animal (HÄGG); Ibidem, 12—35 m, mud, 3 animals (HÄGG); E. of Kap Weber, 72°32' N. 24°35' W., 100—110 m, mud, stones, gravel, 2 young animals (ODHNER); Inner part of Franz Joseph Fjord off Ättestupan, 73°06' N. 27°17' W., 3—9 m, mud, sand, algae, 2 adult and 3 young animals; Isfjord off Haredalen, 9—15 m, clay, 3 adult animals; Isfjord, 30—35 m, clay, 1 adult animal; Eleonore Bugt, 3½—12 m, algae, 52 adult and young animals; Ibidem, 15—27 m, algae, 4 adult animals; Moskusokse Fjord, outer part, 220 m, clay, 26 animals (HÄGG); Moskusokse Fjord, 15—21 m, clay, stones, 5 adult animals (3 finds); Vinterøer off the mouth of Dusénfjord, 15—30 m, 12 adult animals; The mouth of Dusénfjord, 5—9 m, *Desmarestia*, 4 adult animals; Inner part of Dusénfjord, 4—10 m, *Desmarestia*, 2 young animals; Ibidem, 15—20 m, *Fucus*, *Laminaria*, 10 adult and young animals; Off the mouth of Rhedinfjord, 12—20 m, algae, 4 young animals; Ibidem, 23—31 m, *Desmarestia*, *Fucus*, red algae, 37 adult animals (5 finds); Kap Hedlund, 4—10 m, *Fucus*, 3 adult and 2 young animals (3 finds); Ibidem, 10—20 m, brown algae, 70 adult and young animals (11 finds); Ibidem, 20—30 m, *Desmarestia*, *Laminaria*, *Fucus*, red algae, 23 adult animals (6 finds); Ibidem, 20—53 m, 1 adult animal; Carl Jacobsen Bugt, Ymers Ø, 5 m, 1 young animal; Ibidem, 13—18 m, clay, 2 adult animals (2 finds); Ibidem, 21 m, clay, 2 adult and 1 young animal; Solitærbugt at Ella Ø, 3—10 m, clay, *Fucus*, *Desmarestia*, about 330 adult and young animals (13 finds); Ibidem, 10—20 m, clay, stones, *Desmarestia*, red algae, about 230 adult and young animals (38 finds); Ibidem, 20—30 m, clay, stones, shells, *Laminaria*, *Desmarestia*, red algae, 54 adult animals, 2 adult shells (18 finds); Ibidem, 30—40 m, clay, stones, shells, *Fucus*, *Laminaria*, red algae, 82 adult and young animals, 2 shells (13 finds); Ibidem 40—50 m, stones, shells, red algae, 8 adult animals (4 finds).

*Scoresbysund Area*: Kap Tobin, 17—31 m, *Desmarestia*, *Laminaria*, 3 adult animals, 2 young shells; Ibidem, 107 m, 1 adult animal; N.W. of Kap Brewster, 70°10' N. 22°28' W., 25 m, 1 adult animal; Rosenvinges Bugt, 10—12 m, stones, algae, 44 adult animals, 3 adult shells (3 finds); Amdrup Havn, 3—4 m, *Fucus*, 7 adult animals; Ibidem, 6—10 m, *Laminaria*, about 40 adult animals; Ibidem, 10—18 m, *Fucus*, green algae, about 115 adult animals (2 finds); Ibidem, 22—26 m, *Laminaria*, red algae, 42 adult animals; off the Scoresbysund colony, 7—11 m, *Laminaria*, *Fucus*, about 15 adult animals; Kap Hope, 4½ m, 1 young animal; Ibidem, 6—7 m, stones, *Laminaria*, 1 adult, 2 young animals; Ibidem, 9—13 m, sand, laminarians, 3 adult animals (3 finds); Ibidem,

16 m, 1 adult animal; Off Kap Stewart, 70°27' N. 22°35' W., 13—18 m, stones, mud, algae, 9 adult and young animals; Off the mouth of Hurry Fjord, 30 m, 18 adult animals (3 finds); Ibidem, 30—38 m, sand, algae, about 25 adult animals; Ibidem, 55 m, sand, clay, 1 adult shell; Ibidem, 60—75 m, stones, algae, 1 young animal; Middle part of Hurry Fjord, 14—15 m, laminarians, 5 adult and 2 young animals; Ibidem, 25—25 m, sand, algae, 11 adult and 5 young animals (2 finds); Ibidem, 30—40 m, sand, algae, 3 adult animals; Hurry Fjord off Fame Øer, 4—7 m, soft clay, 10 adult animals (2 finds); Ibidem, 8—12 m, 7 adult animals; Ibidem, 15—22 m, red algae, laminarians, about 75 adult and young animals (3 finds); Ibidem, 22—25 m, about 40 adult animals; Off Kap Hooker, about 150 m, 1 adult animal; S.E. of Danmarks Ø, 10—17 m, clay, and gravel, about 35 adult animals; N.E. of Danmarks Ø, 22 m, soft clay, 1 young shell; Heklas Havn, 17 adult animals; Bjørneøerne, 6—13 m, 5 adult animals; Ibidem, 18—28 m, stones, gravel, algae, 3 adult, 1 young animal; Off Røde Ø, 7—13 m, clay, *Fucus*, about 25 adult and young animals (2 finds); Turner Sund, about 6 m, 8 adult and 6 young animals.

*Kangerdlugssuak Area:* Uttental Sund, 0—10 m, rocks, stones, clay, *Fucus*, *Laminaria*, about 250 adult animals (15 finds); Ibidem, 10—20 m, clay, stones, *Laminaria*, *Desmarestia*, 140 adult animals (11 finds); Ibidem, 20—30 m, clay, red algae, 2 adult and 1 young animal (3 finds); Ibidem, 30—40 m, clay, red algae, 2 adult and 1 young animal (2 finds); 50—60 m, clay, 2 adult and 1 young animal (2 finds); Ibidem, 75—100 m, clay, 1 adult and 1 young animal; Ibidem, 150 m, laminarians, 1 adult animal; Kangerdlugssuak, 5—8 m, stones, 4 adult animals, 1 adult shell (2 finds); Ibidem, 10—25 m, stones, 9 adult animals (3 finds); Ibidem, 40—50 m, 5 adult animals (3 finds); Ibidem, 70 m, stones, 1 adult animal, 1 adult shell; Ibidem, 125 m, 2 adult animals.

*Sydostkyst Area:* Tasiusak at Angmagssalik, 1—10 m, sand, stones, *Fucus*, *Laminaria*, about 45 adult and young animals (6 finds); 10—20 m, clay, sand, algae, crust of red algae, 8 adult and 1 young animal (4 finds); 20—30 m, stones, *Desmarestia*, crust of red algae, 17 adult animals, 2 shells (6 finds); Ibidem, 38—57 m, stones, algae, 6 adult and 1 young animal (2 finds); 50—94 m, 4 adult animals (2 finds); Sermilik off Ikatek, 44 m, laminarians, 5 adult animals; Ibidem 125 m, stones, laminarians, 2 adult and 1 young animal; Sermilik off Epilalak, 5—7 m, clay, *Fucus*, about 40 adult animals; Kungmiut at Angmagssalik, 7—15 m, soft clay, 10 adult animals, 1 adult shell (3 finds); Ikerasausak at Angmagssalik, 0—10 m, *Fucus*, *Laminaria*, 5 adult animals; Kap Dan at Angmagssalik, 11—28 m, rocks, 4 adult animals; Smalsund at Angmagssalik, stones, algae, near the shore, 1 adult animal; Ødesund at Angmagssalik,

9—28 m, stones, algae, 3 adult and 2 young animals; Tiningnekelak at Angmagssalik, 11 m, sand, algae, 11 adult and young animals (2 finds); Tiningnikitok at Angmagssalik, 5 adult animals; Ingmikertok at Angmagssalik, 4 adult animals; Angmagssalik,  $\frac{1}{2}$ —19 m, about 95 adult animals (5 finds); Ibidem, 20—47 m, 1 adult animal, 2 adult shells (3 finds); Angmagsivik, 1—9 m, 13 adult animals; Solo Fjord,  $67^{\circ}17' N.$   $33^{\circ}13' W.$ , littoral zone, rocks and algae, 1 young animal; Ingolf Fjord, about  $66^{\circ}15' N.$ , rocks with algae, 1 young animal; Kap Tordenskjold (about  $61^{\circ}20' N.$ ), 4 m, *Laminaria*, 1 adult and 1 young animal (2 finds); Ibidem, 12 m, clay and algae, 1 young shell; Kutdlik,  $61^{\circ}30' N.$ ,  $42^{\circ}05' V.$ , 13 m, rocks, *Laminaria*, *Alaria*, red algae, 1 adult animal; Naparsarsuak, N. of Kap Tordenskjold, 5—8 m, rocks, *Laminaria*, 1 adult animal; Ibidem, 36 m, muddy sand, *Alaria*, red algae, 1 young animal and 1 young shell (2 finds); Nanusik at Lindenows Fjord, 8 m, sand, mud, algae, 1 young animal; Ibidem, 30 m, clay, gravel, 1 adult shell; Ibidem, 50—60 m, clay, gravel, 1 adult animal. Lindenows Fjord, outer part: 4—10 m, gravel, clay, *Laminaria*, 9 adult and 1 young animal, 2 young shells (4 finds); 15—25 m, clay, *Laminaria*, 11 adult animals (2 finds); 25—35 m, rocks, gravel, *Laminaria*, 13 adult animals (3 finds); 40—50 m, gravel, *Laminaria*, 1 adult animal; 100—150 m, sand, bryzoans, 1 adult shell; Lindenows Fjord, middle part: 6 m, *Laminaria*, 1 young animal, 1 adult shell; 17—30 m, gravel, *Laminaria*, bryzoans, 47 adult and 2 young animals, 2 adult shells (5 finds); 40—50 m, clay, 16 adult and young animals (3 finds); 125—150 m, clay, 1 adult animal; Lindenows Fjord, inner part: 15—25 m, clay, gravel, sand, algae, *Laminaria*, 4 adult and 2 young animals, 1 adult shell (4 finds); 30—50 m, clay, sand, gravel, *Laminaria*, 7 adult and 1 young animal, 1 adult and 1 young shell (6 finds); 82 m, clay, 1 young shell;—Kekertaksiak, 60—70 m, sand, gravel, bryzoans, 1 young animal, 7 shells; Ibidem, 80 m, sand, dead bryzoans, 1 young shell.

*Margarita groenlandica* is by far the most common shallow water prosobranch occurring in East Greenland. It inhabits the whole coast stretch from Danmarks Havn in the N. to Kekertaksiak in S. In the large fjord complexes this species is equally common near the mouth and 250—300 km from the open sea. It is attached to the algal fauna, where *Fucus*, *Laminaria* and *Desmarestia* as well as *Delesseria* and other red algae are favourite plants. The optimum occurrence, judged from the 86 finds in Solitærbugt, Ella Ø, seems to be at between 10 and 30 m depth, but the species is also common at depths less than 10 m, reaching its minimum depth at 3 m. The largest depths in which the species has been found alive in East Greenland are: 40—50 m (Ella Ø), 60—75 m (Hurry Inlet), about 150 m (Kap Hooker and Uttental Sund), 50—94 m (Tasiusak), and 125—150 m (Lindenows Fjord).

Distribution: In the Arctic from W. and E. Greenland, Jan Mayen, Spitzbergen, Arctic Norway, the Murman Coast, the White Sea, the Kara Sea, Novaya Zemlya, the Barents Sea, Franz Joseph Land, Grinnell Land, Parry Isles, Jones Sound, Cumberland Sound, Northumberland Sound, and E. Canada. It extends southwards to the W. coast of Norway, the British Isles, the North Channel, Shetland, the Faroes, Iceland and New England. Main distribution: Panarctic with subarctic outposts. Vertical range: From 0 m (Iceland) to about 300 m (W. Greenland).

Remarks: By far the largest part of the population along the whole coast belongs to the var. *umbilicalis*. Specimens with quite smooth shells are three times as common as specimens with a faintly spiral structure on their shells. The following tables give the measurements of the largest shells (breadth  $\times$  height) of living specimens from different localities along the East Greenland coast:

Outer coast				Inner fjords		
Danmarks Havn, about 120 adult specimens examined	Amdrup Havn, about 250 adult specimens examined	Angmagssalik and Tasiusak, about 260 adult specimens examined	Uttental Sund, about 390 adult specimens examined	Lindenows Fjord, about 125 adult specimens examined	Ella Ø, Solitär-Bugt, about 680 adult specimens examined	Kap Hedlund, 105 adult specimens examined
mm	mm	mm	mm	mm	mm	mm
17.0 $\times$ 15.0	18.3 $\times$ 14.9	20.0 $\times$ 18.0	21.5 $\times$ 16.8	20.5 $\times$ 17.0	20.1 $\times$ 16.0	13.0 $\times$ 8.5
17.0 $\times$ 11.8	16.4 $\times$ 13.9	19.0 $\times$ 17.4	21.5 $\times$ 19.2	20.1 $\times$ 15.0	19.3 $\times$ 14.5	12.9 $\times$ 10.2
16.8 $\times$ 13.5	15.9 $\times$ 12.3	18.9 $\times$ 14.6	20.0 $\times$ 17.1	19.7 $\times$ 15.2	17.5 $\times$ 13.4	12.1 $\times$ 9.3
16.4 $\times$ 13.0	15.9 $\times$ 11.5	18.5 $\times$ 15.8	20.0 $\times$ 15.1	19.5 $\times$ 16.3	16.6 $\times$ 11.8	12.0 $\times$ 9.2
15.4 $\times$ 12.0	15.6 $\times$ 12.7	18.5 $\times$ 13.4	18.6 $\times$ 14.2	18.9 $\times$ 14.8	15.9 $\times$ 12.5	11.2 $\times$ 8.2
15.1 $\times$ 11.0	15.3 $\times$ 12.0	18.0 $\times$ 14.0	18.6 $\times$ 14.0	17.8 $\times$ 14.5	15.2 $\times$ 12.2	11.0 $\times$ 8.0
15.1 $\times$ 11.5	15.3 $\times$ 11.8	18.0 $\times$ 15.1	18.5 $\times$ 13.0	17.8 $\times$ 13.2	15.0 $\times$ 11.2	10.4 $\times$ 8.2
14.9 $\times$ 12.0	15.1 $\times$ 12.0	17.9 $\times$ 14.0	18.0 $\times$ 14.5	17.2 $\times$ 13.0	15.0 $\times$ 10.1	..
14.8 $\times$ 12.5	15.1 $\times$ 12.0	17.6 $\times$ 15.1	17.8 $\times$ 12.8	17.1 $\times$ 13.8	15.0 $\times$ 10.1	..
14.7 $\times$ 11.5	15.1 $\times$ 11.8	17.2 $\times$ 13.8	17.2 $\times$ 13.6	17.0 $\times$ 13.0	14.9 $\times$ 10.4	..
..	15.1 $\times$ 11.5	17.2 $\times$ 13.0	17.2 $\times$ 12.0	16.9 $\times$ 12.5	14.5 $\times$ 10.1	..
..	15.1 $\times$ 13.7	17.0 $\times$ 13.1	17.1 $\times$ 12.2	16.0 $\times$ 11.8	14.4 $\times$ 11.0	..
..	..	..	17.1 $\times$ 13.0	15.8 $\times$ 12.0	14.0 $\times$ 10.1	..
..	..	..	17.0 $\times$ 11.3	..	13.9 $\times$ 10.0	..
..	..	..	17.0 $\times$ 11.2	..	..	..

In order to include the measurements from Kap Hedlund we will compare the average measurements of the seven largest shells from each locality: viz. Danmarks Havn (16.1  $\times$  12.5 mm), Amdrup Havn (16.1  $\times$  12.7 mm), Angmagssalik (18.7  $\times$  15.5 mm), Uttental Sund (19.8  $\times$  15.6 mm), Lindenow's Fjord (19.2  $\times$  15.1 mm), Ella Ø (17.1  $\times$  13.1 mm), and Kap Hedlund (11.8  $\times$  8.8 mm). It will thus be seen that the Kap Hedlund

animals, e. g. the population examined which is most removed from the open sea, are extremely small as compared with those from the other localities. In the very large material (1680 adult animals) from Ella Ø only one animal with a shell breadth of more than 20 mm has been found, and the average given for this large material will undoubtedly prove to be too large, as compared with the other average numbers given above. The result is, therefore, that the largest specimens occur along the outer coast and at depths greater than 20 m. The small specimens from Kap Hedlund have a close resemblance with the type. From Angmagssalik, 0—19 m, we have two anomalous specimens of var. *umbilicalis*, both with scalarid shells measuring  $6.0 \times 5.7$  mm and  $8.1 \times 7.8$  mm respectively.

Many of the specimens from the outer coast as well as from the fjords had tubes of living *Spirorbis* and of bryozoans attached to their shells. Now and then tufts of living algae were also found on the shells.

Biology: Reproduction investigated in E. Greenland (THORSON 1935). Larval development direct, without a pelagic stage. Eggs probably deposited in slimy lumps on algae.

#### 6. *Margarita helicina* (PHIPPS).

*Margarita helicina* ODHNER 1912, pl. 3, figs. 26—34.

##### East Greenland records:

*Trochus helycinus* MÖBIUS 1874, p. 249.

*Margarita helicina* POSSELT 1895, p. 79.

*Margarita helicina* POSSELT & JENSEN 1898, p. 123.

*Margarita helicina* HÄGG 1905, p. 5.

*Margarita helicina* ODHNER 1912, p. 52.

*Margarita helicina* ODHNER 1915, p. 145.

*Margarita helicina* THORSON 1934, p. 7.

*Margarita helicina* THORSON 1935, p. 60, 62—65, figs. 69—70, egg masses.

Occurrence at East Greenland (cf. the map, fig. 3, p. 21).

*Nordøstkyst Area*: The records given by MÖBIUS from Shannon Ø, Sabine Ø, and Jackson Ø are erroneous and must be referred to *Margarita groenlandica* (stated in the incompleting MS. of ADOLF JENSEN).

*Franz Joseph Fjord Area*: Mackenzie Bugt, 12—18 m, mud, 1 adult animal (HÄGG); Ibidem, 12—35 m, mud, 30 animals (HÄGG).

*Scoresbysund Area*: Kap Tobin, 17—31 m, *Laminaria*, *Desmarestia*, 32 adult and young animals; Amdrup Havn, 3—4 m, *Fucus* and other algae, 3 adult and 3 young animals; Ibidem, 14—16 m, *Laminaria*, 1 adult and 3 young animals; Ibidem, 22—26 m, *Laminaria*, red algae, 23 adult animals; Rosenvinges Bugt, 10—12 m, 5 adult animals, 2 adult shells (2 finds); Off the Scoresbysund colony, 7—11 m, *Laminaria*, *Fucus*,

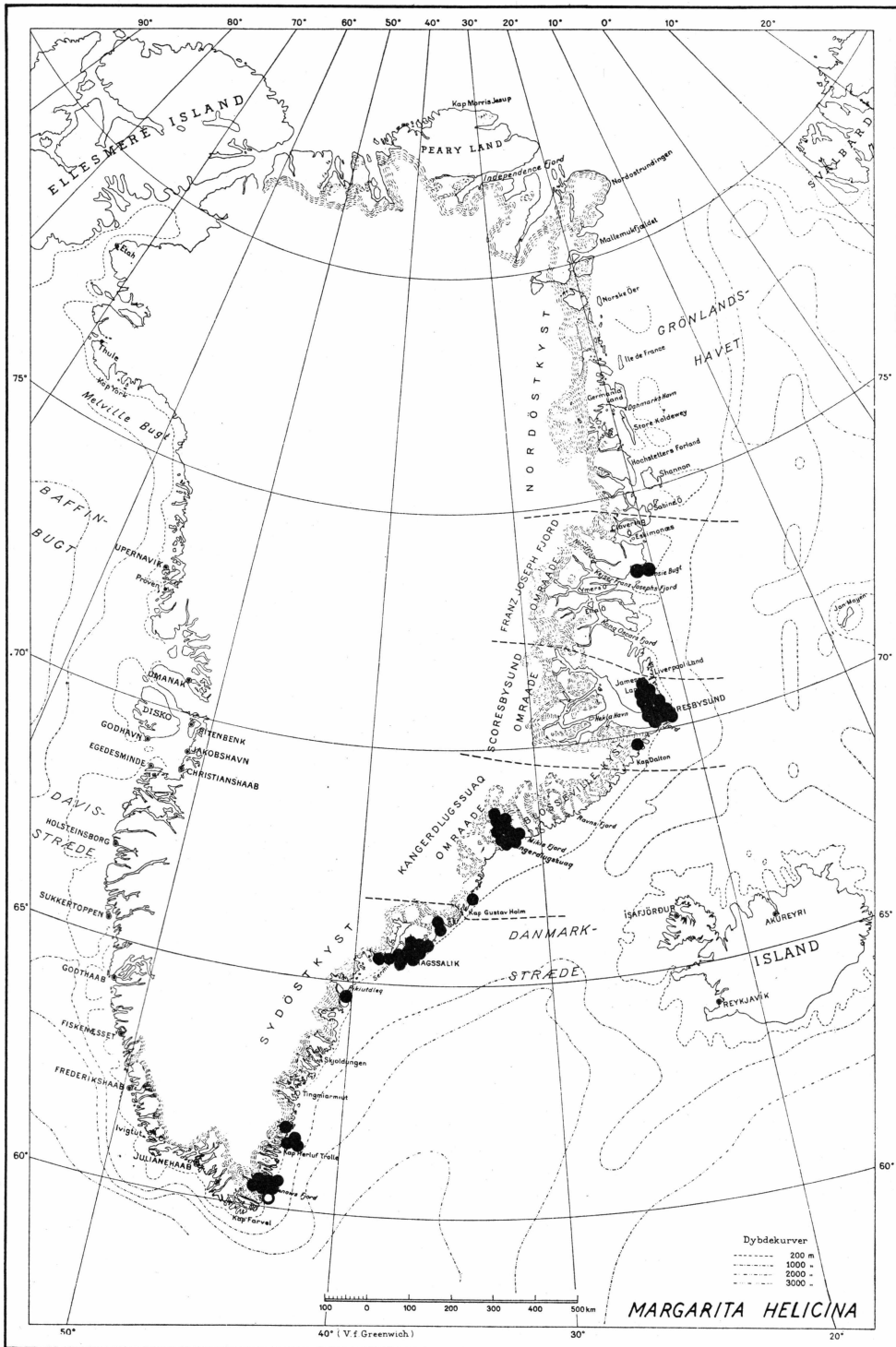


Fig. 3. Distribution of *Margarita helicina* (PHIPPS) along the East Greenland coast. Full circles: Living animals. Open circles: Empty shells.

2 adult and 5 young animals; In the mouth of Scoresbysund, 70°10' N. 22°20' W., 25 m, 2 adult animals; Off Kap Hope, 5—9 m sand, stones, *Laminaria*, 65 adult and young animals; Ibidem, 10—12 m, sand, algae, 14 adult and 1 young animal; Off the mouth of Hurry Fjord, 20—30 m, sand, stones, *Laminaria*, red algae, 17 adult animals (3 finds); Ibidem, 57 m, sandy clay, 1 young animal; Hurry Fjord, 1 mile from the mouth, 3<sup>1</sup>/<sub>2</sub>—4<sup>1</sup>/<sub>2</sub> m, sand, stones, 1 adult animal; Ibidem, 6—15 m, sand, stones, algae, 5 adult and 4 young animals (3 finds); Ibidem, 25—25 m, sand, algae, 12 adult and 3 young animals (2 finds); Ibidem, 35—38 m, *Laminaria*, *Fucus*, red algae, 1 adult animal; Hurry Fjord off Fame Øerne, 4—6 m, gravel, algae, 5 adult animals; Ibidem, 8—12 m, gravel, stones, *Laminaria*, 22 adult animals (2 finds); Ibidem, 15—18 m, clay, red algae, *Laminaria*, 3 adult animals; Turner Sund, 5<sup>1</sup>/<sub>2</sub> m, 5 adult animals.

*Kangerdlugssuak Area*: Uttental Sund, 3—10 m, clay, stones, *Fucus*, *Laminaria*, 73 adult and 3 young animals (8 finds); Ibidem, 15—18 m, *Laminaria*, red algae, 9 adult animals; Kangerdlugssuak, 5—8 m, stones, 9 adult and 2 young animals (2 finds); Ibidem, 25 m, 2 adult animals.

*Sydøstkyst Area*: Solo Fjord, 67°17' N. 33°13' W., 19—28 m, rocks with algae, 4 adult animals; Ingolf Fjord (about 66°15' N.), rocks with algae, 1 adult and 7 young animals; Ødesund, 66°15' N. 35°25' W., 9—28 m, stones, algae, 1 adult animal; Tiningnekelak, 65°56' N. 37°40' W., 2 m, 1 adult and 6 young animals (2 finds); Smalsund, 65°59' N. 35°52' W., stones, algae, 13 adult animals; Kungmiut at Angmagssalik, 19—28 m, 2 adult animals; Tasiusak at Angmagssalik, 1—9 m, stones, *Fucus*, *Desmarestia*, 44 adult and 12 young animals (5 finds); Ibidem, 9—38 m, stones, algae, 4 adult and 2 young animals; Sujunik Kajik, ca. 65°28' N. 39°10' W., on an anchor, 2 adult animals and 2 adult shells; Ikerasarsik, 65°32' N. 38°50' W., from the anchor, 2 adult shells; Kap Tordenskjold, 3—4 m, rocks, *Laminaria*, 24 adult and young animals (3 finds); Naparsarsuak, 9 m, rocks, *Laminaria*, 1 adult animal; Oksefjord, ca. 64°38' N. 40°20' W., 10 m, *Laminaria*, 2 adult and 2 young animals. Lindenow's Fjord, outer part: 4—10 m, gravel, sand, *Laminaria*, 4 adult and 2 young animals (3 finds); 10—15 m, gravel, *Laminaria*, 31 adult and young animals; 22—30 m, *Laminaria*, 2 adult animals (2 finds); Lindenow's Fjord, middle part: 17—25 m, *Laminaria*, 5 adult animals (2 finds); Kekertaksiak, 60 m, gravel and sand, 1 young shell.

The specimens recorded by HÄGG from Mackenzie Bugt seem to have no connection whatever with the main distribution of the species in East Greenland. Apart from these finds *M. helicina* is common from

Lindenow's Fjord in the S. to Scoresbysund in the N.—in the latter locality, however, only near the mouth. From the Franz Joseph Fjord proper and from the Nordøstkyst Area not a single specimen has been found.

**Distribution:** In the Arctic from W. and E. Greenland, Jan Mayen, the Norwegian Sea, Spitzbergen, the Murman Coast, the White Sea, the Kara Sea, Novaya Zemlya, Franz Joseph Land, the Bering Sea, the Aleutians, the Sea of Okhotsk, and Amur. Towards the S. it extends to S. Norway, Bohuslän, the Väderöer, Frederikshavn by Kattegat, the British Isles, the Faroes, and Iceland. **Main distribution:** Pan-arctic-boreal. **Vertical range:** From 0 m (Iceland) to 407 m (Norway).

**Remarks:** The 10 largest East Greenlandic specimens measured (breadth  $\times$  length of shell):  $9.0 \times 8.2$  —  $8.8 \times 6.7$  —  $8.7 \times 7.5$  —  $8.8 \times 7.4$  —  $8.0 \times 6.1$  —  $8.0 \times 5.9$  —  $7.9 \times 5.8$  —  $7.8 \times 7.0$  —  $7.7 \times 6.6$  and  $7.6 \times 6.5$  mm respectively; the largest specimens are those from Uttental Sund. Nearly all adult specimens from Uttental Sund had shells quite overgrown with a crust of bryozoans and tubes of *Spirorbis*.

**Biology:** Reproduction investigated in E. Greenland (THORSON 1935). The eggs are deposited on *Laminaria* and *Fucus* in slimy lumps. Larval development non-pelagic.

#### 7. *Margarita cinerea* (COUTHOUY).

*Margarita cinerea* ODHNER 1912, pl. 4, figs. 28—37, pl. 5, figs. 1—5, pl. 7, figs. 1—4.

##### East Greenland records:

*Margarita cinerea* POSSELT 1895, p. 80.

*Margarita cinerea* var. *grandis* POSSELT 1895, p. 80.

*Margarita cinerea* POSSELT & JENSEN 1898, p. 129—130.

*Margarita cinerea* var. *grandis* POSSELT & JENSEN 1898, p. 131.

*Margarita cinerea* HÄGG 1905, p. 13.

*Margarita cinerea* Var. *grandis* HÄGG 1905, p. 14.

*Margarita cinerea* ODHNER 1912 p. 64.

*Margarita cinerea* ODHNER 1915, p. 151.

*Margarita cinerea* THORSON 1934, p. 7.

*Margarita cinerea* THORSON 1935, p. 60—62, figs. 67—68, egg-capsules.

Occurrence at East Greenland (cf. the map, fig. 19, p. 132).

**Nordøstkyst Area:** S. of lille Pendulum Ø,  $74^{\circ}35' N.$   $18^{\circ}23' W.$ , 18—21 m, sandy mud, algae, 1 adult and 1 young animal, 1 adult shell; S.E. of Pendulum Ø,  $74^{\circ}35' N.$   $18^{\circ}15' W.$ , 300 m, stones, sand, 5 animals, 1 shell (HÄGG); Pendulum Øer, 2 animals (ODHNER); Sabine Ø,  $5\frac{1}{2}$ —9 m, *Laminaria*, 4 adult and 2 young animals.

**Franz Joseph Fjord Area:** Sandø in Tyroler Fjord, in stomach of eider duck, 1 adult animal partly digested; S.E. of Clavering Ø,  $74^{\circ}10' N.$

20°08' W., 25—40 m, mud, shells, pebbles, 1 young animal; Clavering Ø, in stomach of eider duck, 3 adults and 1 young animal; Eskimonæs at Clavering Ø, 10—14 m, sandy clay, 1 adult, 1 young animal; Ibidem, 38—41 m, brown algae, 1 young animal; Ibidem, clay and gravel, 50—55 m, 1 young animal; Off Kap Stosch, 15 m, 2 adult animals; E. of Jackson Ø, 73°55' N. 19°20' W., 150 m, mud, 1 animal (HÄGG); Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 1 adult animal (HÄGG); Ibidem 12—35 m, mud, 80 animals (HÄGG); Ibidem, 12—18 m, mud, 42 animals (HÄGG); Ibidem, 1 animal (ODHNER); Kap Bennet, 73°26' N. 21°13' W., 9—11 m, mud, algae, 3 adult animals; Moskusokse Fjord, 15 m, 6 adult animals, 7 shells; Kong Oscars Fjord, 72°56' N. 24°33' W., 125 m, mud, sand, pebbles, 1 young animal; Forsblads Fjord, 94—170 m, 2 shells; E. of Greenland, 72°25' N. 17°56' W., 300 m, stones, sand, 1 animal (HÄGG).

*Scoresbysund Area:* In the mouth of Hurry Fjord, 19 m, 1 adult animal, 1 adult shell; Ibidem, 153 m, clay, gravel, 1 young animal; Hurry Fjord, 1 mile from the mouth, 13—15 m, sand, stones, gravel, *Laminaria*, 2 adult and 2 young animals (2 finds); Ibidem, 25—25 m, sand, algae, 1 adult animal; Ibidem, 60—75 m, stones, algae, 1 adult animal; Hurry Fjord at Fame Øer, 8—12 m, stones, gravel, *Laminaria*, 1 adult animal; Ibidem, 18—24 m, clay, 5 adult animals (2 finds); Ibidem, 23—25 m, hard clay, 1 animal (ODHNER); "Hurry Fjord", 19 m, clay, 1 young animal; Ibidem, 95 m, 2 young animals; Kap Stewart, 70°27' N. 22°35' W., 13—18 m, mud, stones, algae, 2 adult animals; Ibidem, 4 animals (ODHNER); Off Kap Hooker, 140 m, sand and clay, 1 young animal; 8 miles W. of Kap Hooker, 12 m, sand and clay, 2 adult animals; Jamesonland off Bjerne Øer, 10—10 m, sandy clay, 1 young animal; Hekla Havn, 10 adult animals and 5 adult shells.

*Kangerdlugssuak Area:* Uttental Sund, 8—15 m, clay, 3 adult animals (3 finds); Ibidem, 20—25 m, clay, red algae, 9 adult animals (3 finds); Ibidem, 50 m, clay, 1 adult animal; Ibidem, 70—100 m, clay, 1 adult animal; Kangerdlugssuak, 10—15 m, sand, 1 adult animal, 1 shell (2 finds); Ibidem, 50 m, 5 adult animals (2 finds).

*Sydøstkyst Area:* Ikerasausak, 65°58' N. 37°27' W., 1—10 m, *Fucus*, *Laminaria*, 1 adult animal; Ingmikertok, 65°45' N. 36°58' W., 1 young animal; Angmagsivik, 65°58' N. 37°02' W., sublittoral region, 1 adult animal; Tasiusak at Angmagssalik, 50—95 m, 3 adult animals (2 finds); Sermilik off Ikatek, 44 m, *Laminaria*, 3 adult animals; Kap Tordenskjold (about 30 m from a glacier), sandy clay, 1 young animal; Nanusik at Lindenow's Fjord, 50—60 m, gravel, clay, 1 young shell; Lindenow's Fjord, outer part: 15—25 m, clay, *Laminaria*, 3 adult and 2 young animals, 1 shell (4 finds); Ibidem, 25—35 m, *Laminaria*, 2 adult animals;

Ibidem, 48—70 m, clay, 2 adult shells (2 finds); Ibidem, 100—150 m, sand, bryozoans, 1 adult animal; Lindenow's Fjord, middle part: 20—30 m, gravel, *Laminaria*, 9 adult and 1 young animal; Lindenow's Fjord, inner part, 15—30 m, sand, clay, gravel, algae, 38 adult and 2 young animals (5 finds); Ibidem, 30—50 m, sand, clay, gravel, 1 adult animal, 1 adult shell (2 finds); Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 1 adult and 4 young animals, 1 young shell (3 finds).

This species is in East Greenland attached to the outer coast, where it is found from Pendulum Ø in the N. to Lindenow's Fjord in the S. It has never been seen in living specimens from the inner areas of Franz Joseph Fjord and Scoresbysund. The specimens from Hekla Havn, Scoresbysund seem to be dubious and are probably due to the changing of a label. Thus the variety reported from this locality has for the rest only been reported on the coast stretch from Angmagssalik southwards, and the locality proper, Hekla Havn, seems to be without any connection with the main distribution of the species. As furthermore this species has not been found in the large material from the inner part of Scoresbysund secured during recent years, it seems to me most likely that the Hekla Havn specimens have been labelled erroneously.

*Margarita cinerea* in East Greenland is present in two distinct varieties, viz. one with a fine and one with a very coarse shell-structure. On an average two fine-structured specimens are met with for each of the coarse-structured ones. The latter, however, are only found from Lindenow's Fjord in the S. to Angmagssalik in the N., while the fine-structured specimens are common along the whole outer coast.

The minimum depth from which living specimens with certainty have been stated in East Greenland is 8 to 9 m (Sabine Ø, Hurry Fjord, Uttental Sund) and the maximum depth for living specimens is 300 m (72°25' N. 17°56' W. (HÄGG)). The substratum is stones and algae, especially *Laminaria*.

Distribution. In the Arctic from W. and E. Greenland, Jan Mayen, W. of Norway, Finmarken, the Murman Coast, the White Sea, Novaya Zemlya, the Kara Sea, the Barents Sea, Spitzbergen, Franz Joseph Land, the Bering Sea, Alaska, Grinnell Land, North Devon, E. Canada, New England and Cape Cod. Lofoten, Bergen, Iceland, and Mexico are the southernmost localities. Main distribution: Pan-arctic. Vertical range: From 8 m (E. Greenland) to 660 m (W. of Norway).

The ten largest living East Greenland animals measured (breadth × height of shell): 20.2 × 18.3 — 19.0 × 18.8 — 18.8 × 17.0 — 18.7 × 17.8 — 18.5 × 18.2 — 15.8 × 15.1 — 15.8 × 14.8 — 15.8 × 14.3 — 15.4 × 14.1 and 15.0 × 13.5 mm respectively. The shells are not nearly so overgrown

as those of *Margarita helicina*, but a few specimens with tubes of *Spirorbis* and with tufts of algae on the shells have been found.

Biology: Reproduction known from E. Greenland (THORSON 1935). Eggs deposited in slimy lumps on algae. Larval development non-pelagic.

#### 8. *Margarita vahlii* MØLLER.

*Margarita vahlii* ODHNER 1912, pl. 3, figs. 35—40, pl. 6, figs. 6—7.

East Greenland records:

*Margarita vahlii* THORSON 1935, p. 60.

Occurrence at East Greenland (cf. the map, fig. 25, p. 138):

*Nordøstkyst Area*: "Øresund" at Danmarks Havn, 28—38 m, *Delesseria* and hydroids, 1 adult animal. *Franz Joseph Fjord Area*: W. of Kap Mary at Clavering Ø, 21 m, stones, 1 adult animal; Off Kap Weber, 73°32' N. 24°38' W., 100—110 m, mud, gravel, stones, 1 adult animal. *Scoresbysund Area*: Off the mouth of Hurry Fjord, 140 m, clay, and sand, 1 adult shell; Hurry Fjord at Fame Øerne, 15—18 m, clay, red algae, *Laminaria*, 1 adult animal. *Kangerdlugssuak Area*: Henry Ø, about 69° N., 38 m, 1 young animal; Uttental Sund, 8—10 m, clay, 1 adult animal; 10—14 m, clay, 1 adult animal; 50—60 m, clay, 1 adult shell. *Sydøstkyst Area*: Lindenow's Fjord, 30 m, *Laminaria*, 1 adult animal; Kekertaksiak, 75—90 m, gravel and stones, 1 young animal.

The species is found in scattered specimens along the outer coast from Danmarks Havn in the N. to Kekertaksiak in the S. but seems to be absent from the two large fiord areas. The vertical range in East Greenland for living specimens is from 8 to 110 m, and the species seems to live on the level sea bottom as well as among stones and algae.

Distribution: The Parry Islands, W. and E. Greenland, Spitzbergen, White Sea, Bering Sea, and Puget Sound. Main distribution: Higharctic, with lowartic outposts. Vertical-range: From 8 m, (E. Greenland) to 585 m, (Greenland).

The two largest East Greenlandic specimens measured (breadth × height of shell): 3.4 × 4.0 and 3.2 × 3.8 mm respectively.

Biology: Unknown.

#### 9. *Margarita olivacea* (BROWN).

*Margarita olivacea* ODHNER 1912, pl. 3, figs. 41—46, pl. 4, figs. 1—3, pl. 6, figs. 8—13.

East Greenland records:

*Margarita olivacea* POSSELT 1895, p. 79.

*Margarita olivacea* POSSELT & JENSEN 1898, p. 125.

*Margarita olivacea* HÄGG 1905, p. 7—8.

*Margarita olivacea* ODHNER 1912, p. 55.

*Margarita olivacea* ODHNER 1915, p. 146.

*Margarita olivacea* THORSON 1935, p. 60.

Occurrence at East Greenland (cf. the map, fig. 18, p. 131).

*Nordøstkyst Area:* Danmarks Havn, 0—11 m, sandy clay, *Laminaria*, 6 adult and 3 young animals (3 finds); Ibidem, 150 m, *Delesseria*-region, 1 adult animal; S.E. of Sabine Ø, 207 m, 1 adult animal; Kap Barlase Warren, 19 m, 1 young animal.

*Franz Joseph Fjord Area:* Eskimonæs at Clavering Ø, 38—41 m, clay, gravel, 1 adult animal; 50—55 m, clay and gravel, 1 adult animal; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 3 animals (HÄGG); Ibidem, 12—18 m, mud, 7 animals (HÄGG); Ibidem, 12—35 m, mud, 4 animals (HÄGG); Moskusoksefjord, outer part, 220 m, clay, 1 adult animal (HÄGG); Moskusoksefjord off Mt. Anker valley, 17—21 m, clay with stones; 1 mile E. of Kap Graah, 73°16' N. 23°15' W., 28—36 m, shells, stones, gravel, sand, 1 fragmentary shell; The mouth of Dusénfjord off Kap Graah, 15—30 m, 5 adult animals; Off the mouth of Rhedinfjord, 23—30 m, clay, red algae, *Fucus*, 4 adult animals (2 finds); Carl Jacobsen Bugt at Ymer Ø, 14 m, clay, 4 young animals, 2 adult shells; Solitærbugt at Ella Ø, 31 m, 2 adult animals; Forsblads Fjord, 94—170 m, 6 adult shells (probably subfossil).

*Scoresbysund Area:* Off the mouth of Hurry Fjord, 140—142 m, clay and stones, 4 shells (2 finds); Hurry Fjord, 1 mile from the mouth: 35—38 m, 3 animals; 60—75 m, clay, algae, stones, 1 adult animal; Hurry Fjord, middle part: 7—10 m, clay, 1 adult animal; 18—22 m, clay, 1 adult animal; Hurry Fjord off Fame Øerne: 9 m, mud and algae, 2 adult animals; 15—24 m, clay, 5 adult animals (3 finds); Off Kap Stewart, 70°27' N. 22°35' W., 13—18 m, mud, stones, algae, 1 adult animal; Jamesonland opposite Kap Leslie, 22 m, sandy clay, 2 adult animals (2 finds); Section from Kap Leslie to Jamesonland, 385 m, soft clay, 1 adult animal; Section from Kap Stephenson to Kap Leslie, 120 m, clay, 1 adult animal; Nordbugt in Nordvest Fjord, 25 m, soft clay, 1 adult animal; Off Røde Ø in Røde Fjord, 13—18 m, clay, gravel, 1 adult animal; N.E. of Danmarks Ø, 20 m, clay, 1 adult shell; Hekla Havn at Danmarks Ø, 1 adult animal, 1 adult shell (POSSELT); Kap Dalton, 17—21 m, 2 young animals, 2 shells; Turner Sund, 5 m, 1 young animal; Henry Ø, 38 m, stones, 1 adult shell.

*Kangerdlugssuak Area:* Uttental Sund: 10—15 m, clay and *Desma-restia*, 6 adult animals (3 finds); 20—25 m, clay, red algae, 3 adult animals (2 finds); 40—45 m, clay and red algae, 6 adult animals (3 finds); 50—60 m, 1 adult animal; Kangerdlugssuak, 2 adult animals, 4 adult shells;

Solo Fjord, 67°17' N. 33°13' W., 19—28 m, rocks with algae, 1 young animal.

*Sydøstkyst Area*: Off Angmagssalik, 264 m, stones, 1 young shell; Sermilik off Ikatek, 44 m, *Laminaria*, 2 adult animals.

*Margarita olivacea* is common from Danmarks Havn in the N. to Angmagssalik in the S. It inhabits the two large fjord areas from the mouths to the innermost ramifications. In the large material of proso-branches from Kap Tordenskjold to Lindenow's Fjord not a single specimen was found, and the species seems thus to be absent from the S.E. coast. In our collections the type is much more common than the var. *gigantea* LECHE. The species is in East Greenland associated with the level sea bottom at depths from 5 m (Turner Sund) to 385 m (Between Jamesonland and Kap Leslie).

**Distribution**: In the Arctic from W. and E. Greenland, Iceland, Spitzbergen, Arctic Norway, the Murman Coast, the Kara Sea, the Barents Sea, Novaya Zemlya, the White Sea, the Siberian Arctic Sea, the Bering Strait, Grinnell Land, Jones Sound, North Devon, and Parry Isles. Towards the S. it extends to New England, Cape Cod, Scotland and the Hebrides. **Main distribution**: Panarctic with subarctic outposts. **Vertical range**: From about 5 m (E. Greenland) to 385 m, (E. Greenland).

**Remarks**: The largest living East Greenlandic animals measured (breadth × height of shell) 7.4 × 6.5 — 7.1 × 6.1 — 7.0 × 6.9 — 7.0 × 6.7 — 6.9 × 6.1 — 6.4 × 5.6 — 6.0 × 6.0 — 6.0 × 5.9 — 6.0 × 5.8 and 6.0 × 5.4 mm respectively. The largest specimens found are from Uttental Sund. One specimen bore living crusts of bryozoans, and another tubes of *Spirorbis* on its shell.

**Biology**: Unknown.

#### 10. *Solariella obscura* (COUTHOUY).

*Solariella obscura* ODHNER 1912, pl. 5, fig. 24.

##### East Greenland records:

*Solariella obscura* var. *bella* ODHNER 1912, p. 72.

*Solariella obscura* var. *bella* GRIEG 1914, p. 8.

Occurrence at East Greenland (cf. the map, fig. 16, p. 129).

*Nordøstkyst Area*: 75°58½' N. 14°08' W., 300 m, brown and grey clay, 1 "adult specimen" (GRIEG).

*Franz Joseph Fjord Area*: S. of Ruths Ø, about 125 m, mud, sand, pebbles, 1 shell (ODHNER).

*Scoresbysund Area*: Kap Dalton, 17—21 m, 1 young animal.

The species seems to be rare in East Greenland, though recorded at the outer coast as well as in the fiord areas. From the two southernmost areas in East Greenland there are no finds. The specimen from Kap Dalton had a yellowish-white colour and agrees rather closely with pl. 5, fig. 17 in ODHNER (1912) e. g. the var. *intermedia* LECHE. The underside is without coarse spiral stria, the overside with soft radial folds. The specimen from 75°58½' N. and from Ruths Ø belongs to the var. *bella* VERKRÜZEN.

Distribution: In the Arctic from E. Greenland, Jan Mayen, Spitzbergen, Arctic Norway, the Murman Coast, the Barents Sea, the Kara Sea, Novaya Zemlya, Kolguev, the Siberian Arctic Sea, the Bering Sea, the Aleutians, Sitcha, and E. Canada. Towards the S. it extends to Lofoten, Iceland, the deep sea between the Hebrides and Faroes, and New England. Main distribution: Panarctic with subarctic outposts. Vertical range: From 4 m (Kara Sea) to 917 m (New England).

Remarks: The three specimens from East Greenland measured (breadth × height of shell): 2.9 × 2.3 mm (Kap Dalton)—2.5 × 2 mm (75°58½' N.) and 1.9 mm in breadth (Ruths Ø).

Biology: The eggs and breeding habits are unknown, but the embryonic whorl is of precisely the same shape and size as in *Margarita cinerea*, which has a pronounced non-pelagic development. A similar non-pelagic development is therefore to be expected for *Solariella obscura*.

#### 11. *Moelleria costulata* (MØLLER).

*Mølleria costulata* G. O. Sars 1878, pl. 9, figs. 8 a—c.

East Greenland records:

*Mølleria costulata* POSSELT 1895, p. 79.

*Moelleria costulata* POSSELT & JENSEN 1898, p. 122.

*Moelleria costulata* ODHNER 1912, p. 75, pl. 5, figs. 43—44.

*Moelleria costulata* ODHNER 1915, p. 152.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Off the S.W. part of Clavering Ø, 25—40 m, mud, sand, shells, stones, 2 "specimens" (ODHNER); In the mouth of Dusénfjord, off Kap Graah, 15—30 m, clay, red algae, *Desmarestia*, 1 adult animal; Solitærbugt at Ella Ø, 8—10 m, clay, *Desmarestia*, 1 adult animal; *Scoresbysund Area*: Hekla Havn at Danmarks Ø, depth?, 1 adult animal (POSSELT, and re-examined).

The species has thus been reported from the two large fjord areas only e. g. from the localities from which the most complete collections

are at hand. Future investigations will no doubt prove that this species occurs along the whole coast from Danmarks Havn to Kap Farvel. The vertical range in East Greenland is from 8 to 40 m.

Distribution: Norway (from Lofoten to Vadsø), the Murman Coast, the White Sea, Franz Joseph Land, S.W. Greenland, E. Greenland, Spitzbergen, E. Canada, Iceland, the Faroes (shells only), N.E. of Shetland, and at Bohuslän. The Gulf of Gascogne, E. of Morocco, off Portugal, St. Thomas, and New England are its southern limits. Main distribution: Throughout the N. Atlantic, especially associated with great depths. Vertical range: From  $7\frac{1}{2}$  m (E. Canada) to 1943 m (off Morocco).

The four East Greenlandic specimens measured (breadth  $\times$  height of shell):  $2.6 \times 2.3$  —  $2.4 \times 2.0$  —  $2.4 \times 1.9$  and  $1.9 \times 1.4$  mm respectively. The specimens from Dusénfjord and Ella Ø had a "rusty" periostracum, that from Dusénfjord had further a living foraminifera attached to its shell.

Biology: Unknown.

#### 12. *Cyclostrema trochoide* (JEFFREYS) FRIELE.

*Cyclostrema trochoide* G. O. SARS 1878, pl. 8, fig. 9.

Occurrence at East Greenland: *Scoresbysund Area*: Off the mouth of Hurry Fjord, 140 m, clay, 2 adult shells; *Ibidem*, 145 m, clay, 1 adult fragmentary shell; "Hurry Fjord", 94 m, 1 adult shell. *Kangerdlugssuak Area*: Uttental Sund, 50—60 m, clay, 1 adult animal, 1 adult shell.

The large number of samples taken with the bottom grab from the inner part of Scoresbysund and Franz Joseph Fjord have never contained any specimens of this species, in spite of the suitability of the grab for this very purpose. After this there can hardly be any doubt that *C. trochoide* in East Greenland must be regarded as an inhabitant of protected localities along the outer coast. All the specimens found had a closed umbilicus and a quite smooth shell, thus belonging to the type form.

*Cyclostrema trochoide* is new to the Greenland fauna.

Distribution: (typical form as well as var. *petterseni* included). E. Greenland, Norway (from Lofoten northwards), W. of Norway, Bear Island to Norway, Skagerrak, Iceland (dead spec.), the Murman Coast. Further: Gulf of Gascogne, S. of Cape Mondego (Portugal), Cape Hatteras, and the Antilles. Main distribution: Throughout the N. Atlantic at greater depths. Vertical range: From 19 m (Vardø in Norway) to 1960 m (Gulf of Gascogne).

Remarks: The only living specimen found measured (breadth  $\times$  height of shell):  $2.9 \times 2.2$  mm. The empty shells measured:  $3.0 \times 2.5$  —  $2.8 \times 2.5$  —  $2.7 \times 2.6$  and  $2.6 \times 2.3$  mm respectively.

Biology: Unknown.

### 13. *Cyclostrema laevigatum* (JEFFREYS) FRIELE.

*Cyclostrema laevigatum* G. O. Sars 1878, pl. 21, fig. 2 a—b.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Forsblads Fjord, 94—170 m, 1 adult animal, 1 adult and 1 young shell.

The species is new to the Greenland fauna.

Distribution: Norway (from Lofoten to Bergen), between the Hebrides and the Faroes, N. of the Hebrides, W. and S. Iceland, Spitzbergen, E. Greenland. The few localities seem to indicate that the main distribution is subarctic (boreo-arctic). Vertical range: From 38 m (Bergen) to 330 m (Lofoten).

Remarks: The single living specimen measured (breadth  $\times$  height of shell):  $1.7 \times 1.2$  mm. The adult, empty shell measured  $1.5 \times 1.2$  mm. The embryonic whorl as well as the first ordinary whorl in the living specimen was not glossy, the last whorl was somewhat glossy and of a milky-white colour.

Biology: Unknown.

### 14. *Littorina saxatilis* (OLIVI).

*Littorina saxatilis* DAUTZENBERG & FISCHER 1912, pls. 9—10.

East Greenland records:

*Littorina rudis* Var. *grønlandica* POSSELT 1895, p. 88.

*Littorina rudis* var. *grønlandica* POSSELT and JENSEN 1898, p. 232.

Occurrence at East Greenland (cf. the map, fig. 15, p. 128): *Sydøstkyst Area*: Tasiusak at Angmagssalik: in the littoral zone, 5 adult animals; 1—9 m, 1 adult and 6 young animals; 6—10 m, stones, algae, 1 adult animal; 11—57 m, mud, 2 adult animals; Ibidem, off the "Strømsted", 9 young animals; Tunok at Angmagssalik, in the littoral zone, 2 adult and 1 young animal; Tiningnekelak at Angmagssalik, 2 m, 1 young animal, 1 adult shell; Sarfakfik at Angmagssalik, on stones, 14 adult animals; Kungmiut at Angmagssalik, 10—15 m, 1 young animal; Kap Dan Øer at Angmagssalik, shallow water, algae, 2 young animals; "Angmagssalik", in the littoral zone, 57 adult and young animals (4 finds); Naparsarsuakfjord, N. of Kap Tordenskjold; littoral zone, stones

with *Fucus*, about 145 adult and young animals; Off Kap Tordenskjold, 5 adult and 3 young animals; Nanusik at Lindenow's Fjord, 46 m, sand, algae; 1 adult animal; Lindenow's Fjord, near the mouth, 7 m, greyish clay, 1 young fragmentary shell.

*Littorina saxatilis* seems thus to be common along the whole S.E. coast from Angmagssalik in the N. to Lindenow's Fjord in the S. The greatest depth from which living specimens are known with certainty in E. Greenland is 46 m, but by far the largest number of the animals has been collected in the tidal zone attached to stones and algae.

Distribution: The whole Norwegian coast, Kattegat, the Sound, the British Isles, W. coast of Europe, the Mediterranean, the Black Sea. Further, it lives at the Faroes, Iceland, W. and S.E. Greenland, Spitzbergen, the Siberian Arctic Sea, Japan, N.W. America, Labrador, Newfoundland, Massachusetts, and New England. Main distribution: The Mediterranean, N. Atlantic, and N. Pacific. Vertical range: From 0 m (Iceland, Faroes, Denmark) to 94 m (W. Greenland).

Remarks: The 12 largest E. Greenland animals measured (breadth  $\times$  height of shell):  $14.4 \times 18.8$  —  $11.7 \times 15.2$  —  $10.7 \times 15.1$  —  $10.1 \times 12.8$  —  $10.1 \times 12.5$  —  $10.0 \times 13.1$  —  $10.0 \times 12.3$  —  $9.2 \times 12.7$  —  $9.1 \times 12.2$  —  $9.1 \times 12.1$  —  $8.9 \times 11.7$  and  $8.8 \times 12.0$  mm respectively. The colours of the shells varied from yellowish-brown, brown and reddish-brown to greyish-brown and grey with white bands or dots. They all belong to the var. *groenlandica* MÖLLER. The 16 young specimens from Tasiusak, all from the summer 1902, seem according to shell size to group in at least 5 distinct generations. Judging from these results there can hardly be any doubt, that the largest adult specimens are at least 6 years old.

Biology: The species is viviparous. Nearly all adult females contain embryos in the oviduct (only specimens collected in the summer are in our collections). These embryos hatch in the crawling stage, e. g. without any pelagic stage.

#### 15. *Cingula castanea* (MÖLLER).

*Cingula castanea* G. O. SARS 1878, pl. 10, fig. 2 a—b.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Eskimonæs at Clavering Ø, 4—6 m, brown and green algae, gravel, 4 adult and 1 young animal; Dusénfjord, inner part 4—10 m, *Desmarestia*, soft clay; Solitærbugt, Ellæø, 10—15 m, fowling *Fucus*, 1 young animal; Ibidem, 31 m, clay, 1 adult animal (living?). — *Scoresbysund*

*Area:* Off Kap Hope, 4<sup>1</sup>/<sub>2</sub> m, sand, algae, 1 adult animal; Ibidem, 10—13 m, sand, *Laminaria*, 1 young animal; Hurry Fjord, the mouth, 21 m, sand and fowling algae, 1 adult animal; Hurry Fjord, 1 mile from the mouth, 14—15 m, sand, 4 adult shells (3 finds); Hurry Fjord off the Fame Øer, 4—6 m, gravel, algae, 2 adult animals. — *Sydøstkyst Area:* Tasiusak at Angmagssalik, 11—19 m, 1 young animal; Tiningnekelak at Angmagssalik, 2 m, 1 adult and 1 young animal.

*Cingula castanea* was not hitherto known from E. Greenland. The species has its optimum occurrence along the outer coast in the sand and algae zones on quite shallow water. In the inner parts of the fiords (e. g. Ellaø) it seems to leave the tidal zone and inhabit somewhat deeper water. Vertical range for livings specimens in East Greenland: 2 m (Tiningnekelak) to 31 m (Ellaø). Nearly all the specimens had a pale greyish-horn colour with dark-brown lines of growth.

*Distribution:* Norway (only at Vadsø), Davis Strait, W. Greenland (from Godthaab to Prøven), E. Greenland, Spitzbergen, N. and E. Iceland, Russian Lapmark, Matotschin Schar, Gulf of St. Lawrence, New Brunswick, and New Foundland. Main distribution: Low arctic. Vertical range: 2 m (E. Greenland) to 132 m (Davis Strait).

*Remarks:* The largest living specimens from E. Greenland measured (breadth × height of shell): 2.8 × 4.1 — 2.4 × 3.9 — 2.4 × 3.7 — and 2.2 × 3.6 mm respectively. Several animals had tufts of living algae on their shells.

*Biology:* Unknown.

#### 16. *Cingula mörchi* COLLIN.

*Cingula Mörchii* COLLIN 1886, p. 454, pl. 15, fig. 5 a—b.

*Cingula mörchi* THIELE 1929, pl. 10, fig. 1.

*Occurrence at East Greenland:* *Franz Joseph Fjord Area:* Forsblads Fjord, 95—170 m, 1 young animal, 2 adult and 2 young shells. The species is here recorded for the first time not only from E. Greenland but from the whole Greenlandic coast.

*Distribution:* E. Greenland, Spitzbergen, Kara Sea. Vertical range: 95 m (Kara Sea) to 95—170 m (E. Greenland).

*Remarks:* The two largest (empty) shells from East Greenland measured (breadth × height of shell): 2.4 × 3.1 and 2.2 × 2.9 mm respectively.

*Biology:* Unknown.

17. *Cingula arenaria* (MIGH. & ADAMS).

*Rissoa mighelsi* GOULD & BINNEY 1870, p. 301, fig. 570.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Forsblads Fjord, 95—170 m, 1 adult animal (living?). — *Scoresbysund Area*: Off Kap Tobin, 17—31 m, *Laminaria*, *Desmarestia*, 1 adult animal; Turner Sund, about 69°44' N., 5½ m, 1 adult animal; Henry Land, about 69°35' N., 38 m, stones, 1 adult animal, 2 adult shells. — *Kangerdlugssuak Area*: Uttental Sund, 6—9 m, *Laminaria*, 2 adult shells. — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 6—8 m, mud, *Desmarestia*, 1 adult animal; Ingmikertok at Angmagssalik, depth?, 2 adult animals, 2 adult shells; Kutdlik, N. of Kap Tordenskjold, 13 m, rocks, *Alaria*, *Laminaria*, red algae, 1 adult animal; Naparsarsuak, N. of Kap Tordenskjold, 15 m, rocks, *Laminaria*, 1 adult animal; Lindenow's Fjord, outer part, 4 m, gravel, *Laminaria*, 2 adult animals; Ibidem, 8 m, gravel, sand, 1 adult shell; Ibidem, 90 m, sand, 1 adult shell.

*Cingula arenaria* is here recorded from E. Greenland for the first time. It seems to inhabit both the outer coast and the inner part of the fjords from Franz Joseph Fjord in the N. to Lindenow's Fjord in the S. Vertical range for living specimens at East Greenland: 4 m (Lindenow's Fjord) to 38 m (Henry Land) (or 170 m?, Forsblads Fjord). All the specimens are of the typical shape, those taken South of Angmagssalik, however, with somewhat more pronounced radial ribs than those from the northern areas.

Distribution: Norway (at Vadsø only), Iceland, (Bohuslän?), W. and E. Greenland, Spitzbergen, Newfoundland, and Casco Bay. Further: S. Atlantic (37°25'30" S. lat. 12°28'30" W. long.), and Tristan da Cunha. The few finds indicate the main distribution as Arctic-Antarctic and Atlantic-abysal. Vertical range: 4 m (E. Greenland) to about 190 m (Tristan da Cunha).

Remarks: The largest living animals from East Greenland measured (breadth × height of shell): 1.7 × 3.1 — 1.6 × 3.0 and 1.4 × 2.5 mm respectively. The animal from Henry Land had a tuft of living algae on its shell, and the animal from Tasiusak had the shell covered with tubes of *Folliculina*.

Biology: Unknown.

18. *Liostomia eburnea* (STIMPSON).

*Liostomia eburnea* ODHNER 1915, p. 174, pl. 1, fig. 10.

Occurrence at East Greenland: *Nordøstkyst Area*: Sabine Ø, 5½—9½ m, 1 adult animal with a much eroded apex.

The East Greenland specimen, here recorded for the first time, strongly recalls the figure given by ODHNER (pl. 1, fig. 10) and the drawing by SARS (1878).

Distribution: Grand Manan Island, Gulf of St. Lawrence, W. and E. Greenland, Spitzbergen (dead), East Finmarken. Main distribution: High-arctic with low-arctic outposts. Vertical range:  $5\frac{1}{2}$ — $9\frac{1}{2}$  m (E. Greenland) to 126 m (St. Lawrence Gulf).

Remarks: Our specimen measures 2.3 mm in breadth and 3.8 mm in height of shell.

Biology: Unknown.

#### 19. *Onoba aculeus* (GOULD).

*Onoba aculeus* G. O. SARS 1878, pl. 8, fig. 12 a—b.

*Onoba striata* H. MADSEN 1936, p. 12.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: N. of Kap Biot, 115 m, hard clay with gravel and stones, 1 adult shell with a well preserved periostracum. *Sydøstkyst Area*: Tasiusak at Angmagssalik, 1—10 m, 138 adult animals; Ibidem, in a place with strong current, depth?, about 430 adult animals; Kilifilik at Tasiusak, on *Fucus vesiculosus*, 1 adult animal; Tiningnekelak, Sermilik, about 11 m, 1 adult and 3 young animals.

*O. aculeus* seems to be common in suitable shallow watered localities along the Sydøstkyst. In the Scoresbysund and Franz Joseph Fjord areas it has hardly been overlooked in the numerous shallow water samples, and the only specimen found from these areas—although dead—originates from deeper water. All the specimens known are typical. The species is new to East Greenland.

Distribution: Throughout Norway (common only at Finmarken), S.W. and E. Greenland, Iceland, Spitzbergen, Russian Lapmark, the Sea of Okhotsk, East Port, New England, and Boston. Main distribution: Panarctic. Vertical range: From 0 m (Iceland) to about 200 m (East Greenland).

The largest East Greenland animals measured (breadth  $\times$  height of shell:  $2.0 \times 4.2$  —  $2.0 \times 4.0$  —  $1.9 \times 4.2$  —  $1.9 \times 4.2$  —  $1.9 \times 4.0$  —  $1.9 \times 3.9$  —  $1.8 \times 4.1$  —  $1.8 \times 3.9$  —  $1.8 \times 3.9$  —  $1.8 \times 3.2$  and  $1.7 \times 3.9$  mm respectively. Nearly all living specimens had tubes of *Folliculina* in their sutures.

Biology: The statement given in the Iceland Zoology (THORSON 1941, p. 37), that the species had a non-pelagic development was later questioned by the present author, as it turned out that the egg capsules referred to *Onoba* might just as well belong to *Skeneopsis planorbis*,

which in Iceland occurred in large numbers in the same localities as *Onoba*. *Skeneopsis planorbis* is further known to lay egg capsules of the shape and size found on the *Onoba* shells. From Tasiusak, East Greenland, however, an egg capsules of quite a similar shape and size is present on a dried shell of *Onoba aculeus*. As *Skeneopsis* is absent from the whole East Greenland coast, this capsule can with certainty be referred to *Onoba aculeus*, and the non-pelagic development of this species is thus established.

20. *Alvania jan-mayeni* (FRIELE).

*Rissoa (Alvania) jan-mayeni* FRIELE 1886, pl. 11, figs. 6—7.

East Greenland records:

*Rissoa (Alvania) jan-mayeni* HÄGG 1905, p. 35.

*Alvania jan-mayeni* ODHNER 1915, p. 167.

*Rissoa jan-mayeni* THORSON 1935, p. 48.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Off Mackenzie Bugt, 100 m, mud, 2 animals (HÄGG); S.E. of Kap Bennet, Mackenzie Bugt, 73°20' N. 21°20' W., 70 m, mud shells, pebbles, 1 adult animal; Carl Jacobsen Bugt, Ymers Ø, 14 m, clay, 1 adult animal; Ibidem, 20—24 m, clay, 2 adult, 2 young animals, 2 adult shells (2 finds); Kap Hedlund, 19—27 m, shells, red algae, *Laminaria*, 1 adult animal, 1 adult shell (2 finds). — *Scoresbysund Area*: Off the mouth of Hurry Fjord, 140—150 m, clay, sand, gravel, 2 adult animals, 5 adult shells (3 finds); Ibidem, 95 m, clay, stones, 58 adult and young animals and shells; Hurry Fjord off the Fame Øer, 5—8 m, clay, 1 adult animal; Ibidem, 25 m, soft clay, 1 adult animal; "Hurry Fjord, 19 m", 1 adult and 1 young animal; Off Kap Hooker, 60—67 m, sand and clay, 33 adult and 3 young animals, 9 adult and 2 young shells (7 finds); Ibidem, 140 m, clay, sand, stones, 2 adult animals, 3 adult and 2 young shells (2 finds); Jamesonland opposite to the Bjørne Øer, 30 m, hard clay, 2 adult animals; Ibidem, 78 m, clay, 1 adult animal; Jamesonland opposite to Kap Leslie, 22 m, sandy clay, 1 adult animal; Off Kap Dalton, 17—21 m, 4 adult animals, 1 adult shell. *Kangerdlugssuak Area*: Not found. *Sydøstkyst Area*: Lindenow's Fjord, inner part, 64 m, clay, 1 adult animal; Ibidem, 82 m, clay, 1 adult animal (living?).

The species is thus known from Mackenzie Bugt in the N. to Lindenow's Fjord in the S., and seems to occur along the outer coast as well as in the innermost parts of the fiords. Curiously enough it seems to be totally absent at Ellaø. The vertical range for living East Greenland specimens is: 5—8 m (Hurry Fjord) to 150 m (the mouth of Hurry Fjord). The whole material has been very carefully examined in order to find the closely related *Alvania cruenta* ODHNER, but with a negative result.

Distribution: W. Greenland, E. Greenland, N. Iceland (dead spec.), Jan Mayen, Spitzbergen, E. Finmarken, the Murman Coast, the White Sea, the Kara Sea, Barents Sea, W. part of the Siberian Arctic Sea, Gulf of St. Lawrence, Marthas Vineyard, New England, and "North Atlantic". Main distribution: Panarctic. Vertical range: From 5—8 m (E. Greenland) to 891 m (Marthas Vineyard).

Remarks: The largest living specimens from E. Greenland measured (breadth  $\times$  height of shell):  $3.9 \times 5.4$  (HÄGG) —  $3.4 \times 5.5$  —  $3.4 \times 5.5$  —  $3.4 \times 5.4$  —  $3.3 \times 5.7$  —  $3.3 \times 5.4$  —  $3.3 \times 5.3$ , and  $3.2 \times 5.3$  mm respectively. An adult animal from Ymers Ø had *Foraminifera* attached to its shell.

Biology: Unknown.

#### 21. *Alvania scrobiculata* (MÖLLER).

*Rissoa scrobiculata* MÖLLER 1842, p. 9 (description only; apparently not yet figured).

Occurrence at East Greenland: *Nordøstkyst Area*: Danmarks Havn, 9 m, mud, *Laminaria*, 1 adult shell (probably subfossil). — *Franz Joseph Fjord Area*: Solitærbugt, Ellaø, 5—24 m, 1 adult animal; Ibidem, 22 m, clay, 2 adult animals (2 finds); Ibidem, 30 m, 1 adult animal, 1 adult shell. — *Scoresbysund Area*: Hurry Fjord, 95 m, 1 young animal; Off Kap Hooker, 67 m, sand, clay, 1 adult shell. — *Sydøstkyst Area*: Ingmikertok at Angmagssalik, 2 adult and 1 young shell; Kekertaksiak, 75—90 m, gravel, stones, 2 young shells.

The species is new to East Greenland. Living specimens are thus only known from the two great fiord areas, but the species has probably often been overlooked in the material from the other areas of the coast. In contradistinction to *A. jan-mayeni*, *A. scrobiculata* is common at Ellaø. The vertical range for living specimens in E. Greenland is from (5)—22 m (Ellaø) to 95 m (Hurry Fjord). The living specimens have a pale horn coloured periostracum, a white, swollen, penult volution and a typical structure, with distinct radial ribs. Any confusion with *Alvania cruenta* is totally excluded.

Distribution: Norway (only at Finmarken, according to ODHNER, not cited by SARS), W. and E. Greenland, E. Iceland, Jan Mayen, Spitzbergen, and the Northern Arctic Ocean. Main distribution: High-arctic, with low-arctic outposts. Vertical range: From 22 m (E. Greenland) to 342 m (Northern Arctic Sea).

Remarks: The two largest animals from East Greenland measured (breadth  $\times$  height of shell):  $1.9 \times 3.2$  and  $1.8 \times 3.0$  mm respectively.

Biology: Unknown.

22. *Alvania wyville-thomsoni* (FRIELE) (cf. fig. 4).

*Alvania wyville-thomsoni* THIELE 1929, p. 585, pl. 10, fig. 11.

East Greenland record:

*Rissoa wyville-thomsoni* GRIEG 1914, p. 9.

Occurrence at East Greenland (cf. the map fig. 16, p. 129).  
*Nordøstkyst Area*: E. of Bessel Fjord, 75°58' N. 14°08' W., 300 m, clay, 5 specimens (GRIEG). — *Franz Joseph Fjord Area*: Forsblads Fjord, 95—170 m, 1 young animal, 1 adult and 1 young shell. — *Scoresbysund Area*: Between Kap Brewster and the mouth of Hurry Fjord, 245 m,

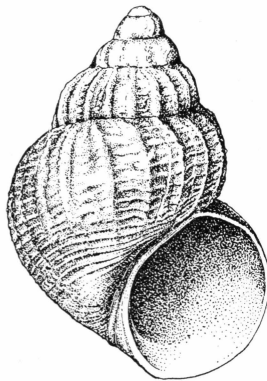


Fig. 4. *Alvania wyville-thomsoni* (FRIELE). Drawn from an empty shell taken off the mouth of Hurry Fjord, 145 m depth.

sandy clay, 1 adult shell; Off the mouth of Hurry Fjord, 140—145 m, clay and gravel, 2 adult shells (2 finds); Hurry Fjord, 95 m, 4 adult animals, 2 adult shells; Section from Kap Leslie to Kap Stevenson, 143 m, soft clay, 1 adult shell.

Living specimens are thus known from E. of Besselfjord and from Franz Joseph Fjord and Scoresbysund, while the species seems to be absent from the southern part of the East Greenlandic coast. All the specimens found had the typical appearance.

*Distribution*: East Greenland, Spitzbergen, Between Beeren Island and Spitzbergen, between Jan Mayen and Iceland, between Norway and Iceland (greater depths), along the whole Arctic coast of Norway. and the Faroe-Channel. *Main distribution*: High-arctic (low-arctic-abyssal outposts). *Vertical range*: From 95 m (East Greenland) to 2814 m (Between Norway and Iceland).

*Remarks*: The two largest living animals from E. Greenland measured (breadth  $\times$  height of shell): 2.7  $\times$  3.3 and 2.6  $\times$  3.8 mm

respectively. The largest shells measured:  $3.0 \times 3.8$  —  $2.9 \times 3.8$  —  $2.7 \times 3.8$  —  $2.5 \times 3.7$ , and  $2.3 \times 3.1$  mm respectively. The shells of living animals from Hurry Fjord had living *Foraminifera* on their surface.

Biology: Unknown.

23. *Homalogyra atomus* (PHILIPPI).

*Homalogyra atomus* G. O. SARS 1878, pl. 22, fig. 21 a—c.

*Homalogyra atomus* H. MADSEN 1936, p. 12.

Occurrence at East Greenland: *Sydøstkyst Area*: Tiningnekelak at Angmagssalik,  $65^{\circ}54'$  N.  $37^{\circ}40'$  W., 34 adult, and halfgrown animals; Tasiusak at Angmagssalik, from a crevice in the fiord ice, 2 adult and 1 young animals.

The species is here recorded from East Greenland for the first time.

Distribution: Norway (from Vadsø to Oslo Fjord), the Sound (unpublished), the British Isles, the Faroes, Iceland, W. Greenland and E. Greenland. Further Madeira and the Mediterranean. Main distribution: The Mediterranean, and the lusitanian, boreal and Arctic parts of the N.E. Atlantic. Vertical range: From 0 m (Iceland) to 38 m (W. Greenland).

Remarks: The largest animals from East Greenland measured as their largest diameter of shell: 1.4 — 1.4 — 1.4 — 1.4 — 1.3 — 1.3 — 1.3, and 1.25 mm respectively.

*Homalogyra atomus* is as well as *Onoba aculeus*, together with which it is often found, a typical inhabitant of the tidal zone, where both species live among the algae. In East Greenland the only tidal zone in the common sense of the word is on the southernmost part of the shore (from Angmagssalik southwards)—a stretch of coast also characterized by the presence of *Littorina saxatilis* (and *Mytilus edulis*); and just on this southern part of the coast *Homalogyra* as well as *Onoba aculeus* seem to have their optimum occurrence. The ice-foot and for all the nearly quite fresh water in the surface during the melting of the ice—common features for all tidal zones in the northernmost areas of the E. Greenlandic coast—, will surpress a real tidal fauna in these areas (THORSON 1933). The fundamental differences, which cause a richer tidal fauna along S.E. Greenland, are probably to be sought for in the sublittoral (HOLGER MADSEN 1936.).

Biology: LEBOUR (1937) is of opinion, that the egg capsules are situated inside the upper cavity of the last whorl of the shell of the adult specimens, and suggests that the young will hatch in the crawling stage, thus having a non-pelagic development (observations from Plymouth). The 29 adult animals (preserved in alcohol) from Tining-

nekelak were captured in quite shallow water in July, e. g. just at the time when the water temperature in East Greenland reaches its optimum. It is a well known fact that nearly all the shallow water animals in E. Greenland will spawn just at this optimal temperature, and this was also to be expected for *Homalogyra*. In spite of this not a single egg capsule was observed in the last whorl of the East Greenlandic animals. On the outer surface of the shells of two animals were, however, quite tiny capsules closely resembling such capsules known for Rissoans, *Skenea* etc.,—but smaller. It seems to me more likely therefore, that these capsules are laid by *Homalogyra*, but nothing definite can be stated at present.

#### 24. *Turritella erosa* COUTHOUY.

*Turritella erosa* GOULD & BINNEY 1870, p. 317, fig. 585.

East Greenland records:

*Turritella erosa* POSSELT 1895, p. 88.

*Turritella erosa* POSSELT & JENSEN 1898, p. 219.

Occurrence at East Greenland: Off the S.E. coast of Greenland, 250 m, clay with stones, "2 specimens" (POSSELT, the "Sofia"-Expedition). (The shells have not been measured).

This is the only find known. At W. Greenland the species is abundant in rather shallow water (depths about 20 m), but in E. Greenland it seems only accidentally to enter the southern part of the shelf, having its main occurrence here in deeper water.

Distribution: Cap Cod to St. Lawrence Bay, Labrador, New Foundland, W. Greenland, S.E. Greenland, Spitzbergen, Matotschkin Schar, Siberian Ice Sea, Bering Sea, Aleutians, Unalashka, Sitka, Northern Japan. Main distribution: Panarctic-circumpolar. Vertical range: 19 m (W. Greenland) to 355 m (W. Greenland).

Biology: Unknown.

#### 25. *Turritella reticulata* MIGHELS & ADAMS.

*Turritella reticulata* KNIPOWITSCH 1901, pl. 18, figs. 1—4; 1902, pl. 9, figs. 32—33.

Occurrence at East Greenland (cf. the map fig. 14, p. 127): *Sydøstkyst Area*: Lindenow's Fjord, outer part, 25 m, clay, gravel, *Laminaria*, 1 adult shell; Ibidem, 58 m, clay, gravel, 1 adult animal, 1 adult shell; Ibidem, 90 m, clay, 1 adult and 2 young shells; Lindenow's Fjord, middle part, 60—80 m, clay, 1 adult shell; Ibidem, 150—175 m, clay, 1 adult animal; Lindenow's Fjord, inner part, 77 m, clay, 1 young animal; Off the north coast of Lindenow's Fjord, 10—75 m, 1 adult

animal, 1 adult shell; Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 19 adult and 18 young animals, 3 adult shells (3 finds).

The species here recorded from E. Greenland for the first time, seems only to inhabit the southernmost fiord on the whole East Greenlandic coast. All the specimens had the appearance typical of the species, except that the apices are much eroded, also in living specimens. The periostracum is horn-coloured. The vertical range for living specimens in E. Greenland is "10—75" m—to 150—175 m.

Distribution: New England, Labrador, W. Greenland, S.E. Greenland, Spitzbergen. Further: Bering strait, Bering Sea, the Aleutians and British Columbia. Main distribution: Panarctic both in the Atlantic and in the Pacific Ocean. Vertical range: 3 m (Labrador, New England, Bering Sea) to 312 m (W. Greenland).

Remarks: The largest living animals from East Greenland measured (breadth  $\times$  height of shell):  $7.2 \times 24.8$  —  $6.1 \times$  about  $19.0$  —  $5.3 \times 17.2$  —  $5.1 \times 17.1$  and  $5.1 \times 15.1$  mm. The shell of one of the living animals was overgrown with hydroids.

Biology: Unknown.

#### 25. *Cerithiopsis costulata* (MØLLER).

*Cerithiopsis costulata* G. O. SARS, 1878, pl. 13, fig. 7.

Occurrence at East Greenland: *Scoresbysund Area*: Section between Kap Stevenson and Kap Leslie, 143 m, soft clay, 1 adult shell (last whorl fragmentaric).

The species, which here is recorded from East Greenland for the first time, may be subfossil, but nothing definite can be stated. The shell (breadth 2.2 mm, height 8.1 mm) is very large.

Distribution: Norway (from Hammerfest southwards), Väderøerne, W. of Ireland, between the Faroes and the Hebrides, the Faroes (dead spec.), Iceland, S.W. Greenland, E. Greenland (dead), Jan Mayen, St. Lawrence Gulf (?), and Fundy Bay. Main distribution: Subarctic (boreo-arctic)-abyssal. Vertical range: From 113 m (W. Greenland) to 565 m (Norway).

Biology: Unknown.

#### 27. *Turritellopsis acicula* (STIMPSON).

*Turritellopsis acicula* G. O. SARS 1878, pl. 10, fig. 14 a—b.

Occurrence at East Greenland: *Nordøstkyst Area*: S. of Lille Pendulum Ø,  $74^{\circ}35'$  N.  $18^{\circ}23'$  W., 18—21 m, sandy clay, algae, 1 young

animal (apparently living), shell with  $4\frac{1}{2}$  whorls, the upper whorls somewhat eroded. Breadth of shell 1.45 mm, height of shell 3.1 mm. The shape and structure agree in all details with the figures given by Sars (l. c.). The species is new to E. Greenland.

Distribution: Cap Cod, Massachusetts, Labrador, Halifax, W. Greenland, E. Greenland, Spitzbergen, Finmarken, Murman Coast, Kara Sea. Main distribution: Panarctic. Vertical range: 18—21 m (E. Greenland) or 2—90 m (American E. coast) to 110—150 m (Spitzbergen).

Biology: Unknown.

[*Scalaria groenlandica* (CHEMNITZ).

*Scalaria gronlandica* G. O. Sars 1878, pl. 10, figs. 15—16.

East Greenland records:

*Scalaria grænlandica* MÖBIUS 1874, p. 250.

*Scalaria gronlandica* POSSELT 1895, p. 89.

*Scalaria groenlandica* POSSELT & JENSEN 1898, p. 233.

Occurrence at East Greenland: *Nordøstkyst Area*: Off Shannon Ø, 57 m, (MÖBIUS).

This is the only find recorded. The locality is curious. The species is—to judge from its occurrence along W. Greenland—low-arctic, but the only find from E. Greenland refers to a high-arctic locality north to one of the best investigated coast stretches in the Arctic, where the animal seems to be totally lacking in all recent collections. As several of the other records given by MÖBIUS have proved to be incorrect (cf. *Sipho propinquus*, *Buccinum undatum* etc.), it seems justifiable to question the occurrence of this species at East Greenland].

28. *Entocolax ludwigi* VOIGT.

*Entocolax ludwigi* VOIGT 1888, pp. 658—689, pl. 41—43.

East Greenland record:

*Entocolax ludwigi* HEDING & MANDAHL-BARTH 1938, p. 5.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Dusénfjord, inner part, 20—25 m, 1 animal in *Myriotrochus rinki* (HEDING and MANDAHL-BARTH). *Scoresbysund Area*: Hurry Fjord, off Konstabel Pynt, depth?, 1 animal in *Myriotrochus rinki*. *Sydøstkyst Area*: Tasiusak at Angmagssalik, 0—10 m, 5 animals in *Myriotrochus rinki* (HEDING and MANDAHL-BARTH).

The species seems thus to occur along the whole coast of East Greenland. The host is always *Myriotrochus rinki*.

**Distribution:** Deficiently known. Arctic America (unpublished), W. Greenland, East Greenland, and the Murman coast.

**Biology:** The species is viviparous. The young hatch with a well developed shell (cf. HEDING and MANDAHL-BARTH, l. c.). This larval shell is more reminiscent of that of a tectibranch (f. i. *Acera*) or that of an ascoglossid (f. i. *Limapontia*) than of the larval shells hitherto known for prosobranchs. The oldest young found in the mother animal have a much reduced velum, and will probably have a very shortened pelagic stage or a non-pelagic development.

29. *Menestho truncatula* ODHNER.

*Menestho truncatula* ODHNER 1915, p. 175, pl. 1, figs. 13—16.

East Greenland record:

*Menestho truncatula* ODHNER 1915, p. 176.

**Occurrence at East Greenland** (cf. the map fig. 16, p. 129): *Nordøstkyst Area*: Sabine Ø, 6—9½ m, 10 adult and 3 young animals, 1 young shell (ODHNER). — *Franz Joseph Fjord Area*: Off the eastern mouth of Vega Sund, 72°45' N. 22°56' W., 35—60 m, mud, stones, 1 adult animal, 1 adult shell. — *Scoresbysund Area*: Hurry Fjord, N. of the Fame Øer, 23—25 m, hard mud, 8 specimens (ODHNER).

ODHNER (l. c.) is of opinion that the East Greenland specimens deviate so much from the type, the lower part of the last whorl being quite smooth without furrows, that they might be separated as var. *semilaevis*. The abrupt apex in this species is on all East Greenlandic specimens very strongly eroded. The periostracum is greasy horn-coloured.

**Distribution:** Spitzbergen, Novaya Zemlya, E. Greenland. Vertical range: 6—9½ m (Spitzbergen, E. Greenland) to 35—60 m (E. Greenland).

**Remarks:** The 5 largest animals from East Greenland measure (breadth × height of shell): ? × 2.2 (ODHNER) — 2.1 × 3.9 — 2.0 × 3.3 — 2.0 × 3.3 and 1.9 × 3.3 mm respectively.

**Biology:** Unknown.

30. *Menestho albula* (FABRICIUS).

*Menestho albula* GOULD & BINNEY 1870, p. 333, fig. 604.

**Occurrence at East Greenland:** *Scoresbysund Area*: Off Kap Hope, 10—13 m, sand, 1 very large animal; Off the mouth of Hurry Fjord, 72 m, clay and stones, 1 halfgrown animal; Hurry Fjord, 1 mile from the mouth, 14 m, sand, 1 young, fresh shell.

The species is here recorded from East Greenland for the first time. It is known only from the outer part of Scoresbysund. The vertical range here: 10—72 m, is rather large.

Distribution: Labrador, Halifax, Spitzbergen, W. and E. Greenland, Northern Japan. Main distribution: Panarctic-circumpolar. Vertical range: 10—13 m (E. Greenland) to 190 m (Godthaab).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):  $3.5 \times 7.8$  mm, and  $2.5 \times 5.1$  mm respectively. The largest living W. Greenland specimen (collected by MØLLER) measures  $3.4 \times 7.4$  mm, and is thus smaller than the largest animal from E. Greenland. The largest empty shell from W. Greenland has, however, the maximum measures of  $3.6 \times 9.0$  mm.

Biology: Unknown.

31. *Trichotropis borealis* BRODERIP & SOWERBY (cf. fig. 6, p. 47.).

*Trichotropis borealis* FORBES & HANLEY 1853, pl. 101, figs. 5—6.

East Greenland records:

*Trichotropis borealis* HÄGG 1905, p. 36.

*Trichotropis borealis* var. *acuminata* HÄGG 1905, p. 37.

*Trichotropis borealis* ODHNER 1915, p. 174.

*Trichotropis borealis* THORSON 1934, p. 7.

*Trichotropis borealis* THORSON 1935, pp. 51—52, figs. 52—54, egg capsules.

Occurrence at East Greenland (cf. the map fig. 5, p. 45.):

*Nordøstkyst Area*: Stormbugt at Danmarks Havn,  $9\frac{1}{2}$ —19 m, soft clay, *Laminaria*, 1 adult animal; Ibidem, 19—38 m, hard clay, *Delesseria*, 1 adult animal; Ibidem, 47 m, stones, red algae, 1 adult animal; S.E. of Hvalros Ø,  $74^{\circ}30'$  N.  $18^{\circ}40'$  W., 80—100 m, mud, stones, 2 animals (HÄGG). — *Franz Joseph Fjord Area*: 30 miles S.E. of Jackson Ø, 201 m, clay with stones, 1 young animal; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 1 adult animal (HÄGG); Ibidem, 12—35 m, mud, 12 animals and 2 shells (2 finds) (HÄGG); Moskusokse Fjord, outer part, 220 m, clay, 2 animals; Dusénfjord, inner part, 4—20 m, clay, *Desmarestia*, *Laminaria*, 5 adult and 1 young animal (5 finds); Kap Hedlund, 7—20 m, clay, shells, stones, *Fucus*, 139 adult and 5 young animals, 8 adult shells (17 finds); 20—30 m, clay, shells, *Desmarestia*, 33 adult and 2 young animals, 7 adult shells (9 finds); Solitærbugt, Ellaø, 30—35 m, stones, shells, 1 adult shell; Ibidem, 42—48 m, stones, gravel, brown algae, 1 adult animal, 1 adult shell (2 finds); Ibidem, 75—80 m, 1 adult shell; *Scoresbysund Area*: Liverpool coast off Raffles Ø, 235 m, sand, gravel, stones, 1 young animal; Hurry Fjord off Konstabel Pynt, 7—10 m, soft clay, 1 adult animal; Hurry Fjord off Fame Øer, 15—18 m, clay *Lamina-*

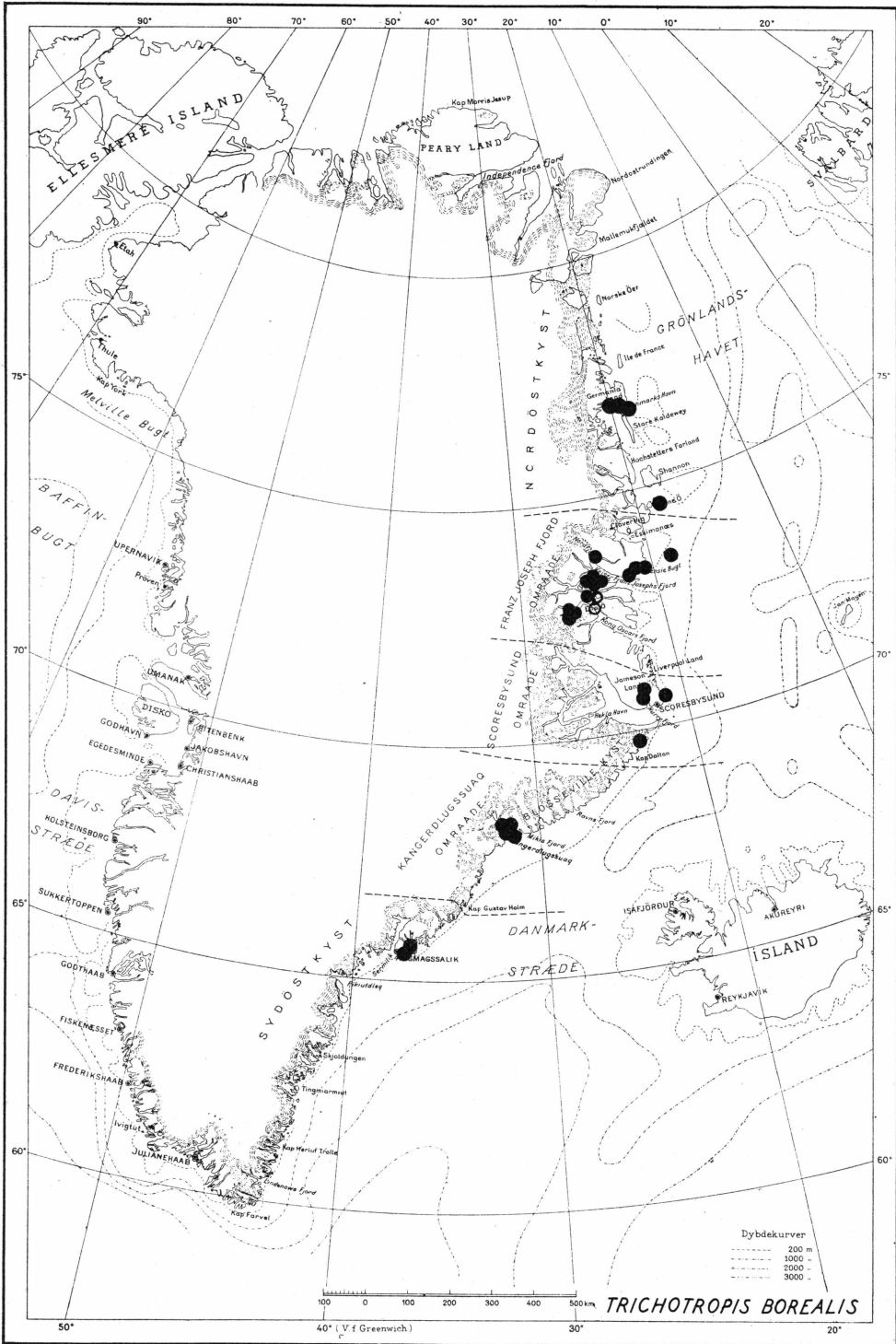


Fig. 5. Distribution of *Trichotropis borealis* BRODERIP & SOWERBY along the East Greenland coast. Full circles: Living animals. Open circles: Empty shells.

*ria*, red algae, 1 young animal, 1 adult shell; Turner Sund, 5 m, 1 young animal. *Kangerdlugssuak Area*: Kangerdlugssuak, 10 m, sand, 1 adult animal; Ibidem, 40—50 m, 1 adult animal; Ibidem, 70 m, stones, 1 adult animal; Uttental Sund, 10—14 m, clay, 1 very large animal. *Sydøstkyst Area*: Tasiusak at Angmagssalik, 28—57 m, rocks with algae, 2 adult animals; Ingmikertok at Angmagssalikfjord, depth?, 2 young shells.

*Trichotropis borealis* is thus known from Danmarks Havn in the North to Angmagssalik in the South, being equally frequent along the outer coast and in the innermost part of the fiords. The absence of this species from Angmagssalik southwards seems difficult to explain, as it is abundant in seas with much higher temperatures (f. i. round the Faroes). The vertical range for living specimens in E. Greenland is 5½ m (Turner Sund) to 235 m (off Raffles Ø).

Distribution: The whole Norwegian coast, Skagerrak, the Dogger Bank, northern part of the British Isles, the Hebrides, Shetland, the Faroes, and Iceland. Further: W. Greenland, E. Greenland, Spitzbergen, Kara Sea, Bering Sea, the Aleutians, Oregon, Arctic America, New England, and Cape Cod. Main distribution: Panarctic, with boreal outposts. Vertical range: From 5½ m (E. Greenland) to 944 m (the Hebrides).

Remarks: While *Trichotropis borealis* in its whole area of distribution outside East Greenland is rather constant in shape, structure and appearance, its variations within the East Greenlandic areas are quite fantastic. The inner fiords (e. g. Kap Hedlund) have animals with a thick, calcareous shell. The periostracum in older specimens is quite worn off and even young specimens are without hairs on their shells. The specimens are so characteristic that it seems justifiable to regard them as a special variety: *var. calcareus*. Along the outer coast and at the mouth of the fiords from Danmarks Havn in the N. to Hurry Fjord in the S. the species is of the normal slender *borealis*-type known from all other North Atlantic areas and figured by COLLIN (1886, pl. 40, fig. 3). At Kangerdlugssuak and Uttental Sund, however, the species is represented by a variety with coarse long hairs on the periostracum, which is so thick that the calcareous layer is nearly absent. Furthermore, the shell is very broad with a depressed spire. It seems reasonable to designate this distinct variety as *var. villosus*. Hence, it has been seen that all transitional stages between the typical *villosus* and the typical *borealis* may be found in our material. The largest living animals of the *borealis* type measure (breadth × height of shell): 12.0 × 17.1 — 10.7 × 16.2 — and 8.1 × 13.0 mm respectively. The largest living animals of *var. calcareus* measure 12.0 × about 16.5 — 11.8 × 16.0 — 11.6 × 16.4 — 11.4 × 16.0 — 11.4 × 16.3 — 11.3 × 16.6 — 11.1 × 16.2 — 11.1 × 15.5 —

11.1 × 16.1 and 11.0 × 15.5 mm respectively and those of var. *villosus* (the hairs on the periostracum not measured): 11.0 × 12.0 — 8.8 × 12.0 — 8.2 × 12.1 — 8.1 × 11.5 — 8.0 × 11.3 and 7.8 × 10.8 mm respectively.

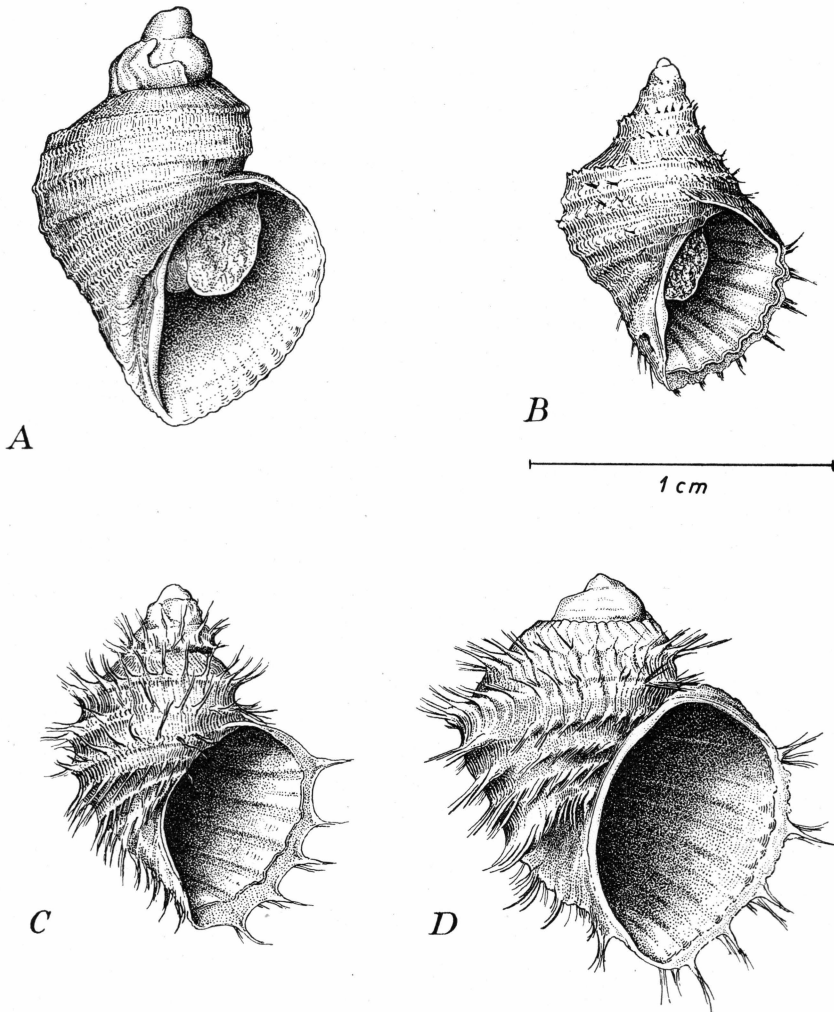


Fig. 6. *Trichotropis borealis* BROD. & SOWB. Figures showing the variation at East Greenland. A. Specimen from Kap Hedlund, 14—17 m depth. B. From Stormbugt at Danmarks Havn, ca. 48 m depth. C. From Kangerdlugssuak, 70 m depth. D. From Uttental Sund, 10—14 m depth.

**Biology:** The reproduction is known from E. Greenland (THORSON 1935). The oval or rounded capsules are laid 2, 3, or 4 together on empty bivalve shells. Several embryos per capsule. Larval development non-pelagic. The young hatch in the crawling stage.

32. *Trichotropis conica* MÖLLER.

*Trichotropis conica* G. O. SARS 1878, pl. 13, fig. 3.

## East Greenland records:

*Trichotropis conica* POSSELT 1895, p. 84.

*Trichotropis conica* THORSON 1934, p. 8.

*Trichotropis conica* THORSON 1935, p. 52—54, figs. 55—58, egg-capsules.

Occurrence at East Greenland (cf. the map fig. 7, p. 49.):  
*Nordøstkyst Area*: Stormbugt at Danmarks Havn, 19—38 m, hard clay, *Delesseria*, 1 adult shell. — *Franz Joseph Fjord Area*: Solitærbugt, Ellæ, 27—29 m, stones, red algae, 1 adult animal; Ibidem, 30—31 m, clay, stones, 2 adult shells (2 finds); Ibidem, 37—41 m, clay, gravel, stones, 3 very large and 1 young animal and 1 young shell (3 finds); Ibidem, 43—44 m, stones, 1 adult animal (living?); Ibidem, 48—52 m, clay, stones, brown algae, 1 young animal, 3 adult shells (2 finds). — *Scoresbysund Area*: 70°21' N. 8°25' W., 300 m, clay with stones (RYDER); The mouth of Hurry Fjord, 88 m, clay, stones, 3 young, fragmentary shells; Off Kap Dalton, 17—21 m, clay, pebbles, 1 young shell. — *Kangerdlugssuak Area*: Uttental Sund, 20—25 m, clay, red algae, 9 adult and 2 young animals (2 finds); Ibidem, 30—40 m, clay, red algae, 2 adult and 3 young animals, 7 adult and 2 young shells (3 finds); Ibidem, 40—45 m, soft clay, red algae, 2 adult and 4 young animals, 2 adult and 1 young shell (2 finds); Ibidem, 50—60 m, clay, 9 adult, 5 young animals, 1 adult shell (2 finds); Ibidem, 75—100 m, clay, 1 adult shell; Kangerdlugssuak, 40—50 m, 6 adult animals (2 finds); Ibidem, depth?, 2 adult animals, 1 adult shell (2 finds). — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 57—59 m, 6 adult animals, 1 adult shell; Ibidem, 100 m, stones, 1 adult and 1 young animal, 1 adult shell; Angmagssalik, 50 m, 1 adult and 1 young animal; Lindenow's Fjord, outer part, 100—150 m, clay, gravel, 1 young shell; Ibidem, inner part, 30—50 m, 1 adult animal.

The species is thus known from the whole E. Greenlandic coast, but seems to be rare North to the Franz Joseph Fjord Area. In contradistinction to *Trichotropis borealis* it does not penetrate to the innermost part of the large fiords. Thus it is absent from Kap Hedlund and the inner part of Scoresbysund, Solitærbugt at Ellæ and Hurry Fjord being the finding places which are farthest removed from the outer coast.—All the specimens were of the shape and appearance typical of the species.—The vertical range for living specimens in East Greenland is 20—25 m, (Uttental Sund) to 57—95 m (Tasiusak).

Distribution: E. and W. Finmarken, Iceland (dead spec.), W. Greenland, E. Greenland, and Jan Mayen (but not Spitzbergen!). Further: Cap Sable at N.E. America. Main distribution: Panarctic

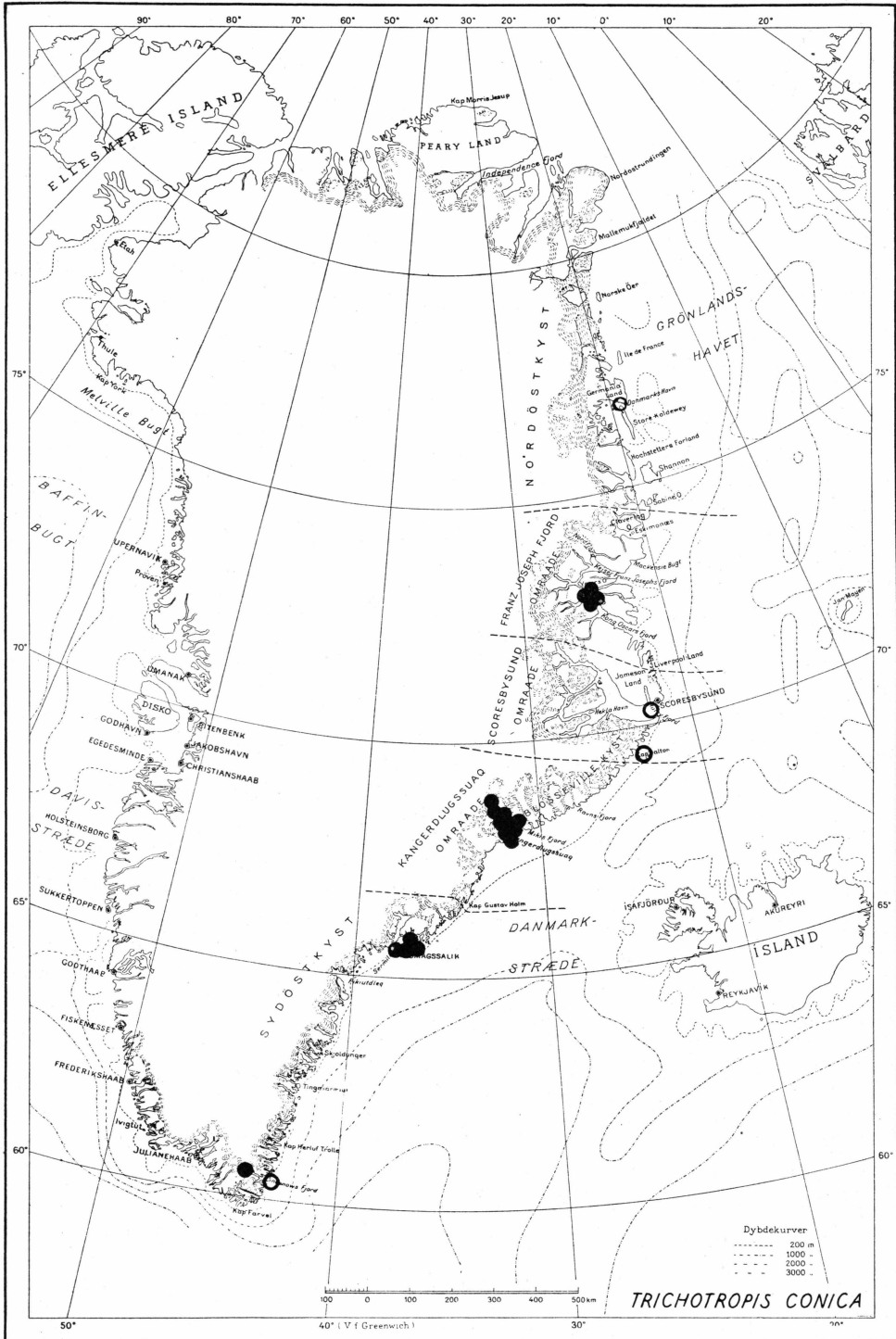


Fig. 7. Distribution of *Trichotropis conica* MÖLLER along the East Greenland coast. Full circles: Living animals. Open circles: Empty shells.

(in the Atlantic sector only). Vertical range: From 20 m (E. Greenland) to 190 m (Norway).

Remarks: The largest living animals from E. Greenland measured (breadth  $\times$  height of shell):  $13.1 \times 17.6$  —  $13.0 \times 17.2$  —  $12.5 \times 17.0$  —  $12.0 \times 16.9$  —  $11.9 \times 17.1$  —  $11.4 \times 16.2$  —  $11.3 \times 16.8$  —  $11.3 \times 16.2$  —  $11.2 \times 15.2$  and  $9.9 \times 13.0$  mm respectively. Several of the living animals had living bryozoans, hydroids, ascidians and *Spirorbis* attached to their shells. Several empty shells are inhabited by *Phascolion strombi*.

Biology: The reproduction is known from E. Greenland (THORSON 1935). The dome-shaped egg capsules are laid 7 to 13 together on Sabellid tubes. Several embryos per capsule. Larval development non-pelagic. The young hatch in the crawling stage.

33. *Trichotropis bicarinata* BRODERIP & SOVERBY.  
var. *tenuis* E. A. SMITH.

*Trichotropis tenuis* E. A. SMITH 1878, pp. 226—227, fig.

*Trichotropis tenuis* HÄGG 1905, pl. 1, figs. 1—2.

East Greenland record:

*Trichotropis tenuis* HÄGG 1905, p. 39, pl. 1, fig. 1—2.

*Trichotropis tenuis* f. *hjorti* GRIEG 1909, p. 36.

Occurrence at East Greenland (cf. the map, fig. 16, p. 129):  
*Nordøstkyst Area*:  $77^{\circ}31'$  N.  $18^{\circ}24'$  W., 275 m, clay, 1 young animal, *forma hjorti*; S.E. of Lille Pendulum Ø,  $74^{\circ}35'$  N.  $18^{\circ}15'$  W., 150 m, mud, stones, 2 animals (HÄGG). *Franz Joseph Fjord Area*: E. of Vega Sund,  $72^{\circ}25'$  N.  $17^{\circ}56'$  W., stones, sand, 300 m, 2 young animals (HÄGG). *Scoresbysund Area*: Off Kap Hope, 228 m, clay, stones, 1 adult animal (now fragmentary, but measurements of shell were taken by SØREN JENSEN, when the animal was intact); Hurry Fjord, 95 m, clay, stones, 2 adult and 3 young animals.

The species although rare, seems thus to occur along the outer coast of the three most high-arctic areas of East Greenland. All the animals—apart from that mentioned by GRIEG—, agree closely with the figures given by HÄGG (see above). The periostracum was cream-coloured to pale horn-coloured. The vertical range for living East Greenland specimens is 95 m (Hurry Fjord) to 300 m (E. of Vega Sund).

Distribution: This rare species is only known from Icy Cape, the Bering Sea, Melville Bay, off Thule in W. Greenland (unpublished), E. Greenland, and from Iceland. Vertical range: From 80 m (off Thule) to 500 m (Melville Bay).

Remarks: The largest living specimens from E. Greenland measured (breadth  $\times$  height of shell):  $28.0 \times 31.5$  —  $26.0 \times 27.4$  (HÄGG) —  $25.7 \times$

27.2 — 19.6 × 23.0, and 18.5 × 20.5 mm respectively. The largest animal (from Hurry Fjord) had crusts of *Bryozoa* attached to its shell.

Biology: Unknown.

#### 34. *Acrybia flava* (GOULD).

*Ampullina Smithii* G. O. Sars 1878, pl. 12, fig. 2; *Acrybia flava* ODHNER 1913, pl. 4, figs. 26—28.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Off Kap Franklin, 325 m, 1 adult shell of a greyish-white colour, inhabited by *Phascolion strombi* and with bryozoans and tubes of *Spirorbis* on the shell, which measured 17.4 mm in breadth and 18.6 mm in height. It seems impossible from our single shell to decide whether the species is recent in the area—or only subfossil. From the locality proper, however, there is also an empty shell of *Capulacmaea radiatum* (see p. 58.) and of this latter species a single living specimen was found at the outer coast too. It is probable that *Acrybia flava* will behave in the same way, having its main occurrence at greater depths off the outer coast, from where it will send outposts to the shelf and the outer parts of the fjords. Nothing definite can, however, be stated as to this.

The species is new to the Greenlandic fauna.

Distribution: Norway (Lofoten to Finmarken), the Faroes, Iceland, between Norway and Bear Island, between Bear Island and Spitzbergen, Spitzbergen, E. Greenland (dead spec.), the Sea of Okhotsk, E. Canada, Halifax, and New England. Main distribution: Subarctic (boreo-arctic). Vertical range: From 28 m (Norway) to 600 m (E. of Iceland).

Biology: Egg masses from the North Atlantic deep-sea contained embryos so large that they could be directly identified (THORSON 1941, p. 16, fig. 5 A). The egg mass is of the *Natica*-type. As, however, the single egg space is 5½ mm in largest diameter and contains one single embryo only, which is 4½ mm across, the egg mass consists only of a few—probably 6 to 7—egg spaces arranged in one row, somewhat reminiscent of a curved pea-shell. The young hatch in the crawling stage. A detailed description with figures will be published later.

#### 35. *Amauropsis islandica* (GMELIN).

*Amauropsis islandica* G. O. Sars 1878, pl. 21, fig. 17.

East Greenland records:

*Amauropsis islandica* HÄGG 1905, p. 27.

*Amauropsis islandica* ODHNER 1915, p. 161.

*Natica (Amauropsis) islandica* THORSON 1935, p. 54 and 59—60, figs. 64—66, egg capsules.

Occurrence at East Greenland: *Nordøstkyst Area*: S.E. of Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 1 shell (HÄGG 1905). *Franz Joseph Fjord Area*: Inner part of Dusénfjord, 240 m, hard, brown clay, 1 adult, eroded shell inhabited by *Phascolion strombi*. — *Scoresbysund Area*: Off Kap Hope, 7—9 m, stones, sand and algae, 1 gigantic, quite fresh shell; Ibidem, 10—13 m, sand 1 adult animal, 1 adult fresh shell.

*Amauropsis islandica* is thus so far known only from the three northernmost areas of East Greenland, but will undoubtedly prove to occur in suitable localities along the South Eastern coast as well. It seems only to inhabit the shallow sandy areas along the outer coast (from where the only living specimen is recorded) and has never been taken in the inner parts of the large fiord areas.

Distribution: Norway (from Vadsø to Oslo Fjord), Bohuslän, Kattegat, Hanstholm, the Dogger Bank, British Isles, Holland, Belgium (rare), the Orkney Islands, the Hebrides, the Faroes and Iceland. In the Arctic the species is known from W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, Novaya Zemlya, Kara Sea, Russian Lapmark, the Siberian Arctic Sea, the Bering Sea, Massachusetts Bay and off New Foundland. Main distribution: Panarctic-boreal. Vertical range: From 10 m (E. Greenland) to 1267 m (New Foundland).

Remarks: Our only living specimen measured (breadth × height of shell): 13.6 × 17.9 mm, and the empty, but absolutely quite fresh shells measured: 21.7 × 27.9 mm! and 14.0 × 17.0 mm respectively.

Biology: Reproduction partly known from E. Greenland (THORSON 1935). The egg masses are flat rings incrustated with sand and laid freely on the bottom. Only one egg in each egg space. The embryo develops in the egg space and attains a rather large size, but since the last embryonic stages have not been found in the material, there may possibly be a very short pelagic larval stage.

### 36. *Lunatia tenuistriata* DAUTZENBERG & FISCHER.

*Lunatia tenuistriata* ODHNER 1913, pl. 4, figs. 9—15, pl. 5, fig. 19.

East Greenland records:

*Lunatia tenuistriata* ODHNER 1913, p. 40.

*Lunatia tenuistriata* ODHNER 1915, p. 160.

*Natica tenuistriata* THORSON 1935, p. 54.

Occurrence at East Greenland: *Nordøstkyst Area*: Sabine Ø, 6—9 m, 1 adult and 1 young animal, 1 adult fresh shell and 1 young

shell. *Franz Joseph Fjord Area*: Sand Ø in Tyroler-Fjord, from the stomach of an eider duck, 1 adult, quite undigested animal; Kap Stosch, about 15 m, 1 adult and 1 young animal; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 1 adult animal (ODHNER 1913). *Scoresbysund Area*: Hurry Fjord, 1 mile from the mouth, 6—9 m, sand, 2 adult and 2 young animals, 1 young shell. *Sydøstkyst Area*: Naparsarsuak, N. of Kap Tordenskjold, 38 m, muddy sand, 1 adult, quite fresh looking shell.

*Lunatia tenuistriata* seems to live along the whole coast of East Greenland, where it is attached to the shallow-watered sand areas near the outer coast as was also the fact in *Amauropsis islandica*. Not a single specimen has been procured from the inner part of the large fjord areas. The greatest depth stated for living specimens in East Greenland is 15 m.

Distribution: E. Greenland, N. and E. Iceland, Spitzbergen, the Kola Peninsula, the Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, and the Bering Sea. Main distribution: Higharctic. Vertical range: From 3 m (E. Greenland) to 70 m (Spitzbergen).

Remarks: The largest living specimens from East Greenland measured (breadth  $\times$  height of shell):  $16.1 \times 19.4$  —  $14.9 \times 17.0$  and  $15.7 \times 16.8$  mm respectively. The largest empty shells measured  $15.0 \times 16.0$  and  $14.1 \times 16.3$  mm respectively. The periostracum varies from reddish-brown to cream-coloured, the reddish-brown colour being most common. The straight columellar callus and the black mantle, which can be seen shining through the shell, are very good criteria of the species. The spiral lines on the shell surface are always more coarse in *tenuistriata* than in *groenlandica*.

Biology: The reproduction is unknown, but a very young animal from Sabine Ø (shell breadth 2.05 mm with  $1\frac{1}{2}$  shell-whorl all in all) had the limits for the embryonic whorls at a maximum diameter of 1.40 mm, i. e. that the embryonic shell of *Lunatia tenuistriata* is of exactly the same size as that of *Natica clausa* (see this), when the latter hatches from its egg space. In *Natica clausa* as in several other species of *Natica* embryos of this size always proved to develop without any pelagic stage, and it can be taken for granted that this will also be the case with *Lunatia tenuistriata*.

### 37. *Lunatia pallida* (BRODERIP & SOWERBY).

*Lunatia groenlandica* G. O. SARS 1878, pl. 21, fig. 15.

East Greenland records:

*Natica (Lunatia) groenlandica* HÄGG 1905, p. 20.

*Lunatia pallida* ODHNER 1913, p. 35.

*Lunatia pallida* GRIEG 1914, p. 9.

*Lunata pallida* ODHNER 1915, p. 159.

*Natica* (*Lunatia*) *groenlandica* THORSON 1935, pp. 54—57, figs. 59—61, egg capsules.

Occurrence at East Greenland (cf. the map fig. 20, p. 133.):

*Nordøstkyst Area:* Greenland Sea, E. of Bessel Fjord, 75°58½' N. 14°08' W., 300 m, 0.4° C, 34.82 ‰, clay, 1 very young animal (GRIEG); Danmarks Havn, 7½—11 m, *Laminaria*, 1 adult animal; S. of Lille Pendulum Ø, 74°35' N. 18°23' W., 18—21 m, sandy clay, algae, 1 adult animal.

*Franz Joseph Fjord Area:* S.E. of Clavering Ø, 74°10' N, 20°08' W., 25—40 m, mud, shells, pebbles, 3 adult and 2 young animals; Eskimonæs east harbour on Clavering Ø, 50—55 m, clayey gravel, 1 young, worn shell; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 2 animals (HÄGG); Mackenzie Bugt, 12—35 m, mud, 3 animals (ODHNER); Mackenzie Bugt, S.E. of Kap Bennet, 73°20' N. 21°20' W., 70 m, mud, shells, pebbles, 1 adult animal; The mouth of Vega Sund, 72°45' N. 22°56' W., 35—60 m, mud, stones, 1 adult animal; Outer part of Moskusokse Fjord, 220 m, clay, 1 shell (HÄGG); The mouth of Dusénfjord, 15—40 m, clay, stones, *Desmarestia*, red algae, 2 adult animals, 1 adult shell (3 finds); Carl Jacobsen Bugt, Ymers Ø, 4—5 m, clay, 2 young animals (2 finds); Ibidem, 13—18 m, clay, 3 adult, 2 young shells (2 finds); Solitærbugt, Ellaø, 10—20 m, clay, algae, *Desmarestia*, 4 adult and 4 young animals, 10 adult and 1 young shells (15 finds); Ibidem, 20—30 m, clay, stones, shells, *Laminaria*, 5 adult animals, 8 adult shells (10 finds); Ibidem, 30—32 m, 1 adult animal, 1 adult shell; Ibidem, 44—52 m, 3 adult animals (3 finds); 75—80 m, shells, stones, 1 adult animal; Ibidem, 85—95 m, 1 adult animal.

*Scoresbysund Area:* Off Kap Hope, 9—20 m, sand, algae, 2 adult animals, 1 adult shell (3 finds); Off Hurry Fjord, 30 m, stones, sand, red algae, *Laminaria*, 1 adult animal; The mouth of Hurry Fjord, 16 m, sand, algae, 1 adult animal; Ibidem, 20—28 m, sand, 1 adult shell; Hurry Fjord, 1 mile from the mouth, 14—15 m, sand, 1 young animal, 2 young shells (2 finds); Off Konstabel Pynt, Hurry Fjord, 7—10 m, soft clay, 1 adult animal; Ibidem, 18—24 m, clay, 3 adult animals, 1 adult shell (3 finds); Ibidem, 46 m, hard clay, 2 adult shells; The Fame Øer in Hurry Fjord, 5—9 m, mud, algae, 3 adult animals, 1 adult shell (2 finds); Ibidem 12—18 m, soft clay, *Laminaria*, red algae, 4 adult animals, 1 adult shell (2 finds); "Hurry Fjord", 0—95 m, clay, stones, 2 young animals, 3 adult shells (3 finds); 8 miles N.W. of Kap Hooker, 12—14 m, sand and clay, 1 adult, 1 young animal, 1 young shell (3 finds); Jamesonland, opposite to the Bjørne Øer, 20—30 m, sandy clay, 2 young animals; Ibidem, 51 m, sandy clay, 1 adult animal; Jamesonland opposite

to Kap Leslie, 22 m, sandy clay, 1 adult shell; Off the N.E. coast of Danmarks Ø, 20—30 m, soft clay, gravel, 1 adult animal, 3 adult shells (3 finds); Kap Dalton, 17—21 m, clay with pebbles, 2 very young animals.

*Kangerdlugssuak Area:* Uttental Sund, 6—9 m, *Laminaria*, 1 adult animal; Ibidem, 10—14 m, clay, 1 very large animal; Ibidem, 20—26 m, red algae, 1 very large and 1 young animal, 2 young shells; Kangerdlugssuak, 12—15 m, 1 adult shell.

*Sydøstkyst Area:* Ikerasarsuak at Angmagssalik, 235 m, 1 very large shell; Tasiusak at Angmagssalik, 5—7 m, sand, *Fucus*, *Laminaria*, 1 adult animal; Naparsarsuak, N. of Kap Tordenskjold, 38 m, muddy sand, 1 adult animal; Lindenow's Fjord, the mouth, 125—150 m, clay, gravel, 1 adult shell; 400—600 m, clay, *Foraminifera*, 1 adult shell; Lindenow's Fjord, outer part, 60—70 m, clay, sand, gravel, 3 adult animals (2 finds); 90 m, clay, 1 adult animal; 100—150 m, clay, and gravel, 1 adult shell; Lindenow's Fjord, middle part, 82 m, clay, 1 young animal; 120—150 m, sand, clay, 2 young animals (2 finds); Lindenow's Fjord, inner part, 15—36 m, clay, sand, gravel, *Laminaria*, 1 adult and 2 young animals, 1 adult shell (3 finds); 25—50 m, clay, 1 adult animal, 1 young shell; 75—100 m, clay, 1 very large animal; 200—350 m, clay, 1 adult animal, 1 adult shell; Kekertaksiak, 50 m, sand, dead bryozoans, 1 adult animal (fragmentary); Ibidem, 60—70 m, sand, gravel, bryozoans, 1 young animal, 1 young shell.

The species is common along the whole E. Greenlandic coast from Danmarks Havn in the N. to Kekertaksiak in the S. and seems—in contradistinction to *Natica clausa*—also to inhabit the inner part of the large fjords. The vertical range for living specimens in East Greenland is from 4 m (Ymers Ø) to 200—350 m (Lindenow's Fjord).

*Distribution:* Norway (Vadsø to Oslo Fjord), Bohuslän, the Kattegat, the Sound, the Dogger Bank, Holland, Belgium, Northumberland, Scotland, the Hebrides, the Faroes, and Iceland. In the Arctic known from: W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, White Sea, Novaya Zemlya, Franz Joseph Land, Siberian Arctic Sea, the Aleutians, the Sea of Okhotsk, the Wellington Channel, Jones Sound, Hudson Bay, E. Canada, Grand Manan, and Cape Cod. Southern limits: Japan, Vancouver, and Cape Hatteras. Main distribution: Panarctic-boreal. Vertical range: From 0 m (Norway) to 2430 m (Cape Hatteras).

*Remarks:* The largest living specimens from East Greenland measure (breadth  $\times$  height of shell): 16.1  $\times$  about 19 — 15.9  $\times$  19.0 — 15.2  $\times$  19.0 — 15.3  $\times$  18.0 — 15.1  $\times$  18.0 — 13.2  $\times$  16.4 — 12.5  $\times$  14.1, and 12.2  $\times$  16.1 mm respectively; the largest shells measure: 24.8  $\times$

28.0 — 20.8 × 24.6 — 18.0 × 20.7, and 15.8 × 19.2 mm respectively. The height of the shell was in several specimens greater than normally found in other seas. Several empty shells were inhabited by the Gephyrean *Phascolion strombi*.

**Biology:** Reproduction known from E. Greenland and from Denmark (THORSON 1935). The egg rings, incrustated with sand or clay, are laid freely on the bottom. The individual egg space is very large and contains only one embryo nourished upon ovalbumen. Larval development non-pelagic. The young hatch in the crawling stage.

38. *Natica bathybi* Friele var. *oblonga* FRIELE.

*Natica bathybi* var. *oblonga* ODHNER 1913, pl. 3, figs. 4 and 18.

East Greenland record:

*Natica bathybi* var. *oblonga* ODHNER 1913, p. 24.

**Occurrence at East Greenland:** The species in question seems not to be included in the Danish material, and the only East Greenland finds are those mentioned by ODHNER (l. c.), who gives the following data from East Greenland: "East Greenland (Swed. Polar Exp. 1900), placed by HÄGG 1905 among *N. clausa*: S.E. of Pendulum Island, 74°35' N. 18°15' W., 150 m, mud, stones (5/8), 3 sps; and 2 shs., var. *oblonga*, max.h. (sh.) 16.4; ap.h. 10.2; br. 14; ap. br. 8; umb. 3.5; sut. 5.4; wh. 5 (Fig. 4); another sh., h. 15.8; ap. h. 10.7; br. 14.3; ap. br. 8.4; umb. 4.2; sut. 5; wh. 5. radula Pl. 5, fig. 15 from a specimen of h. 12.5; the smallest sp., h. 7.2; ap. h. 5.7; br. 7; ap. br. 4.2; umb. 2.2; sut. 2; wh. 4½. — Between Greenland and Jan Mayen, 72°42' N. 14°49' W., 2000 m, mud Foraminifera (27/8), 1 sh., var. *oblonga*, h. 14.6; ap. h. 10.2; br. 13.1; ap. br. 7.4; umb. 3.8; sut. 4.5; wh. 5."

The species seems thus to be rare in East Greenland and must be regarded as a deep water species, which occasionally may reach the deeper part of the East Greenlandic shelf, as is probably also the fact concerning such species as *Acrybia flava* (cf. p. 51.) and *Capulacmaea radiatum* (cf. p. 58.).

**Distribution:** East Greenland; Greenland Sea; W. of Lofoten. Vertical range: 150 m (E. Greenland) to 2000 m (Greenland Sea).

**Biology:** Unknown.

39. *Natica clausa* BRODERIP & SOWERBY.

*Natica affinis* G. O. SARS 1878, pl. 21, fig. 14.

East Greenland records:

*Natica clausa* MÖBIUS 1874, p. 250.

*Natica affinis* POSSELT 1895, p. 81.

*Natica affinis* POSSELT & JENSEN 1898, p. 143.

*Natica clausa* HÄGG 1905, p. 23.

*Natica clausa* ODHNER 1913, p. 18.

*Natica clausa* ODHNER 1915, p. 156.

*Natica clausa* THORSON 1935, p. 54, and pp. 57—59, figs. 62—63, egg capsules.

Occurrence at East Greenland (cf. the map fig. 19, p. 132.):  
*Nordøstkyst Area*: Shannon Ø, 55 m, Sabine Ø, 55 m, (both MÖBIUS); S.E. of Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 3 animals, 2 shells (HÄGG); S. of Pendulum Ø, 74°35' N. 18°23' W., 18—21 m, sandy clay, algae, 1 adult animal (HÄGG). — *Franz Joseph Fjord Area*: E. of Jackson Ø, 73°55' N. 19°20' W., 150 m, clay, 1 animal (HÄGG); Sand Ø, Tyroler Fjord, on the shore, 1 adult, worn shell; Clavering Ø, 55 m (MÖBIUS); Jackson Ø, 55 m (MÖBIUS); Mackenzie Bugt, 12—35 m, mud, 4 animals (HÄGG); Ibidem, 12—18 m, mud, 1 animal (HÄGG); Ibidem, 3—10 m, mud, sand, *Laminaria*, 1 animal (HÄGG); S.E. of Kap Bennet in Mackenzie Bugt, 73°20' N. 21°20' W., 70 m, mud, shells, pebbles, 1 adult animal; Outer part of Moskusokse Fjord, 220 m, clay, 1 animal (HÄGG); Moskusoksefjord, 15 m, 2 adult animals and 1 adult shell; The mouth of Dusénfjord, 73°16' N. 23°15' W., 28—36 m, clay, sand, gravel, pebbles and shells, 1 adult animal; Inner part of Dusénfjord, 240 m, hard clay, 3 adult animals and 2 adult shells; Kap Hedlund, 38—40 m, clay, 1 adult animal; Forsblad Fjord, 95—170 m, 2 adult shells; Kong Oscars Fjord, 73°2' N. 24°36' W., 180—215 m, mud, gravel, stones, 2 adult animals; (Between Greenland and Jan Mayen, 72°42' N. 14°49' W., clay, *Foraminifera*, 2000 m, 1 shell (HÄGG)). — *Scoresbysund Area*: Amdrup Havn, depth ?, *Fucus*, green algae, 1 large, adult animal; Off Kap Hope, 10—13 m, sand, 1 adult animal; Hurry Fjord, the mouth, 28 m, sand, stones, algae, 1 adult animal; Ibidem, 57 m, sandy clay, 1 adult animal; Hurry Fjord, 1 to 2 miles from the mouth, 6—10 m, sand, stones, algae, 1 very large animal and 2 adult animals (2 finds); Ibidem, 30 m, stones, algae, 1 adult animal; Hurry Fjord, off Konstabel Pynt, 24 m, clay, 1 adult animal; Hurry Fjord, off Fame Øer, 4—12 m, clay, gravel, stones, algae, 5 adult animals, 2 adult shells (3 finds); Ibidem, 15—18 m, clay, laminarians, red algae, 4 adult animals (2 finds); Ibidem, 18—28 m, clay, gravel, 4 adult and 1 young animals, 1 adult and 1 young shell (5 finds); 8 miles N.W. of Kap Hooker, 13 m, sand, clay, 1 adult animal; Jamesonland, opposite to the Bjørne Øer, 30 m, hard clay, 1 adult animal, 1 adult shell. — *Kangerdlugssuak Area*: Not known. — *Sydøstkyst Area*: Off Angmagssalik, 265 m, stones, 1 adult shell; The harbour of Angmagssalik, 25 m, 1 large animal; Tasiusak at Angmagssalik, 5—7 m, sand, *Fucus*, *Laminaria*, 1 adult animal; Off the mouth of Lindenow's Fjord, 400—600 m, clay, 1 adult animal; Lindenow's Fjord, outer part, 60—70 m, clay, gravel, 3 adult animals.

*Natica clausa* seems thus to be common along the whole outer coast from Shannon Ø in the N. to Lindenow's Fjord in the S. — Within the large fiord complexes the species seems to be rather frequent in the outer part, while it is very rare or entirely absent in the inner ramifications. The huge material of bottom samples and dredge hauls from Solitærbugt, Ellasø contain not a single specimen. Therefore the isolated finding of a single animal at Kap Hedlund is curious. The vertical distribution in East Greenland is from 4—6 m (at Hurry Fjord) to 400—600 m (the mouth of Lindenow's Fjord).

Distribution: Norway (Vadsø to Oslo Fjord), Kattegat (dead spec.), S. and W. Ireland, Shetland, the Faroes, and Iceland. In the Arctic the species is known from W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, White Sea, Kara Sea, Novaya Zemlya, Franz Joseph Land, the Barents Sea, Siberian Arctic Sea, Bering Sea, Sea of Okhotsk, Kamschatka, The Aleutians, North Devon, Grinnell Land, Wellington Channel, and East Canada. Southern limit: Japan, Vancouver, Cape Hatteras, Portugal, and the Mediterranean. Main distribution: The Mediterranean, and the northern and arctic parts of the Atlantic and the Pacific. Vertical range: From 0 m (Norway) to 2660 m (Algeria).

Remarks: The largest living specimens from East Greenland measure (breadth × height of shell): 20.7 × 21.2 — 17.2 × 18.9 — 17.2 × 17.4 — 15.5 × 17.0 — 15.4 × 17.0 — 15.2 × 16.8 — 14.8 × 15.9, and 14.1 × 15.0 mm respectively, thus being much smaller than the largest Icelandic specimens (measuring up to 30.5 × 34.1 mm).

Biology: Reproduction known from E. Greenland (THORSON 1935). The flat, sand-incrusted egg rings are laid freely on the bottom. The individual egg space is very large and contains only one embryo nourished on white. Larval development non-pelagic. The young hatch in the crawling stage.

#### 40. *Capulacmaea radiatum* (M. Sars).

*Pilidium radiatum* G. O. Sars 1878, p. 144, pl. 8, figs. 6 a—d.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: 5 miles of the Bontekoe Ø, 245 m, very hard clay with stones, 1 young animal (largest diameter 8.0 mm); Franz Joseph Fjord off Kap Franklin, 325 m, 1 adult shell.

The species, which is here recorded from East Greenland for the first time, is thus known only from greater depths in the outer part of Franz Joseph Fjord. The shell from off Kap Franklin has unfortunately disappeared from our collections. Hence no measurements can be given.

Distribution: Le Have Bank, W. Greenland, E. Greenland, Spitzbergen, W. Finmarken, S. of Iceland, Kara Sea, N. of Siberia, Bering Sea, Sea of Okhotsk, the Aleutians. Main distribution: Panarctic-circumpolar. Vertical range: 22 m (W. Greenland) to 430 m (W. Greenland).

Biology: Unknown.

41. *Velutina velutina* (O. Fr. MÜLLER).

*Velutina velutina* ODHNER 1913, pl. 1, figs. 17—26.

East Greenland records:

*Velutina velutina* THORSON 1935, p. 65.

Occurrence at East Greenland (cf. the map fig. 20, p. 133.):  
*Nordøstkyst Area*: Danmarks Havn, 10—38 m, mud, *Laminaria*, *Dellesteria*, 4 adult and 1 young animal, 1 very large shell (6 finds); Stormbugt at Danmarks Havn, 19—47 m, stones, shells, red algae, 2 adult animals (2 finds). — *Franz Joseph Fjord Area*: Eskimonæs at Clavering Ø, 45—47 m, clay, gravel, algae, 1 very young animal; Inner part of Franz Joseph Fjord, off Engdalen, 32—37 m, mud, 2 large animals; Off the mouth of Rhedinfjord, 25—30 m, 2 adult and 1 young animal; Kap Hedlund, 12—23 m, rocks with algae, 2 adult animals (2 finds); Ibidem, 24—26 m, 2 very large animals; Ibidem, 29—31 m, rocks with algae, 1 adult animal; Ibidem, 33—38 m, clay, red algae, 1 adult fresh shell; Ibidem, 71—80 m, Ascidianepifauna, 1 adult animal; Solitærbugt, Ellaø, 20—28 m, clay, stones, shells, 2 adult and 1 young animal, 1 adult shell (4 finds); Ibidem, 39—44 m, clay, stones, shells, 3 adult (one very large) and 1 young animal, 1 adult fresh shell (4 finds); Ibidem, 60—64 m, clay, gravel, 1 adult, worn shell. — *Scoresbysund Area*: Hurry Fjord off Fame Øer, 15—18 m, soft clay, *Laminaria*, red algae, 1 adult animal; Jamesonland opposite to the Bjerne Øer, 40 m, sandy clay, 1 young animal; Off the Bjerne Øer, 18—28 m, stones, gravel, red algae, 1 adult animal (fragmentary). — *Kangerdlugssuak Area*: Uttental Sund, 5—8 m, 1 young animal; Ibidem, 10—15 m, clay, 2 adult animals (2 finds); Ibidem, 20—25 m, clay, red algae, 1 adult animal, 1 adult fresh shell (2 finds); Ibidem, 40—45 m, soft clay, red algae, 2 adult animals; Ibidem, 50—60 m, clay, 1 adult, 1 young animal, 1 adult shell (2 finds); Kangerdlugssuak, 70 m, stones, 1 adult animal, 1 very large shell. — *Sydøstkyst Area*: Angmagssalik, 45 m, 1 adult animal; Lindenow's Fjord, inner part, 30—50 m, gravel, 1 young animal; Lindenow's Fjord, middle part, 25—30 m, gravel, *Laminaria*, 2 adult animals (one of them very large); "North coast of Lindenow's Fjord", 10—75 m, 1 adult animal; Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 1 young animal.

The species, which curiously enough has not been recorded in the older literature, seems to be rather common along the whole coast of East Greenland from Danmarks Havn in the N. to Kekertaksiak in the S. It inhabits the outer coast as well as the innermost ramifications of the large fiords. The vertical range for living specimens in East Greenland is 5—8 m (Uttental Sund) to 71—80 m (Kap Hedlund), and the species seems to be associated with the epifauna, which is in good agreement with its habit: to feed on Ascidians.

Distribution: Whole Norway, Bohuslän, the Sound, the Dogger Bank, the British Isles, Belgium, France, Portugal (rare), Shetland, the Hebrides, the Faroes, and Iceland. In the Arctic known from: W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, White Sea, Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, Franz Joseph Land, Bering Sea, the Aleutians, Kamschatka, E. Canada, and New Foundland. Southern limits: Vancouver, Cape Hatteras, and the Mediterranean. Main distribution: The Mediterranean, and northern and arctic parts of the Atlantic and the Pacific. Vertical range: From 0 m (Norway) to about 100 m (the Hebrides).

Remarks. The largest living East Greenland specimens measure (breadth  $\times$  height of shell): 26.0  $\times$  27.5 — 23.7  $\times$  25.5 — 20.0  $\times$  21.9 — 19.1  $\times$  20.5 — 19.0  $\times$  22.2 — 16.9  $\times$  18.4 — 16.9  $\times$  18.0 and 15.5  $\times$  16.8 mm respectively. The largest empty shell measures 22.1  $\times$  24.1 mm. Some adult specimens from Bjørne Øer and Uttental Sund had a quite smooth shell without the slightest trace of such a spiral structure as is normally met with in the species. A large animal from Lindenow's Fjord had a living specimen of *Spirorbis* attached to its shell.

Biology: Reproduction partly known from Plymouth (LEBOUR 1937). The eggs are unknown. The larva is an *Echinospira* and has a long, pelagic life. Such *Echinospira* larvae have, however, never been observed during the numerous regular plankton hauls from Solitærbugt throughout the year, where the parents are rather abundant. This, in connection with some unpublished observations on the shape and size of the embryonic whorls of the apex in adult specimens, seems, however, to question the pelagic development of this species in high-arctic seas. The author intends to study these problems in detail as soon as possible.

#### 42. *Velutina undata* BROWN.

*Morvillia undata* BROWN (*Velutina zonata* GOULD) G. O. SARS 1878, pl. 21, fig. 7 a—c.

#### East Greenland records:

*Marvillia zonata* Var. *expansa* HÄGG 1905, p. 31.

*Velutina undata* ODHNER 1913, p. 56.

*Velutina undata* ODHNER 1915, p. 164.

*Marvillia undata* var. *expansa* THORSON 1934, p. 7.

*Velutina undata* THORSON 1935, pp. 65—67, figs. 71—72, egg-capsules erroneously referred to this species but in reality belonging to *Admete viridula* (see this).

Occurrence at East Greenland: *Nordøstkyst Area*: Not known. — *Franz Joseph Fjord Area*: Between Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 2 animals (HÄGG); E. of Greenland, 72°25' N. 17°56' W., 300 m, stones, sand, 1 animal (HÄGG); Moskusokse Fjord, inner part, 100 m, clay, 1 animal (HÄGG); Dusénfjord, inner part, 240 m, hard clay, 1 adult, 1 young animal, 1 adult shell (all var. *expansa*); Kap Hedlund, off the mouth of Rhedinfjord, 23—28 m, 1 adult animal (fragmentary, var. ?); Ibidem, 33—40 m, clay, 1 young animal (var. *expansa*); Solitærbugt, Ellaø, 28 m, clay, shells, 1 adult animal (var. *expansa*); Ibidem, 30—40 m, stones, clay, 1 adult and 1 young animal (both fragmentary, var. ?) (2 finds); Ibidem, 44 m, 1 adult animal (var. *expansa*); Forsblads Fjord, 95 m, 3 adult animals (var. *expansa*); Ibidem, 100—170 m, 1 adult shell (var. *expansa*). — *Scoresbysund Area*: Kap Stewart, 70°27' N. 20°35' W., 13—18 m, mud, stones, algae, 1 very large animal (var. *expansa*); Hurry Fjord off Fame Øer, 18—25 m, clay, 2 adult animals (var. *expansa*) (2 finds). — *Kangerdlugssuak Area*: Kangerdlugssuak, 70 m, stones, 1 animal, 1 shell (THORSON). — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 11—57 m, mud, 1 adult, dried shell (probably taken alive); Ikatek at Sermilik, 44 m, *Laminaria*, 1 very large animal (somewhat fragmentary) (var. *expansa*); Lindenow's Fjord, inner part, 30—50 m, gravel, 1 adult animal (var. *expansa*); Lindenow's Fjord, middle part, 20—25 m, *Laminaria*, 1 adult animal (var. *expansa*); "Northcoast of Lindenow's Fjord", 10—75 m, 1 very large animal (var. *expansa*); Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 1 young animal.

This species, which seems to be less common than *Velutina velutina*, has its main occurrence in the inner parts of the fiords and seems to be rare or totally lacking along the outer coast. The vertical range for living specimens in East Greenland is 13—18 m (Kap Stewart) to 240 m (Dusénfjord), the species thus preferring greater depths than *Velutina velutina*.

Distribution: Norway (Vadsø to Christianssund), Scotland—Faroe—ridge, E. of Iceland, Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, Russian Lapmarken, White Sea, Novaya Zemlya, Kara Sea, the Siberian Arctic Sea, Franz Joseph Land, the Bering Sea, Jones Sound, Grinnell Land, St. Lawrence Gulf, Halifax, and Davis Strait. Main distribution: Panarctic. Vertical range: From 8 m (Spitzbergen) to 1187 m (North Atlantic).

Remarks: The largest living, undamaged animals from East Greenland measure (breadth × height of shell): 18.0 × 21.0 — 17.2 ×

19.8 —  $17.2 \times 19.8$  and  $13.2 \times$  about 14.5 mm respectively. They all belonged to var. *expansa*. A large animal from Lindenow's Fjord had a living *Serpula* attached to its shell.

Biology: The egg capsules and embryos described from East Greenland (THORSON 1935) and referred to this species, later on proved to belong to *Admete viridula* (cf. p. 108.). The mode of reproduction in *Velutina undata* is thus still unknown.

43. *Velutina plicatilis* (O. FR. MÜLLER) (= *V. flexilis* (MONTAGU)).

*Velutina plicatilis* ODHNER 1913, pl. 1, figs. 12—16.

Occurrence at East Greenland: *Scoresbysund Area*: Henry Land, about  $69^{\circ}35'$  N., 38 m, bottom unknown, 1 half grown animal, breadth  $\times$  height of shell:  $7.2 \times 5.0$  mm. — *Kangerdlugssuak Area*: Uttental Sund, 50 m, clay, 1 adult animal, breadth  $\times$  height of shell:  $10.7 \times 10.2$  mm.

Both specimens had the features quite typical of the species in other seas, and the two East Greenlandic localities are both associated with the outer coast and are rather near each other. The species is here recorded not only from East Greenland but from the whole Greenlandic coast for the first time. In the unpublished materials from SW. Greenland in the Copenhagen Museum there are, however, four beautiful specimens from Nordre Strømfjord.

Distribution: Norway (Vadsø to Oslo Fjord), Bohuslän, Kattegat, Belgium, E. coast of England and Scotland, the Orkneys, the Hebrides, Shetland, the Faroes, Iceland, E. Greenland, W. Greenland (unpublished), Spitzbergen, the White Sea, the Aleutians, the Sea of Okhotsk, Halifax, and New Foundland. Main distribution: Panarctic-boreal. Vertical range: 15 m (Norway) to 377 m (Norway).

Biology: Unknown.

44. *Marsenina glabra* (COUTHOUY) (= *M. micromphala* BERGH).

*Marsenina glabra* ODHNER 1913, pl. 1, figs. 7—11, pl. 5, figs. 30—31.

East Greenland records:

*Marsenina micromphala* HÄGG 1905, p. 33.

*Marsenina glabra* ODHNER 1913, p. 51.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: E. of Greenland,  $73^{\circ}55'$  N.,  $19^{\circ}20'$  W., 150 m, mud, 2 animals (HÄGG); Between Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 1 adult animal (HÄGG).

ODHNER (l. c.) cites the findings given by HÄGG, states his determination, and figures HÄGG's specimens (pl. 1, fig. 11 and pl. 5, fig. 31); the large material from recent investigations contains not a single specimen of *M. glabra*, which, accordingly, seems to be rather rare and restricted to the outer coast.

Distribution: Norway (from Vadsø to the W. coast), off Norway, Iceland, S.W. and E. Greenland, Denmark Strait, E. of Iceland, Spitzbergen, the White Sea, the Siberian Arctic Sea, Massachusetts, and E. Canada. Main distribution: Panarctic. Vertical range: From 38 m (Norway) to 1222 m (off Norway).

Remarks: HÄGG for two animals gives the following measures (breadth  $\times$  height of shell):  $10.1 \times 7.4$  and  $9.4 \times 8.4$  mm respectively.

Biology: Unknown.

#### 45. *Onchidiopsis glacialis* M. SARS.

*Onchidiopsis glacialis* ODHNER 1913, pl. 2, figs. 17, 18, 23, 24, pl. 5, figs. 3, 5, 32, and 33.

East Greenland records:

? *Onchidiopsis groenlandica* POSSELT 1895, p. 81.

? *Onchidiopsis groenlandica* POSSELT & JENSEN 1898, p. 138.

*Onchidiopsis groenlandica* HÄGG 1905, p. 34.

*Onchidiopsis glacialis* ODHNER 1913, p. 74, pl. 1, figs. 17—23, pl. 5, figs. 3, 5, and 33 (examination of the specimens mentioned by HÄGG).

Occurrence at East Greenland: *Nordøstkyst Area*: Stormbugt at Danmarks Havn, 15—19 m, soft bottom, *Delesseria*, 1 half-grown animal; S.E. of Pendulum Ø,  $74^{\circ}35' N. 18^{\circ}15' W.$ , 150 m, mud, stones, 1 animal (HÄGG); S.E. of Hvalros Ø,  $74^{\circ}30' N. 18^{\circ}40' W.$ , 80—100 m, mud, stones, 1 animal (HÄGG). — *Franz Joseph Fjord Area*: Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 2 animals (HÄGG, ODHNER); Ibidem, 12—35 m, mud, 1 animal (HÄGG); Outer part of Moskusokse Fjord, 220 m, clay, 1 animal; Greenland Sea East of Vega Sund,  $72^{\circ}25' N. 17^{\circ}56' W.$ , 300 m, stones, gravel, 4 animals; Solitærbugt at Ellaø, 17—20 m, stones, shells, *Desmarestia*, 1 very large animal; Ibidem, 43—44 m, stones, 1 half-grown animal (with a dark osphradium); Between Maria Ø and Geographical Society Ø,  $72^{\circ}56' N. 24^{\circ}33' W.$ , 125 m, mud, sand, pebbles, 1 adult animal (with a dark osphradium). — *Scoresbysund Area*: Hekla Havn (POSSELT). The specimen has not been refound in the Copenhagen-Museum, and, hence, it cannot be stated with certainty, that POSSELT's specimen belonged to *O. glacialis* M. Sars. — *Kangerdlugssuak Area*: Uttental Sund, 20—25 m, red algae, 2 young animals (2 finds); Ibidem, 30—40 m, clay, red algae, 1 young animal. — *Syd-*

*østkyst Area*: Angmagssalik, 0—17 m, stones, algae, 3 adult and 1 half-grown animals; Ibidem, about 50 m, 1 half-grown animal; Tasiusak at Angmagssalik, 38—57 m, stones, algae, 1 half-grown and 3 young animals; Ibidem, 100 m, stones, 1 young animal (with a dark osphradium); Ikerasausak at Angmagssalik, 0—10 m, *Fucus*, *Laminaria*, 1 very large animal.

The species is rather common along large areas of the outer coast, but seems to be rare in the inner parts of the large fjords. The vertical range at East Greenland is from 0—10 m (Ikerasausak and Mackenzie Bugt) to 300 m (E. of Vega Sund).

Distribution: (Reexamined according to the remarks on synonymy given below): West Greenland, East Greenland, Spitzbergen, Beeren Island-Hope Island, Iceland (erroneously as *Onchidiopsis groenlandica* in THORSON 1941), Finmarken, the Murman Coast, the Kara Sea, Novaya Zemlya. Main distribution: Panarctic. Vertical range: From 57—75 m (N. Norway) to 113 m (W. Greenland) or ? 860 m (E. of Iceland).

Remarks: The two largest animals had a maximum length of 60 and 41 mm respectively, their shells having a maximum length of 39 and 32 mm respectively.

Biology: MĚŠIACEV (1913) has described the development of *Onchidiopsis glacialis* M. SARS, but his paper is not available in Denmark or neighbouring countries. The eggs and larvae described by BERGH (1887) as belonging to "*Onchidiopsis groenlandica*" (probably identical with *O. spitzbergensis* AD. S. JENSEN, cf. the remark below) belong (according to unpublished results of the present author from Øresund) to *Velutina velutina*.

Remarks on the synonymy of the northern species of *Onchidiopsis*.

The notes published here were put down more than 20 years ago and are kindly placed at my disposal by Professor AD. S. JENSEN, who first intended to publish the results himself, but at present cannot afford the time to enter more thoroughly into these problems. I take the opportunity to thank Prof. AD. S. JENSEN for handing over to me the MS., which is published here just as I have received it:

"In his beautiful Monography of northern *Semiproboscidiifera* Dr. NILS ODHNER (1913) has augmented our knowledge of the species distinguished by RUDOLPH BERGH in 1887, *Onchidiopsis glacialis* M. SARS and *O. groenlandica* BERGH, and has erected a new species: *O. latissima*. ODHNER states that the main characters used by BERGH to distinguish *O. glacialis* from *O. groenlandica* (viz. the colour of the osphradium (white or blackish) and the structure of the inner uncini (denticulated in the outer margin, or smooth)) are not constant, and he found other

characters of a constant specific import, especially the structure of the penis and the shape of the foot.

“When, using Dr. ODHNER’s paper as a guide, I began the revision of our Greenland collection of the genus *Onchidiopsis*, I was surprised to find that the two specimens (one undamaged, the other fragmentary after anatomical investigation) which I could definitely designate as the original specimens for BERGH’s *O. groenlandica* in his paper from 1853, did not agree with Dr. ODHNER’s description of “*O. groenlandica* BERGH”, but, on the contrary, with a species by ODHNER designated as “*O. glacialis* M. SARS”. Therefore, I had to go further into these questions and came to the following results:

“In his monograph on the Marseniads from 1853 BERGH described the species *Onchidiopsis groenlandica* on the basis of two Greenland specimens, one of them sent to the Copenhagen Museum “from Cpt.-lieutenant HOLBØLL (South-Greenland ?), the other one from merchant DORPH (Julianehaab 1830)”. The species is described in detail and its outer and inner features are illustrated by several figures on pl. II.

“When several years later, in 1887 (l. c.) BERGH once more studied the genus *Onchidiopsis* and discussed his species as compared with *Onchidiopsis (Lamellaria) glacialis* from Finmarken, briefly described by MICHAEL SARS in 1851, BERGH, curiously enough, did not re-examine the Greenland original specimens on which *Onchidiopsis groenlandica* 1853 was erected (although these specimens, as stated above, even now are kept in the Copenhagen Museum, from where BERGH had borrowed them), but gave a quite new, detailed and illustrated description of “*O. groenlandica*” based on two large specimens of an *Onchidiopsis* from Spitzbergen, placed at his disposal by H. FRIELE in Bergen. A comparison between BERGH’s text and figures of *O. groenlandica* 1887 and those of his *O. groenlandica* 1853 shows that they do not belong to the same species. BERGH’s *O. groenlandica* from 1853 belongs to the same species as the *O. glacialis*, which he described in 1887, on the basis inter alia of a specimen of “*Lamellaria glacialis*” originating from M. SARS, while BERGH’s *O. groenlandica* from 1887 belonged to a new and hitherto undescribed species.

“These facts—as is easily understood—have escaped Dr. ODHNER’s attention, who evidently has not used BERGH’s paper from 1853, but only that from 1887.

“*Onchidiopsis groenlandica* BERGH from 1853 must accordingly be replaced by *Onchidiopsis glacialis* M. SARS published two years earlier, and must be regarded as synonymous with this species. *Onchidiopsis groenlandica* BERGH from 1887 must be provided with a new name, and I propose to call it *O. spitzbergensis*, it being primarily described and hitherto known only from Spitzbergen.

“A summary of the synonymy accordingly looks as follows:

*Onchidiopsis glacialis* M. SARS

*Lamellaria glacialis* M. SARS l. c. 1851, p. 185.

*Onchidiopsis groenlandica* BERGH l. c. 1853, p. 106.

*Onchidiopsis glacialis* G. O. SARS 1878, p. 153.

*Onchidiopsis glacialis* BERGH l. c. 1887, p. 189, et 280.

*Onchidiopsis glacialis* ODHNER l. c. 1913, p. 12, et 73,

and for the other species:

*Onchidiopsis spitzbergensis* nomen novum.

*Onchidiopsis groenlandica* BERGH l. c. 1887, p. 187 et p. 265.

*Onchidiopsis groenlandica* ODHNER l. c. 1913, p. 12 et p. 74.

“The question of the synonymy of the species of *Onchidiopsis* is, however, still not exhausted.

“As mentioned above, Dr. ODHNER in his paper has erected a new species of *Onchidiopsis*, which he calls *O. latissima*. In reality this new species was, however, long ago described thoroughly and is figured in detail by BERGH in his earlier mentioned monograph of 1853 under the name of *O. carnea*. The well known Danish zoologist H. KRÖYER, who was a member of the expedition with “la Recherche”, had captured adult and young specimens of this species in Bell Sound at Spitzbergen and had given the adult specimens the “museum name” of “*Coriocella carnea* KR.”, and the young ones “*Coriocella recondita* KR.”. BERGH, in his paper of 1887 again withdraws this species which he erroneously considers identical with the “*O. groenlandica*” (= *O. spitzbergensis* mihi) described in the same paper.

“When comparing BERGH’s description of *Onchidiopsis carnea* with ODHNER’s description of *O. latissima* no doubt is left as to their identity; only the osphradium (“den forreste lille Gjælle” (= the anterior small gill) BERGH l. c. 1853, p. 51) was black in the specimen examined by BERGH and uncoloured in those examined by ODHNER, but just this latter author has stated, that the colour of the osphradium is of slight systematic value, being liable to vary within the same species, viz. *O. glacialis*, and here in *O. carnea* we have a new example of the variability of this character.

“The synonymy of this third species is accordingly as follows:

*Onchidiopsis carnea* (KRÖYER) BERGH.

*Coriocella carnea* KRÖYER 1847, p. 115, no. 10.

*Coriocella recondita* KRÖYER 1847, p. 115, no. 11.

*Onchidiopsis carnea* BERGH 1853, p. 107.

*Onchidiopsis carnea* MØRCH 1869, p. 11.

*Onchidiopsis latissima* ODHNER l. c. 1913, p. 12 & p. 75.”

46. *Trophon truncatus* (STRØM).

*Trophon truncatus* G. O. Sars 1878 pl. 15 fig. 9.

Occurrence at East Greenland (cf. the map fig. 15, p. 128.): *Sydøstkyst Area*: Tasiusak at Angmagssalik, 6—8 m, mud, *Desmarestia*, 1 adult and 1 half-grown animal; Ibidem, 9 $\frac{1}{2}$ —36 m, stones, algae, 5 adult and 1 half-grown animals; Ibidem, 38—57 m, stones, algae, 2 adult animals; Sermilik off Epilalak, 5—7 m, clay, *Fucus*, 7 adult animals; Lindenow's Fjord, the mouth, 125—150 m, gravel, clay, 1 adult animal; Lindenow's Fjord, middle part, 37 m, rocks, sand, *Laminaria*, 1 adult shell; Ibidem, 117 m, clay and sand, 1 adult shell; Lindenow's Fjord, inner part, 25—50 m, clay, sand, *Laminaria*, 3 adult and 1 half-grown animal (3 finds).

The species recorded here for the first time from East Greenland seems only to occur along the southernmost part of the coast. The animals from Tasiusak and Sermilik had large, thick shells with rounded lamellae or are quite devoid of lamellae, while those from Lindenow's Fjord had smaller, thin shells with distinct, fine, densely placed lamellae.—The vertical range for East Greenland animals is from 5—7 m (Sermilik) to 125—150 m (Lindenow's Fjord).

Distribution: Norway (N. and W. coasts), the Kattegat, the British Isles, the Faroes, Iceland, W. Greenland, E. Greenland, Spitzbergen, the Murman Coast, the Barents Sea, the Siberian Arctic Sea and Gulf of Maine. Main distribution: Subarctic (boreo-arctic). Vertical range: 3 m (Iceland) to 132 m (W. Greenland).

Remarks: The largest animals from East Greenland measured (breadth  $\times$  height of shell): 12.0  $\times$  25.3 — 9.8  $\times$  21.0 — 8.7  $\times$  19.6 — 8.7  $\times$  19.3 — 8.6  $\times$  19.4 — 8.5  $\times$  18.7 — 8.5  $\times$  18.5, and 8.5  $\times$  18.1 mm respectively.

Biology: Unknown.

47. *Trophon clathratus* LINNÉ var. *gunneri* LOVÉN.

*Trophon clathratus* var. *Gunneri* G. O. Sars 1878 pl. 15 fig. 11.

Occurrence at East Greenland (cf. the map fig. 14, p. 127.): *Sydøstkyst Area*: Lindenow's Fjord, the mouth, 400—600 m, clay, *Foraminifera*, 1 adult animal (typical, slender in shape; shell 7.1 mm in breadth and 13.4 mm in height); Lindenow's Fjord, the outer part, 90 m, clay, 1 adult animal (with an oblique columella; shell 9.2 mm in breadth, and 17.1 mm in height).

The species is here recorded from East Greenland for the first time. It seems only to inhabit the southermost corner of the long coast stretch and to prefer great depths.

Distribution: (type form and var. *gunneri*). Whole Norwegian coast, Bohuslän, North England, the Hebrides, the Faroes, Iceland, W. and S.E. Greenland, Spitzbergen, White Sea, Nowaya Zemlya, Siberian Arctic Sea, Franz Joseph Land, Bering Strait, Japan, Puget Sound, Alaska, Baffin Land, New England, and Cape Cod. Main distribution: Panarctic-circumpolar. Vertical range: From 8 m (Spitzbergen) to 1033 m (the Hebrides).

Remarks: Both animals had crusts of bryozoans attached to their shells.

Biology: The reproduction has been elucidated by means of Icelandic material (Thorson 1940). The lense-shaped egg capsules are laid singly on stones or mollusc shells. Each egg capsule contains several large eggs or embryos. The larval development is non-pelagic, and the young hatch in the crawling stage.

48. *Trophon fabricii* MØLLER (= *Tr. craticulatus* (MØRCH)) (cf. fig. 8, p. 69).  
*Tritonium craticulatum* O. FABRICIUS 1780, p. 400 (description only).

Occurrence at East Greenland (cf. the map fig. 15, p. 128.):  
*Franz Joseph Fjord Area*: Solitærbugt, at Ellaø, 32—35 m, 1 adult, worn shell (probably subfossil). — *Sydøstkyst Area*: Off Angmagssalik, depth ?, 1 adult animal; Ibidem, about 50 m, 1 adult animal; Tasiusak at Angmagssalik, 6—8 m, mud, *Desmarestia*, 1 adult animal; Ibidem, 38—57 m, stones, 1 adult animal, 1 adult shell; Tasiusarsuk at Angmagssalik, 20—30 m, red algae, 1 very large animal; Lindenow's Fjord, the mouth, 100—150 m, sand, bryozoans, 1 adult animal; Lindenow's Fjord, outer part, 100—150 m, clay and gravel, 2 half-grown shells; Ibidem, 11 m, clay, 2 young animals; Lindenow's Fjord, middle part, 25—30 m, gravel, *Laminaria*, 2 very young animals; Ibidem, 55 m, clay, 1 adult, 2 fragmentary shells; Lindenow's Fjord, inner part, 25—50 m, clay, gravel, *Laminaria*, 2 adult, 1 half-grown and 2 young animals (4 finds).

The species is new to the East Greenlandic fauna and seems only to occur along the south eastern part of the coast. The animals are large, the shells—very large and beautiful—show only a slight variation, except that some of the shells from the innermost part of Lindenow's Fjord are somewhat more slender and longer than normally met with. The vertical range for East Greenland animals is 6—8 m (Tasiusak) to 100—150 m (the mouth of Lindenow's Fjord).

Distribution: Iceland, W. Greenland, E. Greenland, Spitzbergen, Finmarken (?), the Bering Sea, the Wellington Channel, Labrador, and St. Lawrence Gulf. Main distribution (according to the few records): Low-arctic. Vertical range: From 6—8 m (E. Greenland) to 160 m (Iceland).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):  $23.1 \times 48.9$  —  $19.5 \times 42.2$  —  $19.5 \times 40.9$  —  $19.4 \times 40.2$  —  $18.2 \times 38.7$  —  $17.5 \times 40.3$ , and  $17.5 \times 38.8$  mm respectively.

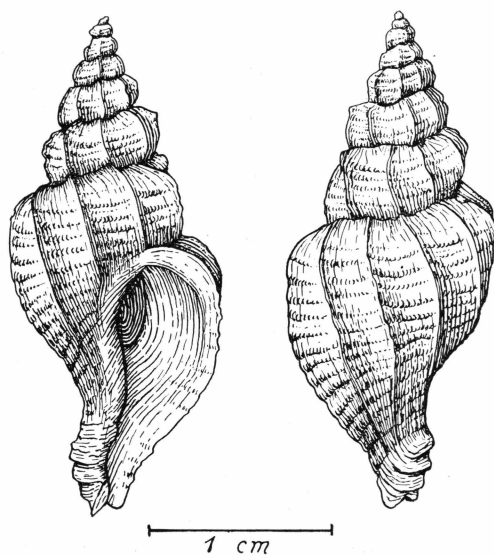


Fig. 8. *Trophon fabricii* MÖLLER. The figures show one of MÖLLER's type specimens from W. Greenland, at the Copenhagen Museum.

Several animals had *Spirorbis*, *Serpula*, hydroids and crusts of bryozoans attached to their shells. Some of the empty shells were inhabited by the gephyrean *Phascolion strombi*.

Biology: A single egg capsule with 7 large embryos was taken at Kekertaksiak (Sydøstkyst Area), 60 m depth, on 13-7-1935, on a dead shell of *Mya truncata*. The shape of the capsule is closely like those of *Trophon clathratus* (see this) but somewhat larger (basal diameter 8 mm). The embryos are essentially larger (height about 2 mm) than those of *Tr. clathratus* (height 0.75 mm), and while the latter species has characteristic angular embryonic whorls, *Tr. fabricii* has rounded whorls without any trace of a keel. The young hatch in the crawling stage. A detailed description with figures will be published later.

49. *Pyrene rosacea* GOULD.

*Pyrene rosacea* G. O. SARS 1878, pl. 16, fig. 1.

## East Greenland record:

*Pyrene (Astyris) rosacea* THORSON 1935, p. 49—50 fig. 50—51, egg capsules.

Occurrence at East Greenland: *Kangerdlugssuak Area*: Utten-tal Sund, 50 m, clay, 2 adult animals and 1 adult shell, 1 egg capsule with 5 large embryos. — *Sydøstkyst Area*: Ingmikertok at Angmagssalik, depth ?, 1 adult and 1 half-grown animal; Tasiusak at Angmagssalik, 28—38 m, rocks with algae, 1 adult shell. The species is known only from the recent Danish expeditions and seems to occur rather rarely and in scattered specimens only the southernmost areas of East Greenland.

Distribution: Norway (from Finmarken to Bergen), the Faroe Channel, N. of the Hebrides, Iceland, W. Greenland, S.E. Greenland, Spitzbergen, the Murman Coast, White Sea, Novaya Zemlya, Bering Sea, Alaska, Labrador to Cape Cod. Main distribution: Low-arctic. Vertical range: From 1 m (Spitzbergen) to 178 m (Cape Cod).

Remarks: The largest living animals measured (breadth  $\times$  height of shell):  $4.5 \times 10.4$  —  $4.0 \times 9.1$ , and  $3.5 \times 7.9$  mm. The empty shell measured  $4.0 \times 8.4$  mm.

Biology: The reproduction is known from E. Greenland (THORSON 1935). The dome-shaped egg capsules, provided with two circular membranes, are laid singly on algae or bryozoans. The capsule contains several (about 5) embryos. The larval development is non-pelagic. The young hatch in the crawling stage.

50. *Volutopsis norvegica* (CHEMNITZ).

*Volutopsis norvegica* G. O. SARS 1878, pl. 15, figs. 1 a—b.

## East Greenland records:

*Volutopsis norvegica* Var. *largillierti* HÄGG 1905, p. 52.

*Neptunea, volutopsis, norvegica* GRIEG 1909, p. 38.

*Volutopsis norvegica* ODHNER 1915, p. 200.

*Volutopsis norvegicus* THORSON 1935, p. 23.

*Volutopsis norvegica* THORSON 1940 p. 258.

Occurrence at East Greenland: *Nordøstkyst Area*: Off Île de France,  $77^{\circ}35'5''$  N.  $18^{\circ}12'$  W., 53 m, 1 young "specimen" (GRIEG). — *Franz Joseph Fjord Area*: Between the Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 1 young animal (HÄGG); Greenland Sea, E. of Vega Sund,  $72^{\circ}25'$  N.  $17^{\circ}56'$  W., 300 m, stones, sand, 1 adult animal (HÄGG). — *Scoresbysund Area*: Off the mouth of Rosenvinges Bugt, 300 m, stones, 1 adult, fragmentary animal; Hurry Fjord, off the Fame Øer, 15—18 m,

clay, *Laminaria*, red algae, 1 egg capsule with newly laid eggs (THORSON 1935, fig. 18). — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 9 $\frac{1}{2}$ —36 m, 1 adult animal; off Angmagssalik, 263 m, stones, 1 adult shell; Off the mouth of Lindenow's Fjord, 100—150 m, sand, bryozoans, 1 rather young animal.

The species seems thus to occur along the whole East Greenlandic coast, where it is found—although rather rarely—along the outer coast, but does not seem to enter the inner part of the fiords. The vertical range for living specimens at East Greenland is 15—18 m, (Fame Øer, fresh egg capsule), and 9 $\frac{1}{2}$  to 36 m (Tasiusak) to 300 m (Rosenvinges Bugt). The species seems here to occur in much shallower water than in its main area of distribution, where it must be regarded a deep-sea species.

Distribution: Norway (E. Finmarken to Lofoten), N.E. England, the Hebrides, Shetland, off the Faroes, the North Sea, and Iceland. Further: W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, the Barents Sea, Kolguev, the Bering Sea, the Sea of Okhotsk, St. Lawrence Gulf, and Newfoundland. Main distribution: Panarctic with subarctic outposts. Vertical range: (9 $\frac{1}{2}$  m?) 15 m (East Greenland) to 650 m (Iceland).

Remarks: The largest non-fragmentary animal from East Greenland (Tasiusak) measured 27.5 mm in breadth and 54.0 mm in height of shell. The largest shell (off Angmagssalik) measured 35.8 × 76.4 mm. — The animals had often living *Spirorbis* or crusts of bryozoans attached to their shells.

Biology: The reproduction is known from England, E. Greenland, and Iceland (cf. THORSON 1935 and 1940). We have an egg capsule from N. Iceland containing two gigantic embryos—to all appearance the largest prosobranch embryos known. The embryos (1 to 4 per capsule) feed on nurse eggs and have a non-pelagic development in the singly laid, dome-shaped, egg capsules.

[*Sipho mohni* (FRIELE).

*Neptunea (Mohnia) Mohni* FRIELE 1882, pl. 3, figs. 7—11, pl. 5, figs. 14—15.

East Greenland record:

*Sipho (Mohnia) mohni* HÄGG 1905, p. 41.

Occurrence at East Greenland: Between E. Greenland and Jan Mayen, 72°42' N. 14°49' W., 2000 m, mud, *Foraminifera*, 110 animals and 1 shell (HÄGG); North of Jan Mayen, 72°1' N. 8°33' W., 2400 m, mud, 2 adult animals, 8 shells (HÄGG).

*Sipho mohni* is thus hitherto not known from the East Greenlandic shelf, but the records given here and those by FRIELE (1882 p. 25) show,

that the species occurs in abundance just outside the shelf in the deep sea, and experience from Iceland and E. Greenland seems to show that such species may now and then enter the outer part of the shelf in scattered specimens. Hence, it is to be expected that future investigations along the E. Greenlandic outer coast, will also incorporate this species as a member of the real shelf fauna.

Biology: Unknown].

[*Sipho danielsseni* (FRIELE).

*Neptunea* (*Siphonorbis*) *Danielsseni* FRIELE 1882, pl. 3, figs. 1—6, pl. 5, figs. 9—13.

East Greenland record:

*Sipho* (*Siphonorbis*) *Danielsseni* HÄGG 1905, p. 42.

Occurrence at East Greenland: Between E. Greenland and Jan Mayen, 72°42' N. 14°49' W., 2000 m, mud, *Foraminifera*, 5 adult animals, 5 shells (HÄGG); North of Jan Mayen, 72°1' N. 8°33' W., 2400 m, mud, 2 shells, probable subfossil. — As was the case with *Sipho mohni*, *Sipho danielsseni* seems also to be abundant throughout the Greenland sea, thus also in the deep sea just outside the East Greenland shelf. Therefore it must be expected that here too future investigations will procure animals of this species from the outer part of the East Greenland shelf.

Biology: Unknown].

[*Sipho propinquus* (ALDER).

*Neptuna propinqua* FORBES & HANLEY 1853 III, p. 419, pl. 103, fig. 2.

East Greenland records:

*Fusus propinquus* MÖBIUS 1874, p. 249.

? *Siphonorbis propinquus* POSSELT 1895, p. 84.

*Sipho* (*Siphonorbis*) *propinquus* POSSELT & JENSEN 1898, p. 179.

*Sipho* (*Siphonorbis*) *propinquus* HÄGG 1905, p. 46.

Occurrence at East Greenland: The records of MÖBIUS: Sabine Ø, Clavering Ø, and Germania Havn, 7<sup>1</sup>/<sub>2</sub>—38 m, are cited by POSSELT and by POSSELT & JENSEN, who have no original finds of this species. HÄGG mentions the species from: Outer part of Moskusoksefjord, 220 m, clay, 4 animals, 1 shell. In the large recent material from North East Greenland, and also from several dredge hauls in Moskusokse Fjord, the species is quite absent. As *Sipho propinquus* further is a pronounced boreal species which is also absent from Iceland (THORSON 1941 p. 82—83), it seems justifiable to question the records of MÖBIUS and HÄGG,

especially as several other of the records given by MÖBIUS have proved to be dubious or directly erroneous (cf. *Scalaria groenlandica*, p. 42, *Buccinum undatum* p. 87).

Hence, *S. propinquus* must be excluded from the East Greenlandic fauna].

#### 51. *Sipho lachesis* (MÖRCH).

*Neptunea* (*Siphonorbis*) *lachesis* FRIELE 1882, p. 21, pl. 2, figs. 28—32, pl. 5, figs. 6—7.

##### East Greenland records:

*Sipho* (*Siphonorbis*) *lachesis* HÄGG 1905, p. 43.

*Sipho lachesis* THORSON 1935, pp. 18—19, figs. 10—11, egg capsules.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Between Bontekoe Ø and Mackenzie Bugt, 25 m, mud, 1 animal (HÄGG); E. of Kap Bennet, Mackenzie Bugt, 73°20' N. 21°20' W., 70 m, mud, pebbles, shells, 1 adult animal; S.W. of Kap Franklin, 320 m, soft clay, 1 adult shell; Between Kap Weber and Ymers Ø, 450 m, clay with large stones, 1 half-grown shell; The mouth of Franz Joseph Fjord, 200—300 m, mud, 1 animal (HÄGG); Moskusokse Fjord, inner part, 100 m, clay, 1 animal (HÄGG); Moskusokse Fjord outer part, 220 m, clay, 1 animal (HÄGG); E. of Greenland, 72°25' N. 17°56' W., 300 m, stones, sand, 2 animals, 1 shell (HÄGG); Dusénfjord, inner part, 240 m, hard clay, 5 adult and 4 young animals, 1 very large shell; Solitærbugt, Ellæ, 48—52 m, clay, stones, shells, 1 half-grown, 1 young animal (2 finds); Forsblads Fjord, 95—170 m, clay with stones, 1 adult animal, 1 adult shell. — *Scoresbysund Area*: Hurry Fjord, 95 m, clay, stones, 3 half-grown animals; Off Kap Hooker, 67 m, clay, sand, 1 egg capsule; Ibidem, 150 m, clay and stones, 2 egg capsules with large embryos; Jamesonland opposite to the Bjerne Øer, 30 m, hard clay, 1 egg capsule. — *Kangerdlugssuak Area*: Unknown. — *Sydøstkyst Area*: Lindenow's Fjord, the mouth, 400—600 m, clay, *Foraminifera*, 1 very young animal; Lindenow's Fjord, middle part, 125—150 m, clay, 1 adult animal; Lindenow's Fjord, inner part, 200—350 m, clay, 2 young animals, 1 young shell.

*Sipho lachesis* seems thus to live along the main part of the E. Greenlandic coast, where it occurs along the outer coast as well as in the innermost part of the fiords. The vertical distribution of living specimens within E. Greenland is from 30 m (Jamesonland opposite to the Bjerne Øer) to 400—600 m (mouth of Lindenow's Fjord). The animals from all areas of the coast belonged to var. *bicarinata* FRIELE, which has an intensively haired periostracum. Only the adult animal from the middle part of Lindenow's Fjord had a nearly smooth periostracum and agrees in all details concerning shell as well as operculum with FRIELE's figure (1882 pl. 2, fig. 28). This smooth-shelled variety seems to have

the whorls somewhat less narrowly twined than var. *bicarinata* and to be of a somewhat smaller size.

Distribution: Norway (Vadsø), W. of the W. coast of Norway, between the Hebrides and the Faroes, Iceland, W. and E. Greenland, Spitzbergen, Bear Island, the Barents Sea, the Kara Sea, Jones Sound (not published), and Lancaster Sound (not published). Main distribution: Panarctic. Vertical range: From 30 m (E. Greenland) to 900—1040 m (E. of Iceland).

Remarks: The largest living animals from East Greenland measure (breadth  $\times$  height of shell):  $25.8 \times 72.9$  —  $24.9 \times 70.6$  —  $24.5 \times 65.5$  —  $23.2 \times 67.8$  and  $19.5 \times 50.8$  mm respectively (all of var. *bicarinata*). The largest empty shell measures  $26.6 \times 80.4$  mm. The smooth-shelled animal from Lindenow's Fjord measures:  $16.3 \times 44.1$  mm. Animals from Mackenzie Bugt and Dusénfjord had crusts of bryozoans and sponges on their shells.

Biology: Reproduction known from E. Greenland (THORSON 1935); the semi-globose egg capsule has a faintly tuberculated surface. The basal diameter of the capsule is about 7 to 8 mm, and each capsule contains only one embryo (with characteristic spiral membranes), which feeds on nurse eggs, hatches in the crawling stage, and thus has a non-pelagic development.

## 52. *Sipho tortuosus* (REEVE) (= *S. turritus* M. SARS).

*Neptunea* (*Siphonorbis*) *turrita* FRIELE 1882, pl. 2, figs. 24—27, pl. 5, figs. 4—5; *Sipho tortuosus* DAUTZENBERG & FISCHER 1912, pl. 4, figs. 1—2.

### East Greenland records:

*Siphonorbis turritus* var. *distincta vel species nova* POSSELT 1895, p. 84.

*Sipho* (*Siphonorbis*) *turritus* POSSELT & JENSEN 1898, p. 179.

*Sipho* (*Siphonorbis*) *turritus* Var. *attenuata* HÄGG 1905, p. 45.

*Sipho turritus* var. *distincta* THORSON 1934, p. 8.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: S.E. of Clavering Ø,  $74^{\circ}10' N.$   $20^{\circ}08' W.$ , 25—40 m, mud, shells, pebbles, 1 adult animal; Kap Broer Ruys,  $73^{\circ}30' N.$   $20^{\circ}18' W.$ , 25—27 m, gravel, red algae, 1 very large animal; Between Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 1 fresh shell (HÄGG); E. of Greenland,  $72^{\circ}25' N.$   $17^{\circ}56' W.$ , 300 m, stones, sand, 1 animal; Franz Joseph Fjord S.W. of Kap Franklin, 320 m, clay, stones, 3 adult shells (var. *distincta*). — *Scoresbysund Area*: Hekla Havn at Danmarks Ø,  $5\frac{1}{2}$ —11 m, 1 half-grown animal; (Greenland Sea, E. of Scoresbysund,  $70^{\circ}32' N.$   $8^{\circ}10' W.$ , 885 m, clay with stones, 3 adult shells). — *Kangerdlugssuak Area*: Kangerdlugssuak, 11—15 m, 1 adult animal. — *Sydostkyst Area*: Tasiusak at Angmagssalik,

57—95 m, 1 young, fragmentary shell; Lindenow's Fjord, the mouth, 125—150 m, clay, gravel, 1 adult animal; Lindenow's Fjord, off Nanusik, 50—60 m, clay, gravel, 1 adult animal, 1 young shell; Lindenow's Fjord, outer part, 60—70 m, sand, gravel, 1 adult and 1 young animal; Ibidem, 90 m, clay, 1 adult fresh shell; Ibidem, 100—150 m, clay, gravel, 2 adult animals, 2 young shells; Lindenow's Fjord, middle part, 40—50 m, clay, 2 adult animals (2 finds); Ibidem, 60—80 m, clay, 1 young shell; Ibidem, 125—150 m, clay, 2 adult animals; "Off the northcoast of Lindenow's Fjord", 10—75 m, 1 very large animal; Lindenow's Fjord, innermost part, 21—30 m, clay, gravel, 1 adult animal.

This species, occurring rarely and in scattered specimens in the large material from the Franz Joseph Fjord-, the Scoresbysund-, and the Kangerdlugssuak-Areas, seems to be extremely common in Lindenow's Fjord. The vertical range for living specimens in East Greenland is from  $5\frac{1}{2}$ —11 m (Hekla Havn) to 300 m (E. of Franz Joseph Fjord). Var. *distincta* POSSELT, described from Jan Mayen, is rare at East Greenland. The animals from Lindenow's Fjord have a short, tumid, broad shape of the shell with a rather short siphon. The last whorl is often nearly quite smooth, and the Lindenow specimens exhibit all transitional stages between *Sipho tortuosus typicus* and *Sipho Holbøllii* MØLLER; some of the Lindenow specimens agree closely with *S. Holbøllii* in shape and structure, but are on an average smaller in size. From Nanortalik near Julianehaab in S.W. Greenland there are four specimens in the Copenhagen Museum, which by POSSELT are labelled "*Sipho Sabinii* JEFFR. var. *Holbøllii*". These four specimens agree in all details with the *tortuosus*-specimens from Lindenow's Fjord. It may be taken for granted that all transitional stages occur between *S. tortuosus* and *S. Holbøllii*, but the literature mentions also transitional stages between *S. Holbøllii* and *S. curtus*. A detailed examination of large series from the whole Arctic region seems necessary to solve these very delicate systematic questions, and it seems to me likely that a couple of "Rassenkreise" with changing races varying with the changing ecological conditions along the huge Greenlandic coast stretches will be the result of a special investigation.

Distribution: Norway (Vadsø to Bergen), Iceland, E. Greenland (but not W. Greenland), Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, the Barents Sea, the Siberian Arctic Sea, Alaska, and the Parry Islands. Main distribution: Panarctic-East Atlantic. Vertical range: From  $5\frac{1}{2}$ —11 m (E. Greenland) to 1187 m (W. of W. Finmarken).

Remarks: The largest living animals from E. Greenland measure (breadth  $\times$  height of shell): Lindenow's Fjord:  $19.6 \times 44.9$  —  $16.3 \times 35.2$  —  $14.1 \times 31.7$  —  $13.8 \times 29.0$  —  $13.5 \times 30.6$  —  $13.1 \times 29.3$  and  $12.4 \times$

27.8 mm respectively; Kap Broer Ruys (large, slender with spiral lines, typical *tortuosus*):  $23.2 \times 56.1$  mm; S.E. of Clavering Ø, (short, broad shell with spiral lines):  $13.9 \times 28.2$  mm, and Kangerdlugssuak (short, broad shell with a smooth last whorl):  $12.0 \times 27.5$  mm; Some of the empty shells were inhabited by the Gephyrean *Phascolion strombi*.

Biology: Egg capsules are described from the N. Atlantic (FRIELE 1882). They are semiglobose, about 5 mm in basal diameter, and the embryos were quite young. The species, like all other *Buccinidae*, must be supposed to feed on nurse eggs and to have a non pelagic development.

### 53. *Sipho islandicus* (CHEMNITZ).

*Sipho islandicus* G. O. SARS 1878, pl. 15, fig. 3.

#### East Greenland records:

*Sipho islandicus* POSSELT 1895, p. 85.

*Sipho islandicus* POSSELT & JENSEN, 1898, p. 189.

*Sipho islandicus* HÄGG 1905, p. 51.

*Sipho islandicus* ODHNER 1915, p. 204.

*Sipho islandicus* THORSON 1934, p. 8.

*Sipho islandicus* THORSON 1935, pp. 13—17.

Occurrence at East Greenland (cf. the map fig. 21, p. 134.):  
*Nordøstkyst Area*: Stormbugt at Danmarks Havn,  $9\frac{1}{2}$ —19 m, soft bottom, *Laminaria*, 1 young shell. — *Franz Joseph Fjord Area*: 5 miles S.E. of Bontekoe Ø, 245 m, hard clay with stones, 1 adult animal; Moskusoksefjord off Mt. Anker valley, 17—21 m, red clay with large stones, 1 half-grown animal; Outer part of Moskusokse Fjord, depth ?, 1 adult and 1 young animal (HÄGG); Franz Joseph Fjord, off Engdalen, 32—37 m, clay, 1 adult animal; Dusénfjord, inner part, 240 m, clay, 2 very large animals, 1 young shell; Ibidem, 15—20 m, *Laminaria*, *Fucus*, 1 young shell; Kap Hedlund, 16—23 m, clay, red algae, *Fucus*, 3 adult and 2 young animals (3 finds); Ibidem, 23—28 m, clay, pebbles, shells, 1 young animal, 1 adult shell (2 finds); Solitærbugt, Ellaø, 13 m, clay, algae, 1 half-grown animal; Ibidem, 18 m, 1 young animal; Ibidem, 20—25 m, clay, gravel, shells, *Desmarestia*, red algae, 3 adult and 1 young animals (4 finds); Ibidem, 25—38 m, clay, gravel, shells, red algae, 4 adult and 1 young animal (4 finds); Forsblads Fjord,  $5\frac{1}{2}$ —26 m, 1 very large animal; Ibidem, 95—170 m, 2 half-grown and 1 young shell. — *Scoresbysund Fjord Area*: “Outer part of Scoresbysund”, depth ?, 1 adult animal; ( $70^{\circ}32'$  N. Br.  $8^{\circ}10'$  W. Lg., 875 m, clay with stones, 4 specimens (POSSELT)); Hurry Fjord, near the mouth, 25—25 m, sand, algae, 1 adult animal; Hurry Fjord, 1 mile from the mouth, 30 m, algae, stones, 1 adult animal; Hurry Fjord off the Fame Øer, 15—18 m, clay, *Laminaria*, red algae, 1 adult shell; Ibidem, 23—25 m, clay, 1 adult

animal, 1 young shell (2 finds); Hekla Havn at Danmarks Ø, depth ?, 2 adult animals. — *Kangerdlugssuak Area*: Kangerdlugssuak, 100 m, 1 adult animal; Ibidem, 40—50 m, 1 half-grown shell. — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 5—7 m, sand, *Fucus*, *Laminaria*, 1 adult animal; Ibidem, 57—95 m, 1 half-grown animal; Angmagssalik, 45 m, 1 adult animal; Lindenow's Fjord, 60—70 m, gravel, sand, 1 adult animal.

The species seems to live along the whole East Greenlandic coast from Danmarks Havn in the N. to Lindenow's Fjord in the S. It is known from the outer coast as well as from the innermost part of the large fiords. All specimens found have a size and shape corresponding to that typical of the species in other sea-areas too. The vertical range for living specimens at East Greenland is: 5—7 m (Angmagssalik) to 240 m (Dusénfjord) or 875 m (E. of Scoresbysund).

Distribution: Norway (Lofoten to Vadsø and Bergen), British Isles, the Hebrides, Shetland, Ireland, the Faroes, Iceland, Gulf of Gascogne, and Morocco. In the Arctic known from W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, the Barents Sea, Novaya Zemlya, Franz Joseph Land, Siberian Arctic Sea, the Bering Strait, the Bering Sea. Main distribution: Widely distributed in the Northern Atlantic and the arctic part of the Pacific. Vertical range: 5—7 m (E. Greenland) to 1203 m (between Spitzbergen and the Bear Island).

Remarks: The largest living E. Greenland animals measure (breadth × height of shell): 45.0 × about 120 — 44.0 × about 110 — 42.3 × about 91 — 40.4 × about 95 — 38.3 × about 97 — 36.3 × about 89 — 37.1 × 90.6 — 33.5 × 82.2 — 33.0 × 74.0, and 32.7 × 79.8 mm respectively.

Biology: Reproduction known from the North Atlantic and from E. Greenland (cf. FRIELE 1882; THORSON 1935). The egg capsule is lense-shaped, 11 to 16 mm in basal diameter, and contains from 1 to 16 embryos. These embryos feed on nurse eggs, and the young hatch in the crawling stage, thus having a non-pelagic development.

#### 54. *Sipho curtus* (JEFFREYS).

*Neptunea* (*Sipho*) *curta* FRIELE 1882, pl. 1, fig. 26, pl. 2, figs. 1—11, pl. 6, figs. 5—10.

#### East Greenland records:

*Sipho curtus* HÄGG 1905, p. 48.

*Neptunea, sipho, curta* GRIEG 1909, p. 38.

*Neptunea curta* GRIEG 1914, p. 9.

*Sipho togatus* ODHNER 1915, p. 203.

*Sipho curtus* THORSON 1935, p. 7—13.

Occurrence at East Greenland (cf. the map fig. 9, p. 79.):

*Nordostkyst Area*: "Greenland sea", 280 m, clay, gravel, 1 adult fresh shell; Near Île de France, 77°35'5" N. 18°12' W., 53 m, stones, 1 "specimen" (GRIEG); Greenland Sea, W. of Koldewey Ø, 75°58½' N. 14°08' W., 300 m, clay, 3 animals, 3 shells (GRIEG). — *Franz Joseph Fjord Area*: Mackenzie Bugt, 12—35 m, mud, 4 young animals, 2 adult shells (HÄGG); the mouth of Franz Joseph Fjord, 200—300 m, mud, 3 adult and 3 young animals (HÄGG); 5 miles S. of Bontekoe Ø, 245 m, clay, gravel, stones, 2 half-grown animals; inner part of Franz Joseph Fjord, off Engdalen, 27—37 m, clay, 3 adult and 2 young animals; Ibidem, 36—45 m, clay, *Laminaria*, 2 adult animals; Ibidem, 50—55 m, clay, 3 adult and 2 young animals; Franz Joseph Fjord, E. of the Zoolog valley, 180 m, clay and stones, 1 half-grown and 2 young animals, 1 adult shell; Franz Joseph Fjord, W. of Ymers Ø, 73°15' N. 25°42' W., 760 m!, mud, sand, stones, 1 half-grown animal; The mouth of Dusénfjord, 1 mile from the shore, 28—36 m, clay, gravel, sand, shells, stones, 1 adult and 1 young animal; Moskusokse Fjord, 95 m, clay with stones, 1 young animal, 1 young shell; Ibidem, off the Norwegian house, 230 m, clay, 1 adult animal; Carl Jacobsen Bugt at Ymers Ø, 18 m, clay, 1 young shell; Sophia Sund, off the Botaniker Bugt, 210 m, clay, stones, gravel, 2 very large animals; Dusénfjord, inner part, 240 m, clay, 1 young fresh looking shell; Eleonora Bugt, 15—27 m, clay, *Laminaria*, *Desmarestia*, 1 adult and 1 young animal; At the East mouth of Vega Sund, 72°45' N. 22°56' W., 35—60 m, mud, stones, 1 half-grown animal; Kap Hedlund, 12 m, sandy clay, *Desmarestia*, 2 young animals; Ibidem, 14—15 m, clay, brown algae, 2 adult and 1 young animal (2 finds); Ibidem, 15—20 m, clay, stones, shells, *Desmarestia*, *Laminaria*, *Fucus*, 4 adult and 2 young animals, 1 young shell (5 finds); Ibidem, 20—30 m, clay, rocks, stones, shells, red- and brown algae, 1 very large, 6 adult, 6 half-grown, and 2 young animals, 1 adult fresh shell (12 finds); Ibidem, 30—40 m, clay, pebbles, 2 adult and 4 half-grown animals, 1 very large shell (6 finds); Ibidem, 40—50 m, clay, *Fucus*, 1 adult, 2 half-grown and 1 young animal (2 finds); Ibidem, 35—60 m, mud, 1 young animal; Ibidem, 85 m, clay, stones, 1 half-grown animal; Solitærbugt, Ellaø, 20—30 m, stones, shells, *Laminaria*, 5 adult animals and 1 young shell (3 finds); Ibidem, 30—40 m, stones, shells, clay, 1 adult and 1 young animal (2 finds); Ibidem, 51—55 m, clay, stones, 1 adult and 2 half-grown animals (3 finds); Between Maria Ø and Geographical Society Ø, 72°56' N. 24°33' W., about 125 m, mud, pebbles, sand, 1 half-grown animal; Forsblads Fjord, the mouth, 5½—26 m, 1 adult animal. — *Scoresbysund Area*: Off Kap Hope, 228 m; clay, stones, 1 adult and 1 young, fragmentary shell; Off the mouth of Hurry Fjord, 19 m, clay, 1 adult animal; Hurry Fjord off Konstabel Pynt, 18—22 m, clay, 1 half-grown animal; Hurry Fjord off Fame Øer.

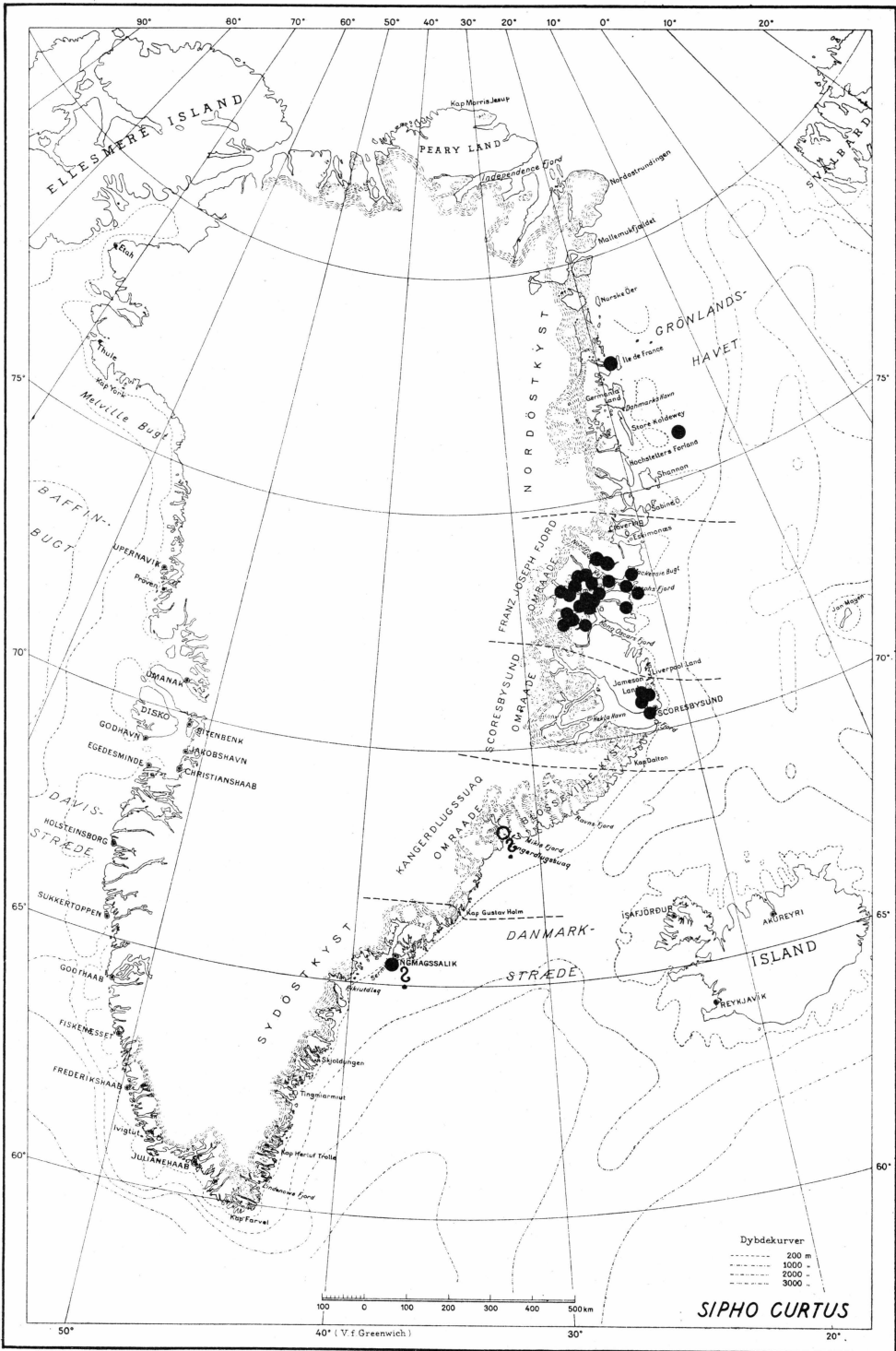


Fig. 9. Distribution of *Sipho curtus* (JEFREYS) along the East Greenland coast. Full circles: Living animals. Open circles: Empty shells.

22—25 m, clay, *Laminaria*, red algae, 1 adult and 1 half-grown animal (2 finds). — *Kangerdlugssuak Area*: Kangerdlugssuak, 70 m, 1 adult, fragmentary shell (identity somewhat dubious). — *Sydøstkyst Area*: Angmagssalik, 45 m, 1 adult animal (typical var. *togatus* MØRCH).

The main occurrence of *Sipho curtus* along the East Greenlandic coast is thus from Mackenzie Bugt in the N. to Scoresbysund in the S. The species always occurs here in a very characteristic shape. The shell is much shorter and broader and also smaller than the typical *Sipho togatus* MØRCH, but *Sipho curtus* is by several authors regarded as a variety of *S. togatus*. The single hairs on the periostracum of *S. curtus* are much coarser, but the density of the hairs much smaller than in *S. togatus typicus*. The typical *curtus*-specimens have never been found S. of Scoresbysund. The specimen from Kangerdlugssuak (a worn shell) is so fragmentary, that the identity could not be established with certainty, and the living animal from Angmagssalik shows all features of the typical *togatus* (MØRCH). Thus at East Greenland there seems to be an isolated population of *S. curtus* in the northernmost areas which is without any connection with the *togatus*-populations of Angmagssalik and S.W. Greenland. The occurrence of the *S. togatus*—*S. curtus*-populations in East Greenland seems to form a parallel to the occurrence of the *Buccinum groenlandicum*-population (= *S. togatus* from Lindenow's Fjord to Angmagssalik) in contrast to the *Buccinum belcheri*-population (= *S. curtus* from Kangerdlugssuak northwards). Curious is the high frequency of *S. curtus* in the innermost parts of the large fiords, e. g. at Kap Hedlund, where the lamellibranch *Pecten islandicus* lives in large numbers, probably as a relict of a warmer period. The occurrence here of *S. curtus* may probably be explained in a similar way.

Distribution: *Sipho togatus* (MØRCH) is known from W. Greenland, E. Greenland, Spitzbergen, between Bear Island and Finmarken, the Murman Coast, Franz Joseph Land, the Barents Sea, Kara Sea, Novaya Zemlya, Iceland, and the N. Atlantic to 50° N. 50° W. and 63° N. 03° E. Main distribution: Panarctic with subarctic outposts. Vertical range. From 12 m (E. Greenland) to 1230 m (between Bear Island and Finmarken). *S. curtus*, probably a variety of this, is deficiently known, but occurs at least at East Greenland, the Greenland Sea, and Spitzbergen.

Remarks: The largest living animals from North East Greenland measure (breadth × height of shell: 29.8 × 61.5 — 28.6 × about 74 — 28.5 × about 67 — 27.8 × 61.4 — 26.5 × about 60 — 26.6 × about 55 — 25.8 × 61.5 — 25.7 × about 55 — 25.2 × 54.5 — 24.8 × 54.6 — 23.7 × about 56 — 23.5 about 63, and 23.0 × 49.5 mm respectively. The living

*S. togatus* from Angmagssalik measures:  $26.3 \times 63.8$  mm. — Nearly all living animals of *S. curtus* had crusts of Hydroids on their shells; several also had specimens of the actinian *Allantactis parasitica*.

Biology: The reproduction is described from the Atlantic and E. Greenland (FRIELE 1882; THORSON 1935) (as *Sipho curtus*). The lense-

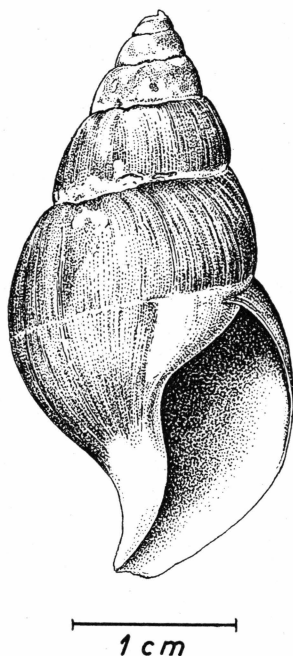


Fig. 10. *Sipho turgidulus* (JEFFREYS) FRIELE, var *minor* n. var. Lindenow's Fjord 400—600 m.

to dome-shaped egg capsule has a basal diameter of from 5 to 10 mm and contains 1 or 2 embryos, which hatch in the crawling stage. They feed on nurse eggs and thus have a non-pelagic larval development.

55. *Sipho turgidulus* (JEFFREYS) FRIELE (cf. fig. 10, p. 81).

*Neptunea* (*Sipho*) *turgidula* FRIELE 1882, pl. 1, figs. 13—18, pl. 4, figs. 14—18.

Occurrence at East Greenland: *Sydostkyst Area*: Off the mouth of Lindenows Fjord, 400—600 m, clay, *Foraminifera*, 2 adult and 2 very young animals, 1 adult and 1 half-grown shell.

The shape of the shell and the operculum agrees rather well with the figure 14, pl. 1 of FRIELE (l. c.), but the East Greenlandic specimens are smaller, somewhat more compact, and the periostracum is more brownish-green than stated by FRIELE. The East Greenland specimens

must probably be regarded, not as a new species, but as a hitherto unknown variety of FRIELE's species: var. *minor n. var.* (cf. fig. 10, p. 81).

The species is new not only to East Greenland but to the whole Greenlandic coast.

Distribution: E. Greenland (var. *minor*), E. of Iceland (650 m), off Lofoten (1185 m), off Norway from about 63° N. lat. to off Lofoten, between Bear Island and Hammerfest (420—1220 m), between the Faroes and the Hebrides, and N. of Spain (Bay of Biscay, 283—1353 m). Main distribution: Abyssal in the N. Atlantic. Vertical range: From 223 m (Bay of Biscay) to 1220 m (Bear Island to Hammerfest).

Remarks: The two adult animals from E. Greenland measure (breadth × height of shell): 18.8 × 37.2 and 17.3 × 35.2 mm respectively.

Biology: Unknown.

#### 56. *Sipho fusiformis* (BRODERIP).

*Buccinum fusiforme* BRODERIP 1835, pl. 3, fig. 3; *Sipho fusiformis* G. O. SARS 1878, pl. 14, fig. 1.

Occurrence at East Greenland: *Sydostkyst Area*: Off Angmagssalik, 263 m, stones, 1 adult shell, very well preserved with mud in the mouth. The shape of the shell agrees in all details with fig. 1, pl. 14 by SARS (l. c.), except that the spiral structure is somewhat coarser in the East Greenlandic specimen. The colour is yellowish-white, the periostracum is partially worn.

The species is new not only to E. Greenland but to the whole Greenlandic coast. It is, however, impossible from this single find to state, whether the species lives at Greenland now-a-days, but it seems to me most reasonable to regard a find in this depth along the outer coast as an outpost for a recent population in the neighbouring deep-sea areas and not as a subfossil remnant.

Distribution: Norway (Vadsø to Bergen), the British Isles, W. Greenland?, E. Greenland (an empty shell), Iceland, between Cape Clear and Newfoundland. Main distribution: (according to the few records): Subarctic-boreal. Vertical range: From 57 m (Norway) to 300 m (Norway).

Remarks: The shell from Angmagssalik measures 14.9 mm in breadth and 29.6 mm in height.

Biology: Unknown.

57. *Sipho dalli* (FRIELE).

*Neptunea* (*Siphonorbis*) *Dalli* FRIELE 1882, pl. 2, figs. 18—19.

## East Greenland records:

*Siphonorbis Dalli* POSSELT 1895, p. 85.

*Sipho* (*Siphonorbis*) *Dalli* POSSELT & JENSEN 1898, p. 180.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: The Greenland sea, W. of Wallastone Foreland, 74°17' N. 15°20' W., 238 m, 4 adult shells, two of them very well preserved (POSSELT).

The specimens mentioned by POSSELT and collected by the RYDER-Expedition are still in the Copenhagen Museum. They closely recall the figures given by FRIELE (1882 pl. 2, figs. 18—19) and must probably be regarded as outposts from the deep-sea fauna of the Greenland sea, which will now and then reach the outermost part of the E. Greenlandic shell (cf. f. i. *Sipho fusiformis*, *Sipho turgidulus*).

Besides the find mentioned above, POSSELT (1895, p. 85), mentions a find from "Hekla Havn (at Danmarks Ø, Scoresbysund), 1 dead specimen, pullus" also taken by the RYDER expedition. This "pullus", still preserved in the Copenhagen Museum, has been reexamined by the present author with the result that it turned out to be a worn apex of an old shell of *Trichotropis borealis*.

Distribution: E. Greenland (dead specimens); Between Bear Island and Finmarken (dead specimens); Varanger Fjord (living); Between the Shetlands and the Faroes (dead spms.).

Remarks: The two well preserved shells from East Greenland measure (breadth × height of shell): 7.4 × 14.3 and 7.2 × 13.6 mm respectively.

Biology: Unknown.

58. *Sipho* (*Anomalosipho*) *altus* (S.V. WOOD) (= *S. virgatus* (FRIELE)).

*Neptunea* (*Sipho*) *virgata* FRIELE 1882, pl. 1, figs. 21—25, pl. 6, figs. 3—4.

## East Greenland records:

*Sipho virgatus* HÄGG 1905, p. 50.

*Sipho* (*Anomalosipho*) *altus* ODHNER 1915, p. 207.

Occurrence at East Greenland (cf. the map fig. 16, p. 129): *Nordøstkyst Area*: S. E. of Lille Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 1 animal (HÄGG). — *Franz Joseph Fjord Area*: 5 miles S. of Bontekoe Ø, 245 m, hard clay with stones, 1 young animal, 1 very large shell; the mouth of Franz Joseph Fjord, 200—300 m, mud, 1 animal (HÄGG); Off Kap Franklin, 325 m, clay, 1 adult shell;

Off Kap Weber, 73°32' N. 24°38' W., 100—110 m, mud, gravel, stones, 1 halfgrown animal; Between Kap Weber and Ymers Ø, 450 m, clay with large stones, 1 adult animal; the western mouth of Antarctic Sund, 230 m, clay, 1 very large animal; Forsblads Fjord, 95—170 m, 1 halfgrown animal. — *Scoresbysund Area*: Hurry Fjord, 96 m, clay, stones, 2 adult and 2 young animals (var. *plicifera* BRØGGER), 1 adult shell; »Scoresbysund«, depth?, 3 adult and 4 young animals.

The species seems to live in the three northernmost areas of the East Greenlandic coast, where it is associated with the outer coast and the outer part of the deep fiords. From the coast stretch S. of Scoresbysund not a single specimen has been found. Vertical range for living animals at East Greenland: 100—110 m (Kap Weber) to 450 m (Between Kap Weber and Ymers Ø). The shape and structure of the shell as well as the operculum agree in all details with the figures given by FRIELE (l. c.).

Distribution: North of Pistilfjörður, Iceland (dead), N. Atlantic between Spitzbergen and Bear Island (225 m), Spitzbergen (40—197 m), W. of Nordlandet (Norway) (640 m), the Kara Sea (52 m), E. of Greenland (150—300 m); and the high-arctic part of E. Greenland.

Remarks: The largest living animals from East Greenland measure (breadth  $\times$  height of shell): 19.3  $\times$  42.0 — 17.3  $\times$  36.5 — 17.0  $\times$  37.5 — 16.3  $\times$  36.6 — 14.1  $\times$  34.5 — 13.9  $\times$  31.1, and 12.3  $\times$  27.6 mm respectively. The largest shells measure: 19.0  $\times$  42.3, and 16.8  $\times$  41.0 mm. Some empty shells were inhabited by the Gephyrean *Phascolion strombi*.

Biology: Unknown.

#### 59. *Sipho (Parasipho) krøyeri* (MØLLER).

*Neptunea (Sipho) Kroyeri* FRIELE 1882, pl. 2, figs. 12—15, pl. 4, figs. 11—15.

East Greenland records:

*Sipho (Tritonofusus) krøyeri* HÄGG 1905, p. 47.

*Sipho (Parasipho) krøyeri* ODHNER 1915, p. 206.

*Sipho krøyeri* THORSON 1934, p. 8.

*Sipho (Parasipho) krøyeri* THORSON 1935, p. 19—20, figs. 12—13, egg capsules.

Occurrence at East Greenland (cf. the map fig. 25, p. 138): *Nordøstkyst Area*: Danmarks Havn, 9 $\frac{1}{2}$ —15 m, hard bottom, *Delesseria*, 1 adult, fragmentary shell (probably subfossil); Ibidem, about 28 m, mud, *Delesseria*, 1 adult, rather fresh looking shell; Off Kap Bismarck at Danmarks Havn, on the shore, 1 adult shell (probably subfossil); S. of Lille Pendulum Ø, 74°35' N. 18°23' W., 18—21 m, sandy clay, algae, 2 young animals. — *Franz Joseph Fjord Area*: Sand Ø, at Tyroler Fjord, on the shore, 1 adult, worn shell; Off Kap Mary, Clavering Ø, on the

shore, 1 adult animal; Mackenzie Bugt, 12—18 m, mud, 1 animal. — *Scoresbysund Area*: Off Kap Stewart, 70°27' N. 22°35' W., 13—18 m, mud, stones, algae, 1 adult animal; Off the mouth of Hurry Fjord, 95 m, 1 young animal; Hurry Fjord off Fame Øer, 4—6 m, gravel and algae, 1 adult and 1 young animal; Ibidem, 8—12 m, clay, gravel, stones, *Laminaria*, 2 adult animals, 3 egg capsules (2 finds); Turner Sund, 5½ m, 3 adult, 7 half-grown and 13 young animals. — *Kangerdlugssuak Area*: Not found. — *Sydøstkyst Area*: Angmagssalik, 20 m, sand, 1 adult animal; Ibidem, depth?, 1 adult animal; Off Kap Tordenskjold, 26 m, clay, 1 very young shell; Lindenow's Fjord, in the mouth, 25—35 m, *Laminaria*, 1 young animal; Lindenow's Fjord, middle part, 40—50 m, clay, 2 young animals; Lindenow's Fjord, inner part, 15—30 m, clay, gravel, 4 adult and 2 young animals (2 finds); Ibidem, 75—100 m, clay, 1 adult, fresh shell.

The species seems thus to occur along the whole outer coast and in the mouth of the large fiords, being totally absent from their innermost ramifications. All the specimens examined showed the features quite typical of the species, and the variation seems only slight. The vertical range is at East Greenland from (0 m) 4—6 m (Hurry Fjord) to 95 m (the mouth of Hurry Fjord).

Distribution: Labrador to New Foundland, W. Greenland, E. Greenland, Spitzbergen, Murman coast, Kolquew, Siberian Ice Sea, Bering Sea, Alaska. Main distribution: Panarctic-circumpolar. Vertical range: from 0 m (Spitzbergen) to 122 m (Spitzbergen).

Remarks: The largest living animals from East Greenland measure (breadth × height of shell): 30.5 × 61.4 — 30.0 × 63.1 — 28.7 × 68.2 — 28.4 × 63.9 — 28.6 × 64.5 — 27.5 × 65.4 — 26.1 × 59.1 — 24.2 × 55.9 — 24.2 × 57.5, and 22.9 × 56.0 mm respectively. The largest shell measures: 35.7 × 76.5 mm. One of the animals had crusts of bryozoans, and another a living specimen of *Miroserpula inflata* attached to its shell.

Biology: The egg capsules earlier described by MØRCH (1869) and FRIELE (1882) have been re-examined on East Greenland material (THORSON 1935). The very slight domed capsules have the exit hole in the centre from where two grooves continue to the edge. The capsules contains from 3 to 6 large embryos feeding on nurse eggs. Non-pelagic development.

#### 60. *Chrysodomus ossiani* (FRIELE).

*Jumala Ossiani* FRIELE 1882, pl. 1, figs. 1—6, pl. 4, figs. 1—3.

#### East Greenland records:

*Jumala ossiani* HÄGG 1905, p. 54.

*Jumala (Chrysodomus) ossiana* THORSON 1935, pp. 22—23, figs. 16—17, egg capsules.

*Chrysodomus ossianus* THORSON 1940, p. 256.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Between the Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 1 adult animal (HÄGG); Kap Hedlund, near the mouth of Rhedinfjord, 23—28 m; clay, 1 egg capsule with a large embryo (THORSON); Solitærbugt, Ellaø, 25—30 m, shells and stones, 1 very large animal. — *Sydøstkyst Area*: Tasiusak at Angmagssalik, about 65°35' N., 57 to 95 m, 1 young animal; Lindenow's Fjord, depth?, 1 egg capsule, newly laid (THORSON).

The species, although rather rare, seems thus to occur along the whole East Greenland coast from Mackenzie Bugt in the N. to Lindenow's Fjord in the S. It has been found along the outer coast as well as in the innermost parts of the fiords.

Distribution: Newfoundland, Gulf of St. Lawrence, W. Greenland (fresh egg capsule, THORSON 1940), E. Greenland, S.W. of Jan Mayen (dead), N.W. of Spitzbergen, W. of Norway (between 66° N. and 69° N.), and E. of Iceland. Main distribution: Panarctic with subarctic outposts. Vertical range: 23—28 m (E. Greenland) to 839 m (N.W. of Spitzbergen).

Remarks: The largest animals from E. Greenland measure (breadth × height of shell): 42 × 100 mm (HÄGG) and 43.1 × 93.2 mm (Ellaø). HÄGG (l. c.) states that his specimen is the largest one known till now. As the specimen from Ella is nearly quite as large, the species seems to reach its maximum size in East Greenland. — The animal from Ellaø had living hydroids and *Spirorbis* attached to its shell.

Biology: The reproduction is described and figured by FRIELE (1882) from the North-Atlantic, and by THORSON (1935 and 1940) from East Greenland. The eggs are laid in large, ovate, compressed capsules, the margin of which passes into a rather short peduncle by which the capsule is attached to a substratum. No clusters; the capsules are laid singly. Each capsule contains from 1 to 4 embryos, which feed on large numbers of nurse eggs and leave the capsule as large bottom-stages without any pelagic stage.

#### 61. *Neptunea despecta* (LINNÉ).

*Neptunea despecta forma typica* and var. *carinata* G. O. SARS 1878, pl. 14, figs. 4 a—c.

##### East Greenland records:

*Neptunea despecta* POSSELT 1895, p. 86.

*Neptunea despecta* HÄGG 1905, p. 55.

*Neptunea despecta* ODHNER 1915, p. 199.

*Neptunea despecta* THORSON 1935, pp. 20—21, figs. 14—15, egg clusters.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Greenland Sea, off Geographical Society Ø, 72°53' N. 20°36' W., 181 m,

1 adult, fresh looking shell (POSSELT, and reexamined); Greenland Sea off Vega Sund, 72°25' N. 17°56' W., 300 m, sand, stones, 1 adult animal (HÄGG); Forsblads Fjord, 95—170 m, mud, gravel, stones, 1 egg cluster with newly laid eggs. — *Scoresbysund Area*: Hurry Fjord, 0—13 m, 1 adult animal with two distinct spiral ribs; Hurry Fjord, 1 mile from the mouth, 35—38 m, sand, stones, *Laminaria*, 1 adult animal; Off Kap Hooker, about 150 m, soft clay, stones, 1 half-grown animal. — *Sydøstkyst Area*: Angmagssalik, depth?, 1 adult animal, var. *denselirata*; Off Angmagssalik, 263 m, stones, 2 adult shells, var. *carinata*; Kungmiut at Angmagssalik depth?, 1 adult animal, var. *denselirata*; Near the northern coast, Lindenow's Fjord, 10—75 m, 1 very young animal.

The species seems to be rather rare at East Greenland and has never been taken in the innermost parts of the fiords. The vertical range in East Greenland is from 0—13 m (Hurry Fjord) to 300 m (E. of Vega Sund).

Distribution: Whole of Norway, Kattegat, the Sound, the British Isles, Portugal, the Faroes, Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, the White Sea, the Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, Franz Joseph Land, the Bering Strait, the Bering Sea, Japan, N. of Alaska, Labrador, Newfoundland, and Cape Cod. Main distribution: Lusitanian, boreal, and arctic parts of the N. Atlantic, and arctic part of the Pacific. From 10 m (Denmark, Spitzbergen) to 1203 m (between Spitzbergen and the Bear Island).

Remarks: The largest animals from E. Greenland measure (breadth × height of shell): 47.9 × 93.1 — 43.4 × 88.7 — 42 × 85.4 (HÄGG) — 41.5 × 81.3 — 37.3 × 66.8, and 28.5 × 57.2 mm respectively. — Some of the animals carried hydroids and *Spirorbis* on their shells.

Biology: Reproduction known from E. Greenland (THORSON 1935). The egg capsules are deposited several together in a cluster attached to stones. The embryos feed on nurse eggs, have a non-pelagic development, and hatch in the crawling stage.

[*Buccinum undatum* LINNÉ.

*Buccinum undatum* G. O. SARS 1878, pl. 24, fig. 2.

East Greenland records:

*Buccinum undatum* MÖBIUS 1874, p. 249.

*Buccinum undatum* POSSELT 1895, p. 86.

*Buccinum undatum* POSSELT & JENSEN 1898, p. 193.

*Buccinum undatum* ODHNER 1915, p. 182.

Occurrence at East Greenland: The species is only recorded by MÖBIUS (l. c.), who mentions it from Jackson Ø and Clavering Ø,

7 $\frac{1}{2}$  m. In the huge numbers of dredge hauls and bottom samples taken by recent expeditions along the whole coast of East Greenland there is not a single animal, which—even with some doubt—might be referred to the species in question. *Buccinum belcheri*, which is common along the northernmost areas of East Greenland, may however be confused with *Buccinum undatum*, but only when the author working up the material is very ignorant in arctic prosobranchs, as was MÖBIUS. Several of the other records given by him have proved to be erroneous (cf. e. g. *Scalaria groenlandica* and *Sipho propinquus*), and therefore I think it justifiable to exclude this species from the East Greenland fauna.]

### 62. *Buccinum hydrophanum* HANCOCK.

*Buccinum hydrophanum* G. O. SARS 1878, pl. 24, fig. 8.

#### East Greenland records:

*Buccinum hydrophanum* var. *fusco-rufescens* POSSELT 1895, p. 87.

*Buccinum hydrophanum* var. *fusco-rufescens* POSSELT & JENSEN 1898, p. 210.

*Buccinum hydrophanum* HÄGG 1905, p. 63.

*Buccinum hydrophanum* var. *elata* HÄGG 1905, p. 64.

*Buccinum hydrophanum* var. *jenseni* HÄGG 1905, p. 65.

*Buccinum hydrophanum* GRIEG 1909, p. 36.

*Buccinum hydrophanum*, formen *tumidula* GRIEG 1909, p. 36.

*Buccinum hydrophanum* ODHNER 1915, p. 196.

*Buccinum hydrophanum* THORSON 1934, p. 8.

*Buccinum hydrophanum* THORSON 1935, pp. 24—27, figs. 19—22, egg capsules.

Occurrence at East Greenland (cf. the map fig. 21, p. 134): (Remarks are given in brackets on the variety of the single specimens, viz. "typical", var. *elata*, and var. *fusco-rufescens*. Var. *jenseni* and var. *albus* are dealt with in detail on p. 91).

*Nordostkystkyst Area*: The Greenland Sea off Besselfjord, 75°58 $\frac{1}{2}$ ' N. 14°08' W., 300 m, clay, 2 young specimens (var. *tumidula*) (GRIEG); The Greenland Sea E. of Store Koldewey Ø, 76°08' N. 13°26' W., 250—300 m, clay, gravel, 1 adult shell (var. *elata*); Danmarks Havn, 5 $\frac{1}{2}$ —19 m, mud, *Laminaria*, *Delesseria*, 1 adult, 3 half-grown and 2 young animals, 1 adult and 1 young shell (type and var. *elata*) (5 finds); Ibidem, on the shore, 2 adult, fragmentary shells (var. *elata*); Ibidem 19—28 m, *Delesseria*, 1 adult animal (var. *elata*); Stormbugt at Danmarks Havn, 9 $\frac{1}{2}$ —19 m, *Laminaria*, 6 adult, 10 half-grown, and 6 young animals (var. *elata* and var. *fusco-rufescens*); Ibidem, 19—38 m, stones, shells, *Delesseria*, 4 adult animals, 5 adult shells (type, var. *elata* and var. *fusco-rufescens*) (3 finds); The Koldewey Ø, 76°28' N., on the shore, 2 halfgrown shells (type); S.E. of Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 1 fresh looking shell (HÄGG); S.E. of Hvalros Ø, 74°30' N.

18°40' W., 80—100 m, mud, stones, 1 animal (HÄGG); Off Kap Borlase Warren, 19 m, 1 adult animal (var. *fusco-rufescens*); Eskimonæs at Clavering Ø, 55 m, clay, gravel, *Laminaria*, 2 very young shells; East of Jackson Ø, 73°55' N. 19°20' W., 150 m, mud, 3 animals. — *Franz Joseph Fjord Area*: Between the Bontekoe Ø and Mackenzie Bugt, 250 m, mud, 2 young animals (var. *elata*) (HÄGG); Mackenzie Bugt, 12—18 m, mud, 7 animals (type) (HÄGG); Ibidem, 3—10 m, mud, sand, *Laminaria*, 2 animals (type) (HÄGG); Ibidem, 12—35 m, mud, 9 animals (type), and 9 adult and 2 young animals (var. *elata*) (HÄGG); E. of Kap Bennet, Mackenzie Bugt, 73°20' N. 21°20' W., 70 m, mud, shells, pebbles, 1 adult animal (var. *elata*); Off Mackenzie Bugt, 100 m, mud, 1 animal and 1 shell (var. *elata*) (HÄGG); Moskusokse Fjord, outer part, 220 m, clay, 47 animals (type), 7 animals (var. *elata*), and 1 animal (var. *jenseni*) (HÄGG); Moskusokse Fjord, inner part, 100 m, clay, 1 adult and 1 young animal (type), and 4 adult and 2 young animals (var. *elata*) (HÄGG); Moskusokse Fjord, 95 m, clay with large stones, 1 adult and 1 half-grown animal (var. *fusco-rufescens*); Eleonore Bugt, 3½—12 m, clay, *Fucus*, *Laminaria*, 1 adult and 1 half-grown animal (type and var. *fusco-rufescens*); Ibidem, 15—27 m, clay, *Laminaria*, *Desmarestia*, red-algae, 5 adult and 7 young animals, 2 adult shells (var. *fusco-rufescens*) (2 finds); Franz Joseph Fjord, inner part off Engdalen, 13—18 m, clay, 3 half-grown animals; Ibidem, 27—34 m, clay, 1 young animal; Ibidem, 32—37 m, clay, 1 half-grown animal (var. *fusco-rufescens*); Ibidem, 36—45 m, clay, *Laminaria*, 1 young animal (var. *fusco-rufescens*); Franz Joseph Fjord, inner part near Kierulf Fjord, 73°06' N. 27°17' W., 3—9 m, mud, sand, algae, 2 adult and 3 half-grown animals (type); Ibidem, 40—70 m, mud, stones, 1 adult animal (var. *fusco-rufescens*); The mouth of Dusénfjord, 15—30 m, clay, *Desmarestia*, red-algae, 1 young animal (type), 2 adult shells; Ibidem, 28—36 m, clay, gravel, sand, shells, stones, 1 half-grown animal (var. *fusco-rufescens*); Dusénfjord, inner part, 15—20 m, *Laminaria*, *Fucus*, 1 very young animal; Carl Jacobsen Bugt at Ymers Ø, 18—20 m, clay, 1 young animal 1 young shell (2 finds); Sophia Sund, E. of Botaniker Bugt, 210 m, clay, gravel, stones, 2 adult animals (type); Off the Eastern mouth of Vega Sund, 72°45' N. 22°56' W., 35—60 m, mud, stones, 1 adult and 1 young animal (var. *elata*); Forsblads Fjord, 95—170 m, clay, stones, 9 adult animals, 1 adult shell (var. *elata*); Akerbloms Ø at Kong Oscars Fjord, 20 m, 1 half-grown animal (type); Antarctic Havn, Kong Oscars Fjord, 72°01' N. 23°03' W., 32—40 m, mud, 1 adult animal (var. *elata*); “Franz Joseph Fjord”, depth?, 1 adult and 2 young animals (type); Kap Hedlund, 7—11 m, clay, *Fucus*, 2 half-grown animals (type); Ibidem, 10—20 m, clay, rocks, stones, shells, red-algae, *Desmarestia*, *Fucus*, *Laminaria*, 22 adult, 40 half-grown, and 9 young animals (most of them typical, a few var.

*elata* and var. *fusco-rufescens*) (24 finds); Ibidem, 20—30 m, clay, rocks, shells, stones, red algae, *Fucus*, *Desmarestia*, 12 adult, 12 half-grown, and 14 young animals (nearly all typical, a few var. *elata*) (15 finds); Ibidem, 30—40 m, 2 adult, 3 half-grown, and 1 young animal (type and var. *fusco-rufescens*), 1 young shell (5 finds); Ibidem, 52—60 m, clay, 1 adult and 1 half-grown animal (type) (2 finds); Ibidem, 35—60 m, mud, 1 half-grown and 2 young animals, 1 adult shell (type); Ibidem, 61—63 m, clay, 1 very large animal; Solitærbugt, Ellaø, 2—7 m, brown algae, 1 half-grown animal (type); Ibidem, 10—20 m, clay, stones, shells, *Laminaria*, *Desmarestia*, 5 adult, 1 half-grown, and 4 young animals, 4 adult, 2 half-grown, and 1 young shells (type and var. *fusco-rufescens*) (13 finds); Ibidem, 20—30 m, clay, stones, shells, gravel, red algae, *Desmarestia*, *Laminaria*, 4 very large, 13 adult, 14 half-grown, and 6 young animals; 1 adult and 1 half-grown shell (type, var. *elata* and var. *fusco-rufescens*) (20 finds); Ibidem, 30—40 m, clay, stones, shells, red algae, *Laminaria*, 1 very large, 9 adult, 4 half-grown and 9 young animals, 2 adult shells (type, var. *elata* and var. *fusco-rufescens*) (11 finds); Ibidem, 40—50 m, stones, 1 adult animal (type); Ibidem, 48—56 m, clay, stones, 1 adult and 1 young animal (type).

*Scoresbysund Area*: The mouth of Scoresbysund, depth?, 6 adult animals (type); Off Kap Hope, 10—11 m, sand, dead algae, 1 half-grown animal (type); Ibidem, 65 m, sand, 1 young animal; Off Kap Stewart, 70°27' N. 22°35' W., 13—18 m, mud, stones, algae, 1 half-grown animal (type); Off the mouth of Hurry Fjord, 30 m, stones, sand, red algae, *Laminaria*, 3 adult animals (var. *fusco-rufescens*); The mouth of Hurry Fjord, 20—28 m, sand, 1 young animal (type); Ibidem, 142 m, clay with stones, 1 young shell; Ibidem, 19 m, clay, 1 adult animal (type); Hurry Fjord, 1 mile from the mouth, 25—38 m, sand, stones, red algae, *Laminaria*, *Fucus*, 1 very large and 2 adult animals (var. *fusco-rufescens*) (3 finds); Hurry Fjord off Konstabel Pynt, 7—10 m, sand, 1 young animal (var. *fusco-rufescens*); Hurry Fjord off Fame Øer, 15—18 m, clay, red algae, *Laminaria*, 3 adult, 3 half-grown and 9 young animals (var. *fusco-rufescens*); Ibidem, 22—24 m, clay, red algae, *Laminaria*, 3 adult and 3 young animals (var. *fusco-rufescens*); Ibidem, 18—22 m, clay, 1 half-grown and 7 young animals, 1 young shell (var. *fusco-rufescens*); Ibidem, 5—8 m, clay, 1 very large animal (type); "Hurry Fjord", 0—13 m, 9 adult and 3 half-grown animals (type and var. *fusco-rufescens*); Ibidem, 95 m, clay with stones, 1 very large and 1 adult animal (var. *elata*); Jamesonland, opposite to the Bjørne Øer, 20—30 m, sandy clay, 1 half-grown and 1 young animal; Nordvest Fjord, inner part, 10—18 m, clay, 1 half-grown animal (type); The bay off Røde Ø, 13—18 m, clay, gravel, 1 adult and 1 half-grown animal (type); S.E. of Danmarks Ø, 10—17 m, clay, 1 half-grown animal; Hekla Havn at Danmarks Ø,

depth?, 5 adult, 4 half-grown and 6 young animals (type); Turner Sund, about 5½ m, 4 young animals; Kap Dalton, 17—21 m, 1 half-grown animal (var. *fusco-rufescens*).

*Kangerdlugssuak Area*: Kangerdlugssuak, 40—50 m, 1 very large animal (type); Ibidem, 175 m, 1 adult animal; Uttental Sund, 25—30 m, clay, 1 half-grown animal (type); Ibidem, 30—41 m, clay, 1 adult, 1 half-grown and 3 young animals (type) (2 finds); Ibidem, 75—100 m, clay, 1 very large animal (type).

*Sydøstkyst Area*: Angmagssalik, 25 m, 1 adult animal (type); Ikera-sausak at Angmagssalik, 0—10 m, *Fucus*, *Laminaria*, 1 half-grown animal (type); Skjoldunge Fjord, 63°32' N. 41°50' W., 2½—20 m, clay, 1 adult animal (var. *fusco-rufescens*).

var. *jenseni* HÄGG.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Eleonora Bugt, 15—27 m, clay, algae, 1 half-grown animal; Kap Hedlund, off the mouth of Rhedinfjord, 26—31 m, clay, *Fucus*, 1 adult and 2 half-grown animals; Solitærbugt at Ellaø, 19—30 m, clay, shells, red algae, 1 very large, 4 adult, 3 half-grown, and 1 young animal (5 finds); Ibidem, 30—40 m, clay, stones, shells, red algae, *Fucus*, 1 adult, 5 half-grown, and 1 young animal (6 finds); Ibidem, 40—50 m, 2 half-grown animals; Ibidem, 4—40 m, 1 adult animal. — *Scoresbysund Area*: Amdrup Havn, 22—25 m, *Laminaria*, red algae, 1 very large animal; The bay off Røde Ø at Røde Fjord, 30—35 m, clay, stones, 1 adult animal; Nordvestfjord, inner part, 30—37 m, clay, 2 young animals. — *Sydøstkyst Area*: Lindenow's Fjord, inner part, 15—30 m, clay, gravel, 2 young animals; Ibidem, outer part, 60—70 m, sand, gravel, 1 half-grown animal.

var. *albus* n. var.

Diagnose: Shell of the same shape as the type or normally somewhat more tumid, of a milky-white colour and rather transparent.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: 5 miles S. of the Bontekoe Ø, 245 m, hard clay with stones, 5 adult and 4 half-grown animals, 2 adult shells; the Moskusokse Fjord off Mt. Anker valley, 19—23 m, clay, stones, 1 adult and 2 young animals (probably only pale specimen of var. *fusco-rufescens*); Off Kap Weber, 73°32' N. 24°35' W., 100—110 m, mud, gravel, stones, 2 adult animals; Franz Joseph Fjord, East of the Zoolog valley, 180 m, clay, stones, 3 adult and 1 half-grown animal; Between Kap Weber and Ymers Ø, 400 m, clay,

stones, 1 adult animal; Off Nordfjord, 205 m, clay, 1 adult animal; Dusénfjord, inner part, 240 m, clay, 2 adult and 1 half-grown animal, 2 very large shells; Between Maria's Ø and Geographical Society Ø, 73°21' N. 24°30' W., 180—215 m, mud, gravel, stones, 1 adult animal; Kap Hedlund off the mouth of Rhedinfjord, 20—31 m, clay, *Fucus*, 1 adult animal; Solitærbugt at Ellaø, 4—40 m, 2 adult animals; Ibidem, 250 m, clay, gravel, stones, 1 half-grown animal. — *Scoresbysund Area*: Off Kap Hope, 228 m, clay, stones, 1 adult animal; Hurry Fjord off the Fame Øer, 22—24 m, clay, red algae, *Laminaria*, 1 half-grown animal.

*Buccinum hydrophanum* is by far the most common Buccinid at East Greenland, where it occurs in abundance from Danmarks Havn in the N. to Lindenow's Fjord in the S. being equally frequent along the outer coast and in the innermost ramifications of the large fiords. The vertical range of living animals from East Greenland is from 2—7 m (Ellaø) to 400 m (Between Kap Weber and Ymers Ø). — The typical form, the var. *fusco-rufescens*, and the var. *elata* seem to occur together in nearly all the localities examined. All transitional stages between them are found, and it seems impossible to find the slightest rule for the occurrence of each single variety. The var. *jenseni*, however, has a more distinct appearance and occurrence, being especially associated with the red-algae epifauna in somewhat deeper water. Finally, the var. *albus* is very distinct and seems to be especially associated with very deep water (150—400 m); The few specimens apparently belonging to this variety and originating from more shallow water (Solitærbugt, Kap Hedlund, and Fame Øer) were all taken in the 3 localities from which

The typical form	var. <i>elata</i>	var. <i>fusco-rufescens</i>	var. <i>jenseni</i>	var. <i>albus</i>
mm	mm	mm	mm	mm
33.4×64.2	40.9× about 74	29.5×53.4	31.6×57.4	28.6×58.3
31.5×60.1	35.0×63.9	28.2×52.8	30.8×56.5	24.3×42.0
31.4×60.0	34.2×70.9	27.8×53.4	27.9×52.2	23.4×43.3
29.9×59.3	33.5×65.7	27.1×47.7	26.0×47.9	23.1×44.3
29.9×55.4	33.4×65.6	26.4×49.7	25.5×44.9	22.9×43.9
29.6×55.5	32.8×64.8	26.0×49.7	21.0×36.5	22.5×43.2
28.9×55.5	32.0×67.7	25.9×47.6	A transitional	22.1×40.6
28.4×50.6	31.5×61.5	25.7×42.1	stage between	21.9×44.6
27.5×55.6	28.5×54.8	25.6×45.9	var. <i>fusco-rufescens</i> and	21.0×42.2
27.4×52.4	27.7×60.4	24.7×44.7	var. <i>jenseni</i>	20.5×39.1
25.4×48.2	27.3×53.3	24.1×44.6	measured:	18.7×34.3
23.9×44.0	26.4×53.0	23.8×42.7	36.3×65.8	17.9×33.1
23.5×43.8	25.8×53.3	20.4×39.0		1 empty shell
22.8×46.3	25.5×49.1			measured
21.4×36.7	23.6×48.4			38.7×79.1

we have the largest quantities of dredge hauls and must probably be regarded as accidental albino-specimens within a large population.

**Distribution:** Norway (Finmarken to W. Norway), between the Faroes and the Hebrides, Iceland, W. and E. Greenland, Spitzbergen, the Murman Coast, the Barents Sea, Novaya Zemlya, the Kara Sea, Franz Joseph Land, the Siberian Arctic Sea, Baffin Land, and Newfoundland. **Main distribution:** Panarctic. **Vertical range:** From 3 m (Franz Joseph Land) to 1187 m (Norway).

**Remarks.** The largest East Greenland animals (breadth  $\times$  height of shell) are given in the table p. 92.

The var. *elata* seems thus normally to reach the largest size in East Greenland. — Several animals had living algae, actinians, crusts of bryozoans, and *Spirorbis* attached to their shells.

**Biology:** The egg capsules were previously known from E. Greenland (THORSON 1935); they are laid several together in clusters, and each capsule contains from 2 to 8 embryos feeding on nurse eggs. The development is non-pelagic; the young hatch in the crawling stage.

### 63. *Buccinum belcheri* REEVE.

*Buccinum belcheri* GRIEG 1909, pl. 79, figs. 8—9.

#### East Greenland records:

*Buccinum undatum* MÖBIUS 1874, p. 249.

*Buccinum undatum* POSSELT 1895, p. 86.

*Buccinum undatum* POSSELT & JENSEN 1898, p. 193.

*Buccinum groenlandicum* HÄGG 1905, p. 59.

*Buccinum belcheri* GRIEG 1909, p. 37.

*Buccinum belcheri* THORSON 1934, p. 8.

*Buccinum belcheri* THORSON 1935, pp. 27—30, figs. 23—26, egg capsules.

**Occurrence at East Greenland** (cf. the map fig. 22, p. 135): **Nordøstkyst Area:** Off Île de France, 77°31' N. 18°24' W., 275 m, clay, 2 adult "specimens" (GRIEG) and 2 adult animals (collection of Copenhagen Museum); Danmarks Havn, 5<sup>1</sup>/<sub>2</sub>—9<sup>1</sup>/<sub>2</sub> m, *Laminaria*-region, 2 adult animals; Stormbugt at Danmarks Havn, 9<sup>1</sup>/<sub>2</sub>—18 m, mud, *Laminaria*, 1 half-grown animal; Ibidem, 19—38 m, *Delesseria*, 1 adult shell; Hvalrosodden at Danmarks Havn, on the shore, 1 adult fragmentary shell.

**Franz Joseph Fjord Area:** S.E. of Clavering Ø, 74°10' N. 20°08' W., 25—40 m, mud, shells, pebbles, 1 adult and 1 young animal; Clavering Ø and Jackson Ø (MÖBIUS, as "*Buccinum undatum*"); Loch Fyne, on the shore, 1 fragmentary shell; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 3 adult animals (HÄGG); Ibidem, 12—18 m, mud, 6 animals

(HÄGG); Ibidem, 12—35 m, mud, 3 animals (HÄGG); Moskusokse Fjord, 15 m, 1 adult and 2 half-grown animals; Eleonore Bugt, 15—27 m, clay, red algae, *Laminaria*, *Desmarestia*, 2 adult and 1 young animal; Vinter Øer off the mouth of Dusénfjord, 15—30 m, clay, red algae, *Desmarestia*, 1 adult animal; the mouth of Dusénfjord, 15—30 m, stones, algae, 1 adult and 1 young animal; Dusénfjord, inner part, 16—18 m, clay, *Laminaria*, *Desmarestia*, 1 adult animal; Kap Hedlund, 9—20 m, sand, clay, shells, stones, rocks, red algae, *Fucus*, *Desmarestia*, 6 adult, 3 half-grown, and 3 young animals (8 finds); Ibidem, 20—30 m, red algae, *Fucus*, 2 half-grown animals (2 finds); Ibidem, 33—40 m, clay, 1 adult animal; Solitærbugt at Ellaø, 13—24 m, *Laminaria*, *Desmarestia*, stones, shells, 2 adult, 1 half-grown, and 2 young animals (5 finds); Ibidem, 24—28 m, stones, shells, 1 half-grown animal, 1 adult shell (2 finds); Ibidem, 19—40 m, clay, red algae, 1 adult and 1 half-grown animal (2 finds); Ibidem, 4—40 m, 2 adult animals; Ibidem, 32—38 m, stones, clay, red algae, *Laminaria*, 3 half-grown and 1 young animal (2 finds); Ibidem, 51—51 m, clay, stones, 1 adult animal; Ibidem, 68—74 m, stones, gravel, 1 adult, fresh shell; Forsblads Fjord, 95—170 m, 1 adult animal, 2 half-grown shells.

*Scoresbysund Area*: Amdrup Havn, depth ?, *Fucus*, 1 half-grown and 1 young animal; Ibidem, 22—26 m, *Laminaria*, red algae, 1 adult animal; Off Kap Stewart, 70°27' N. 22°35' W., 13—18 m, mud, stones, algae, 2 adult animals; Hurry Fjord, 22—24 m, 1 half-grown animal; Hurry Fjord, off the Fame Øer, 15—18 m, clay, red algae, *Laminaria*, 1 half-grown animal.

*Kangerdlugssuak Area*: Mikis Fjord, 7—8 m, clay, 1 very young animal; Uttental Sund, 6—10 m, mud, stones, rocks, *Fucus*, *Laminaria*, 1 very large, 3 adult, 3 half-grown and 1 young animal (6 finds); 10—20 m, stones, *Laminaria*, red algae, 2 adult, 3 half-grown, and 3 young animals (4 finds); Ibidem, 25 m, clay, red algae, 1 adult animal; Ibidem, 150 m, *Fucus*, 3 adult and 1 half-grown animal; Kangerdlugssuak, 5—10 m, sand, 5 adult and 1 half-grown animal (3 finds); Ibidem, 12—15 m, 2 half-grown animals; Ibidem, 50 m, 1 adult animal; Ibidem, depth ?, 2 half-grown animals.

*Sydøstkyst Area*: Kungmiut at Angmagssalik, depth ?, 1 half-grown animal; Ikerasausak at Angmagssalik, 0—10 m, *Fucus*, *Laminaria*, 1 half-grown animal; Off Sermilik, 25 m, clay, 1 half-grown animal; Sermilik, off Epilalak, 25 m, 2 adult animals; Tiningnekelak at Angmagssalik, depth ?, 1 half-grown animal; Angmagsivik, 65°58' N. 37°02' W, 9 m, 1 adult animal; Tasiusak at Angmagssalik, 6—8 m, mud, *Desmarestia*, 1 adult animal; Ibidem, 10—12 m, sand, clay, 1 young animal; Ibidem, 25—30 m, *Desmarestia*, 2 very large, 1 adult, 3 half-grown, and

2 young animals (2 finds); Off Angmagssalik, 20 m, 1 young animal; Lindenow's Fjord, the mouth, 125—150 m, clay, gravel, 1 young animal; Lindenow's Fjord, outer part, 60—70 m, gravel, sand, 1 half-grown animal; Lindenow's Fjord, the middle part, 60—80 m, clay, 2 young animals; Ibidem, 25—30 m, clay, gravel, 3 half-grown animals; Lindenow's Fjord, inner part, 75—100 m, clay, 1 half-grown animal.

The species is thus known from the whole East Greenlandic coast from Île de France in the N. to Lindenow's Fjord in the S. It is, however, much more abundant in the four northernmost areas than along the southeast coast. In the Franz Joseph Fjord Area it occurs both along the outer coast and in the innermost ramifications of the fjords, while in Scoresbysund it seems restricted to the areas near the open sea. In the northernmost areas of East Greenland including Scoresbysund the species occurs in a very typical shape. The shell is pale yellowish with reddish-brown nuances, and has no hairs on the periostracum, while *Buccinum groenlandicum* according to ODHNER (1915, p. 194) always has a hairy periostracum. The operculum is oval, the nucleus is not in the centre. The shell has strong spiral-keels placed rather densely. This type dominates totally along the outer coast and mouths of the fjords in the northern areas. In the innermost parts of the Franz Joseph Fjord (thus at Kap Hedlund) the shell is somewhat shorter and broader, but the structure is still the same. At Kangerdlugssuak-Uttental Sund the structure of the short, broad shell is interrupted by thin, lamel-like radial-ribs. At Lindenow's Fjord, both typical specimens and those with radial ribs have been found. Vertical range for living animals at East Greenland from 5 m (Kangerdlugssuak) to 150 m (Lindenow's Fjord) and 275 m (Île de France).

Distribution: Labrador (unpublished), W. Greenland, E. Greenland, Jan Mayen, Finmarken. Main distribution: Panarctic. Vertical range: From 5 m (E. Greenland) to 314 m (Labrador, unpublished).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):

Outer coast from Danmarks Havn to Scoresbysund:  $26.5 \times 47.6$  —  $26.3 \times 47.9$  —  $24.5 \times$  about 42 —  $23.7 \times$  about 46 —  $22.7 \times 40.1$  —  $20.8 \times 35.7$  —  $20.2 \times 37.1$  —  $22.1 \times 40.2$ , and  $19.9 \times 41.2$  mm respectively.

Inner part of Franz Joseph Fjord (Kap Hedlund, Solitærbugt):  $27.2 \times 48.2$  —  $27.0 \times 49.4$  —  $23.0 \times$  about 37.5 —  $21.4 \times 37.3$  —  $22.1 \times 40.2$ , and  $19.7 \times 35.6$  mm respectively.

Kangerdlugssuak and Uttental Sund:  $29.3 \times 46.3$  —  $27.5 \times 49.4$  —  $25.5 \times 44.8$  —  $23.7 \times 42.9$  —  $23.4 \times 37.7$  —  $22.4 \times 37.6$  —  $20.3 \times$  about 32.5 —  $18.9 \times 30.3$  —  $18.5 \times 33.0$  mm respectively.

Angmagssalik:  $30.5 \times$  about 56, and  $28.3 \times$  about 50 mm respectively.

Several animals had living algae and crusts of hydroids, bryozoans and *Spirorbis* attached to their shells.

**Biology:** The egg capsules and embryos are known from East Greenland (THORSON 1935). The egg capsules are laid in densely, coherent, semiglobular clusters of 2.5 to 2.75 cm in diameter attached to stones, *Fucus* etc. In shape they remind one closely of the capsules and clusters of *Buccinum groenlandicum* (see this), but capsules as well as clusters of *B. belcheri* are only half the size known for *B. groenlandicum*. The characteristic embryos feed as all *Buccinidae* do, on nurse eggs, and leave the capsules in the crawling stage. Hence, there is no free swimming pelagic stage.

#### 64. *Buccinum groenlandicum* CHEMNITZ.

*Buccinum groenlandicum* G. O. SARS 1878, pl. 25, figs. 1—2, pl. 13, figs. 9 a—b.

##### East Greenland records:

*Buccinum groenlandicum* POSSELT 1895, p. 86.

*Buccinum groenlandicum forma normalis* POSSELT & JENSEN 1898, p. 200.

*Buccinum groenlandicum* HÄGG 1905, p. 59 (erroneously, is *Buccinum belcheri*).

*Buccinum groenlandicum* ODHNER 1915, p. 194 (partially citing POSSELT, partially HÄGG).

*Buccinum groenlandicum* THORSON 1935, pp. 30—32, figs. 27—28; egg capsules.

Occurrence at East Greenland (cf. the map fig. 15, p. 128):  
*Sydøstkyst Area:* Tiningnekelak at Angmagssalik, 65°54' N., 9½—19 m, sand, brown algae, 2 adult, and 2 young animals, 1 adult shell (3 finds); Ikerasausak at Angmagssalik, 65°58' N. 37°27' W., 0—10 m, *Fucus*, *Laminaria*, 4 adult animals (one of them var. *hybrida*, 2 var. *patula*). Off Kungmiut at Angmagssalik, 65°52' N. 36°54' W., 5 m, *Fucus*, 1 adult animal (var. *tenebrosa*); Ibidem, 10—15 m, clay, *Fucus*, 1 adult and 1 half-grown animal (var. *tenebrosa*); Sermilik, off Epilalak, 5—7 m, clay, *Fucus*, 8 adult and 3 half-grown animals (1 adult var. *hybrida*, 7 adult var. *tenebrosa*); Sermilik, off Ikatek, 25 m, 1 adult animal (typical); Ibidem, 49 m, *Laminaria*, 2 adult, 1 half-grown, and 1 young animal (typical); Tasiusak at Angmagssalik, 5—7 m, sand, *Fucus*, *Laminaria*, 1 adult, 13 half-grown, and 13 young animals (2 finds) (typical); Ibidem, 1—10 m, *Fucus*, *Laminaria*, *Desmarestia*, clay, stones, 13 adult and 8 half-grown animals (var. *major* × *wandeli*, var. *tenebrosa*, and typical) (7 finds); Ibidem, 10—20 m, sand, clay, stones, algae, 2 very large, 8 adult, 6 half-grown, and 5 young animals (var. *major* POSSELT × var. *wandeli* POSSELT, and typical specimens) (4 finds); Ibidem, 20—30 m, red algae, 2 adult animals (typical); Tasiusak, depth?, 2 adult and 2 half-grown animals (typical); Off the S.E. coast of Greenland, 245 m, 4 “specimens” (POSSELT, “Sofia”-Exp.); Off Angmagssalik, 0—20 m, 17 adult and 4 half-grown animals, 4 adult, fragmentary shells (typical, and var. *magna*)

(4 finds); Ibidem, 25 m, 1 adult, 1 half-grown animal, 2 adult shells (var. *magna*); Ibidem, depth ?, 5 adult, 4 half-grown, and 2 young animals (typical, and var. *magna*) (2 finds); Ibidem, from the stomach of a shark, 1 adult animal (var. *tenebrosa*); Singmiamiut, off Kekertak, 62°42' N. 42°27' W., 8—12 m, 1 half-grown animal; Oksefjord, 64°38' N. 40°20' W., 10 m, *Laminaria*, 1 adult fragmentary shell; Skjoldunge Fjord, 63°33' N. 41°50' W., 2 $\frac{1}{2}$ —20 m, *Laminaria*, clay, 1 half-grown and 1 young animal (var. *tenebrosa*); Off Kap Tordenskjold, 4 m, mud and *Laminaria*, 1 adult, 2 half-grown and 1 young animal (typical); Ibidem, 35 m, clay, 1 half-grown animal (typical); Lindenow's Fjord, the mouth, 10—15 m, gravel, *Laminaria*, 1 adult and 5 young animals (typical); Ibidem, 15—35 m, gravel, *Laminaria*, 13 half-grown and 7 young animals (3 finds); Ibidem, 40—50 m, gravel, *Laminaria*, 1 adult animal; Ibidem, 50—75 m, clay, 1 young animal; Lindenow's Fjord, the middle part, 20—25 m, *Laminaria*, 1 adult and 1 young animal (typical).

The species is thus known only from the south-eastern part of the East Greenland coast and seems totally to avoid the most high-arctic areas. In the Sydøstkyst Area it is rather common and seems here to play a part similar to that of *Buccinum belcheri* in the northernmost areas. The species is very variable in East Greenland. Dominants are: a form of medium size with hairy lamellae (very near to type) and the var. *tenebrosa*. The vertical range for living specimens at East Greenland is from 4 m (Kap Tordenskjold) to 50—75 m (Lindenow's Fjord) or 245 m (Off S.E. Greenland, living?).

Distribution: Norway (Finmarken only), Iceland, W. and S.E. Greenland, Spitzbergen, the Murman Coast, the White Sea, the Barents Sea, Novaya Zemlya, the Siberian Arctic Sea, Franz Joseph Land, the Bering Strait, the Aleutians, British Columbia, Labrador, and Nova Scotia. Main distribution: Panarctic. Vertical range: From 0 m (Norway) to 392 m (the Barents Sea).

The largest animals from East Greenland measure (breadth  $\times$  height of shell):

Typical specimens: 27.3  $\times$  46.8 — 25.1  $\times$  45.7 — 23.7  $\times$  41.4 — 22.0  $\times$  37.5 — 21.6  $\times$  37.4 — 21.2  $\times$  34.1 — 20.8  $\times$  39.7 — 20.5  $\times$  37.4 — 20.0  $\times$  33.7 — 20.0  $\times$  36.3 mm respectively.

var. *tenebrosa*: 22.8  $\times$  38.3 — 21.0  $\times$  35.3 — 20.6  $\times$  36.8 — 20.5  $\times$  34.2 — 19.8  $\times$  35.6 — 19.2  $\times$  32.3 — 18.5  $\times$  32.2 — 18.3  $\times$  31.3 — 16.5  $\times$  28.2, and 15.5  $\times$  28.9 mm respectively.

var. *hybrida*: 29.4  $\times$  48.5 and 24.5  $\times$  43.0 mm respectively.

var. *major*  $\times$  var. *wandeli*: 30.2  $\times$  54.1 — 28.4  $\times$  52.7 — 27.5  $\times$  about 48 — 23.7  $\times$  42.7, and 23.4  $\times$  43.8 mm respectively.

var. *magna*:  $30.7 \times 56.4$  —  $25.4 \times 46.6$  —  $27.0 \times 50.4$  —  $25.2 \times 46.0$  —  $24.9 \times 42.1$ , and  $24.8 \times 42.7$  mm respectively.

var. *patula*:  $28.3 \times 48.4$ , and  $23.9 \times 40.2$  mm respectively.

Biology: The reproduction is known from Norway and E. Greenland (DONS 1913; THORSON 1935). The egg capsules are deposited several together in dome-shaped clusters. Each capsule contains 7 to 9 embryos feeding on nurse eggs. They have a non-pelagic development and hatch in the crawling stage.

#### 65. *Buccinum ovum* MIDDENDORFF.

*Buccinum ovum* KNIPOWITSCH 1902, pl. 8, figs. 1—3 and 23—25.

East Greenland records:

*Buccinum ovum* HÄGG 1905, p. 67.

*Buccinum ovum* ODHNER 1915, p. 91.

*Buccinum ovum* THORSON 1935, pp. 34—35, figs. 33—34, egg capsules.

Occurrence at East Greenland: *Nordøstkyst Area*: Sabine Ø,  $5\frac{1}{2}$ — $9\frac{1}{2}$  m, 2 half-grown animals. — *Franz Joseph Fjord Area*: Clavering Ø, in the stomach of an eider-duck, 1 half-grown animal; Off Kap Stosch, 15 m, 1 adult animal; 10 km N. to Loch Fyne, on the shore, 1 adult fragmentary shell; Mackenzie Bugt, 3—10 m, mud, sand, *Laminaria*, 1 adult animal (HÄGG); Moskusokse Fjord, 15 m, 1 adult animal, 2 adult shells; Eleonore Bugt,  $3\frac{1}{2}$ —12 m, clay, *Fucus*, *Laminaria*, *Desmarestia*, 3 adult and 5 half-grown animals; inner part of Franz Joseph Fjord off Engdalen, 36—45 m, clay, *Laminaria*, 1 half-grown shell; Kong Oscars Fjord at Åkerbloms Ø, 20 m, stones, 1 adult and 1 half-grown animal. — *Scoresbysund Area*: Off Kap Hope, 7—9 m, sand, algae, 2 half-grown animals; Ibidem, 9—13 m, sand, algae, 5 half-grown and 3 young animals (4 finds) with egg masses; Kap Stewart,  $70^{\circ}27' N.$   $22^{\circ}35' W.$ , 13—18 m, mud, stones, algae, 1 adult animal; Off the mouth of Hurry Fjord, 95 m, 1 adult animal; Hurry Fjord, 1 mile from the mouth, 6—9 m, sand, 1 adult, 5 half-grown and 7 young animals; Ibidem, 12—13 m, sand, stones, 2 half-grown, 2 young animals (2 finds); Ibidem, 35—38 m, sand, stones, *Laminaria*, *Fucus*, red algae, 1 half-grown animal, 1 half-grown shell; Hurry Fjord, 2 miles from the mouth, 14—15 m, stones, *Laminaria*, 1 young animal; Hurry Fjord off Konstabel Pynt, 7—10 m, sand, 1 half-grown animal, 1 adult and 1 young shell; Hurry Fjord off Fame Øer, about 9 m, mud, algae, 3 adult, and 1 half-grown animal; "Hurry Fjord",  $5\frac{1}{2}$ —11 m, 5 adult animals; Off Kap Hooker, 12 m, clay, 1 adult animal. — *Sydøstkyst Area*: Lindenows Fjord, middle part, 25—30 m, gravel, clay, 1 adult animal.

The species seems thus to be common along the whole East Greenlandic coast from Sabine Ø in the N. to Lindenow's Fjord in the S. and

to be closely associated with localities where a sandy bottom dominates. Hence, no finds are available from the innermost part of the fjords, while the species is abundant in the outer parts of the fjords and along the outer coast, where the movements of the water are more pronounced. —The vertical range for East Greenland animals is from 6—9 m (Hurry Fjord) to 95 m (Hurry Fjord).

Distribution: East Greenland, Spitzbergen, West-Finmarken, the Murman-Coast, Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, and Bering-Sea. Main distribution: Panarctic. Vertical range: 6—9 m (E. Greenland) to 107 m (the Murman coast).

Remarks: The largest living animals from East Greenland measure (breadth  $\times$  height of shell):  $24.4 \times 38.7$  —  $23.7 \times 37.0$  —  $27.0 \times 31.8$  —  $21.5 \times 33.4$  —  $19.9 \times 31.6$  —  $19.0 \times 31.2$  (HÄGG) —  $18.3 \times 27.8$  —  $17.3 \times 26.5$  —  $17.2 \times 28.7$ , and  $16.5 \times 26.7$  mm respectively.

Biology: The egg capsules and young embryos have been described and figured from East Greenland (THORSON 1935). The capsules are laid in big, shapeless, densely aggregated clusters on stalks and leaves of *Laminaria*. 50 to 400 capsules are united in a single cluster. Each capsule (4—9 mm across) has a distinct sculpture of nearly parallel longitudinal folds on the surface, and contains from 1 to 9 embryos feeding on nurse eggs; The young will accordingly hatch in the crawling-stage without any free swimming veliger larva.

#### 66. *Buccinum ciliatum* FABRICIUS var. *laevior* MÖRCH.

*Buccinum ciliatum* DAUTZENBERG & FISCHER 1912, pl. 6, fig. 8—9.

##### East Greenland records:

*Buccinum ciliatum* Var. *laevior* POSSELT 1895, p. 88.

*Buccinum ciliatum* var. *laevior* POSSELT & JENSEN 1898, p. 211.

*Buccinum ciliatum* Var. *laevior* HÄGG 1905, p. 69.

*Buccinum ciliatum* ODHNER 1915, p. 189.

Occurrence at East Greenland: Off the S.E. coast of Greenland, 245 m ("130 fathoms"), clay with stones, 1 "specimen" (from the "Sofia" Expedition).

The species has not been refound in the recent large collection from East Greenland and seems thus to be restricted to the outermost part of the shelf in the southern part of the coast as was also the case for *Turritella erosa* (cf. p. 40).

Distribution: N. of the mouth of Mackenzie River, Baffin Land, Labrador, New Foundland, St. Lawrence Gulf, W. and S.E. Greenland, Jan Mayen, Spitzbergen, Beeren Island, Murman Coast, White Sea,

Waigatsch, Novaya Zemlya, Siberian Ice Sea, Bering Strait, Bering Sea, Alaska. — Main distribution: Panarctic circumpolar. Vertical range: From 5—14 m (W. Greenland, Labrador) or 3—27 m (Matotschkin Strait) to 245 m (S.E. Greenland).

Biology: Unknown.

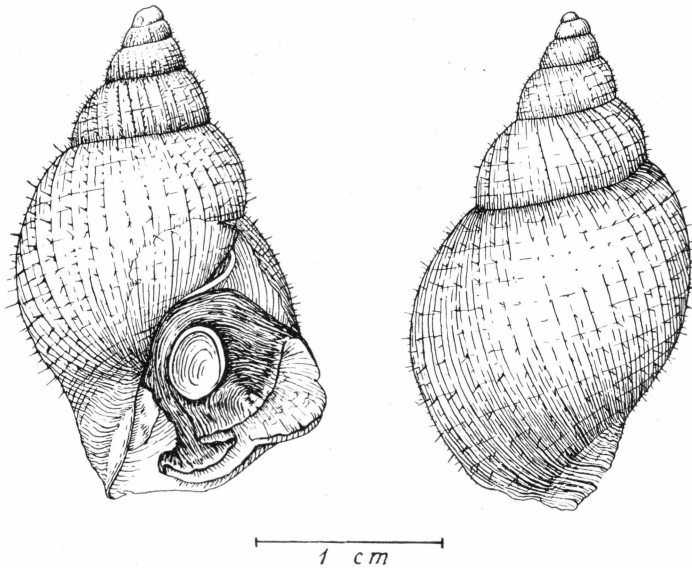


Fig. 11. *Buccinum micropoma* n. sp. Rosenvinges Bugt, 8—10 m depth, stones, algae. Type-specimen.

67. *Buccinum micropoma* AD. JENSEN MS. (cf. fig. 11, p. 100).

Diagnose: Shell ovate, thin and fragile; colour reddish-brown to violet, often nearly white. No longitudinal folds or undulations; growing lines distinct. The spiral sculpture consists of larger and smaller striæ. The spire is short and rather elongated, and the ovate form of the shell is related to the great development of the body-whorl. Whorls are rather impressed—the suture somewhat less—the length of the mouth making  $\frac{3}{5}$ — $\frac{3}{8}$  of the length of the whole shell. The shell, except the embryonic whorls, is covered with a light yellowish periostracum, which, where the lines of growth cross the spiral lines, rises in small, stiff, short and erect bristles, which consequently are arranged in regular longitudinal and transverse rows. Operculum very small. Nucleus very excentrical. The upper whorls of the apex are scalarid.

In the unpublished material from the “Danmark-expedition” partially worked up by Professor ADOLF S. JENSEN, who later on handed the uncompleted MS over to me, AD. S. JENSEN had separated specimens

of this new species for a closer examination and in his MS designated them with the new name: *Buccinum micropoma*, which accordingly will be used here too. As the specimens from the "Danmark-expedition" used by AD. JENSEN to erect the species were dissected and fragmentary, a specimen from Rosenvinges Bugt, Scoresbysund, August 12th 1928, 8—10 m depth has been used as the type (fig. 11). The type showed the following measurements: Height of shell 28 mm, height of body-whorl 21.5 mm, height of mouth 16.5 mm, largest diameter of operculum 4 mm.

Type preserved in alcohol. Kept in the Zoological Museum of the University of Copenhagen.

Egg capsules, embryos and a young specimen are figured in THORSON 1935, p. 32—34, figs. 29—32, under the name *Buccinum sericatum* HANCOCK. An adult specimen is figured by HÄGG 1905, pl. 1, fig. 9 as *Buccinum sericatum* HANCOCK with which species *Buccinum micropoma* has hitherto often been confused. It can, however, hardly be doubted that *B. micropoma* is a distinct species, as HANCOCK's species is much more tumid and has a much larger operculum.

#### East Greenland records:

*Buccinum sericatum* HÄGG 1905, p. 62, pl. 1, fig. 9.

*Buccinum sericatum* THORSON 1934, p. 8.

*Buccinum sericatum* THORSON 1935, pp. 32—34, figs. 29—32, egg capsules and embryos.

Occurrence at East Greenland (cf. the map fig. 22, p. 135):  
*Nordøstkyst Area*: Stormbugt at Danmarks Havn, 19—38 m, stones, shells, *Delesseria*-region, 2 adult, 2 half-grown animals (2 finds); S.E. of Hvalros Ø, 74°30' N. 18°40' W., 80—100 m, mud, stones, 1 animal and 1 shell (HÄGG); S.E. of Pendulum Ø, 74°35' N. 18°15' W., 150 m, mud, stones, 2 adult animals (HÄGG). — *Franz Joseph Fjord Area*: S.E. of Clavering Ø, 74°10' N. 20°08' W., 25—40 m, mud, shells, pebbles, 1 young animal; Mackenzie Bugt, 12—18 m, mud, 2 adult animals (HÄGG); East of Jackson Ø, 73°55' N. 19°20' W., 150 m, mud, 2 animals (HÄGG); The mouth of Dusénfjord off the Vinter Øer, 15—30 m, stones, algae, 1 adult animal; Solitærbugt, Ellaø, 38—40 m, 1 half-grown animal. — *Scoresbysund Area*: Off Kap Tobin, 17—31 m, *Laminaria*, *Desmarestia*, 2 very young animals; Amdrup Havn, 3—5 m, stones, *Fucus*, 2 adult and 1 half-grown animal (2 finds); Ibidem, 6—10 m, *Laminaria*, brown algae, 1 young animal; Ibidem, 10—18 m, *Fucus*, green algae, 5 adult and 4 half-grown animals; Rosenvinges Bugt, 8—10 m, stones, algae, 2 adult and 1 half-grown animal (Type-specimen for the whole species!); Off Kap Hope, 6—7 m, sand, algae, 2 half-grown animals; Off the mouth of Hurry Fjord, 30 m, stones, sand, *Laminaria*, red algae, 1 young animal; Hurry Fjord, 1 mile from the mouth, 25 m, sand, algae, 1 adult and young animal; Ibidem, 35—38 m, sand, stones,

algae, 1 adult animal. — *Kangerdlugssuak Area*: Kangerdlugssuak, 11—15 m, 1 half-grown animal; Uttental Sund, 4—5 m, clay, *Fucus*, 1 adult animal; Ibidem, 8—10 m, stones, *Laminaria*, 1 half-grown and 2 young animals; Ibidem, 15—18 m, *Laminaria*, red algae, 1 half-grown animal. — *Sydøstkyst Area*: Kungmiut at Angmagssalik, depth ?, 2 adult animals; Angmagssalik, 65°51' N., 1—9½ m, 1 half-grown animal; Tasiusak at Angmagssalik, 38—57 m, stones, algae, 1 adult and 1 half-grown animal; Nanusik at the mouth of Lindenow's Fjord, 50—60 m, gravel, clay, 1 adult animal; The mouth of Lindenow's Fjord, 10—15 m, gravel, *Laminaria*, 1 half-grown and 1 young animal; Ibidem, 25—35 m, *Laminaria*, 1 half-grown animal.

The characteristic species is thus common along the whole East Greenlandic coast from Danmarks Havn in the N. to Lindenow's Fjord in the S., where it occurs along the outer coast and in the outer part of the fjords, but seems to be absent from their innermost ramifications. *B. micropoma* is closely associated with the epifauna: the algal-zones. The species has a very constant shape and structure with a slight variation only in spite of the distended areas investigated.

Distribution: Between Ellesmere Land and Thule (Godthaab-exp. 1928, unpublished), E. Greenland, and W. of Spitzbergen (HÄGG). Main distribution: High-arctic. Vertical range: 3—4 m (East Greenland) to 100 m (W. of Spitzbergen).

Remarks. The largest East Greenland animals measure (breadth × height of shell): 21.6 × 24.4 (HÄGG) — 19.5 × 31.6 — 19.1 × 33.8 — 17.9 × 30.6 — 17.1 × 28.4 — 16.9 × 29.1 — 16.5 × 26.5 — 16.0 × 29.9 — 15.8 × 27.9, and 15.7 × 27.1 mm respectively.— Several animals had living hydroids, bryozoans and algae attached to their shells or even to their operculum.

Biology: The egg capsules and embryos are described and figured from East Greenland (as *Buccinum sericatum*, THORSON 1935). In contrast to most other egg capsules of species belonging to the genus *Buccinum* the egg capsules are as a rule laid singly or very few together. Each capsule recalls in shape a jockey cap, the capsule bearing a wing at one end. The surface has a "beaten" structure. Each capsule contains from 2 to 4 embryos feeding on nurse eggs. There is no pelagic stage.

#### 68. *Buccinum glaciale* LINNÉ

*Buccinum glaciale* DAUTZENBERG & FISCHER 1912, pl. 7, figs. 1—10.

Occurrence at East Greenland (cf. the map fig. 14, p. 127): *Sydøstkyst Area*: Naparsarsuak N. of Kap Tordenskjold, 2—4 m, rocks, *Laminaria*, 1 young animal; Ibidem, 36 m, mud and sand, 1 half-grown

animal; Lindenow's Fjord, the mouth, 8—10 m, *Laminaria*, 1 half-grown and 1 young animal; Ibidem, 25—35 m, *Laminaria*, 2 adult and 1 young animals; Ibidem, 50—75 m, clay, algae, 1 adult and 1 half-grown animal, 1 adult shell (2 finds); Lindenow's Fjord, middle part, 25—30 m, gravel, clay, 2 half-grown and 2 young animals; Ibidem, 55 m, clay, 1 half-grown and 1 young shell; Lindenow's Fjord, 25—50 m, clay, 1 very large animal.

The species which here is recorded from East Greenland for the first time seems to be common along the southernmost part of the coast. All the variations in shape and structure at East Greenland are contained within the limits of variations given by ODHNER (1915 pp. 187—188) for this species from the Isfjord at Spitzbergen. Most of the specimens had rather thick shells with a distinct angular basal-keel and with pronounced coarse radial ridges. The vertical range for living animals is at East Greenland from 2—4 m (Naparsarsuak) to 50—75 m (Lindenow's Fjord).

Distribution: Arctic part of America, Baffin Land, St. Lawrence Gulf, W. Greenland, S.E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, Kara Sea, Barents Sea, Franz Joseph Land, Novaya Zemlya, the White Sea, the Siberian Ice Sea, Bering Sea, Kamschatka, Japan, the Aleutians and Alaska. Main distribution: Panarctic-circumpolar. Vertical range: From 0 m (W. Greenland, Spitzbergen) to 318 m (the Murman Coast).

Remarks: The largest animals from E. Greenland measure (breadth  $\times$  height of shell): about  $32 \times$  about  $57$  —  $22.4 \times 40.2$  —  $19.7 \times 34.6$ , and  $17.7 \times 32.2$  mm respectively. The largest shell measures  $26.8 \times 46.3$  mm.— Several animals had living hydroids and *Spirorbis* on their shells.

Biology: The egg capsules are described (not figured) by FRIELE (1882 p. 34) from the northern part of the North Atlantic. They are deposited in shapeless clusters smaller than those laid by *B. undatum* and have a wrinkled appearance. The embryos are smooth. There is no pelagic stage.

69. *Buccinum nivale*, FRIELE (cf. this paper fig. 12, p. 104).

*Buccinum nivale* FRIELE 1882, pl. 3, figs. 24, 25 a—b.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: 5 miles S. of the Bontekoe Ø, 245 m, hard clay with stones, 2 adult animals; Off Kap Weber,  $73^{\circ}32'$  N.  $24^{\circ}38'$  W., 100—110 m, mud, gravel, stones, 1 adult animal. — *Scoresbysund Area*: Hurry Fjord, 95 m, clay with stones, 1 very large animal.

The species is here recorded not only from East Greenland but from the whole Greenlandic coast for the first time. The four East Greenland animals are mutually very similar and agree with FRIELE's description and figures (l. c.), in having a snow-white shell (when the animal is inside shining through the shell, the total colour of the shell is ivory-coloured), in the quite straight columella and in the curious, quite tiny operculum with the nucleus near the lower extremity. The East Greenlandic specimens have, however, a more tumid shape and a still larger mouth than those described by FRIELE. The shell is smooth. The animal

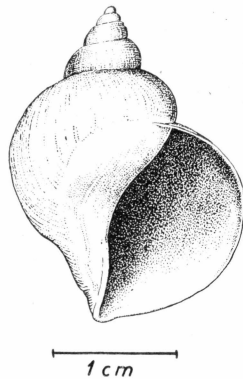


Fig. 12. *Buccinum nivale* FRIELE. Hurry Fjord, depth?, adult specimen.

seems to be a pronounced deep-water species and is easily distinguished from *Buccinum hydrophanum* var. *albus*, which also has a smooth white shell and lives at the same depth. The vertical range at East Greenland is from 95 m (Hurry Fjord) to 245 m (S. of Bontekoe Ø).

Distribution: Deficiently known. East Greenland (95—245 m), W. of Lofoten (860 m), and Kara Sea (94 m).

Remarks: The four East Greenland animals measure (breadth  $\times$  height of shell): 17.5  $\times$  25.9 — 12.0  $\times$  18.0 — 11.8  $\times$  18.2, and 10.8  $\times$  16.7 mm respectively.— Living specimens of *Spirorbis* and *Foraminifera* were attached to their shells.

Biology: Unknown.

#### 70. *Buccinum finmarchianum* VERKRÜZEN.

*Buccinum finmarchianum* G. O. SARS 1878, pl. 13, fig. 10, pl. 25, figs. 3—4.

East Greenland records:

*Buccinum perdix* POSSELT 1895, p. 87.

*Buccinum perdix* var. *Sarsii* POSSELT 1895, p. 87.

*Buccinum perdix* forma *normalis* POSSELT & JENSEN 1898, p. 203.

*Buccinum perdix* var. *Sarsii* POSSELT & JENSEN 1898, p. 204.

Occurrence at East Greenland (cf. the map fig. 14, p. 127): *Sydøstkyst Area*: Naparsarsuak N. of Kap Tordenskjold, 5—8 m, rocks with *Laminaria*, 1 adult, 3 half-grown and 3 young animals; Lindenow's Fjord, middle part, 25—30 m, gravel, *Laminaria*, 3 very young animals; Ibidem, 40 m, rocks, 1 half-grown and 1 young animal; "Lindenow's Fjord near the northern coast", 10—75 m, 2 adult, 1 half-grown and 1 young animal; Off the S.E. coast of Greenland, 242 m, clay, with stones, 3 "specimens" (POSSELT, from the "Sofia"-Expedition).

The species is thus known only from the southeastern part of the coast. All the East Greenlandic animals are without any spiral keels on their last whorls, which are quite smooth with the characteristic pattern of reddish-brown spots. The adult specimens seem to form an intermediate stage between var. *Sarsii* PFEFFER (Jahr. Hamb. wissenschaft. Anst., Vol. 3, p. 40, fig. 3) and var. *attenuata* G. O. SARS (1878 pl. 25, fig. 3). The whole shell is more slender than that of var. *sarsi*, but the single whorl is more tumid.

Distribution: Norway (Vadsø to Lofoten), Iceland, W. and S.E. Greenland, Jan Mayen, Spitzbergen, American Arctic Ocean to Nova Scotia, St. Lawrence Gulf, Cape Cod, and Newfoundland. Main distribution: Low-arctic. Vertical range: 5—8 m (East Greenland) to 245 m (S.E. Greenland).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):  $19.7 \times 40.0$  —  $19.0 \times 41.2$  — and  $17.5 \times 31.8$  mm respectively. — Several specimens had *Spirorbis* and crusts of bryozoans attached to their shells.

Biology: Egg capsules are known from the N. Atlantic (FRIELE 1882). Only a few capsules are deposited together. As in all species of *Buccinum* they feed on nurse eggs, and the larval development is non-pelagic.

#### 71. *Buccinum terrae-novae* BECK.

*Buccinum Terræ Novæ* FRIELE 1882, pl. 3, figs. 13—16.

Occurrence at East Greenland: *Sydøstkyst Area*: Angmagssalik, depth ?, 1 very large shell; Lindenow's Fjord, the mouth, 400—600 m, 1 adult animal, 1 adult shell; Lindenow's Fjord, inner part, 200—350 m, clay, 1 very large, fragmentary shell; Ibidem, 425 m, clay, 1 very large shell.

The species here recorded from East Greenland for the first time is known only from the southernmost part of the coast and seems even here to be rather rare and associated with deeper water. The only living animal found had a less pronounced "shoulder" on the last whorl and had some similarity with *Buccinum groenlandicum* var. *magna*. The

empty shells had an angular shoulder as pronounced as normally found in *B. terrae-novae*.

Distribution: N.W., N. and E. Iceland, E. and W. Greenland, Spitzbergen, Bear Island, Novaya Zemlya, the Siberian Arctic Sea, the Bering Sea, and Newfoundland. Main distribution: Panarctic. Vertical range: From 9 m (W. Greenland) to 400—600 m (E. Greenland).

Remarks: The living specimen measures (breadth  $\times$  height of shell): 29.0  $\times$  53.3 mm; The largest shells measured: 33.6  $\times$  61.0 — about 26  $\times$  about 50, and 28.6  $\times$  55.6 mm respectively.

Biologi: Egg capsules are known from the N. Atlantic and from Norway (FRIELE 1882, DONS 1913, DEGNER 1934). Several egg capsules are deposited together in a fir-conelike cluster. Each capsule contains several embryos feeding on nurse eggs. Larval development non-pelagic. From Iceland (Skagaströnd 1876) we have two egg clusters both with eggs and very young embryos (THORSON 1941).

#### 72. *Volutomitra groenlandica* (BECK).

*Volutomitra groenlandica* G. O. SARS 1878, pl. 23, fig. 12.

East Greenland record:

*Volutomitra groenlandica* HÄGG 1905, p. 82.

Occurrence at East Greenland: *Nordøstkyst Area*: Greenland Sea, E. of store Koldewey Ø, 76°08' N. 13°26' W., 250—300 m, clay, gravel, 1 adult animal (living?). — *Franz Joseph Fjord Area*: The author found in dredge hauls in deeper water in the outer part of Franz Joseph Fjord (Summer 1932) an adult, well preserved shell of this species, which could not be refound in the collections after their arrival in Copenhagen; East of Vega Sund, 72°25' N. 17°56' W., 300 m, stones, sand, 1 adult animal (HÄGG). — *Sydøstkyst Area*: Lindenow's Fjord, the mouth, 100—125 m, gravel, *Laminaria*, 1 half-grown animal; Ibidem, 100—150 m, sand, bryozoans, 1 half-grown animal; Lindenow's Fjord, middle part, 40 m, clay, 1 young animal; Ibidem, 91 m, clay, 1 adult shell; Lindenow's Fjord, 30—50 m, gravel, 1 adult animal.

Living specimens are thus known from off Vega Sund in the N. to Lindenow's Fjord in the S. The vertical range at East Greenland is from 40 m (Lindenow's Fjord) to 300 m (E. of Vega Sund).

Distribution: Norway (Finmarken to W. coast), the Faroes (dead spec.), Iceland, between Iceland and Greenland, S.W. Greenland, E. Greenland, the Parry Islands, and northwards to Cape Cod. Main distribution: Low-arctic. Vertical range: From 27 m (W. Greenland) to 549 m (Norway).

Remarks: The largest East Greenland animals measure (breadth  $\times$  height of shell):  $10.5 \times 23.4$  —  $10.2 \times 24.1$  —  $7.6 \times 17.3$  —  $7.0 \times 16.9$  (HÄGG) mm respectively.

Biology: Unknown.

73. *Admete viridula* (O. FABRICIUS) (cf. fig. 13, p. 108).

*Admete viridula* G. O. SARS 1878, pl. 13, fig. 1 a.

East Greenland records:

*Admete viridula* Var. *laevior* HÄGG 1905, p. 79.

*Admete viridula* ODHNER 1915, p. 209.

Occurrence at East Greenland (cf. the map fig. 23, p. 136):  
*Nordøstkyst Area*: Danmarks Havn, 28 m, mud, *Delesseria*, 1 adult shell; S.E. of Sabine Ø, 207 m, 1 half-grown and 1 young shell; S.E. of Pendulum Ø,  $74^{\circ}35' N. 18^{\circ}15' W.$ , 150 m, mud, stones, 1 adult animal (HÄGG). — *Franz Joseph Fjord Area*: Mackenzie Bugt, 12—35 m, mud, 1 animal (HÄGG); Mackenzie Bugt, S.E. of Kap Bennet,  $73^{\circ}20' N. 21^{\circ}20' W.$ , 70 m, mud, shells, pebbles, 2 adult and 1 half-grown animal (1 adult with very coarse spiral ribs); Solitærbugt at Ellaø, 28—31 m, *Laminaria*, *Desmarestia*, 2 adult animals (coarse spiral ribs) (2 finds); Forsblads Fjord, 95—170 m, clay, with stones, 1 adult animal (coarse ribs), 1 adult shell. — *Scoresbysund Area*: Hurry Fjord, the mouth, 145 m, 1 half-grown shell (*contabulata*-like), Hurry Fjord off the Fame Øer, 15—18 m, red algae, *Laminaria*, 4 adult animals; Ibidem, 18—22 m, soft clay, 1 half-grown animal; Hurry Fjord, 95 m, 1 half-grown animal; "Hurry Fjord", 95 m, 1 half-grown animal and 2 adult shells. — *Kangerdlugssuak Area*: Uttental Sund, 30—40 m, clay, 1 adult animal (with coarse spiral ribs). — *Sydøstkyst Area*: Lindenow's Fjord, outer part, 60—70 m, gravel, sand, 1 adult animal; Ibidem, 90 m, sand, 1 young shell; Lindenow's Fjord, middle part, 25—30 m, gravel, *Laminaria*, 1 adult animal; Ibidem, 40—50 m, clay, 1 adult animal (with coarse spiral ribs); Ibidem, 125—150 m, clay, 1 adult animal; Lindenow's Fjord, inner part, 32 m, sand, clay, 1 half-grown animal; Lindenow's Fjord, near the north coast, 10—75 m, 1 half-grown animal; Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 1 young animal.

The species is thus known from the whole East Greenlandic coast from Danmarks Havn in the N. to Lindenow's Fjord in the S., but seems not to penetrate into the inner parts of the large fjords. Thus, at Ellaø, the species is rare, and at Kap Hedlund it is not found at all. — FRIELE (1886 p. 24) mentions the large variation of *Admete viridula* within the Northatlantic and especially the Arctic, and a similar wide range of variation is found at East Greenland. The form mentioned above with

coarse spiral ribs is so characteristic that it would be taken for a distinct species, had not some specimens from Ellaø and Lindenow's Fjord been typical transitional-stages between this coarse-ribbed form and the type. — The whole material was carefully examined for *Admete contabulata*, which was not found. — The vertical range for East Greenland animals is from 15—18 m (Hurry Fjord) to 125—150 m (Lindenow's Fjord).

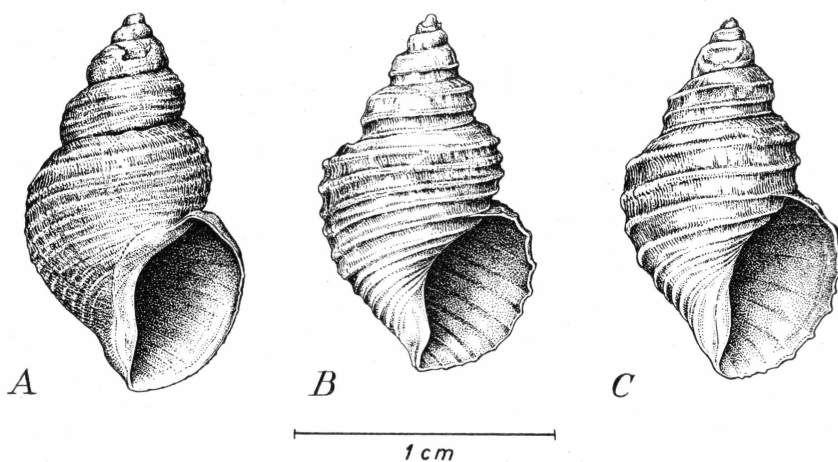


Fig. 13. *Admete viridula* (O. FABRICIUS). Figures showing the variation at East Greenland. A. Typical form (Lindenow's Fjord, 25—30 m depth). B. Transitional stage (Ellaø, 31—30 m depth). C. Coarse ribbed form (Uttental Sund, 30—40 m).

Distribution: Norway (Finmarken to W. coast), W. of the Channel, Hebrides to the Faroes, the Faroes (dead spec.), Iceland, W. Greenland, E. Greenland, Spitzbergen, Barents Sea, the White Sea, the Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, the Bering Strait, the Bering Sea, the Aleutians, Japan, Baffin Land, Labrador, and New-England. Main distribution: Panarctic with subarctic outposts. Vertical range: 3 m (Novaya Zemlya) to 1010 m (English Channel).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):  $9.0 \times 14.6$  —  $8.5 \times 12.7$  —  $8.5 \times 14.9$  —  $8.4 \times 12.6$  —  $8.1 \times 14.5$  —  $8.1 \times 13.8$  —  $8.1 \times 15.4$  —  $8.0 \times 13.6$  —  $7.6 \times 11.5$ , and  $6.5 \times 12.4$  mm respectively. The largest shell measures  $11.1 \times 19.2$  mm.

Biology: The egg capsule was described (not figured) from Spitzbergen by MØRCH (1869, overlooked by THORSON 1935) and later on from East Greenland by THORSON (1935, as *Velutina undata*). The characteristic 2-winged egg capsules are laid singly on algae, stones, or Sabelid tubes. The larval development is non-pelagic; the young hatch in the crawling stage.

74. *Bela violacea* (MIGHELS) (incl. var. *bicarinata* COUTHOUY).

*Bela violacea* G. O. SARS 1878, pl. 17, fig. 2; *Bela bicarinata* ibidem, pl. 16, fig. 12.

## East Greenland records:

*Bela violacea* POSSELT 1895, p. 82.

*Bela bicarinata* var. *violacea* POSSELT & JENSEN 1898, p. 157.

*Bela bicarinata* HÄGG 1905, p. 85.

*Bela bicarinata* Var. *brevis* HÄGG 1905, p. 85.

*Bela bicarinata* ODHNER 1915, p. 219.

*Bela bicarinata* THORSON 1934, p. 8.

*Bela bicarinata* THORSON 1935, p. 36 and 41—43, figs. 41—43, egg capsules.

Occurrence at East Greenland (cf. the map fig. 23, p. 136):

## Typical Form.

*Nordøstkyst Area*: Danmarks Havn, 5<sup>1</sup>/<sub>2</sub>—11 m, *Laminaria*, 1 adult and 1 half-grown animal (with white shells); Off Sabine Ø, 5<sup>1</sup>/<sub>2</sub>—9<sup>1</sup>/<sub>2</sub> m, 40 adult and young animals; S.E. of Sabine Ø, 207 m, 1 adult shell. — *Franz Joseph Fjord Area*: Mackenzie Bugt off Kap Bennet, 73°26' N. 21°13' W., 9—11 m, sandy clay, algae, 1 adult animal; Carl Jacobsen Bugt, Ymers Ø, 5 m, clay, algae, 1 adult animal; Kap Hedlund, 14 m, 1 adult animal, Solitærbugt at Ellaø, 11—13 m, 2 adult shells, 2 adult animals (2 finds); Ibidem, 13—19 m, 2 adult animals. — *Scoresbysund Area*: Off Kap Hope, 9 m, sand, 2 half-grown and 2 young animals, 1 adult fragmentary shell; Ibidem, 20 m, sand, 1 half-grown animal; Hurry Fjord, 1 mile from the mouth, 13—15 m, sand, 2 adult animals (2 finds); Hekla Havn at Danmarks Ø, 8 "specimens" (POSSELT); Turner Sund, 5<sup>1</sup>/<sub>2</sub> m, 4 adult and 3 half-grown animals. — *Sydøstkyst Area*: Lindenow's Fjord, the mouth, 11 m, gravel, *Laminaria*, 1 adult animal; Lindenow's Fjord, outer part, 48 m, gravel, clay, 1 half-grown animal; Ibidem, 60—70 m, clay, gravel, 1 adult animal; Lindenow's Fjord, middle part, 22 m, sand, *Laminaria*, 2 adult animals; Kekertaksiak, 60—70 m, sand, gravel, bryozoans, 1 adult and 1 half-grown animal, 1 adult and 1 half-grown shell.

var. *bicarinata* COUTHOUY.

*Nordøstkyst Area*: Danmarks Havn, 0—4 m, mud, stones, sand 4 adult animals; Ibidem, 0—9<sup>1</sup>/<sub>2</sub> m, mud, algae, 3 half-grown animals (2 finds); Ibidem, 5<sup>1</sup>/<sub>2</sub>—15 m, *Laminaria*, *Delesseria*, 2 adult animals (2 finds); Ibidem, 19 m, *Laminaria*, 1 half-grown animal. — *Franz Joseph Fjord Area*: Eskimonæs at Clavering Ø, 4—6 m, gravel, 2 adult and 4 half-grown animals; Mackenzie Bugt, 1—3 m, sand, 1 adult animal (HÄGG); Dusénfjord, inner part, 15—20 m, *Laminaria*, *Fucus*, 2 adult animals; Carl Jacobsen's Bugt at Ymers Ø, 5 m, 1 half-grown animal; Ibidem, 14—20 m, clay, 3 adult animals (3 finds); Solitærbugt at Ellaø, 10—15 m, clay, algae, 2 adult and 4 half-grown animals;

Ibidem, 20—31 m, clay, stones, red algae, 1 adult shell. — *Scoresbysund Area*: Off Kap Hope, 9 m, sand, 1 adult and 1 half-grown animal; Ibidem, 10—13 m, sand, *Laminaria*, 7 adult and 14 half-grown animals (3 finds); Ibidem, 20 m, sand, 2 half-grown and 1 young animals; Hurry Fjord, 1 mile from the mouth, 14—16 m, sand, 1 adult and 1 half-grown animal, 1 adult and 1 half-grown shell (2 finds); Hurry Fjord, off Fame Øer, 5—8 m, mud, 2 adult animals; Ibidem, 15—18 m, clay, red algae, 4 half-grown animals; "Hurry Fjord", depth ?, 1 adult animal; Jamesonland opposite to the Bjørne Øer, 20—30 m, sandy clay, 1 adult animal; S.E. of Danmarks Ø, 27—30 m, clay, gravel, 1 adult animal; Hekla Havn at Danmarks Ø, depth ?, 1 half-grown animal; Off Kap Dalton, 17—21 m, 1 half-grown animal. — *Kangerdlugssuak Area*: Uttental Sund, 5—7 m, *Fucus*, 1 adult animal. — *Sydøstkyst Area*: Ingmikertok at Angmagssalik Fjord, depth ?, 1 young shell; Lindenow's Fjord, at Nanusik, 58 m, gravel, clay, 1 adult shell; Lindenow's Fjord outer part, 30 m, *Laminaria*, 1 half-grown animal; Ibidem, 65 m, clay, sand, 1 half-grown animal; Lindenow's Fjord, the middle part, 33 m, sand, *Laminaria*, 1 adult animal; Ibidem, 40—50 m, clay, 1 adult animal; Kekertaksiak, 60—70 m, sand, gravel, bryozoans.

var. *cylindracea* (MØLLER).

*Nordøstkyst Area*: Danmarks Havn 5<sup>1</sup>/<sub>2</sub>—15 m, *Laminaria*, 1 very large and 7 adult animals, 2 adult shells (4 finds); Stormbugt at Danmarks Havn, 9<sup>1</sup>/<sub>2</sub>—19 m, *Laminaria*, 3 adult animals. — *Franz Joseph Fjord Area*: Solitærbugt at Ellaø, 3—7 m, *Fucus*, *Desmarestia*, 1 adult animal; Ibidem, 14 m, 1 adult animal. — *Scoresbysund Area*: Off Kap Hope, 7—13 m, sand, algae, 32 adult animals and 1 half-grown, 1 adult shell (5 finds); Off Kap Hope, 20 m, 2 adult animals; Hurry Fjord, 1 mile from the mouth, 6—9 m, sand, 4 adult and 1 half-grown animal; Hurry Fjord off the Konstabel Pynt, 7—10 m, clay, 1 adult animal; Hekla Havn, at Danmarks Ø, depth ?, 2 adult animals, 1 young shell; Gaaseland, depth ?, 1 adult shell; Turner Sund, 5 m, 1 adult animal. — *Kangerdlugssuak Area*: Uttental Sund, 7—8 m, 1 adult animal, 1 adult shell. — *Sydøstkyst Area*: Sermilik Fjord off Ikatek, 25 m, 1 adult shell; Off Kap Tordenskjold, 12 m, sand, algae, 1 adult animal; Nanusik off the mouth of Lindenow's Fjord, 46 m, sand, algae, 1 adult animal; Lindenow's Fjord, the mouth, 11 m, gravel, *Laminaria*, 1 adult animal; Ibidem, 50—75 m, clay, 1 adult animal, Lindenow's Fjord, middle part, 32 m, sand, 1 adult and 1 half-grown animal; Lindenow's Fjord, inner part, 25—50 m, clay, 1 adult animal.

Transitional forms between var. *cylindracea* (MØLLER) and var. *brevis* (LECHE).

*Nordøstkyst Area*: Danmarks Havn, 0—4 m, sand, mud, stones, 3 adult animals; Ibidem, 0—9 m, *Laminaria*, 17 adult and 1 half-grown

animal, 1 adult and 2 half-grown shells (3 finds); Ibidem, 19 m, *Laminaria*, 1 half-grown animal, 1 adult shell. — *Franz Joseph Fjord Area*: Eskimonæs at Clavering Ø, 6—10 m, clay, sand, algae, 7 adult animals; Moskusokse Fjord, 15 m, 1 adult animal; Isfjord off Haredalen, 2<sup>1</sup>/<sub>2</sub>—5 m, *Fucus*, *Laminaria*, green algae, 1 adult animal; Dusénfjord, 15—20 m, *Fucus*, *Laminaria*, 3 adult animals; Dusénfjord, inner part, 4—10 m, clay, *Desmarestia*, 10 adult and 4 half-grown animals; Ibidem, 5—19 m, clay, *Desmarestia*, 1 adult animal; Carl Jacobsen Bugt, Ymers Ø, 2<sup>1</sup>/<sub>2</sub> m, clay, 1 adult and 2 half-grown animals, 1 adult shell; Ibidem, 19 m, clay, 1 half-grown animal; Solitærbugt at Ellaø, 3—7 m, clay, *Fucus*, *Desmarestia*, 2 adult and 2 half-grown animals (3 finds); Ibidem, 8—10 m, clay, *Desmarestia*, 1 adult animal, 1 adult shell (2 finds); Ibidem, 12—16 m, 6 adult animals, 5 adult shells (4 finds); Ibidem, 20—28 m, clay, stones, shells, 1 adult animal, 1 adult shell (2 finds); Ibidem, 4—40 m, 1 adult shell. — *Scoresbysund Area*: Amdrup Havn, 6—10 m, *Laminaria*, 1 adult animal, 1 adult shell; Rosenvinge's Bugt, 8—12 m, stones, algae, 4 adult animals, 1 adult shell; Off Kap Hope, 7 m, 1 adult animal; Ibidem, 9—12 m, sand, 4 adult, 4 half-grown and 2 young animals (3 finds); Ibidem, 15—20 m, sand, 1 adult and 1 half-grown animal (2 finds); Hurry Fjord, 1 mile from the mouth, 14 m, sand, 1 adult animal; Ibidem, 25 m, sand, algae, 1 adult animal; Hurry Fjord off the Fame Øer, 6—7 m, 2 half-grown animals; Ibidem, 20—24 m, 3 half-grown animals; North of Danmarks Ø, 19 m, soft clay, 2 half-grown shells; Turner Sund, about 5 m, 7 half-grown animals. — *Kangerdlugssuak Area*: Mikis Fjord, 3<sup>1</sup>/<sub>2</sub>—4 m, clay, 10 adult and 2 half-grown animals; Ibidem, 15 m, stones, 1 adult animal; Uttental Sund, 4—5 m, clay, *Fucus*, 4 adult animals; Ibidem, 8—10 m, stones, *Laminaria*, 1 adult shell. — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 5—8 m, sand, *Desmarestia*, *Fucus*, *Laminaria*, 18 adult and 1 half-grown animals (2 finds); Ibidem, 10—12 m, clay, sand, 20 adult and 1 half-grown animal; Angmagssalik, 20 m, 3 adult animals; Sermilik Fjord, 12 m, clay, sand, 1 half-grown animal; Ibidem, 25 m, clay, 4 adult and 3 half-grown animals; Lindenow's Fjord, middle part, 22—30 m, clay, gravel, *Laminaria*, 4 adult animals (2 finds); Lindenow's Fjord, inner part, 15 m, sand, 1 adult animal.

var. *brevis* (LECHE).

*Nordøstkyst Area*: Danmarks Havn, 0—11 m, mud, *Laminaria*, 34 adult and 2 half-grown animals (5 finds); Ibidem, 9<sup>1</sup>/<sub>2</sub>—15 m, *Laminaria* and *Delesseria*, 1 adult animal; South of Lille Pendulum Ø, 74°35' N. 18°23' W., 18—21 m, mud, algae, 7 adult and 7 half-grown animals. — *Franz Joseph Fjord Area*: Mackenzie Bugt, 1—3 m, sand, 1 adult animal (HÄGG). — *Scoresbysund Area*: Hekla Havn at Danmarks Ø, depth ?, 3 adult and 1 half-grown animal. — *Sydøstkyst Area*: Tasiusak at Ang-

magssalik, 11—19 m, mud, with algae, 1 adult shell; Lindenow's Fjord middle part, 16 m, sand, algae, 1 adult animal; Lindenow's Fjord, inner part, 14 m, gravel, 1 adult animal.

var. *becki* MØLLER.

*Nordøstkyst Area*: Sabine Ø, 5 $\frac{1}{2}$ —9 m, 23 adult, and 6 half-grown animals. — *Franz Joseph Fjord Area*: Inner part of Franz Joseph Fjord, 73°06' N. 27°17' W., about 3—9 m, mud, sand, algae, 7 half-grown animals. — *Sydøstkyst Area*: Angmagssalik, 0—19 m, 1 adult animal.

The species is thus extremely common along the East Greenlandic coast from Danmarks Havn in the N. to Kekertaksiak in the S. It occurs along the outer coast as well as in the fjords, where it seems to be rather rare in the innermost ramifications (e. g. at Kap Hedlund). It seems impossible to discover the slightest relation between the abundance of the single varieties and the surrounding conditions. Several varieties seem to occur among each other in the same localities and the same dredge hauls. — The vertical range of living specimens at East Greenland is from 0—4 m (Danmarks Havn) or 2 $\frac{1}{2}$  m (Ymers Ø) to 60—70 m (Kekertaksiak and Lindenow's Fjord).

Distribution: Whole Norwegian coast, Bohuslän, W. of Ireland, the Faroes (?), Iceland, W. and E. Greenland, Spitzbergen, the Murman Coast, the Kara Sea, the Barents Sea, the White Sea, Novaya Zemlya, the Siberian Arctic Sea, the Bering Strait, the Bering Sea, British Columbia, Parry Islands, Labrador, Newfoundland, and New England. Main distribution: Panarctic-circumpolar. Vertical range: 0—4 m (E. Greenland) to 761 m (Spitzbergen).

Remarks: The largest animals from East Greenland measure (breadth  $\times$  height of shell):

The type	var. <i>bicarinata</i>	var. <i>cylin- dracea</i>	var. <i>cylin- dracea</i> $\times$ var. <i>brevis</i>	var. <i>brevis</i>	var. <i>becki</i>
mm	mm	mm	mm	mm	mm
4.1 $\times$ 9.4	4.0 $\times$ 8.4	5.5 $\times$ 14.1	5.3 $\times$ 9.3	5.3 $\times$ 10.4	4.9 $\times$ 8.8
4.1 $\times$ 9.0	3.9 $\times$ 8.5	4.9 $\times$ 11.7	5.1 $\times$ 10.4	4.6 $\times$ 9.1	4.8 $\times$ 7.7
4.0 $\times$ 8.4	3.9 $\times$ 8.3	4.8 $\times$ 11.2	5.0 $\times$ 11.0	4.3 $\times$ 8.1	4.8 $\times$ 7.7
3.9 $\times$ 8.4	3.9 $\times$ 7.4	4.7 $\times$ 11.6	4.9 $\times$ 10.5	4.3 $\times$ 8.1	4.7 $\times$ 7.8
3.7 $\times$ 8.4	3.7 $\times$ 7.6	4.7 $\times$ 11.2	4.7 $\times$ 10.3	3.8 $\times$ 9.4	4.6 $\times$ 7.9
3.7 $\times$ 8.1	3.5 $\times$ 7.0	4.7 $\times$ 10.9	4.7 $\times$ 9.6	3.5 $\times$ 6.8	4.6 $\times$ 7.7
3.6 $\times$ 7.4	3.4 $\times$ 8.0	4.4 $\times$ 10.5	4.6 $\times$ 9.4	3.4 $\times$ 7.0	4.6 $\times$ 7.7
3.6 $\times$ 7.6	3.2 $\times$ 7.1	4.4 $\times$ 10.3	4.6 $\times$ 10.6	..	..
3.6 $\times$ 7.1	3.0 $\times$ 5.9	4.2 $\times$ 10.7	4.6 $\times$ 10.0	..	..
3.4 $\times$ 7.7	..	4.1 $\times$ 9.8	4.5 $\times$ 10.1	..	..
..	..	4.0 $\times$ 10.9	4.4 $\times$ 10.2	..	..
..	..	3.9 $\times$ 10.3	4.4 $\times$ 9.5	..	..

A single living animal had a tuft of algae attached to its shell.

Biology: The reproduction of var. *bicarinata* is known from E. Greenland (THORSON 1935). The lense-shaped egg capsules are laid singly. Each capsule contains from 3 to 11 eggs or embryos, which have a non-pelagic larval-development and hatch in the crawling stage.

75. *Bela pyramidalis* (STRØM).

*Bela pyramidalis* G. O. SARS 1878, pl. 16, fig. 3.

East Greenland records:

*Pleurotoma pyramidalis* MÖBIUS 1874, p. 249.

*Bela pyramidalis* POSSELT 1895, p. 83.

*Bela pyramidalis* POSSELT & JENSEN 1898, p. 161.

*Bela pyramidalis* ODHNER 1915, p. 220.

*Bela pyramidalis* THORSON 1934, p. 8.

*Bela pyramidalis* THORSON 1935, p. 36 and 43—46, figs. 44—45, egg capsules.

Occurrence at East Greenland (cf. the map fig. 24, p. 137): Danmarks Havn, 7 $\frac{1}{2}$ —15 m, *Laminaria*, *Delesseria*, 2 adult animals (var. *laevior*) (2 finds); Sabine Ø (MÖBIUS), Jackson Ø (MÖBIUS), Shannon Ø (MÖBIUS). — *Franz Joseph Fjord Area*: Kap Hedlund, 33—40 m, clay, 1 adult animal; Solitærbugt at Ellaø, 3—7 m, *Fucus*, *Desmarestia*, 1 adult shell; Ibidem, 10—18 m, mud, and clay, 5 adult, 6 half-grown and 2 young animals, 7 adult shells (10 finds); Ibidem, 14—22 m, 1 adult animal. — *Scoresbysund Area*: Off Kap Hope, 10—13 m, sand, 1 adult animal; Hurry Fjord, the mouth, 20—28 m, stones, sand, algae, 1 adult animal; Hurry Fjord, 1 mile from the mouth, 6—9 m, sand, 1 adult animal; Ibidem, 15 m, sand, 1 young animal; Hurry Fjord, off the Fame Øer, 18—25 m, soft clay, *Laminaria*, red algae, 2 adult animals, 2 adult and 1 half-grown shell (3 finds); N.E. of Danmarks Ø, 20 m, soft clay, 1 adult shell; The bay off Røde Ø at Røde Fjord, 13—18 m, clay, gravel, 7 adult and 3 half-grown animals; Turner Sund, about 5 m, 1 adult and 1 half-grown animal. — *Kangerdlugssuak Area*: Kangerdlugssuak, 5 m, 1 specimen (THORSON). — *Sydøstkyst Area*: Tasiusak at Angmagssalik, 1—9 m, 1 half-grown animal; Sermilik at Angmagssalik, 25 m, clay, 1 adult animal; Kutdlik, N. of Kap Tordenskjold, 30 m, sand, mud, 1 adult animal; Naparsarsuak, N. of Kap Tordenskjold, 38 m, mud, clay, 1 half-grown animal; Nanusik at the mouth of Lindenow's Fjord, 150—175 m, clay, 1 adult animal; Lindenow's Fjord, the mouth, 25—35 m, *Laminaria*, 1 adult animal; Lindenow's Fjord, middle part, 11 m, sand, algae, 1 adult and 2 half-grown animals; Ibidem, 1 adult and 1 half-grown animal, 1 half-grown shell (2 finds).

The species is rather common along the whole East Greenland coast from Danmarks Havn in the N. to Lindenow's Fjord in the S. and seems to inhabit the outer coast as well as the large fjords to their

innermost ramifications. — All the East Greenland specimens belonged to var. *laevior*. The vertical range for living specimens at East Greenland is from 1—9 m (Tasiusak) to 150—175 m (Nanusik).

Distribution: Norway (Lofoten to Vadsø), N. of the Hebrides, the Faroes, Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, the Barents Sea, the White Sea, the Kara Sea, Novaya Zemlya, the Siberian Arctic Sea, Labrador, and Davis Strait. Main distribution: Panarctic with subarctic outposts. Vertical range: From 0 m (Spitzbergen) to 707 m (W. Greenland).

Remarks: The largest East Greenland animals measure (breadth  $\times$  height of shell):  $7.4 \times 17.6$  —  $6.9 \times 15.7$  —  $6.8 \times 15.7$  —  $6.8 \times 14.7$  —  $6.4 \times 15.7$  —  $6.4 \times 14.7$  —  $6.4 \times 14.5$  —  $6.3 \times 14.4$  —  $6.3 \times 14.1$ , and  $6.1 \times 13.8$  mm. — A single living animal had *Spirorbis* attached to its shell. An empty shell was inhabited by the Gephyrean *Phascolion strombi*.

Biology: Reproduction known from E. Greenland (THORSON 1935). The lense-shaped egg capsules are laid singly. Each capsule contains from 4—20 large eggs or embryos. The embryos have a non-pelagic development and the young hatch in the crawling stage.

#### 76. *Bela exarata* (MÖLLER).

*Bela exarata* G. O. SARS 1878, pl. 16, fig. 18.

East Greenland record:

*Bela exarata* THORSON 1935, p. 36, and 39—41, figs. 34—40, egg capsules.

Occurrence at East Greenland: *Scoresbysund Area*: Off Kap Hope, 7—9 m, sand, 2 adult and 1 half-grown animal (3 finds); Ibidem, 9—13 m, sand, algae, 15 adult and 2 young animals (3 finds); Ibidem, 20 m, sand, 3 adult and 1 half-grown animal (3 finds); Hurry Fjord, the mouth, 16 m, sand, algae, 1 adult animal; Ibidem, 20—28 m, sand, algae, 1 adult and 1 half-grown animal, 1 adult shell; Hurry Fjord, 1 mile from the mouth, 14—15 m, sand, 1 adult and 4 half-grown animals, 1 adult shell (3 finds); Hurry Fjord, off Konstabel Pynt, 33 m, clay, 1 half-grown animal; Hurry Fjord off Fame Øer, 8—12 m, gravel, stones, *Laminaria*, 1 adult animal, "Hurry Fjord", 19 m, 1 adult animal; 8 miles W.N.W. of Kap Hooker, 13 m, clay, sand, 1 half-grown animal; Jamesonland opposite to the Bjerne Øer, 20—30 m, sandy clay, 2 adult animals; Turner Sund about 5 m, 1 adult and 1 young animal. — *Sydøstkyst Area*: Kutdlik N. of Kap Tordenskjold, 30 m, sand, mud, 1 half-grown animal; Naparsarsuak, N. of Kap Tordenskjold, 38 m, mud, sand, 5 half-grown and 1 young animal, 1 adult shell; Lindenow's Fjord, outer part, 46 m, clay, 1 adult animal; Ibidem, 60—70 m, clay, gravel,

1 adult animal; Lindenow's Fjord middle part, 25—33 m, clay, gravel, sand, *Laminaria*, 1 adult and 5 half-grown animals (4 finds); Ibidem, 44 m, clay, 1 adult animal; Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 2 adult and 1 half-grown animal.

The species, which in East Greenland is known only from the recent Danish expeditions, seems to inhabit suitable localities with sandy bottom along the outer coast from Scoresbysund in the N. to Kekertaksiak in the S. In such sandy localities it is one of the dominating species on the bottom. The variation within the species is only slight at East Greenland. A very careful comparison of radula's and shells of a large material showed, that *Bela exarata* has a very constant appearance (See, however, the remarks under *Bela trevelyana* p. 121). The numerous longitudinal stripes on the shell which totally dominate over the faint radial ribs, and the very acute keel forming the "shoulder" on the last whorl are distinct characters. Also the long, slender arrow-teeth of the radula are most characteristic. The East Greenland specimen remind one closely of MØLLER's type specimens from W. Greenland, which are kept in the Copenhagen Museum. — The vertical range for living animals in East Greenland is from 5½ m (Turner Sund) to 60—70 m (Lindenow's Fjord and Kekertaksiak).

Distribution: Norway (Tromsø to Vadsø), W. of Ireland, the Faroes, Iceland, W. and E. Greenland, Spitzbergen, the Kara Sea, the Siberian Arctic Sea, Labrador, and New England. Main distribution: Panarctic (Atlantic sector) with subarctic outposts. Vertical range: From 3 m (Norway) to 2214 m (W. of Ireland).

The largest animals from East Greenland measure (breadth × height of shell): 5.4 × 11.5 — 5.3 × 10.4 — 5.1 × 10.8 — 5.1 × 10.6 — 5.1 × 10.0 — 5.1 × 9.7 — 5.0 × 10.4 — 4.9 × 10.8 — 4.8 × 10.1 — 4.6 × 9.5 — 4.5 × 9.5 — 4.4 × 9.1, and 4.4 × 8.4 mm respectively.

Biology: The reproduction is known from E. Greenland (THORSON 1935). The lense-shaped egg capsules are laid singly. Each capsule contains from 5 to 21 large eggs or embryos. The larval development is non-pelagic, and the young hatch in the crawling stage.

#### 77. *Bela simplex* (MIDDENDORF).

*Bela simplex* G. O. Sars 1878, pl. 17, fig. 4, pl. 23, fig. 11.

East Greenland record:

*Bela simplex* THORSON 1935, p. 36—38, figs. 35—36, egg capsules.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Carl Jacobsen Bugt, Ymers Ø, 2½ m, clay, 1 young shell (rather fresh looking; hardly subfossil). — *Scoresbysund Area*: Off Kap Hope, 5½ m,

sand, 1 adult animal; Ibidem, 7—9 m, sand, algae, 36 adult, 2 half-grown and 2 young animals (4 finds); Ibidem, 9—13 m, sand, algae, 8 adult, 7 half-grown and 4 young animals, 9 adult, 2 half-grown, and 1 young shell (3 finds); Ibidem, 15 m, sand, 1 adult and 1 half-grown animal; Ibidem, 20 m, sand, 1 adult and 2 half-grown animals (2 finds); Hurry Fjord, 1 mile from the mouth, 3<sup>1</sup>/<sub>2</sub>—4<sup>1</sup>/<sub>2</sub> m, sand, stones, 3 adult animals; Ibidem, 6—9 m, sand, 1 adult and 2 half-grown animals; Ibidem, 15 m, sand, 1 young animal.

The species in question has only been found by the recent Danish expeditions and is unknown from W. Greenland. It seems to prefer a clean sand bottom near the outer coast, and living specimens are hitherto known only from the mouth of Scoresbysund, where they are dominants on the bottom. The variation of the shell is very slight. The East Greenland specimens are most characteristic. The shape and the violet colour of their shell make them easily recognisable from all other Arctic species of *Bela*. Also their special association with a clean sandy bottom (like *Bela exarata*) and their characteristic egg capsules (cf. THORSON l. c.) show so good criteria on a well limited species, that the present author cannot agree with DALL (1886) and POSSELT & JENSEN (1898) in regarding *Bela simplex* as a variety within the group: *Bela laevigata* DALL — *Bela gigas* VERKR. — *Bela Mørchi* LECHE, and *Bela arctica* ADAMS. — The vertical range for East Greenland animals is from 3<sup>1</sup>/<sub>2</sub>—4<sup>1</sup>/<sub>2</sub> m (Hurry Fjord) to 20 m (Kap Hope).

Distribution: Norway (Vadsø), E. Greenland, Spitzbergen, Siberian Arctic Sea, Bering Sea, and N.E. Iceland. The few records indicate a panarctic main distribution. Vertical range: From 3<sup>1</sup>/<sub>2</sub>—4<sup>1</sup>/<sub>2</sub> m (E. Greenland) to 20 m (E. Greenland).

Remarks: The largest living animals from East Greenland measure (breadth × height of shell): 6.3 × 12.1 — 6.3 × 11.3 — 6.1 × 11.5 — 5.9 × 11.0 — 5.8 × 11.6 — 5.8 × 10.7 — 5.8 × 11.7 — 5.7 × 11.3 — 5.7 × 11.0, and 5.6 × 10.4 mm respectively.

Biology: The reproduction is known from E. Greenland (THORSON 1935). The dome-shaped egg capsules are laid singly. Each capsule contains from 2—7 large eggs or embryos, which have a non-pelagic development and hatch in the crawling stage.

#### 78. *Bela tenuicostata* (M. SARS).

*Bela tenuicostata* G. O. SARS 1878, pl. 17, fig. 1 a—b.

#### East Greenland records:

*Bela tenuicostata* HÄGG 1905, p. 90.

*Bela tenuicostata* var. *willei* HÄGG 1905, p. 91.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Mackenzie Bugt, 12—35 m, mud, 2 adult animals (the typical form); *Ibidem*, 12—18 m, mud, 1 half-grown animal (var. *willei*). — *Sydøstkyst Area*: Kekertaksiak, 60—70 m, sand, gravel, dead bryozoans, 1 adult animal, 1 adult fresh shell.

The records from Mackenzie Bugt given by HÄGG (l. c.) are curious, as not a single specimen has been found in the large number of bottom samples and dredge hauls from the Franz Joseph Fjord area taken during recent years. But as HÄGG records not only the species but also the variety, it seems unresonable to question his statements. — The 2 specimens from Kekertaksiak recall in all details a similar specimen from Bakkafjörður at E. Iceland.

Distribution: Norway (W. coast to E. Finmarken), W. of W. coast of Norway, W. of Finmarken, Bay of Biscay, W. of Ireland, between the Hebrides and the Faroes, S. of the Faroes, N. of the Faroes, the Faroe channel, Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Barents Sea, Novaya Zemlya, the Bering Sea, and the E. coast of America. Main distribution: Panarctic with subarctic outposts. Vertical range: From 3 m (Novaya Zemlya) to 2582 m (N. Atlantic).

Remarks: The animals from East Greenland measure (breadth  $\times$  height of shell):  $4.7 \times 9.9$  (HÄGG) —  $2.8 \times 5.5$ , and  $2.3 \times 4.8$  mm (HÄGG) respectively. The empty shell measures  $3.6 \times 7.5$  mm.

Biology: Unknown.

79. *Bela decussata* (COUTHOUY) incl. var. *conoidea* G. O. SARS.

*Bela decussata* FRIELE 1886, pl. 8, figs. 11—14, pl. 10, figs. 12—13; *Bela conoidea* G. O. SARS 1878, pl. 16, fig. 14.

East Greenland record:

*Bela decussata* THORSON 1935, p. 36.

Occurrence at East Greenland:

The typical form.

*Franz Joseph Fjord Area*: S.E. of Clavering Ø,  $74^{\circ}10' N.$   $20^{\circ}08' W.$ , 25—40 m, mud, shells, pebbles, 1 adult animal. — *Scoresbysund Area*: Hurry Fjord, 1 mile from the mouth, 14 m, 1 adult shell; Jamesonland opposite Bjørne Øer, 20—30 m, 2 adult animals; innermost part of Nordvest Fjord, 10—18 m, 1 adult shell; N.E. of Danmarks Ø, 20 m, 1 adult shell; Turner Sund, about 5 m, 4 adult and 2 half-grown animals (identity somewhat dubious. Recalling transitional stages between *Bela decussata* and *B. exarata*).

var. *conoidea* G. O. SARS.

*Franz Joseph Fjord Area*: Mackenzie Bugt, S.E. of Kap Bennet, 73°20' N. 21°20' W., 70 m, mud, shells, 1 adult shell; Dusénfjord, inner part, 20—23 m, 1 adult animal; Carl Jacobsen Bugt, Ymers Ø, 8 m, clay, 1 adult animal. — *Scoresbysund Area*: Hurry Fjord, 1 mile from the mouth, 13 m, 1 adult shell; Hurry Fjord, off Fame Øer, 25 m, 1 adult animal; Jamesonland opposite Bjørne Øer, 51 m, 1 adult animal; Off Røde Ø at Røde Fjord, 500 m, 1 adult animal. — *Kangerdlugssuak Area*: Miki's Fjord, 3½—4 m, clay, 1 adult animal. — *Sydøstkyst Area*: Lindenow's Fjord, inner part, 60 m, clay, 1 adult animal.

The species, although not very common, seems thus to occur along the East Greenland coast from Clavering Ø in the N. to Lindenows Fjord in the S. It penetrates into the innermost part of the large fjords (Røde Fjord f. i.) and has an astonishingly wide vertical range: from 3½—4 m (Miki's Fjord) to 500 m (Røde Ø).

Distribution: Norway (Finmarken), N. of Scotland, W. and E. Greenland, Jan Mayen, Spitzbergen, the Murman Coast, the Kara Sea, Nowaya Zemlya, Siberian Arctic Sea, Labrador, and New England. Main distribution: Panarctic. Vertical range: From 3½—4 m (East Greenland) to 1008 m (N. Scotland).

Remarks: The largest living animals from East Greenland measure (breadth × height of shell):

The typical form: 4.7 × 10.0 — 4.4 × 9.4, and 3.9 × 8.2 mm respectively.

var. *conoidea*: 4.4 × 10.2 — 4.2 × 9.1 — 3.9 × 7.6 — 3.8 × 8.9 — 3.8 × 8.9, and 3.8 × 8.2 mm respectively. — One empty shell was inhabited by *Phascolion strombi*.

Biology: Unknown.

80. *Bela nobilis* (MÖLLER) (incl. *Bela rugulata* (TROSCHEL)).

*Bela nobilis* G. O. SARS 1878, pl. 16, figs. 19—20; *B. scalaris*, *B. rugulata*, *B. scalaroides* G. O. SARS 1878, pl. 23, figs. 5, 6 and 7.

East Greenland records:

*Bela nobilis* POSSELT 1895, p. 82.

*Bela nobilis* POSSELT & JENSEN 1898, p. 149.

*Bela rugulata* HÄGG 1905, p. 82.

*Bela rugulata* var. *scalaroides* GRIEG 1914, p. 9.

*Bela rugulata* ODHNER 1915, p. 211.

*Bela nobilis* THORSON 1935, p. 36 and 46—48, figs. 46—47, egg capsules.

Occurrence at East Greenland (cf. the map fig. 24, p. 137):

The typical form:

*Nordøstkyst Area*: Danmarks Havn, 5—11 m, *Laminaria*, 1 half-grown animal. — *Franz Joseph Fjord Area*: Mackenzie Bugt, 12—35 m, mud, 1 young animal (HÄGG); E. of Vega Sund, 72°24' N. 19°42' W., 245—264 m, 1 half-grown shell (POSSELT); Dusénfjord, inner part, 240 m, hard clay, 1 very large shell (reminds one closely of FRIELE 1886 pl. 7, fig. 11); Forsblads Fjord, 95—170 m, 1 adult shell. — *Scoresbysund Area*: Off the mouth of Hurry Fjord, 140 m, clay, sand, 1 adult animal, 1 adult and 1 young shell (3 finds); Hurry Fjord off Konstabel Pynt, 45 m, clay, 2 young animals (2 finds); Ibidem, 91 m, soft clay, 1 adult, fragmentary shell; Off Kap Hooker, 67 m, sandy clay, 1 young animal; Ibidem, 150 m, clay with stones, 1 very large shell (closely recalls FRIELE 1886 pl. 7, fig. 11); Inner part of Nordvest Fjord, 112 m, clay, 1 half-grown animal; Ibidem, 339 m, clay, 1 adult, fragmentary shell; North of Stewart Ø, 69°55' N. 22°45' W., 297 m, clay with stones, 1 adult, fragmentary shell. — *Sydøstkyst Area*: Lindenow's Fjord, the mouth, 400—600 m, clay, *Foraminifera*, 1 adult animal, 1 adult shell; Lindenow's Fjord, middle part, 150 m, clay, 1 adult animal; Ibidem, 225 m, clay, 1 adult animal; Lindenow's Fjord, inner part, 200—250 m, clay, 1 very large animal, 1 adult shell (somewhat more slender than FRIELE 1886 pl. 7, fig. 11 and with a rather diffuse structure).

var. *clathrata* FRIELE.

*Franz Joseph Fjord Area*: Dusénfjord, the mouth off Kap Graah, 150 m, clay, 1 adult shell; 1 km from Murrays Ø, 71°33' N. 21°30' W., 200 m, mud, sand, 1 adult animal. — *Scoresbysund Area*: Off the mouth of Hurry Fjord, 140 m, clay, 3 half-grown animals; Off Kap Hooker, 220 m, clay, 1 adult shell; Between Kap Leslie and Jamesonland, 233 m, hard clay, 1 adult shell; Ibidem, 342 m, clay, *Foraminifera*, 1 adult animal, 1 adult shell; Lindenow's Fjord, middle part, 125—150 m, clay, 1 adult, worn shell; Lindenow's Fjord, inner part, 25 m, sand, algae, 1 half-grown animal.

var. *scalaroides* G. O. SARS.

*Nordøstkyst Area*: 75°58½' N. 14°08' W., 300 m, clay, 1 adult "specimen" (GRIEG).

The species is thus known from the whole East Greenland coast from Danmarks Havn in the N. to Lindenow's Fjord in the S. It occurs along the outer coast as well as in the inner parts of the fjords and has a very wide vertical range, viz. from 5—11 m (Danmarks Havn) to 400—600 m (Lindenow's Fjord). — The typical form has a rather wide

variation ranging from specimens with a very coarse “*nobilis*-structure” to large specimens recalling FRIELE 1886, pl. 7, fig. 11. The var. *clathrata*, however, seems to undergo slight variations only.

Distribution: (*B. nobilis*, *B. rugulata*, *B. scalaris* and *B. scalarioides*). Norway (Vadsø to Oslo Fjord), the Faroes (dead spec.), Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, the Barents Sea, the Kara Sea, the Murman Coast, the Siberian Arctic Sea, the Bering Sea, the Bering Strait, Northern Japan, Labrador, Nova Scotia, and Cape Cod. Main distribution: Panarctic-circumpolar. Vertical range: From 5 m (Spitzbergen) to 995 m (the Siberian Arctic Sea).

Remarks: The largest East Greenland animals measure (breadth  $\times$  height of shell):

The typical form:  $7.9 \times 18.3$  —  $6.1 \times 12.4$ , and  $5.4 \times 10.3$  mm respectively. Empty shells:  $12.1 \times 26.2$ , and  $9.7 \times 20.8$  mm.

var. *clathrata*:  $4.5 \times 10.2$  —  $3.8 \times 9.1$  —  $2.9 \times 6.7$  mm respectively. Empty shells  $5.4 \times 12.0$ , and  $4.4 \times 9.5$  mm. — A few empty shells were inhabited by *Phascolion strombi*.

Biology: Reproduction known from E. Greenland (*Bela nobilis*, THORSON 1935). The lense-shaped capsules are laid singly. Each capsule contains from 3 to 7 large eggs or embryos, which have a non-pelagic larval development and hatch in the crawling stage.

#### 81. *Bela trevelyana* (TURTON).

*Bela Trevelyana* G. O. SARS 1878, pl. 16, fig. 13.

East Greenland records:

*Bela trevelyana* HÄGG 1905, p. 84.

*Bela trevelyana* GRIEG 1914, p. 9.

*Bela trevelyana* THORSON 1935, p. 36.

Occurrence at East Greenland: *Nordostkyst Area*:  $75^{\circ}58\frac{1}{2}'$  N.  $14^{\circ}08'$  W., 300 m, clay, 3 adult “specimens” (GRIEG). — *Franz Joseph Fjord Area*: Mackenzie Bugt, 12—35 m, mud, 1 adult shell (HÄGG); Solitærbugt, Ellaø, 11—15 m, clay, 2 adult, and 1 half-grown fragmentary shells (3 finds); Ibidem, 20—25 m, clay, 2 half-grown and 1 young animal, 3 adult, fresh shells (4 finds); Ibidem, 31 m, 1 half-grown animal; E. of Vega Sund,  $72^{\circ}28'$  N.  $21^{\circ}48'$  W., 180 m, mud, stones, 1 adult shell. — *Scoresbysund Area*: Hurry Fjord,  $70^{\circ}43'$  N.  $22^{\circ}29'$  W., 70 m, mud, 1 adult animal; Hurry Fjord off the Fame Øer, 15—18 m, clay, red algae, *Laminaria*, 4 adult and 1 half-grown animal (see the remarks below); Nordvest Fjord, inner part, 25 m, clay, 1 adult animal. — *Sydøstkyst Area*: Ikerasausak, 235 m, 2 adult animals (see the remarks below);

Lindenow's Fjord, middle part, 40—50 m, clay, 1 adult animal; Ibidem, 100 m, clay, 1 adult animal (slender, and with more structure than usual).

Although rather rare this species is found from Store Koldewey Ø in the N. to Lindenow's Fjord in the S. In Franz Joseph Fjord it reaches from the middle part of the area (Solitærbugt) to 235 m (Ikerasausak).—The specimens from Fame Øer and from Ikerasausak have broad shells with a short spire, and a sharp keel as a "shoulder" on their last whorl. Probably they might be regarded bastards between *B. trevelyana* and *B. exarata* or simply a variety of the latter.

Distribution: Norway (Finmarken to Oslo Fjord), Bohuslän, Kattegat, the Sound, England, Gulf of Gascogne, Scotland, the Hebrides, the Faroes, Iceland, W. and E. Greenland, Jan Mayen, Spitzbergen, Bear Island, the Murman Coast, the White Sea, the Kara Sea, Barents Sea, British Columbia (dead spms.); St. Lawrence Bay, Fundy Bay, Newfoundland, New England, Nova Scotia, Cape Cod, and Davis Strait. Main distribution: All over the lusitanian-boreal, and arctic parts of the N. Atlantic. Vertical range: From 9 m (Spitzbergen) to 337 m (N. of the Hebrides).

The largest animals from East Greenland measure (breadth × height):

The typical form:  $4.8 \times 10.4$  —  $4.4 \times 8.8$  —  $3.6 \times 7.4$  mm respectively. The empty shell measures  $4.3 \times 8.7$  mm.

The *exarata*-like form:  $3.9 \times 7.5$  —  $3.7 \times 6.6$  —  $3.6 \times 6.8$  —  $3.4 \times 6.4$ , and  $3.2 \times 6.0$  mm respectively.

Biology: The egg capsules and larvae are known from Danish seas (THORSON, unpublished). Each capsule—of the normal *Bela*-type—contains from 25—31 embryos. They hatch as very large larvae and have in Danish seas a short, pelagic stage. As the adults are common at Solitærbugt, Ellaø, from where 10—70 regular plankton-samples are available from every month throughout the year, and as the very characteristic and easily perceptible larva never have been observed here, it may be taken for granted that the short pelagic life is quite suppressed in the Arctic.

#### 82. *Bela declivis* (LOVÉN).

*Bela declivis* G. O. Sars 1878, pl. 16, fig. 10.

East Greenland record:

*Bela cancellata* var. *declivis* THORSON 1935, p. 36.

Occurrence at East Greenland: *Scoresbysund Area*: Between Hurry Fjord and Kap Brewster, 250 m, sandy clay, 1 adult shell;

Between Kap Leslie and Jamesonland, 182 m, hard clay, 1 adult, fresh looking shell; Ibidem, hard clay, 1 adult, fragmentary shell; 1 km from the Murray Ø, 71°33' N. 21°30' W., 200 m, mud, sand, 1 adult shell.

Hence, only shells have been found and only from the recent Danish expeditions, and it is impossible from the material at hand to decide whether the species is subfossil or recent in East Greenland.

Distribution: W. Finmarken, Iceland (dead), S.W. Greenland, and E. Greenland (shells only). Main distribution: Uncertain. Vertical range: From 107 m (S.W. Greenland) to 245 m (dead, E. Greenland).

Remarks: The largest shells measure (breadth  $\times$  height of shell):  $5.4 \times 14.2$  —  $5.0 \times 13.6$ , and  $4.1 \times 10.3$  mm respectively. One shell was inhabited by *Phascolion strombi*.

### 83. *Bela pingeli* (BECK).

*Bela Pingelii* G. O. Sars 1878, pl. 16, fig. 5.

Occurrence at East Greenland: *Sydøstkyst Area*: Ingmikertok at Angmagssalikfjord, depth?, 3 adult, quite fresh looking shells, hardly subfossil. They measure (breadth  $\times$  height of shell):  $4.4 \times 10.0$  —  $3.4 \times 8.3$ , and  $3.2 \times 8.3$  mm respectively. — The species is here recorded from East Greenland for the first time.

Distribution: E. Finmarken, Iceland, W. Greenland, S.E. Greenland, Spitzbergen, the Murman Coast, St. Lawrence Bay, Nova Scotia, and Cape Cod. Main distribution: Low-arctic. Vertical range: From 3 m (Iceland) to 774 m (American E. coast).

Biology: Unknown.

### 84. *Raphitoma amoena* G. O. Sars.

*Raphitoma amoena* G. O. Sars 1878, pl. 17, fig. 10 a—b.

East Greenland record:

*Raphitoma (Teretia) amoena* THORSON 1935, p. 48—49, figs. 48—49, egg capsules.

Occurrence at East Greenland: *Franz Joseph Fjord Area*: Carl Jacobsen's Bugt at Ymers Ø, 20 m, clay, 1 adult and 1 half-grown shell (2 finds). — *Scoresbysund Area*: Off Kap Hooker, 67 m, sand with clay, 1 adult animal and 1 egg capsule; Between Kap Stevenson and Kap Leslie, 106 m, soft clay, 1 adult shell. — *Kangerdlugssuak Area*: Uttental Sund, 30—40 m, clay, 1 adult animal.

The species, which is only recorded from East Greenland by the recent Danish expeditions, seems—although rare (hardly overlooked



Nine of these species, marked with two asterisks, are new not only to East Greenland but to the whole Greenlandic coast.

Besides, 12 further species have only been recorded from East Greenland in papers from the expeditions during the last ten years, viz.:

<i>Margarita vahli</i> ,	<i>Bela exarata</i> ,
<i>Onoba aculeus</i> ,	<i>Bela simplex</i> ,
<i>Homalogyra atomus</i> ,	<i>Bela decussata</i> ,
<i>Velutina velutina</i> ,	— <i>declivis</i> (shells only),
<i>Pyrene rosacea</i> ,	<i>Raphitoma amoena</i> ,
<i>Buccinum belcheri</i> ,	<i>Entocolax ludwigi</i> .

The total number of prosobranch species known from East Greenland has thus during the last decennium (this paper included) been augmented from 49 to 84.

Further, the following species, which had not hitherto with certainty been recorded as living specimens, have now been found with the animals inside, viz.

<i>Puncturella noachina</i> ,	<i>Alvania wyville-thomsoni</i> ,
<i>Solariella obscura</i> ,	<i>Bela trevelyana</i> .

Out of the 84 species now known from East Greenland 79 have been found as living specimens, while 5 species, viz. *Cerithiopsis costulata*, *Acrybia flava*, *Sipho dalli*, *Sipho fusiformis*, and *Bela declivis*, are known as empty shells only. In the analysis and the comparisons with other sea areas made below only the 79 species which have been taken alive will be considered.

Analysed as to zoogeographical types, the 79 living species of the East Greenland prosobranch fauna prove to have the following components: An Arctic element, a pure American element, a Cosmopolitan element, and two species whose range of distribution is so poorly known that it cannot be characterised with certainty.

The Arctic element (63 species = 81% of the total number of species) can be analysed into<sup>1)</sup>:

Species of a panarctic distribution (39 species = 50% of the total number), viz.

* <i>Acmaea rubella</i> ,	* <i>Margarita cinera</i> ,
* <i>Margarita groenlandica</i> ,	* — <i>olivacea</i> ,

<sup>1)</sup> The species marked with an asterisk in the following survey are known from the American as well as from the European coasts of the North Atlantic. The species not marked with an asterisk are only known from the European coasts.

- |                                   |                                |
|-----------------------------------|--------------------------------|
| * <i>Solariella obscura</i> ,     | * <i>Chrysodomus ossiani</i> , |
| * <i>Onoba aculeus</i> ,          | * <i>Buccinum belcheri</i> ,   |
| * <i>Alvania jan-mayeni</i> ,     | * — <i>groenlandicum</i> ,     |
| * <i>Turritella reticulata</i> ,  | * — <i>hydrophanum</i> ,       |
| * — <i>erosa</i> ,                | * — <i>ciliatum</i> ,          |
| * <i>Turritellopsis acicula</i> , | — <i>ovum</i> ,                |
| * <i>Menestho albula</i> ,        | * — <i>terrae-novae</i> ,      |
| * <i>Trichotropis borealis</i> ,  | * — <i>glaciale</i> ,          |
| * — <i>conica</i> ,               | * <i>Admete viridula</i> ,     |
| * <i>Capulaemaea radiata</i> ,    | * <i>Bela pyramidalis</i> ,    |
| * <i>Velutina undata</i> ,        | * — <i>nobilis</i> ,           |
| <i>Onchidiopsis glacialis</i> ,   | * — <i>exarata</i> ,           |
| * <i>Marsenina glabra</i> ,       | * — <i>violacea</i> ,          |
| * <i>Trophon clathratus</i> ,     | * — <i>simplex</i> ,           |
| * <i>Volutopsis norvegica</i> ,   | * — <i>tenuicostata</i> ,      |
| <i>Sipho tortuosus</i> ,          | * — <i>decussata</i> ,         |
| * <i>Sipho lachesis</i> ,         | <i>Raphitoma amoena</i> .      |
| * — <i>krøyeri</i> ,              |                                |

Species of a high-arctic distribution (11 species = 14 % of the total number), viz.:

- |  |                               |
|--|-------------------------------|
| <i>Margarita vahli</i> <sup>1)</sup> , | <i>Menestho truncatula</i> ,  |
| <i>Cingula mørchi</i> ,                | <i>Lunatia tenuistriata</i> , |
| <i>Natica bathybi</i> ,                | <i>Sipho altus</i> ,          |
| <i>Sipho curtus</i> ,                  | <i>Buccinum nivale</i> ,      |
| * <i>Liostomia eburnea</i> ,           | — <i>micropoma</i> n. sp.     |
| <i>Alvania scrobiculata</i> ,          |                               |

Species of a low-arctic distribution (6 species = 8 % of the total number), viz.

- |                             |                                     |
|-----------------------------|-------------------------------------|
| * <i>Cingula castanea</i> , | * <i>Buccinum finmarchianum</i> ,   |
| * <i>Trophon fabricii</i> , | * <i>Volutomitra groenlandica</i> , |
| * <i>Pyrene rosacea</i> ,   | * <i>Bela pingeli</i> .             |

Species of a subarctic distribution (2 species = 3 % of the total number), viz.

- |                               |                          |
|-------------------------------|--------------------------|
| <i>Cyclostrema laevigatum</i> | <i>Trophon truncatus</i> |
|-------------------------------|--------------------------|

Species of a panarctic-boreal distribution (5 species = 6 % of the total number), viz.

- |                               |                              |
|-------------------------------|------------------------------|
| * <i>Lepeta coeca</i>         | * <i>Lunatia pallida</i> ,   |
| * <i>Margarita helicina</i>   | * <i>Velutina plicatilis</i> |
| * <i>Amauropsis islandica</i> |                              |

<sup>1)</sup> Not known from the European coasts (excl. of Spitzbergen), but from Arctic America.

The southern element (1 species = 1% of the total number of species) consists only of *Sipho turgidulus*, which has a subarctic-boreal distribution.

The cosmopolitan element (12 species = 15% of the total number of species), viz.

* <i>Scissurella crispata</i> ,	* <i>Homalogyra atomus</i> ,
* <i>Puncturella noachina</i> ,	* <i>Natica clausa</i> ,
* <i>Cyclostrema trochoide</i> ,	* <i>Velutina velutina</i> ,
* <i>Moelleria costulata</i> ,	* <i>Sipho islandicus</i> ,
* <i>Littorina saxatilis</i> ,	* <i>Neptunea despecta</i> ,
* <i>Cingula arenaria</i> ,	* <i>Bela trevelyana</i> .

The American element (which also is high-arctic) (1 species = 1% of the total number of species), viz.

*Trichotropis tenuis*

Species with poorly known distribution (2 species = 2% of the total number of species), viz.

*Alvania wyville-thomsoni*

*Entocolax ludwigi*.

The subjoined table shows the zoogeographical composition of the five East Greenland coast areas:

	Arctic element						Sub-arctic boreal element	Cosmopolitan element	Poorly known distribution	Total number of species
	Pan-arctic	High-arctic including the American element	Low-arctic	Sub-arctic	Panarctic-boreal	Total for Arctic element				
	%	%	%	%	%	%	%	%	%	
N.E.coast area ..	18 = 51	9 = 26	1 = 3	0 = 0	2 = 6	30 = 86	0 = 0	4 = 11	1 = 3	35
Franz Joseph Fjord area....	25 = 51	10 = 21	1 = 2	1 = 2	3 = 6	40 = 82	0 = 0	8 = 16	1 = 2	49
Scoresbysund area .....	26 = 52	9 = 18	1 = 2	0 = 0	5 = 10	41 = 82	0 = 0	8 = 16	1 = 2	50
Kangerdlugssuak area .....	15 = 60	2 = 8	1 = 4	0 = 0	4 = 16	22 = 88	0 = 0	3 = 12	0 = 0	25
Sydøstkyst area .	31 = 57	3 = 5½	6 = 11	1 = 2	3 = 5½	44 = 81	1 = 2	9 = 17	0 = 0	54
Total number of species at East Greenland ....	39 = 50	12 = 15	6 = 8	2 = 3	5 = 6	64 = 82	1 = 1	12 = 15	2 = 2	79

The table shows: Rather great constancy as to the percentage of panarctic and cosmopolitic species in all the five East Greenlandic coastal areas, a significant decrease of the percentage of high-arctic

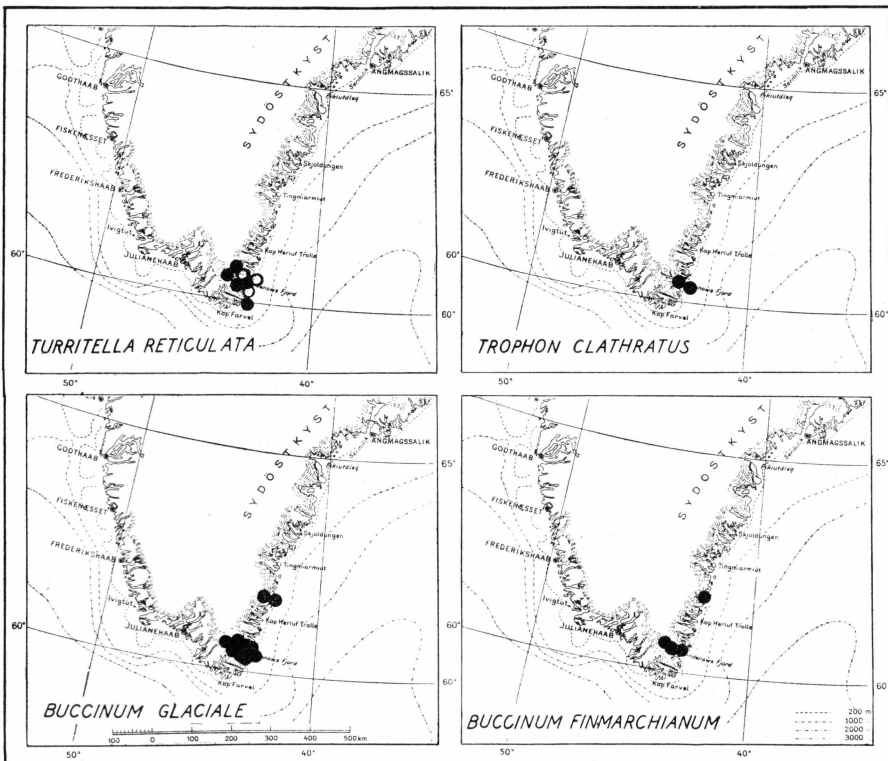


Fig. 14. Map showing species occurring only along the southernmost part of the Sydøstkyst area, viz. *Turritella reticulata*, *Trophon clathratus*, *Buccinum glaciale*, and *Buccinum finmarchianum*. Full circles: Living animals. Open circles: Empty shells.

species from North to South, and a corresponding increase of the percentage of low-arctic species in the same direction.

Fig. 14 to 25, show the various types of distribution observed along East Greenland, illustrated through maps indicating the localities in which characteristic species have been found along the East Greenland coast. Full circles indicate specimens found alive and open circles indicate that only empty shells have been found. Each circle represents one dredge-haul in which the species in question was observed.

Fig. 14 shows species which are recorded only from the southernmost part of the Sydøstkyst Area: The Lindenow's Fjord and Kap Tordenskjold, viz. *Turritella reticulata*, *Trophon clathratus*, *Buccinum glaciale*, and *Buccinum finmarchianum*. Fig. 15 shows species distributed along the whole Sydøstkyst Area but absent from the coast N. of Angmagssalik, viz. *Littorina saxatilis*, *Trophon truncatus*, *Trophon fabricii*, and *Buccinum groenlandicum*. Such species as *Onoba aculeus* and *Homalogyra atomus* seem to occur in the same area but have probably been overlooked at Lindenow's Fjord because of their tiny size.

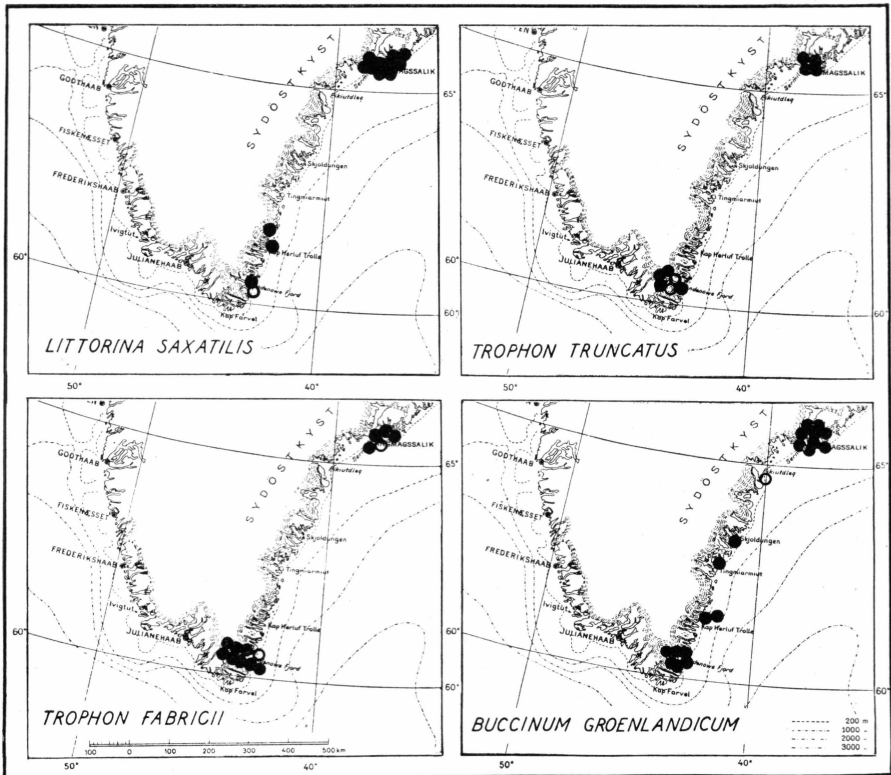


Fig. 15. Map showing species distributed along the whole Sydøstkyst area, but absent from the coasts N. of Angmagssalik, viz. *Littorina saxatilis*, *Trophon truncatus*, *Trophon fabricii*, and *Buccinum groenlandicum*. Full circles: Living animals. Open circles: Empty shells.

Fig. 16 and 8 show species distributed along the three northernmost areas of the East Greenland coast, viz. *Solariella obscura*, *Menestho truncatula*, *Alvania wyville-thomsoni*, *Trichotropis bicarinata*, *Anomalosipho altus*, and *Sipho curtus*, which thus are restricted to the most high-arctic areas of the East Greenland coast.

By far the largest number of East Greenland species are distributed along the whole coast, occurring in all five areas, at the outer coast as well as in the inner parts of the large fjords. Such species, the distribution of which is shown in figs. 5, and 17—24 are: *Lepeta coeca*, *Acmaea rubella*, *Margarita olivacea*, *Margarita groenlandica*, *Margarita cinerea*, *Natica clausa*, *Velutina velutina*, *Lunatia pallida*, *Trichotropis borealis*, *Sipho islandicus*, *Buccinum hydrophanum*, *Buccinum belcheri*, *Buccinum micropoma*, *Admete viridula*, *Bela violacea*, *Bela pyramidalis*, and *Bela nobilis*. Further examples, which after all have a similar type of distribution, but which hitherto have not all been found in all the five East

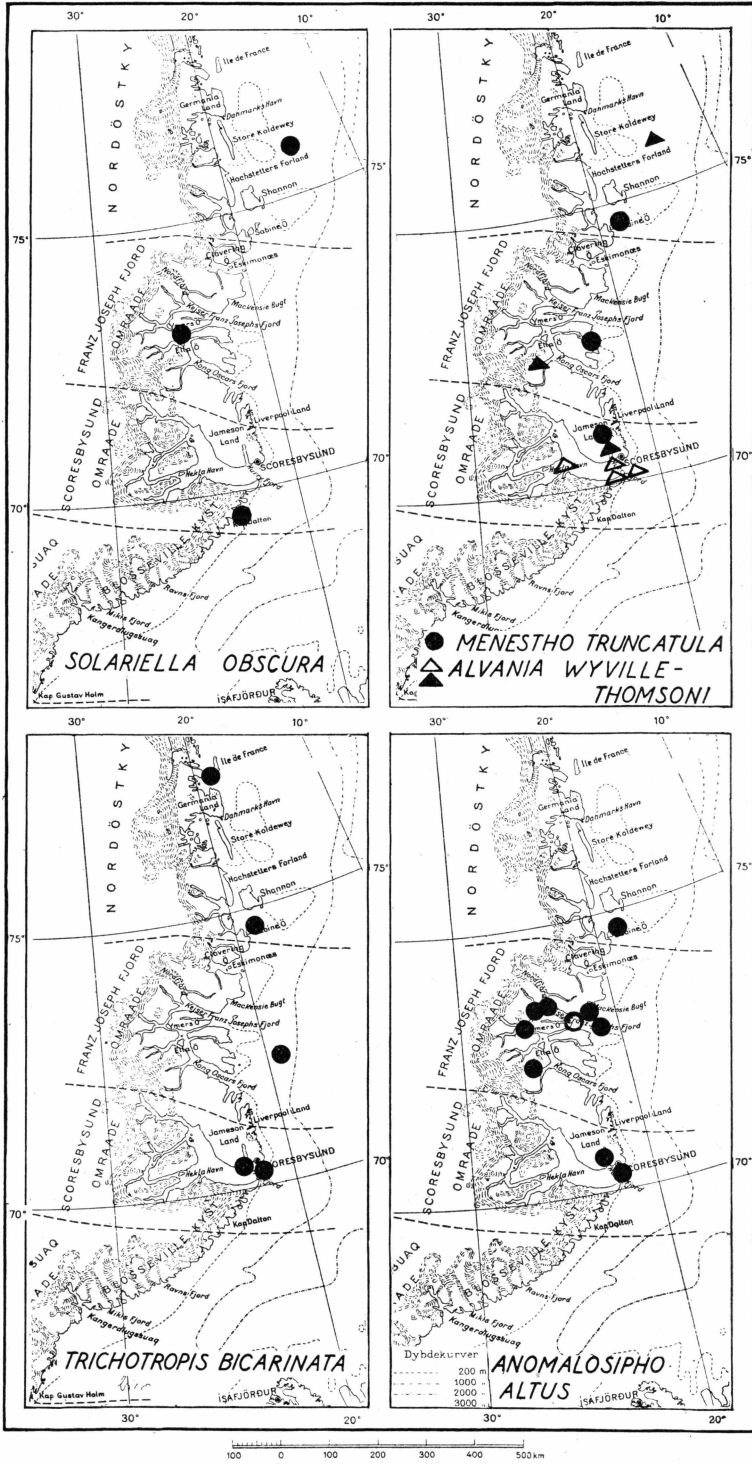


Fig. 16. Map showing species distributed along the three northernmost areas of the East Greenland coasts, viz. *Solariella obscura*, *Menestho truncatula*, *Alvania wyville-thomsoni*, *Trichotropis bicarinata*, and *Anomalosiphon altus*. Full signatures: Living animals. Open signatures: Empty shells.

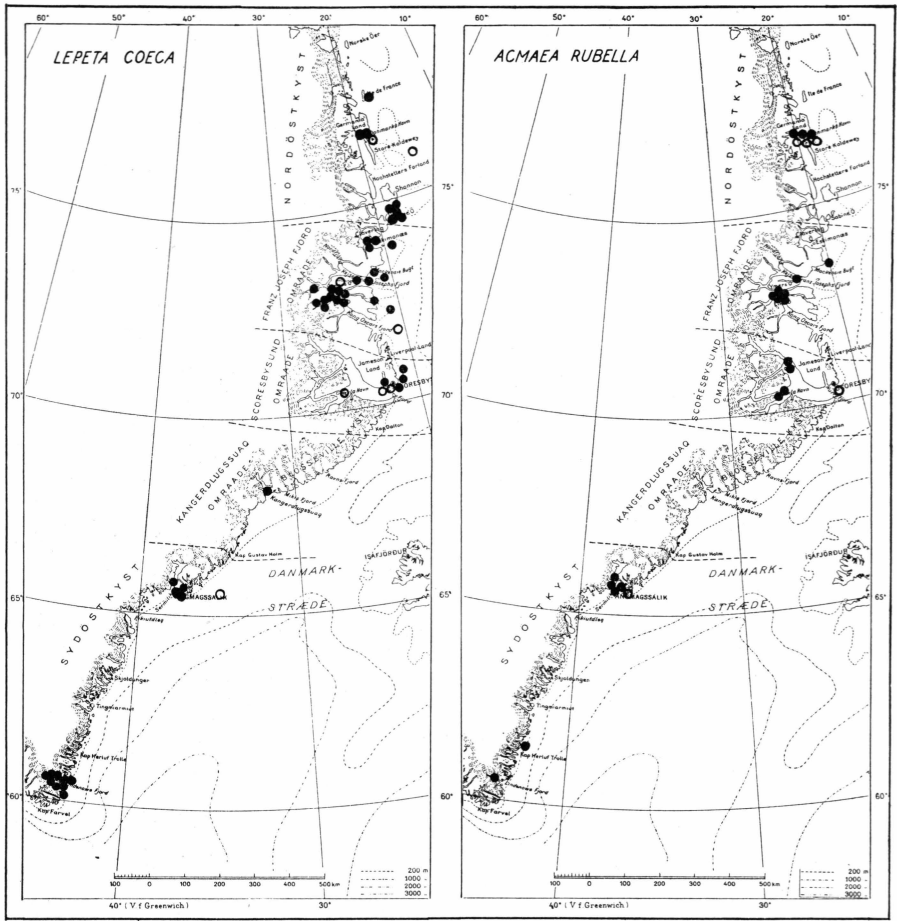


Fig. 17. Species distributed along the whole East Greenland coast, viz. *Lepeta coeca*, and *Acmaea rubella*. Full circles: Living animals. Open circles: Empty shells.

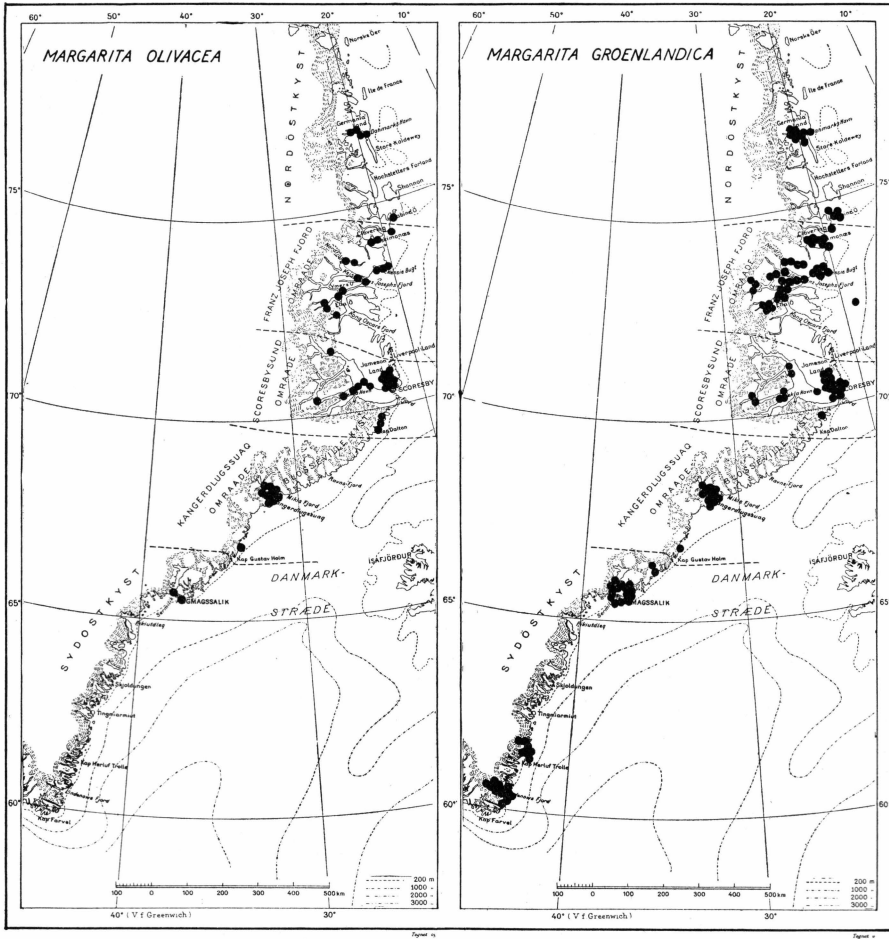


Fig. 18. Continued from fig. 17. *Margarita olivacea*, and *Margarita groenlandica*. Only living animals considered.

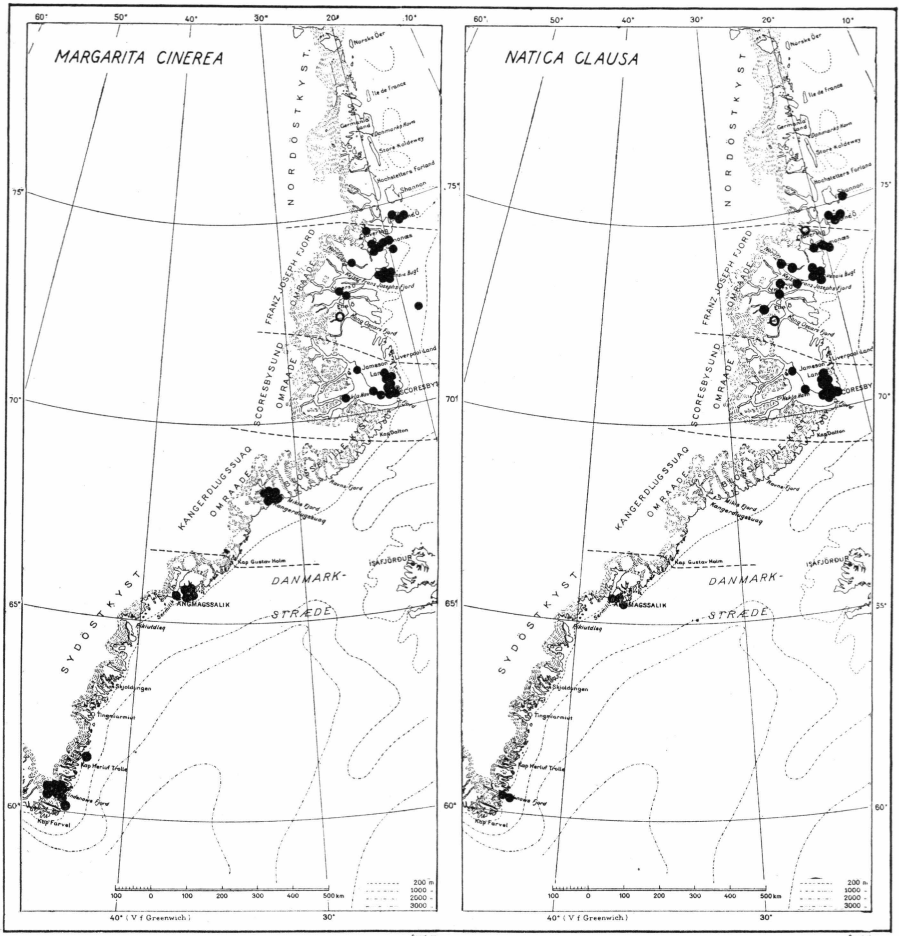


Fig. 19. Continued from the preceding figures. *Margarita cinerea*, and *Natica clausa*.  
Full circles: Living animals. Open circles: Empty shells.

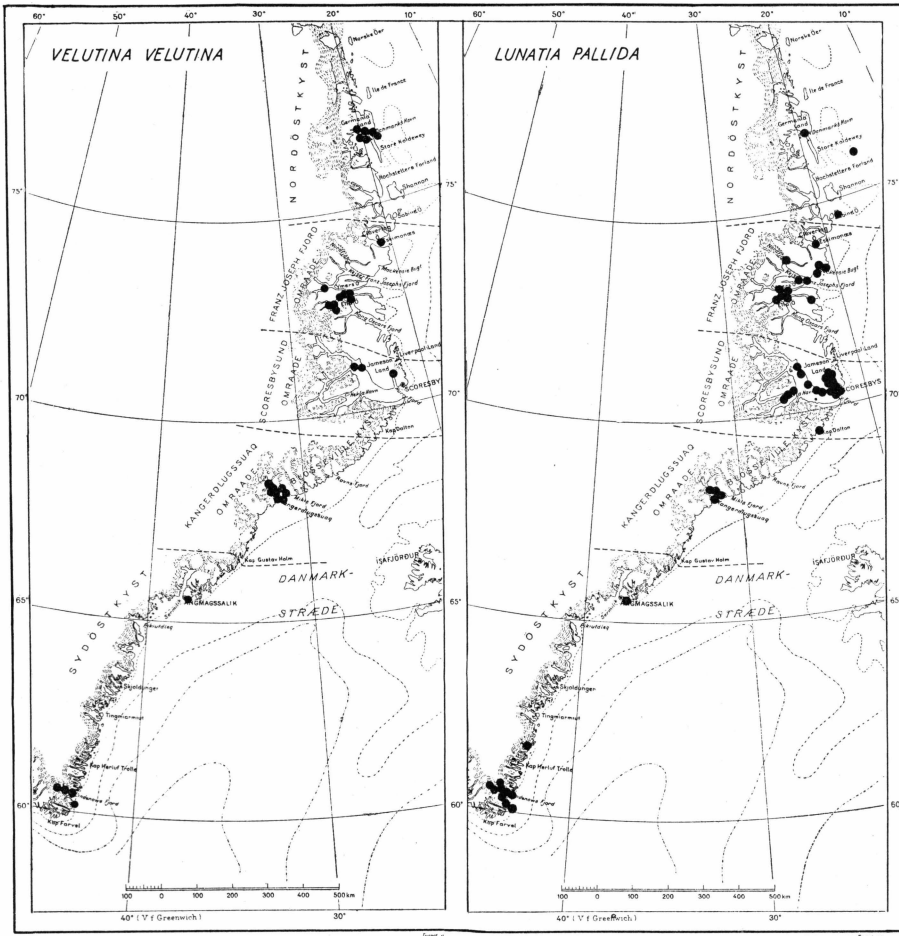


Fig. 20. Continued from the preceding figures. *Velutina velutina*, and *Lunatia pallida*. Only living animals considered.

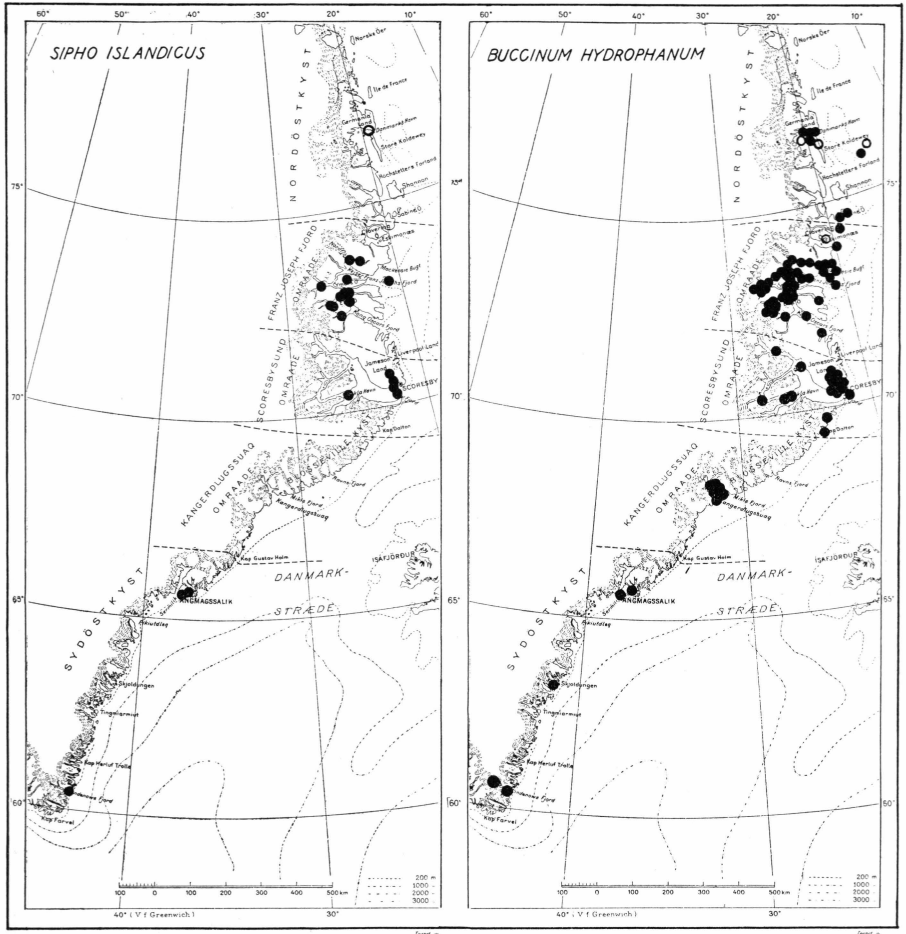


Fig. 21. Continued from the preceding figures. *Sipho islandicus*, and *Buccinum hydrophanum*. Full circles: Living animals. Open circles: Empty shells.

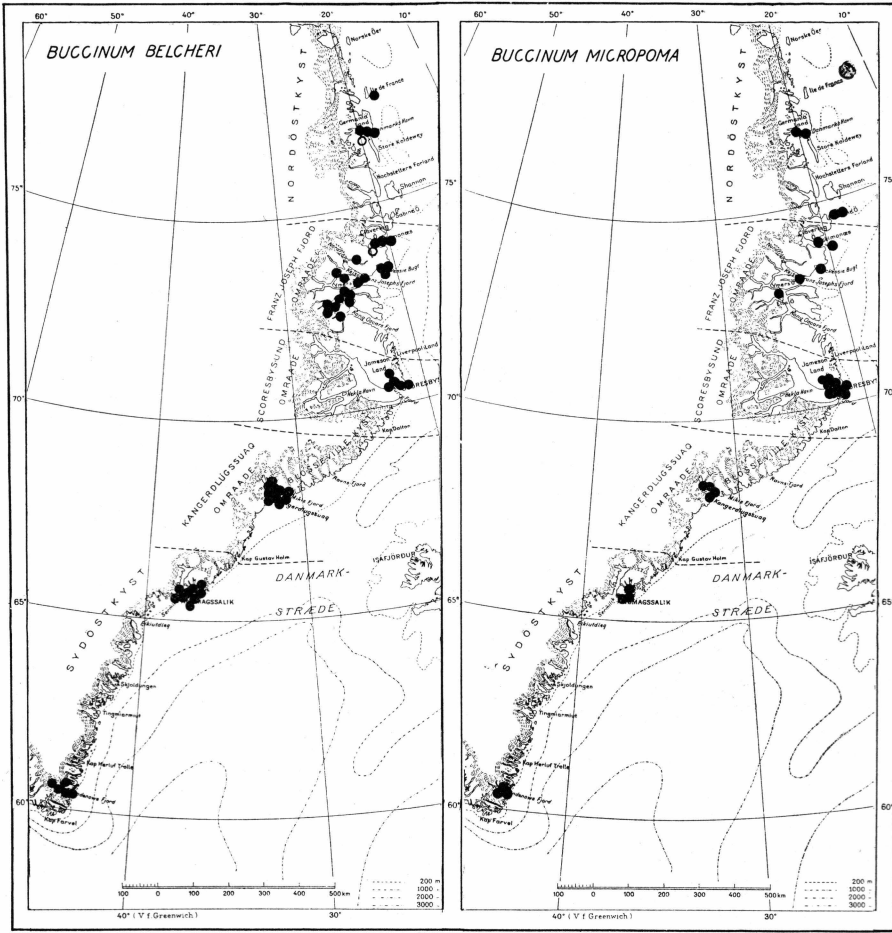


Fig. 22. Continued from the preceding figures. *Buccinum belcheri*, and *Buccinum micropoma*. Full circles: Living animals. Open circles: Empty shells.

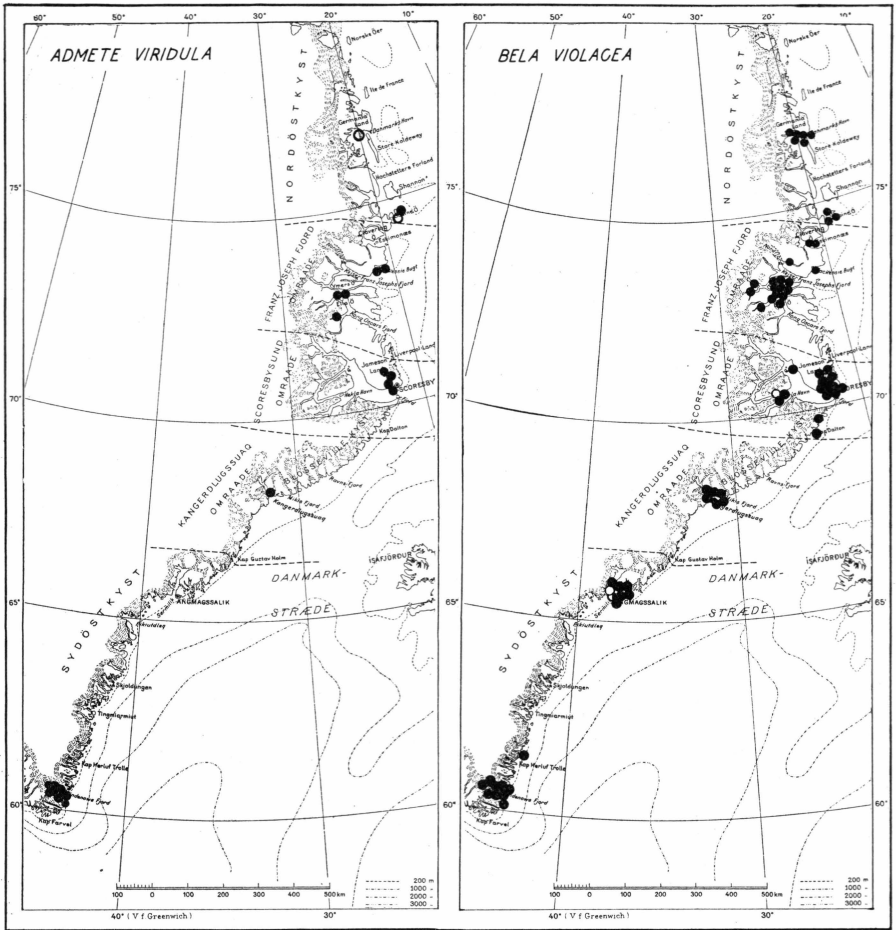


Fig. 23. Continued from the preceding figures. *Admete viridula*, and *Bela violacea*. Full circles: Living animals. Open circles: Empty shells.

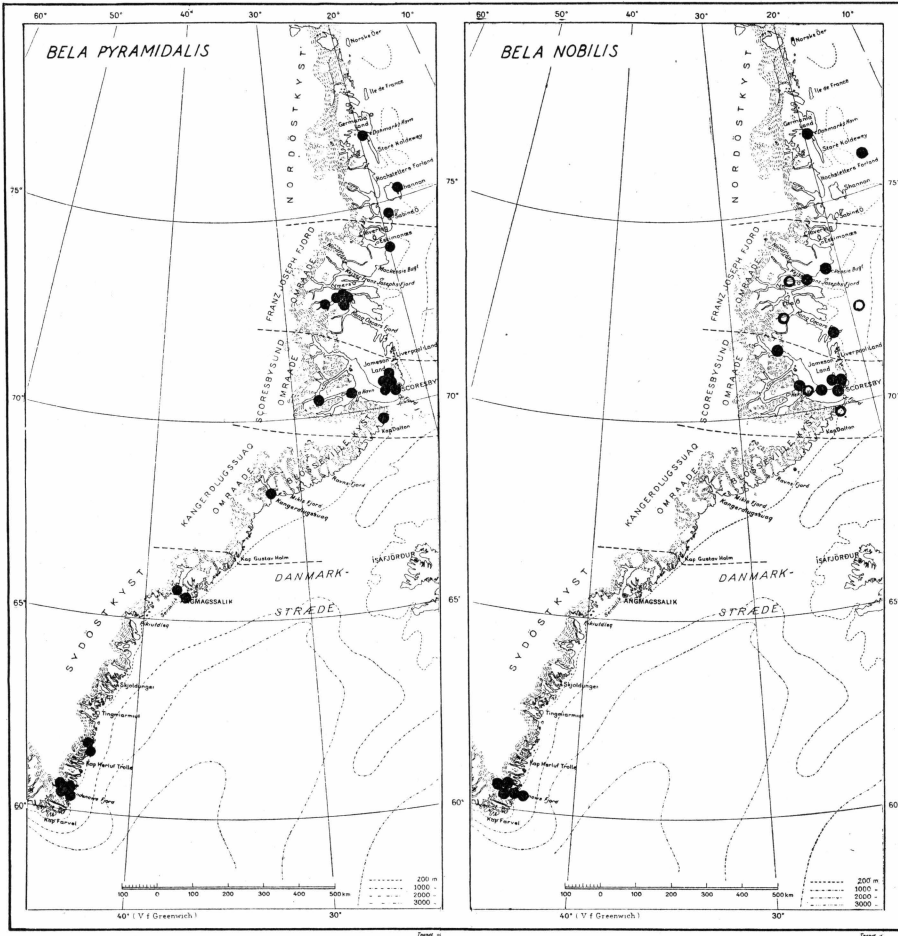


Fig. 24. Continued from the preceding figures. *Bela pyramidalis*, and *Bela nobilis*. Full circles: Living animals. Open circles: Empty shells.

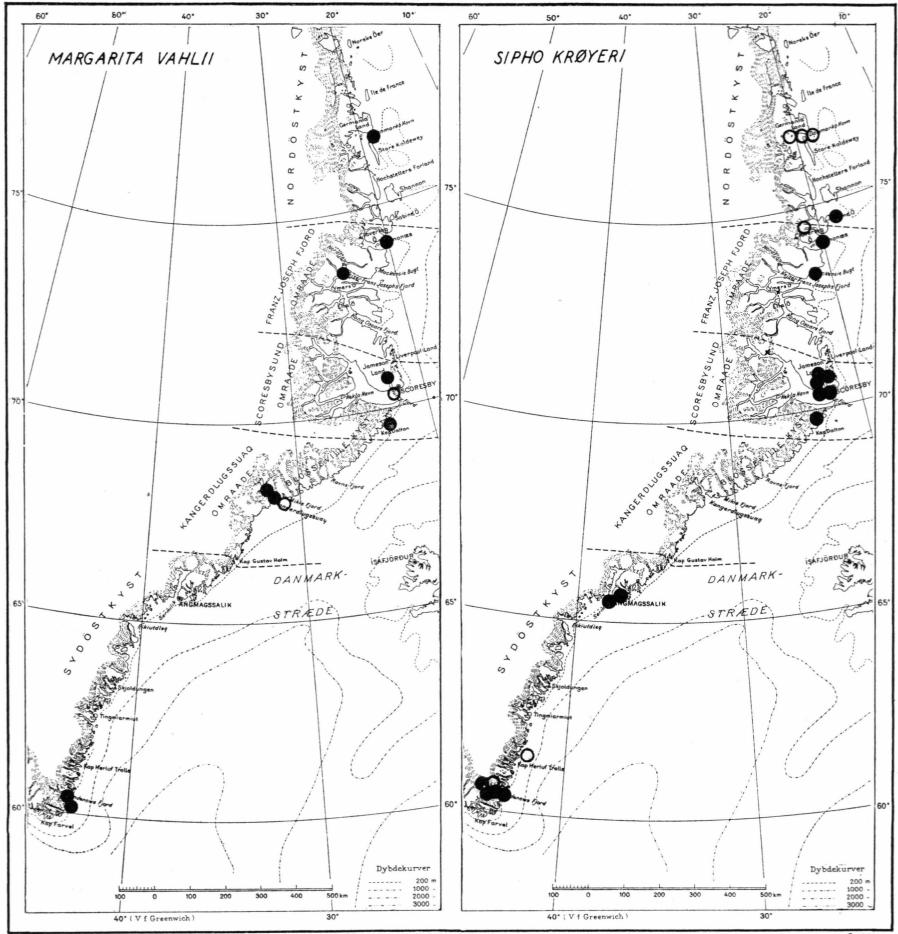


Fig. 25. Species distributed along the whole East Greenland outer coast without entering the inner parts of the large fjords, viz. *Margarita vahlii*, and *Sipho krøyeri*. Full circles: Living animals. Open circles: Empty shells.

Greenland areas are: (The areas in which they have been found are designated as 1 to 5 respectively, beginning with the Nordøstkyst Area and ending with the Sydøstkyst Area. Brackets round a single figure tell that only empty shells are known from the area in question): *Lunatia tenuistriata* (1—2—3—5), *Onchidiopsis glacialis* (1—2—3—4—5), *Alvania scrobiculata* ((1)—2—3—(4)—(5)), *Cingula castanea* (2—3—5), *Cingula arenaria* (2—3—4—5), *Trichotropis conica* ((1)—2—3—4—5), *Sipho tortuosus* (2—3—4—5), *Chrysodomus ossiani* (2—5); *Volutopsis norvegica* (1—2—3—5), *Buccinum ovum* (1—2—3—5), *Bela decussata* (2—3—4—5), and *Bela trevelyana* (1—2—3—5).

Two species, viz. *Margarita vahlii* and *Sipho krøyeri* (Fig. 25) seem to occur along the whole outer coast but are absent in the inner areas of the large fjords. Also *Margarita helicina*, fig. 21, which is abundant along the outer coast, is totally absent from these fjords and seems furthermore to be limited to the four southernmost areas. *Bela exarata*, known from the mouth of Scoresbysund and off Lindenow's Fjord, seems also to be a typical inhabitant of the outer coast.

Further, three species, viz. *Velutina velutina*, *Alvania jan-mayeni*, and *Neptunea despecta* are all known from Franz Joseph Fjord, Scoresbysund and the Sydøstkyst Area but are absent from the Nordøstkyst Area and the Kangerdlugssuak Area, and one species, viz. *Pyrene rosacea* is known from the Sydøstkyst-Area and the Kangerdlugssuak Area.

The distribution of the 79 living species of prosobranchs known from East Greenland may thus be summarized in the following scheme:

Species distributed along the whole coast	Species known from the 3 northernmost areas	Species known from the Sydøstkyst area only	Species known from Franz Joseph Fjord to Lindenows Fjord	Species known from Scoresbysund to Lindenows Fjord	Species known from Kangerdlugssuak to Lindenows Fjord	Species with a poorly known distribution
32 sp., viz.	6 sp., viz.	10 sp., viz.	3 sp., viz.	2 sp., viz.	1 Lowarctic sp.	25 sp.
20 Panarctic, 4 High-arctic, 1 Low-arctic,	1 Panarctic, 4 High-arctic, 1 with poorly known distri- bution	5 Panarctic, 2 Low-arctic, 1 Subarctic, 2 Cosmopo- litic	2 Panarctic, 1 cosmopo- litic	1 Panarctic, 1 Panarctic- boreal, Lowarctic		
2 Panarctic- boreal, 5 Cosmopo- litic						

The three dominating elements among East Greenland prosobranchs are, thus: A stock of predominantly panarctic species distributed along the whole coast, a stock of predominantly high-arctic species restricted

to the three northernmost areas, e. g. to the high-arctic parts of the coast, and a stock of panarctic, lowarctic, subarctic and cosmopolitic species restricted to the Sydøstkyst Area, e. g. to the area influenced by the Irminger current. When these facts are compared with those given in the table p. 126, it is understandable, why the number of species known from the Kangerdlugssuak Area is so poor, viz. 25 species as compared with those from the other four areas, viz. 35 sp. (Nordøstkyst), 49 sp. (Franz Joseph Fjord), 50 sp. (Scoresbysund), and 54 sp. (Sydøstkyst). The Kangerdlugssuak area is very well examined. Two Danish expeditions have made large series of dredge-hauls in this area in recent years, and although most of the collections originate from the epifauna, those from the level bottom being somewhat more scarce, it may be taken for granted that the astonishingly poor number of species known from Kangerdlugssuak cannot be explained by insufficient collections.—According to the analysis in table p. 126, the explanation must be sought in the climatic conditions. The Kangerdlugssuak area is—when only to a small degree—influenced by the Irminger current, and the great ice-crust, which in the form of a nearly unbroken border covers the surface along the N.E. coast of East Greenland, breaks S. of Scoresbysund into smaller pieces, which spread over larger areas of the sea and hence are of less influence on the coast stretches here. These eliminations of some of the most high-arctic features are sufficient to exclude some of the most high-arctic species from the Kangerdlugssuak area, but on the other hand are not striking enough to alter the climate to a such degree that the southernmost species are able to live here. The Kangerdlugssuak area with the whole of Blossville coast must be regarded as a marine transitional area, the fauna of which consists of impoverished outposts for the high-arctic as well as for the low-arctic-subarctic-panarctic fauna element. To illustrate the distribution of such representatives of the high-arctic and the low-arctic fauna element in East Greenland and other north-atlantic seas, two species have been chosen, viz. *Anomalosipho altus* (high-arctic) and *Buccinum finmarchianum* (low-arctic) (cf. the map. fig. 26). Apart from a few “overlappings” of both species in deeper water outside the shelves, it will be seen that their areas of distribution are most distinct and different. The low-arctic species inhabits Arctic America, W. Greenland, S.E. Greenland, N. and E. Iceland, Jan Mayen, the Norwegian arctic coast and greater depths in the Greenland Sea, off Spitzbergen and in the Kara Sea, while the high-arctic species inhabits N.E. Greenland, the Spitzbergen fjords, and a few deep water localities. Both species are absent from the middle part of the East Greenland coast, e. g. the high-arctic species has its optimum occurrence in “the polar-current areas”, the low-arctic in the “gulf-stream areas”, both of them being absent (or at least very rare) in the “mixed areas”.

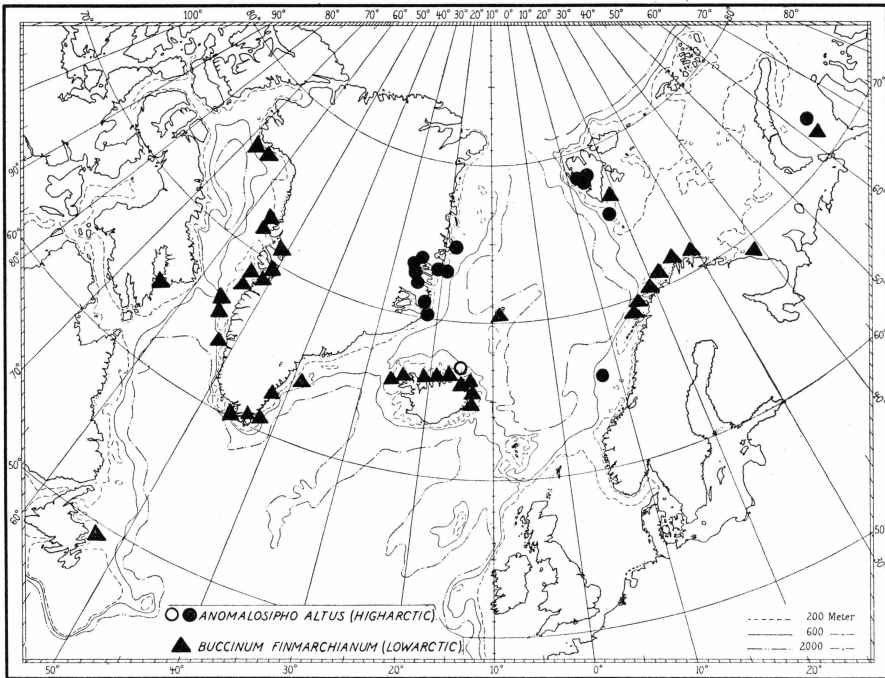


Fig. 26. Map showing the distribution of a high-arctic species, viz. *Anomalosipho altus*, and of a low-arctic species, viz. *Buccinum finmarchianum* throughout the North Atlantic. Full signatures: Living animals. Open signatures: Empty shells.

A fact shown on the map in question and also very evident in the lists p. 124—126, is that the high-arctic species seem to have a much more restricted area of distribution than found for e. g. the low-arctic species. Thus, out of the 11 high-arctic species known from the East Greenland coast only one, viz. *Liostomia eburnea*, is known from the N. American as well as the N.W. European areas of the North Atlantic, while all the other species seem to be more or less “endemic” to the Greenland sea and neighbouring areas. In contradistinction to these high-arctic species, all six low-arctic species occurring at East Greenland are known from the American as well as the European Arctic seas, and the same is of course the case with most of the panarctic species known from East Greenland (cf. pp. 124—126).

B. Distribution of East Greenlandic species along the neighbouring coasts.

The East Greenlandic prosobranch fauna having now been analysed into its elements, it will be of interest to compare the East Greenlandic fauna with the faunas of the surrounding Arctic and North Atlantic coast stretches in order to form a judgment as to their relations. Table I

Table 1. Synopsis of the distribution of the prosobranchs occurring along East Greenland. Species, which only are known in empty shells from East Greenland are placed in brackets.

+ = living specimens; ⊕ = empty shells.

	Parry Islands to Labrador	West Greenland	Spitzbergen	Jan Mayen	N. and E. Iceland	Norway North of Lofoten	Further Distribution
<i>Scissurella crispata</i> .....	+	+	+	..	..	+	Medit.; Azores; W.-Indies.
<i>Puncturella noachina</i> .....	+	+	+	+	+	+	Japan; Vancouver; Antarctic.
<i>Acmæa rubella</i> .....	+	+	+	+	+	+	?
<i>Lepeta coeca</i> .....	+	+	+	+	+	+	Azores; W.-Indies; Japan.
<i>Margarita groenlandica</i> .....	+	+	+	+	+	+	Arctic Russia; British Isles.
— <i>helicina</i> .....	+	+	+	+	+	+	British Isles; Aleutians; Amur.
— <i>cinerea</i> .....	+	+	+	+	+	+	Bering Sea; Alaska; Mexico.
— <i>vahlîi</i> .....	+	+	+	..	+	..	Bering Sea; Puget Sound.
— <i>olivacea</i> .....	+	+	+	+	+	+	Bering Sea; British Isles.
<i>Solariella obscura</i> .....	+	?	+	+	..	+	Bering Sea; Aleutians.
<i>Cyclostrema laevigatum</i> .....	..	..	⊕	..	..	+	N. of the Hebrides.
— <i>trochoide</i> .....	..	..	..	..	..	+	Portugal; Cape Hatteras; Antilles.
<i>Moelleria costulata</i> .....	+	+	+	..	+	+	Portugal; Morocco; St. Thomas.
<i>Littorina saxatilis</i> .....	+	+	+	..	+	+	Medit.; Japan; N.W. America.
<i>Cingula castanea</i> .....	+	+	+	..	+	+	Arctic Russia.
— <i>arenaria</i> .....	..	+	+	+	+	..	S. Atlantic; Tristan da Cunha.
— <i>mørchi</i> .....	..	..	..	+	..	..	Kara Sea.
<i>Liostomia eburnea</i> .....	..	+	⊕	..	..	+	Gulf of St. Lawrence.
<i>Onoba aculeus</i> .....	..	+	+	..	+	+	Sea of Okhotsk.
<i>Alvania scrobiculata</i> .....	..	+	+	+	+	..	?
— <i>jan mayeni</i> .....	..	+	+	+	⊕	..	Siberian Arctic Sea.
— <i>wyville-thomsoni</i> .....	..	..	⊕	..	..	..	Between Jan Mayen and Iceland.
<i>Homalogyra atomus</i> .....	..	+	..	..	+	+	Medit.; Madeira.
<i>Turritella reticulata</i> .....	+	+	+	..	..	..	Bering Sea; Aleutians; British Columbia.
— <i>erosa</i> .....	+	+	..	..	..	..	Cape Cod; Siberian Arctic Sea; N. Japan
( <i>Cerithiopsis costulata</i> ) .....	..	+	..	+	⊕	+	Eastern Kattegat.
<i>Turritellopsis acicula</i> .....	+	⊕	+	..	..	+	Cape Cod; Murman coast; Kara Sea.
<i>Entocolax ludwigi</i> .....	+	+	..	..	..	..	Murman coast.
<i>Menestho albula</i> .....	+	+	..	+	..	..	Halifax; Northern Japan.
— <i>truncatula</i> .....	..	..	+	..	..	..	Novaya Zemlya.
<i>Trichotropis borealis</i> .....	+	+	+	..	+	+	British Isles; Aleutians; Oregon.
— <i>conica</i> .....	+	+	..	+	..	+	—
— <i>tenuis</i> .....	+	+	..	..	+	..	Bering Sea.
( <i>Acrybia flava</i> ) .....	..	..	+	..	+	+	Bear Island; Sea of Okhotsk.
<i>Amauropsis islandica</i> .....	..	+	+	+	+	+	Kattegat; Belgium; Bering Sea.

Table 1 (continued).

	Parry Islands to Labrador	West Greenland	Spitzbergen	Jan Mayen	N. and E. Iceland	Norway North of Lofoten	Further Distribution
<i>Lunatia pallida</i> .....	+	+	+	+	+	+	Siberian Arctic Sea; Aleutians.
— <i>tenuistriata</i> .....	..	..	+	..	+	..	Siberian Arctic Sea; Bering Sea.
<i>Natica clausa</i> .....	+	+	+	+	+	+	Medit.; Japan; Cape Hatteras.
— <i>bathybii</i> .....	..	..	..	..	..	..	Greenland Sea; W. of Lofoten.
<i>Capulacmaea radiatum</i> .....	+	+	+	..	..	+	S. of Iceland; Bering Sea; Aleutians.
<i>Velutina velutina</i> .....	+	+	+	+	+	+	Medit.; Vancouver; Cape Hatteras.
— <i>undata</i> .....	+	+	+	..	+	+	Bering Sea; Scotland-Faroe-ridge.
— <i>plicatilis</i> (= <i>flexilis</i> ) .....	..	+	+	..	..	+	Aleutians; Sea of Okhotsk; Denmark.
<i>Onchidiopsis glacialis</i> .....	+	+	+	..	+	+	Murman coast; Novaya Zemlya.
<i>Marsenina glabra</i> .....	+	+	+	..	+	+	Siberian Arctic Sea; White Sea.
<i>Trophon clathratus</i> .....	+	+	+	..	+	+	Japan; Puget Sound; Alaska; British Isl.
— <i>fabricii</i> .....	+	+	+	..	+	..	Bering Sea.
— <i>truncatus</i> .....	..	+	+	..	+	+	British Isles; Siberian Arctic Sea.
<i>Pyrene rosacea</i> .....	+	+	+	..	+	+	Bering Sea; Alaska; Faroe-Channel.
<i>Volutopsis norvegica</i> .....	+	+	+	+	+	+	British Isles; Bering Sea; Sea of Okhotsk.
<i>Sipho islandicus</i> .....	+	+	+	+	+	+	British Isles; Siberian Arctic Sea; Bering Sea.
— <i>turgidulus</i> .....	..	..	..	..	+	..	N. of Spain; S. of the Faroes.
— <i>togatus</i> (incl. <i>S. curtus</i> ) .....	+	+	+	..	+	..	Franz Joseph Land.
— <i>tortuosus</i> .....	+	..	..	+	+	+	Siberian Arctic Sea; Alaska.
(— <i>dalli</i> ) .....	..	..	..	..	..	+	Between Shetland and Faroes.
— <i>lachesis</i> .....	+	+	+	..	+	+	Between Hebrides and Faroes.
— <i>kroyeri</i> .....	+	+	+	+	..	..	Murman coast; Bering Sea; Alaska.
(— <i>fusiiformis</i> ) .....	..	..	..	..	..	+	?
<i>Anomalosipho altus</i> (= <i>virgatus</i> ) ..	..	..	+	..	⊕	..	Kara Sea.
<i>Chrysodomus ossiani</i> .....	..	..	..	⊕	..	..	E. of Iceland; Gulf of St. Lawrence.
<i>Neptunea despecta</i> .....	+	+	+	+	+	+	Portugal; Japan; Alaska.
<i>Buccinum nivale</i> .....	..	..	..	..	..	..	W. of Lofoten; Kara Sea.
— <i>belcheri</i> .....	+	+	..	+	..	..	—
— <i>groenlandicum</i> .....	+	+	+	+	+	+	Aleutians; British Columbia.
— <i>hydrophanum</i> .....	+	+	+	+	+	+	Between Faroes and Hebrides.
— <i>ciliatum</i> .....	+	+	+	+	..	..	Murman coast; Siberian Arctic Sea.
— <i>finmarchianum</i> .....	+	+	+	+	+	+	Bering Sea.
— <i>ovum</i> .....	..	..	+	..	..	..	Murman coast; Siberian Arctic Sea,
							Bering Sea.
— <i>terrae-novae</i> .....	..	+	+	+	+	..	Siberian Arctic Sea; Bering Sea.
— <i>glaciale</i> .....	+	+	+	+	..	..	Siberian Arctic Sea; Aleutians; Japan.
— <i>micropoma</i> .....	..	+	..	+	..	..	W. of Spitzbergen.

Table 1 (continued).

	Parry Islands to Labrador	West Greenland	Spitzbergen	Jan Mayen	N. and E. Iceland	Norway North of Lofoten	Further Distribution
<i>Volutomitra groenlandica</i> .....	+	+	..	..	+	+	The Faroes (dead).
<i>Admete viridula</i> .....	+	+	+	+	+	+	Faroes (dead); Bering Sea; Japan.
<i>Bela pyramidalis</i> .....	+	+	+	+	+	+	Faroes; N. of Hebrides; Siberian Arctic Sea.
— <i>pingeli</i> .....	..	+	+	+	+	+	Murman coast.
(— <i>declivis</i> ) .....	..	+	..	+	?	+	?
— <i>nobilis</i> (= <i>rugulata</i> ) .....	+	+	+	+	+	+	Faroes (dead); Bering Strait; N. Japan.
— <i>exarata</i> .....	+	+	+	..	+	+	Faroes; W. of Iceland; Siberian Arctic Sea.
— <i>trevelyana</i> .....	..	+	+	+	+	+	British Isles; British Columbia.
— <i>violacea</i> .....	+	+	+	..	+	+	Bering Sea; British Columbia.
— <i>simplex</i> .....	..	..	+	..	+	+	Bering Sea; Siberian Arctic Sea.
— <i>tenuicostata</i> .....	..	+	+	+	+	+	Gulf of Biscay; Bering Sea.
— <i>decussata</i> .....	+	+	+	+	?	..	N. of Scotland; Siberian Arctic Sea.
<i>Raphitoma amoena</i> .....	..	+	+	+	..	+	—

(p. 142) shows the occurrence or non-occurrence along the surrounding coasts of all the prosobranchs hitherto found along East Greenland. If the 79 living East Greenlandic species are estimated at 100 %, it will be found that:

78 %	of these (62 living spec.)	are known from	West Greenland
76 %	— (60 — — )	- — —	Spitzbergen
66 %	— (52 — — )	- — —	N. and E. Iceland
65 %	— (51 — — )	- — —	Norway N. of Lofoten

The East Greenland prosobranch fauna has, accordingly, characteristic features which differ rather much from those of the very well explored neighbouring coast areas. The percentages of the faunas given above, however, fall into two distinct magnitudes, viz. the W. Greenland Spitzbergen element: two faunas which show rather great and equally close similarities to the East Greenland fauna, and the N.- and E.-Iceland—N.-Norway element with a much smaller similarity to the East Greenland fauna. The geographical situation of East Greenland makes it a priori most likely that the fauna here will show the closest similarity to those of W. Greenland and Spitzbergen, and indeed their similarities

are, as mentioned, very evident. On the other hand there are also great differences between them. Among the East Greenland prosobranchs are seventeen species unknown from W. Greenland and nineteen unknown from Spitzbergen. The striking difference between W. Greenland and E. Greenland is shown by a comparison of the East Greenlandic Sydøstkyst Area, where large collections have been made at Kekertaksiak and Lindenow's Fjord, with the S.W. Greenlandic Julianehaab Area. These two areas form the southernmost coasts of E. and W. Greenland respectively and are further connected by the only 100 km long Prins Christian Sund. In spite of this Julianehaab has fourteen species of prosobranchs which are absent from the Sydøstkyst Area, viz. *Acmaea testudinalis*, *Lacuna divaricata*, *Littorina palliata*, *Cingula globulus*, *Acirsa borealis*, *Nucella lapillus*, *Sipho holbølli*, *Sipho latericeus*, *Chrysodomus turtoni*, *Buccinum undatum*, *Buccinum tenue*, *Bela incisula*, *Bela elegans*, and *Bela harpularia*.

Further, W. Greenland and Spitzbergen have twelve species of prosobranchs in common, which are absent from the intermediate East Greenland coast, viz. *Lacuna crassior*, *Lacuna pallidula*, *Alvania cruenta*, *Scalaria groenlandica*, *Lunatia nana*, *Velutina lanigera*, *Sipho latericeus*, *Buccinum undatum*, *Buccinum tenue*, *Bela obliqua*, *Bela cinerea*, and *Bela woodiana*.

The well-marked difference between the East Greenland prosobranch fauna on the one side and the W. Greenland and Spitzbergen faunas on the other side must be explained by the fact that both S.W. Greenland and S. Spitzbergen are influenced by the Gulf stream, while the East Greenland coast must be regarded a typical Polar-stream area (cf. the hydrography pp. 160—161). Although the Polar stream water S. of Scoresbysund has a small contribution of warmer water from the Irminger current, the heating is still so slight that most of the southern prosobranch species are unable to live here. Most of the species mentioned above as living at W. Greenland and S. Spitzbergen but absent at East Greenland belong to this southern element. Furthermore, W. Greenland species of southern distribution which have never been met with at East Greenland are: *Acmaea testudinalis*, *Lacuna divaricata*, *Littorina obtusata*, *Littorina palliata*, *Skeneopsis planorbis*, *Aporrhais occidentalis*, and *Nucella lapillus*.

To the southern fauna element which reaches into the Arctic region, the East Greenland coasts must be regarded as an Arctic barrier which, extending from 83° N. down to 60° N., divides the southern species into two arctic areas of occurrence: a western and an eastern one.

When comparing such North Atlantic coast stretches as are washed by a Polar Stream and those which are washed by a Gulf Stream, the distinction in their prosobranch fauna will clearly show how totally

Table 2. Synopsis of the prosobranchs of NE. America, Greenland, Iceland, Jan Mayen, Spitzbergen, and Norway.

+ = living specimens; ⊕ = empty shells.

	Parry Islands, and Grinnel Land to Labrador	New Foundland to Cape Cod	W. Greenland	E. Greenland	N., and E. Iceland	S., W., and NW. Iceland	Jan-Mayen	Spitzbergen	Norway N. of Lofoten	Norway S. of (and including) Lofoten
<i>Scissurella crispata</i> .....	+	+	+	+	..	+	..	+	+	+
<i>Emarginula crassa</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>fissura</i> .....	..	..	..	..	..	+	..	..	+	+
<i>Puncturella noachina</i> .....	+	+	+	+	+	+	+	+	+	+
<i>Patella vulgata</i> .....	..	..	..	..	..	?	..	..	..	+
<i>Helcion pellucidum</i> .....	..	..	..	..	..	+	..	..	+	+
<i>Acmæa testudinialis</i> .....	+	+	+	..	+	+	..	..	+	+
— <i>rubella</i> .....	+	+	+	+	+	⊕	+	+	+	+
— <i>virginea</i> .....	..	..	..	..	+	+	..	..	+	+
— <i>emydia</i> .....	+	..	..	..	..	..	..	..	..	..
— <i>alveus</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Propilidium ancyloide</i> .....	..	..	..	..	..	..	..	..	..	⊕
<i>Lepeta coeca</i> .....	+	+	+	+	+	+	+	+	+	+
<i>Pilidium fulvum</i> .....	..	..	..	..	..	+	..	..	+	+
<i>Danilia tinei</i> .....	..	..	..	..	..	..	..	..	..	+
<i>Margarita groenlandica</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>helicina</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>cinerea</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>vahlî</i> .....	+	..	+	+	+	+	..	+	..	..
— <i>olivacea</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>acuminata</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>minutissima</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Solariella obscura</i> .....	+	+	?	+	..	+	+	+	+	+
— <i>varicosa</i> .....	+	..	..	..	..	..	..	+	+	..
— <i>affinis</i> .....	..	..	..	..	..	..	..	..	..	+
<i>Caaliostoma conuloide</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>occidentale</i> .....	..	+	..	..	..	+	..	..	+	+
— <i>militare</i> .....	..	..	..	..	..	..	..	..	..	+
<i>Gibbula tumida</i> .....	..	..	..	..	..	+	..	..	+	+
— <i>cineraria</i> .....	..	..	..	..	?	+	..	..	+	+
<i>Cyclostrema laevigatum</i> .....	..	..	..	+	..	+	..	⊕	+	+
— <i>areolatum</i> .....	..	..	..	..	..	..	..	..	+	..
— <i>trochoide</i> .....	..	..	..	+	..	⊕	..	..	+	+
— <i>rugulosum</i> .....	..	..	..	..	..	+	..	..	+	+
— <i>basistriatum</i> .....	..	..	..	..	..	..	..	⊕	..	+
<i>Moelleria costulata</i> .....	+	+	+	+	+	+	..	+	+	+

Table 2 (continued).

	Parry Islands, and Grinnel Land to Labrador	New Foundland to Cape Cod	W. Greenland	E. Greenland	N., and E. Iceland	S., W., and NW. Iceland	Jan-Mayen	Spitzbergen	Norway N. of Lofoten	Norway S. of (and including) Lofoten
<i>Lacuna divaricata</i> .....	+	+	+	:	+	+	:	:	+	+
— <i>crassior</i> .....	:	:	+	:	:	:	:	+	:	:
— <i>pallidula</i> .....	:	+	+	:	+	+	:	+	+	+
— <i>puteolus</i> .....	:	:	:	:	:	:	:	:	?	+
<i>Littorina littorea</i> .....	:	+	:	:	:	:	:	:	+	+
— <i>saxatilis</i> .....	+	+	+	+	+	+	:	+	+	+
— <i>obtusata</i> .....	:	:	+	:	?	+	:	+	+	+
— <i>palliata</i> .....	+	+	+	:	+	+	+	:	+	:
<i>Rissoa interrupta</i> .....	:	:	:	:	:	:	:	:	+	+
— <i>octona</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>albella</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>membranacea</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>sarsi</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>turgida</i> .....	:	:	:	:	:	:	:	:	+	+
— <i>violacea</i> .....	:	:	:	:	:	:	:	:	+	+
— <i>inconspicua</i> .....	:	:	:	:	:	:	:	:	+	+
<i>Cingula castanea</i> .....	+	+	+	+	+	:	:	+	+	:
— <i>soluta</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>globulus</i> .....	:	:	+	:	:	:	:	:	:	:
— <i>arenaria</i> .....	:	+	+	+	+	:	+	+	:	:
— <i>mørchi</i> .....	:	:	:	+	:	:	+	:	:	:
— <i>tumidula</i> .....	:	:	:	:	:	:	:	:	+	:
— <i>islandica</i> .....	:	:	:	:	⊕	:	:	:	:	⊕
— <i>cingillus</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>semistriata</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>areolata</i> .....	:	+	:	:	:	:	:	:	:	:
— <i>latior</i> .....	:	+	:	:	:	:	:	:	:	:
— <i>multilineata</i> .....	:	+	:	:	:	:	:	:	:	:
— <i>carinata</i> .....	:	+	:	:	:	:	:	:	:	:
<i>Liostomia nitida</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>clavula</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>eburnea</i> .....	:	+	+	+	:	:	:	⊕	+	:
<i>Setia griegi</i> .....	:	:	:	:	:	+	:	:	:	:
<i>Onoba aculeus</i> .....	:	+	+	+	+	+	:	+	+	+
— <i>striata</i> .....	:	:	:	:	+	+	:	:	?	+
— <i>vitrea</i> .....	:	:	:	:	:	:	:	:	:	+
— <i>proxima</i> .....	:	:	:	:	+	⊕	:	:	:	+
— <i>costata</i> .....	:	:	:	:	:	:	:	:	:	+
<i>Alvania scrobiculata</i> .....	:	:	+	+	+	:	+	+	:	:





Table 2 (continued).

	Parry Islands, and Grinnel Land to Labrador	New Foundland to Cape Cod	W. Greenland	E. Greenland	N., and E. Iceland	S., W., and N.W. Iceland	Jan-Mayen	Spitzbergen	Norway N. of Lofoten	Norway S. of (and including) Lofoten
<i>Turbonilla rufa</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>scalaris</i> .....	..	..	..	..	..	..	..	..	..	++
— <i>indistincta</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>polita</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>nivea</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>interrupta</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>cascoensis</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Torellia vestita</i> .....	..	+	..	..	..	+	..	..	..	+
— <i>fimbriata</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Trichotropis borealis</i> .....	+	+	+	+	+	+	..	+	+	+
— <i>kroyeri</i> .....	..	..	..	..	..	..	..	+	..	..
— <i>conica</i> .....	+	+	+	+	+	⊕	+	..	+	..
— <i>tenuis</i> .....	+	..	+	+	+	..	..	..	..	..
<i>Capulus hungaricus</i> .....	..	..	..	..	..	⊕	..	..	+	+
<i>Crucibulum striatum</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Crepidula fornicata</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>glauca</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>plana</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Aporrhais pes pelecani</i> .....	..	..	..	..	..	+	..	..	?	+
— <i>occidentalis</i> .....	+	+	+	..	..	..	..	..	..	..
— <i>serrestiana</i> .....	..	..	..	..	..	+	..	..	..	+
<i>Amaura candida</i> .....	..	..	+	..	..	..	..	..	..	..
<i>Aerybia flava</i> .....	..	+	..	⊕	+	+	..	+	+	+
<i>Amauropsis islandica</i> .....	..	+	+	+	+	+	+	+	+	+
<i>Lunatia levicula</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>pallida</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>nitida</i> .....	..	..	..	..	..	+	..	..	..	+
— <i>montagui</i> .....	..	..	..	..	..	+	..	..	+	+
— <i>tenuistriata</i> .....	..	..	..	+	+	..	+	..	..	..
— <i>nana</i> .....	..	+	+	..	+	⊕	..	+	+	..
— <i>triseriata</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Natica immaculata</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>clausa</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>bathybi</i> .....	..	..	..	+	..	..	..	..	..	..
— <i>heros</i> .....	⊕	+	..	..	..	..	..	..	..	..
— <i>pusilla</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Capulacmaea radiatum</i> .....	+	..	+	+	..	..	..	+	+	..
<i>Velutina velutina</i> .....	+	+	+	+	+	+	+	+	+	+
— <i>undata</i> .....	+	+	+	+	+	..	+	+	+	+

Table 2 (continued).

	Parry Islands, and Grinnel Land to Labrador	New Foundland to Cape Cod	W. Greenland	E. Greenland	N., and E. Iceland	S., W., and NW. Iceland	Jan-Mayen	Spitzbergen	Norway N. of Lofoten	Norway S. of (and including) Lofoten
<i>Velutina plicatilis</i> (= <i>flexilis</i> )	..	+	+	+	..	+	..	+	+	+
— <i>lanigera</i>	..	..	+	..	+	..	..	+	+	+
— <i>insculpta</i>	..	..	..	..	..	..	..	+	..	..
<i>Onchidiopsis spitzbergensis</i>	..	..	..	..	..	..	..	+	..	..
— <i>carnea</i>	..	..	+	..	..	..	..	+	..	..
— <i>glacialis</i>	+	..	+	+	+	..	..	+	+	..
<i>Lamellaria perspicua</i>	+	..	..	..	..	+	..	..	..	+
<i>Marsenina glabra</i>	+	+	+	+	+	+	..	+	+	+
— <i>ampla</i>	..	+	..	..	..	..	..	..	..	..
<i>Trivia arctica</i>	..	..	..	..	..	..	..	..	..	+
<i>Trophon clathratus</i>	+	+	+	+	+	+	..	+	+	+
— <i>fabricii</i>	+	+	+	+	+	+	..	+	..	..
— <i>truncatus</i>	..	+	+	+	+	+	..	+	+	+
— <i>barvicensis</i>	..	..	..	..	..	+	..	..	+	+
— <i>clavatus</i>	..	..	..	..	..	..	..	..	..	+
<i>Urosalpinx cinerea</i>	..	+	..	..	..	..	..	..	..	..
<i>Nucella lapillus</i>	..	+	+	..	+	+	..	..	+	+
<i>Pyrene rosacea</i>	+	+	+	+	+	⊕	..	+	+	+
— <i>costulata</i>	..	+	..	..	..	⊕	..	..	+	+
— <i>lunata</i>	..	+	..	..	..	..	..	..	..	..
— <i>dissimilis</i>	..	+	..	..	..	..	..	..	..	..
<i>Pyrolofusus deformis</i>	..	..	..	..	..	..	..	+	..	..
<i>Volutopsis norvegica</i>	+	+	+	+	+	+	+	+	+	+
<i>Sipho hirsutus</i>	..	..	..	..	..	..	..	..	..	..
— <i>hanseni</i>	..	..	..	..	..	..	..	+	..	..
— <i>holbølli</i>	..	..	+	..	..	..	..	..	..	..
— <i>islandicus</i>	+	..	+	+	+	+	+	+	+	+
— <i>propinquus</i>	..	..	+	..	..	..	..	..	..	+
— <i>glaber</i>	..	..	..	..	..	+	..	..	+	+
— <i>turgidulus</i>	..	..	..	+	+	..	..	..	..	..
— <i>gracilis</i>	..	..	..	..	..	⊕	..	..	..	+
— <i>togatus</i> (incl. <i>S. eurtus</i> )	+	+	+	+	+	..	..	..	..	..
— <i>tortuosus</i>	+	..	+	+	+	+	+	+	+	+
— <i>dalli</i>	..	..	..	⊕	..	..	..	..	+	..
— <i>undulatus</i> (= <i>costiferus</i> )	..	+	⊕	..	..	+	..	+	..	..
— <i>lindahli</i>	..	..	⊕	..	..	..	..	..	..	..
— <i>lachesis</i>	+	..	+	+	+	..	..	+	+	..
— <i>kroyeri</i>	+	+	+	+	..	..	+	+	..	..
— <i>latericeus</i>	..	+	+	..	+	+	+	+	..	..





Table 2 (continued).

	Parry Islands, and Grinnel Land to Labrador	New Foundland and Cape Cod	W. Greenland	E. Greenland	N., and E. Iceland	S., W., and NW. Iceland	Jan-Mayen	Spitzbergen	Norway N. of Lofoten	Norway S. of (and including) Lofoten
<i>Bela simplex</i> .....	..	..	..	+	+	..	..	+	+	..
— <i>tenuicostata</i> .....	..	..	+	+	+	..	+	+	+	+
— <i>decussata</i> .....	+	+	+	+	..	+	+	+	..	⊕
— <i>pleurotomaria</i> .....	+	+	..	..	..	..	..	..	..	..
— <i>blaneyi</i> .....	..	+	..	..	..	..	..	..	..	..
— <i>tanneri</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Pleurotomella packardii</i> .....	..	+	..	..	..	..	..	..	..	..
<i>Raphitoma amoena</i> .....	..	..	+	+	..	..	+	+	+	..
— <i>anceps</i> .....	..	..	..	..	..	..	..	..	+	+
<i>Typhlomangelia nivalis</i> .....	..	..	..	..	..	+	..	..	+	+
<i>Mangelia striolata</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>attenuata</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>costata</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>brachystoma</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>nebula</i> .....	..	..	..	..	..	..	..	..	..	+
<i>Thesbia nana</i> .....	..	..	..	..	..	⊕	..	..	+	+
<i>Taranis morchi</i> .....	..	..	..	..	..	..	..	..	+	+
<i>Clathurella linearis</i> .....	..	..	..	..	..	+	..	..	+	+
— <i>purpurea</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>reticulata</i> .....	..	..	..	..	..	..	..	..	..	+
— <i>leufroyi</i> .....	..	..	..	..	..	..	..	..	..	+
	70 living sp. and 4 dead sp.	123 living sp.	97 living sp. and 4 dead sp.	79 living sp. and 5 dead sp.	76 living sp. and 7 dead sp.	84 living sp. and 24 dead sp.	46 living sp. and 1 dead sp.	93 living sp. and 5 dead sp.	133 living sp. and 3 dead sp.	186 living sp. and 3 dead sp.
	143 living and 1 dead sp. along the whole N.E. American coast N. of Cape Cod.		113 living and 6 dead sp. round the whole Greenlandic coast.		109 living and 23 dead sp. round whole Icelandic coast.				216 living and 5 dead sp. along the whole Norwegian coast.	

different they are from an ecologically point of view. Table II gives some hints in this direction. W. Greenland (Gulf Stream Area) has 97 species of prosobranchs, while E. Greenland (Polar Stream Area) has 79 species only. Still more striking is the comparison between the coast of Arctic America down to Cape Cod (washed by the Labrador Stream) with 143 sp. and the whole Norwegian coast (washed by the Gulf Stream) with 216 sp. To make this latter comparison complete, it seems to me, however, necessary to compare the N. E. American and the W. European coasts within the same space of latitudes. The East American coast area from the Parry Islands to Cape Cod have an extension from the high-arctic seas down to lat. 42° N., thus corresponding to a W. European coast stretch from the Murman coast and Arctic Norway down to and including the Bay of Biscay. When reckoning the number of prosobranchs from these two areas, the result will be:

NE. America Parry Islands to Cape Cod	E. Europe Murman coast and Arctic Norway to and including the Bay of Biscay
Literature: PACKARD (1867), PFEFFER (1866), BUSCH (1884), VERRIL (1880), GOULD & BINNEY (1870), JOHNSON (1915) DALL (1926), and new dates	Literature: FRIELE (1882-86), SARS (1878), ODHNER (1912-13), PETERSEN (1888), JEFFREYS (1865-67), Plymouth- fauna (1931), LOCARD (1886), NOBRE (1932).
143 living species	465 living species

The warm European coast has thus more than three times as many species as are known from the cold N. E. American coast. The East Greenland coast has a still more Arctic stamp than the American coast stretch in question; and, as to the prosobranch fauna, East Greenland must be regarded as one of the poorest coasts in the North Atlantic.

It seems reasonable to consider in detail the figures given above (p. 144) on the percentage of the total number of East Greenland species of prosobranchs found at W. Greenland, Spitzbergen, N. and E. Iceland, and Norway N. of Lofoten, and to undertake an analysis of the composition of each of the five East Greenlandic coast areas and the relation of their prosobranch fauna to the faunas of the four neighbouring areas in question.

The five columns of each group (in fig. 27) represent the five East Greenlandic coast stretches: Nordøstkyst Area, Franz Joseph Fjord Area, Scoresbysund Area, Kangerdlugssuak Area and Sydøstkyst Area,

and the ordinate indicates the percentage of the total number of species from each of these coast stretches found at W. Greenland (graph A), Spitzbergen (graph B), N. and E. Iceland (graph C), and Norway N. of Lofoten (graph D).

On comparing the graphs it clearly appears, that the area which

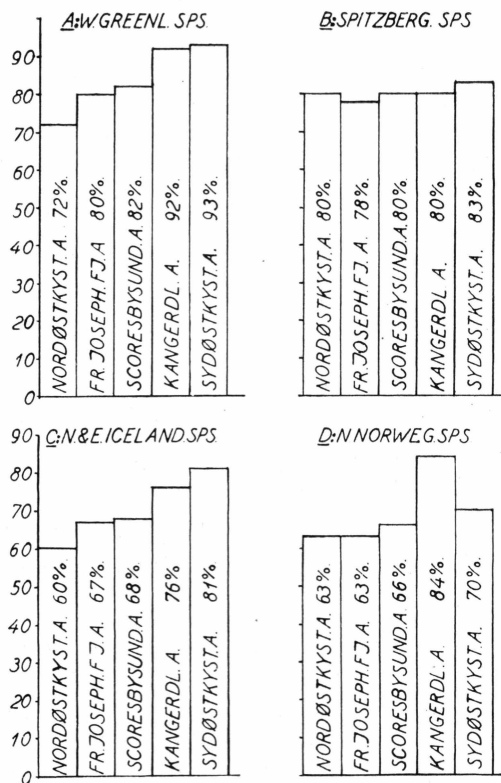


Fig. 27. Graphs showing the percentage of the total number of species from each of the five East Greenland coast areas found at: W. Greenland (graph A), at Spitzbergen (graph B), along N. and E. Iceland (graph C), and at Norway, North of Lofoten (graph D), (cf. the text p. 155—157).

shows the largest percentage of similarity with East Greenland is W. Greenland (graph A). This similarity is evident in both northern and southern areas, although with a distinct increase from 72 to 93 per cent. in the direction from N. to S. Again, the comparison with Spitzbergen (graph B) shows a rather close similarity; but, in contradistinction to the W. Greenland graphs, this similarity is almost equally close in all five East Greenland areas, viz. 78—83 per cent. The difference between the W. Greenland graphs and those from Spitzbergen may mainly be sought

in the "endemic" character of the high-arctic fauna element (cf. p. 141). In their main distribution the high-arctic species which form a significant element of the fauna in the three northernmost areas of East Greenland are restricted to the east-arctic area of the North Atlantic, e. g. they occur at Spitzbergen but not at W. Greenland. Such North-East Greenlandic areas which harbour these high-arctic species will accordingly deviate more from the W. Greenland fauna than the Sydøstkyst area, where this high-arctic "endemic" element is absent. Like East Greenland, Spitzbergen has northern areas with a high-arctic fauna and southern areas more or less influenced by warm currents, and accordingly comprises most of the fauna elements (including the east-arctic species) which dominate in all the five East Greenland coastal areas.

The relative zoogeographical composition of the fauna elements differs rather significantly from W. Greenland to East Greenland, but it agrees closely for East Greenland and Spitzbergen (cf. table 158).

The graphs illustrating the percentages of East Greenland prosobranchs found at N. and E. Iceland (graph C) and at Arctic Norway (graph D) deviate essentially from the graphs for Spitzbergen and W. Greenland. The percentages which connect East Greenland with Iceland and Norway are considerably smaller than those found for W. Greenland and Spitzbergen. The comparison with Iceland (graph C) shows clearly that the closest similarity, viz. 81 per cent., is found in the Sydøstkyst Area of East Greenland, a fact that is in good agreement with the more low-arctic-subarctic character of the N. and E. Icelandic fauna, while the East Greenlandic Nordøstkyst Area only has 60 per cent. in common with Iceland. Again, the connection between the East Greenlandic and the Arctic Norwegian fauna seems to be relatively small (63—70 per cent.), apart from the conditions in the Kangerdlugssuak Area, where 84 per cent. of the species recur at Norway. This latter figure, which at first seems rather surprising, is in reality in good agreement with the suggestions p. 140, that the Kangerdlugssuak Area with its "mixed" climate conditions excludes a couple of high-arctic and low-arctic species, the fauna thus mainly consisting of such resistant pan-arctic and cosmopolitan forms as are able to thrive along every coast in the Arctic-Atlantic sector, e. g. species which also will occur along the Norwegian Arctic coast.

The table p. 158 gives an analysis of the fauna elements within the prosobranch faunas of Arctic N. America, W. Greenland, E. Greenland, Spitzbergen, Arctic Norway, Iceland and Jan Mayen. For Iceland and W. Greenland a special analysis is included for such coastal areas, as agree most closely with the East Greenlandic conditions.

This table exhibits on several points the tendencies shown by the graphs in fig. 27. The faunas of Arctic America, W. Greenland, East

Locality	Arctic America (Parry Islands to and including Labrador)	W. Greenland			East Greenland Total	Spitzbergen Total	Jan Mayen Total	Arctic Norway Total	Iceland			
		W. Greenland Total	Julianaab area	Frederikshaab to Holsteinsborg					Iceland Area	North-Iceland	East-Iceland	
Number of living species known from the Area...	70	97	48	78	79	93	46	133	109	63	61	
Arctic element	Panarctic .....	48	42	52	38	50	47	50	24	27	35	41
	High-arctic .....	7	5	0	5	14	14	6 <sup>1</sup> / <sub>2</sub>	1	4	5	5
	Low-arctic .....	9	11	13	13	8	9	6 <sup>1</sup> / <sub>2</sub>	7	10	14	10
	Subarctic .....	9	7	4	10	3	6	4	12	5	3	3
	Panarctic-Boreal . American .....	6 0	5 1	6 0	5 0	6 1	6 0	9 0	5 0	4 1	6 <sup>1</sup> / <sub>2</sub> 1 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub> 0
Cosmopolitan....	15	15	15	17	15	12	15	13	14	19	20	
Southern element	Subarctic-Boreal .	1	3	4	2	1	1	0	2	5	3	1 <sup>1</sup> / <sub>2</sub>
	Lusitanian-Boreal	1	2	0	2	0	1	0	19	17	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>
	Boreal.....	0	1	0	0	0	0	0	6	4	0	0
Poorly known...	4	8	6	8	2	4	9	11	9	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>	
Total percentage.	100	100	100	100	100	100	100	100	100	100	100	
Total for Arctic element.....	79	70	75	71	82	82	76	49	50	63 <sup>1</sup> / <sub>2</sub>	65 <sup>1</sup> / <sub>2</sub>	
Total for southern element.....	2	6	4	4	1	2	0	27	26	9 <sup>1</sup> / <sub>2</sub>	8	

Greenland, Spitzbergen and Jan Mayen all show real Arctic features, the Arctic element forming: 79, 70, 82, 82, and 76 per cent. respectively of their total stocks of prosobranchs, while the faunas of Arctic Norway and Iceland with only 49 and 50 per cent. of Arctic species respectively are mutually very similar but belong to quite another category, in which the lusitanian-boreal element plays an essential part for all.

Interesting is the slight variation as to the percentages of panarctic and cosmopolitan species within the real Arctic areas. When the total faunas of Arctic N. E. America, W. Greenland, E. Greenland, Spitzbergen, and Jan Mayen are considered, the percentage of panarctic

species varies only between 42 and 50 per cent. of all species found, while the cosmopolitan species within the same areas represent from 12—15 per cent. Accordingly these two fauna elements—the panarctic, and the cosmopolitic—form the common denominator for all Arctic coasts of the North Atlantic.

The close similarity in the percentages of fauna elements between East Greenland and Spitzbergen in the table p. 158 is in good agreement with the graphs fig. 27.

In the discussion given above the prosobranch fauna of Jan Mayen has hitherto been neglected, in spite of the close proximity of this island to the East Greenland coast. The available records (BECHER 1886, FRIELE 1879, 1902, FRIELE & GRIEG 1901, HÄGG 1905, and ODHNER 1912, 1913, and 1915) comprise only 34 species of prosobranchs from Jan Mayen. The present author is, however, able to add twelve further species now in the Copenhagen Museum and collected by RYDER, NATHORST, SØREN JENSEN, and "Pourquoi pas", viz.

<i>Margarita olivacea,</i>	<i>Buccinum ciliatum,</i>
<i>Cingula mörchi,</i>	— <i>micropoma,</i>
— <i>arenaria,</i>	— <i>terrae novae,</i>
<i>Menestho albula,</i>	<i>Admete contabulata,</i>
<i>Sipho krøyeri,</i>	<i>Bela declivis</i> (living?),
— <i>latericeus,</i>	— <i>pingeli</i> (living?).

The complete list of Jan Mayen prosobranchs so far known is given in table II, p. 146. In spite of the 46 species of prosobranchs recorded here, the area in question seems still to be so deficiently examined that future investigations may add several species to the fauna. The relative comparison of the fauna elements for Jan Mayen given in the table p. 158 therefore seems hardly to be of the same value as those from the other well-examined coastal areas. The figures from the table p. 158, with 76 per cent. of arctic species and 0 per cent. belonging to a real southern element, of course provide a hint of the Arctic character of the fauna; but from the species actually found along Jan Mayen it proves possible to deduce a few facts, which show rather clearly the zoogeographical composition of the prosobranch fauna proper. Some of the species known from Jan Mayen are at East Greenland restricted to the Sydøstkyst Area, viz. *Buccinum glaciale*, *Buccinum groenlandicum*, *Buccinum terrae-novae*, *Buccinum finmarchianum*, and *Bela pingeli*, while other species, viz. *Sipho latericeus*, *Buccinum undulatum*, and *Littorina palliata* are unknown to East Greenland but occur on W. Greenland. Hence, it transpires that the Jan Mayen fauna of prosobranchs is less Arctic than that of any area of the East Greenland

coast, which, in good agreement with its "Atlantic" position, is less influenced by the Polar current than the East Greenland coast itself.

Summarizing the above discussion it may be emphasized that: The East Greenland prosobranch fauna ranges among the poorest and most high-arctic in the North Atlantic and in its composition is rather closely related to the faunas of Arctic East America, W. Greenland, and Spitzbergen, while it deviates considerably from the faunas of N. and E. Iceland and Arctic Norway. The composition of the East Greenlandic prosobranch fauna is very similar to that of Spitzbergen; both these areas have 82 per cent. of Arctic species and 1 and 2 per cent. respectively of southern species. The fauna of Arctic America, with 79 Arctic and 2 southern species, also corresponds very well to that of East Greenland. The W. Greenland fauna, however, which is the area outside East Greenland in which most of the East Greenlandic species recur, comprises furthermore a stock of southern species, which makes the total fauna less arctic than that of the neighbouring areas.

#### C. Vertical distribution of the prosobranchs along East Greenland.

To discuss the vertical distribution of the East Greenlandic prosobranchs is to analyse the influence of temperature and salinity on their occurrence. It seems therefore necessary to give a short summary of the hydrography along the East Greenland coast.

The total water mass along East Greenland is composed of three water layers viz. "Polar-current water", "Gulf Stream water", and "Fjord-water".

The Polar current runs along the whole coast in the direction from N. to S. It has constantly negative temperatures ( $0^{\circ}$  to  $-1.70^{\circ}$  C.), 32 to 34.7 per mille salinity, and along the three northernmost coast areas the layer has a thickness of 220 to 400 m in the large fjords as well as along the outer coast, where it extends as a 200 km broad belt from the shore eastwards into the Greenland Sea. From the Kangerdlugssuak Area southwards the layer decreases in thickness until off Lindenow's Fjord it is reduced to 40 m thickness and 11—12 km in breadth.

The Gulf Stream water runs parallel with and below the Polar current. It is formed by a mixture of polar current water with Atlantic water, has positive temperatures ( $0^{\circ}$  to  $3.5^{\circ}$  C.) and a higher salinity (34.7 to 34.95 per mille). This layer fills up the sea and most of the large fjords from the lower limit of the polar current water to the bottom. When along the southernmost parts of the coast the polar current layer decreases in thickness, the Gulf Stream water will accordingly increase.

The Fjord water layer is totally absent during the winter, but

dominates the surface along the whole coast during summer. It consists of a mixture of polar-current water with fresh water from the rivers and the melting ice. The slight salinity (less than 30 per mille) and accordingly the low specific gravity stabilize this water as a typical surface layer, which, heated by the sun, has positive temperatures of up to 12° C. in the innermost parts of the fjords down to 0° along the outer coast and in the transitional zone to the polar current. This water mass has normally its largest extent in the middle of August, when the highest temperatures are also reached. The thickness of the fjord-water layer varies considerably from place to place and, also somewhat from year to year.—The following data are available concerning the thickness of this water layer along the East Greenland coast (the data are from August measurements). The innermost and middle parts of Franz Joseph Fjord has a fjord-water layer of about 20 to 25 m thickness, while the corresponding layer in the inner parts of Scoresbysund is 10 to 15 m thick only. The thickness decreases towards the mouth of the fjords, being 10 to 15 m off Franz Joseph Fjord and off Scoresbysund about 10 m. (Hydrography of the fjords, see SPÄRCK 1933, THORSON 1933, USSING 1938). The outer coast shows the following features. In lat. 77° N. no surface layer is formed at all (TROLLE 1913, p. 317). At Danmarks Havn the surface layer is only 1 to 2 m thick (TROLLE l. c., pp. 332—33); off Gaël Hamke Bay it is 10 m thick (AMDRUP 1900, p. 347), S. of Bontekoe Ø 10 m thick (SPÄRCK 1933, p. 38), off Geographical Society Ø 10 m (last days of July) (RYDER 1895, p. 262), off the Blossville coast 10 m (RYDER 1895, p. 278), at Uttental Sund 10 to 15 m (BERTELSEN 1937, p. 10), in the Angmagssalik Fjord more than 25 m (ibid. p. 9), at Kutlek (69°30' N. Lat.) less than 5 m (late in June); off Lindenow's Fjord 10—25 m, and in the innermost part of this fjord up to 50 m (the three latter from THOMSEN 1935, pp. 104—106).

The hydrographical conditions summarized above involve that a couple of species which in the maps show a most absolute concordance as to their distribution in East Greenland may live under quite different ecological conditions, all according to the vertical zone in which they occur. This fact, which has already been pointed out by H. LEMCHE (1941, p. 36), for the Opisthobranchs is one of the main points enabling us to understand the zoogeographical conditions in East Greenland.

As the hydrographical conditions vary considerably from area to area, great caution must be observed before a species is "placed" in a special category as to temperature and depth in the present survey. It is necessary to control each single find of living animals of the species and to mobilize all data on hydrography in order to give a reliable picture of the ecological conditions. The large series of dredge-hauls from

different depths taken in small limited areas where the hydrographical features are known have been the main bases for this estimate, e. g. all the abundant number of samples from Ellaø, supplemented with the samples from Kap Hedlund, Hurry Fjord, and Uttental Sund. When only a few finds of a species are known from East Greenland, the possibility of faulty judgment must be regarded as so great that the species has been excluded from the classification given below.

The East Greenland species that occurred frequently enough to allow of a fairly safe valuation as to their vertical distribution and temperature requirements, may be divided into four groups, viz. 1) Species associated with the tidal zone; 2) Species associated with the Fjord-water layer (positive summer temperatures); 3) Species associated with the Polar-current water, and 4) Species associated with the Fjord-water layer as well as with the Polar current layer.

1) Species found in the tidal zone. Typical tidal zone prosobranchs seem to be totally absent in the four northernmost areas of the coast, including the two large fjord complexes. In these areas no prosobranchs will be met with normally at depths of less than 3 m. This fact has earlier been explained as being due to the ice-foot, which covers the tidal zone proper during eight to nine months of the year. In the large fjords animal life is, however, also poor just below the ice-foot down to 5 to 6 m depth, and as it has been observed that the surface water during spring time is almost entirely fresh (salinity 3—4 per mille at 3 m depth), it seems likely that the lack of a real tidal zone fauna in these areas is due partly to the ice-foot, partly to the effect of the melting water in the spring (cf. THORSON 1933, pp. 16—17, H. MADSEN 1936, pp. 45—46, and BERTELSEN 1937, p. 14).

Along the Sydøstkyst Area large fjords like those in the northern areas are lacking; the main parts of the areas are outer coasts, the water movement is much stronger, the temperature higher, the ice spreads and carries away before melting etc. The brackish water layer is thinner, the ice-foot will never reach the dimensions of northern areas. A detailed discussion on all these external factors in the tidal zone is given by HØLGER MADSEN (1936, pp. 44—51) who, however, summarizes his results in the remark "that it is not due to any of the special littoral factors that the littoral molluscs, *Balanus balanoides*, etc. have their northern limit in this place (viz. directly N. of Angmagssalik, author). The delimiting factor (or factors) must be sought in the sublittoral". Whatever the reasons may be, it is a fact that the coast stretch from Kap Farvel to N. of Angmagssalik is inhabited by three typical tidal-zone prosobranchs, viz. *Littorina saxatilis*, *Onoba aculeus*, and *Homalogyra atomus*, which all seem to crowd in the quite shallow water in large numbers. In the four northernmost areas of East Greenland all these

species are not only absent from the tidal-zone but totally absent from the fauna.

Species associated with the Fjord-water layer play an important part along the whole coast. They are few as to species but very numerous as to specimens. Such species are *Margarita groenlandica* and *M. helicina*, which dominate the *Fucus* vegetation along the coasts at smaller depths. Other species, which seem exclusively to live in water which in summer has positive temperatures, are: *Puncturella noachina*, *Cingula castanea*, *Trophon clathratus*, *Trophon fabricii*, and *Bela violacea*.—*Buccinum groenlandicum*, *Trophon truncatus*, and *Bela pyramidalis* seem to belong to the same category, but may now and then be found also in water with constantly negative temperatures. As regards all these species it is, however, a fact that the whole animal stock or part of the animal stock, which during the winter lives at negative temperatures, in the summer has the chance to spend one or two (three) months at higher temperatures. It is known that several of these species, viz. *Margarita helicina*, *Trophon fabricii*, *Buccinum groenlandicum*, *Bela violacea* and *Bela pyramidalis* spawn their eggs within these months (perhaps also outside?) with positive temperatures. The reproduction and the development of the embryos in these species have thus a chance to be accomplished under temperature conditions much less "arctic" than those to which the constant inhabitants of the Polar current water are exposed. And just these points: The reproduction and development of the embryos, have proved to be the most sensitive stages in the whole life-cycle of most marine animals. ORTON (1920) gives several striking examples on temperature as a limiting factor for both the ripening of the sexual products and the spawning of marine invertebrates. PELSENEER (1901, p. 288) and later on SVEN RUNNSTRÖM (1927, p. 40) have shown that the first cleaving stages of marine invertebrates are much more sensitive to extreme temperatures than are the older larvae and the adults. Hence it is very probable that several of the prosobranchs associated with the Fjord water layer in East Greenland would be able to vegetate as adults at negative temperatures the whole year round, while the positive temperatures during the few summer months are absolutely necessary to ripen their sexual products, to induce them to spawn and to secure a successful development of the first sensitive cleaving stages.—These circumstances allow us to explain why a low-arctic species like *Cingula castanea* is able to maintain a population in such high-arctic areas as Franz Joseph Fjord and Scoresbysund. *Cingula castanea* is the only low-arctic prosobranch which with certainty has been found living in the northernmost, high-arctic areas of East Greenland, but the species here is restricted only to the Fjord-water layer with its positive summer temperatures. The occurrence of the panarctic-

boreal *Margarita helicina* in high-arctic seas must probably be explained in a similar way. Among the species which reproduce in the fjord water layer are furthermore the only sub-arctic prosobranch of East Greenland, viz. *Trophon truncatus* and the low-arctic *Trophon fabricii*, while *Puncturella noachina* is cosmopolitan and *Margarita groenlandica*, *Buccinum groenlandicum*, *Trophon clathratus*, *Bela violacea*, and *Bela pyramidalis* have a pan-arctic distribution.

Species associated with the Polar-current water comprise a very significant contingent of the whole East Greenland prosobranch fauna. Examples are: *Scissurella crispata*, \**Acmaea rubella*, *Margarita vahlii*, *Velutina undata*, *Alvania wyville-thomsoni*, *Menestho truncatula*, *Menestho albula*, \**Trichotropis conica*, *Trichotropis bicarinata*, *Anomalosiphon altus*, \**Chrysodomus ossiani*, *Buccinum nivale*, \**Bela exarata*, *Bela trevelyana*, and \**Raphitoma amoena*. A few more species in the high-arctic, northernmost areas are exclusively found in the Polar-current layer, while in the Sydøstkyst area (especially Lindenow's Fjord) they may live at positive summer temperatures; but here too with their maximum occurrence in the negative layer. Such species are: *Lepeta coeca*, *Velutina velutina*, *Alvania jan-mayeni*, \**Siphon lachesis*, \**Neptunea despecta*, \**Admete viridula*, and \**Bela nobilis*. The nine species marked with an asterisk have in East Greenland been recorded as spawning their egg capsules and developing their embryos at negative temperatures, thus forming the direct contrast to the species of the fjord-water layer. While the inhabitants of the fjord-water layer had a contingent of low-arctic and sub-arctic forms, the fauna of the Polar-current layer contains five high-arctic species (*Margarita vahlii*, *Menestho truncatula*, *Trichotropis bicarinata*, *Anomalosiphon altus*, and *Buccinum nivale*), while the other forms restricted to this water layer are panarctic (11 species), cosmopolitan (4 species), panarctic-boreal (1 species, viz. *Lepeta coeca*), or deficiently known (1 species, viz. *Alvania wyville thomsoni*). The high-arctic *Lunatia tenuistriata* also has its main occurrence in the negative layer, with small outposts in the fjord-water layer, and the same is true of the panarctic *Siphon tortuosus*. Surprising is the fact that species such as *Lepeta coeca*, *Velutina velutina* and *Bela trevelyana*, which in the high-arctic parts of East Greenland are restricted exclusively to negative water layers, all occur commonly in boreal seas, thus for instance in Øresund, Denmark, at temperatures exceeding 10° C. It seems likely that such species in East Greenland belong to another "physiological race" than in boreal seas, a supposition which for *Velutina velutina* and *Bela trevelyana* seems to be strengthened by observations on differences in their mode of larval development from boreal to high-arctic seas. Nothing definite can, however, be stated at present.

Species associated with the fjord-water layer as well

as with the Polar-current layer. This group too comprises a rather large contingent of species, viz. \**Margarita cinerea*, *Margarita olivacea*, \**Natica clausa*, \**Natica pallida*, *Cingula arenaria*, \**Trichotropis borealis* (mostly in negative water), \**Sipho krøyeri*, \**Sipho islandicus*, \**Sipho curtus* (mostly in negative water), \**Volutopsis norwegica*, \**Buccinum hydrophanum*, \**Buccinum belcheri*, \**Buccinum ovum* (mostly in the fjord-water layer), \**Buccinum micropoma* (mostly in negative water), *Buccinum glaciale*, \**Bela simplex* (mostly in the fjord-water layer), and *Bela decussata* (mostly in fjord water). For thirteen out of these seventeen species (marked with an asterisk) egg capsules have been collected and data are available on the depths and temperatures at which spawning takes place. These spawning data show the following features: *Margarita cinerea*, *Natica clausa*, *Lunatia pallida*, *Sipho islandicus*, *Sipho curtus*, *Buccinum hydrophanum*, *Buccinum belcheri*, and *Buccinum micropoma* all seem to spawn in positive as well as negative water and are thus pronounced "ubiquists" as to depth and temperature. The egg capsules of *Sipho islandicus* and *Sipho curtus* are, however, much more numerous in the Polar-current layer than in the fjord-water layer, while those of *Buccinum belcheri* and *B. micropoma* dominate in the positive fjord-water layer. Finally, the egg capsules of *Trichotropis borealis* (3 finds), *Sipho krøyeri* (2 finds), *Volutopsis norwegica* (1 find), *Buccinum ovum* (several finds), and *Bela simplex* (several finds) are known only from positive water, while the parents may occur in negative water too. As to *Volutopsis norwegica*, all the four finds of living adult specimens in the three northernmost areas lie between 53 and 300 m, while the single fresh egg capsule was attached to a stone at a depth of 15—18 m (inner part of Hurry Fjord. Probably positive temperatures). The adults of *Trichotropis borealis* live chiefly in the negative water just below the fjord-water layer, but the egg capsules (three finds, all from Kap Hedlund) were taken at depths from 7 to 20 m, viz. at positive temperatures. Hence, there seems to be a tendency for several species to place their eggs at higher temperatures than those within which the parent animals have their optimum occurrence. The analysis below shows that the majority of the East Greenland prosobranchs have their optimum occurrence in the upper zone of the Polar-current layer directly below the fjord-water layer. For species living here it seems by no means out of the question that migrations to the lower stratum of the fjord-water layer may take place during the spawning time. Such migrations to more shallow water during the spawning season have been observed for several other marine invertebrates in other seas.

By far the greater majority of the species which live in positive as well as negative water layers are panarctic. The 17 species mentioned

above are thus distributed as follows: 11 panarctic species, 2 high-arctic species (which have their main occurrence in the negative water), 1 panarctic-boreal species (*Lunatia pallida*), and 3 cosmopolitan species.

As mentioned on p. 160, a "Gulf-stream layer" with positive temperatures occurs below the "Polar-current layer" down to the bottom. Within the large fjords and along the three northernmost areas the limit between these two layers lies at 220 to 400 m depth. As will be seen from the scheme below, only very few species in these areas seem to reach depths greater than 300 m (in spite of dredge hauls and trawlings down to 760 m depths), and among the few species which actually occur at depths greater than 300 m, viz. *Lepeta coeca* (350 m), *Margarita olivacea* (385), *Anomalosiphon altus* (450 m), *Siphon curtus* (760 m), and *Bela nobilis* (342 m) there are no new species but only impoverished outposts of the stock living in the Polar-current water.

The table below shows the number of species which occur at different depths along the five East Greenlandic coast areas. (The waved lines indicate the limit between Fjord water and Polar-current water).

Depth	Nordøst-kyst area	Frantz Joseph Fjord area	Scoresby-sund area	Kangerdlugssuak area	Sydøstkyst area
0— 5 m.....	2	4	12	3	15
5— 10 m.....	~ 12 ~	14	~ 22 ~	9	23
10— 20 m.....	17	~ 23 ~	31	~ 11 ~	26
20— 30 m.....	12	30	34	11	~ 31 ~?
30— 40 m.....	14	31	23	11	31
40— 50 m.....	11	24	19	10	~ 33 ~?
50—100 m.....	12	29	25	11	35
100—200 m.....	13	26	11	3	19
200—300 m.....	10	20	6	..	9
More than 300 m.....	1	2	2	..	9

The calculations used for the table are the following: When a species within an area is known with certainty in living specimens e. g. from 14 m, 38 m, and 167 m depth, it has been reckoned as one species for each of all depths between 10—20 m as the most shallow and 100—200 m as the deepest interval. A species, the most shallow find of which is a dredge-haul from e. g. 23—35 m depth, and which is known from series of other hauls at greater depths, is reckoned, only from the deepest figures in the dredge haul and accordingly placed in the 30—40 m interval (not in 20—30 m). A species of which the deepest find is a dredge-haul from e. g. 90—120 m and which is known from a couple of samples from smaller depths, is only reckoned from the smallest figure and

therefore placed in the 50—100 m interval (not in the 100—200 m interval); The wave lines in the table show the approximate limit between the fjord-water layer and the Polar-water layer in each single area.

When examining in detail the figures in the table, it seems justifiable at first to ignore the 0—5 m interval, because it is known that quite local phenomena, such as brackish water, ice-foot, or a hard swell may alter the picture essentially at such small depths. Let us first take the three northern high-arctic areas, the fauna of which shows so many common features. In all three areas it is quite evident that the largest number of species live in the uppermost layer of the negative Polar-water just below the summer-positive fjord-water layer. It is a well known fact that the production of organic matter, viz. Phyto- and Zooplankton, algae and bottom invertebrates decreases considerably from the surface and the shallow water towards the greater depths. Hence it may be supposed that the demand for nourishment of the East Greenland prosobranchs will be fulfilled better, the closer the animals are situated to the food-producing zones. This supposition comprises all kinds of prosobranchs, "grassers", plankton, plant, and clay feeders as well as carnivora. Their "crowding" just below the fjord-water layer must accordingly be explained as a compromise between their demand for sufficient nourishment and a suitable temperature. A very striking example of this "crowding" is given by the lamellibranch *Pecten groenlandicus* (cf. THORSON 1936, pp. 112—114, fig. 28). Several experiments on its oxygen consumption have shown that the requirements of this species at temperatures over  $-1^{\circ}$  to  $0^{\circ}$  C. cannot after all be satisfied under the conditions of nutrition prevailing in Northeast Greenland. As, however, just this species proper has a heavy food requirement also at a negative temperature it "crowds" in huge numbers at 25 to 50 m depth (Ellaø), e. g. the depth with constantly negative temperatures which is nearest to the food-producing surface layer.

The apparent increase in the number of species in the interval from 50—100 m, and 100—200 m, as compared with the numbers at 40—50 m depth must after all be explained by the fact that the intervals in the table at depths exceeding 50 m are larger and accordingly comprise more dredge hauls than the single 10 m interval at depths smaller than 50 m.

When comparing the figures from the three northernmost coast areas with those from the Kangerdlugssuak area, the difference is striking. The number of species per interval at Kangerdlugssuak is small, which must be explained partly by somewhat less all-round collecting in this area than in the other four, but essentially by the absence of both the high-arctic and the southern fauna elements (cf. p. 140). This explanation is heavily supported by the figures in the table p. 166. It will

be seen that the number of species occurring below and above the limit between fjord-water and Polar water is practically the same. The same stock of species occurs in both water masses here, viz. the most robust stock of the East Greenland prosobranchs able to endure large variations in temperature. The pronounced positive element which dominates the smaller depths in the Sydøstkyst Area is still absent at Kangerdlugssuak.

Quite different furthermore are the conditions in the Sydøstkyst Area, and the table must here be used with somewhat more caution than in the four other areas, as the limit for the fjord-water varies rather much from Angmagssalik over the mouth of Lindenow's Fjord to the interior part of Lindenow's Fjord. Again, the thickness of the Polar-current layer varies greatly along the coast proper. It is, evident, however, that the number of species living in the positive shallow water layer (less than 20 m depth) is very large. This stock is here augmented partly by southern species and partly by species living at negative temperatures along the northernmost areas but having a positive occurrence in the S. The large number of species within the intervals from 20 to 100 m means not (as along the N. E. areas) a crowding of species below the fjord-water layer but a combined figure for fjord-water species and polar-water species. Thus in Lindenow's Fjord, the fjord water layer is only 10—15 m thick off the mouth, while in the innermost part it has a thickness of about 50 m (THOMSEN 1937, p. 108, plan I). The intervals from 20 to at least 50 m thus comprise both polar-current species and fjord-water species, while the water column from 50 m and deeper may comprise Polar-current water (innermost part of Lindenow's Fjord, and off Angmagssalik) or "Gulf-stream water (below the Polar current water) (off the mouth of Lindenow's Fjord).

A characteristic feature within the vertical distribution of East Greenland prosobranchs is also the fact that 27 species, e. g. 34 per cent of all East Greenlandic prosobranchs seem in East Greenland to be recorded from smaller depths than in any other place within their area of distribution. It must be kept in mind, however, that it is very difficult from records in the literature to decide the exact depth at which a species has been taken. When a species is recorded from a dredge-haul e. g. from "7 to 28 m", it is impossible to decide the exact depth and incorrect to state that this species occurs at depths as shallow as 7 m. Hence it may be that some of the species mentioned below were found at just as small depths outside East Greenland as in the area proper. Here the smallest depths for such living specimens at East Greenland will be reckoned (with the finding place between brackets), and it is left to future investigators to control the other North Atlantic areas in a similar way. *Acmaea rubella* 4 m (Kap Tordenskjold); *Margarita olivacea*

5 m (Turner Sund); *Amauropsis islandica* 10—13 m (Kap Hope); *Lunatia tenuistriata* 6—9 m (Sabine Ø); *Alvania jan-mayeni* 5—8 m (Hurry Fjord); *Alvania scrobiculata* 22 m (Ellaø); *Cingula castanea* 4 m (Hurry Fjord, Eskimonæs); *Cingula arenaria* 4 m (Lindenow's Fjord); *Menestho albula* 10—13 m (Kap Hope); *Liostomia eburnea* 5 $\frac{1}{2}$ —9 $\frac{1}{2}$  m (Sabine Ø); *Turritellopsis acicula* 18—21 m (S. of Lille Pendulum Ø); *Trichotropis borealis* 5 $\frac{1}{2}$  m (Turner Sund); *Trichotropis conica* 20—25 m (Uttental Sund); *Sipho lachesis* 30 m (Jameson Land); *Sipho tortuosus* 5 $\frac{1}{2}$ —11 m (Hekla Havn); *Sipho islandicus* 5—7 m (Angmagssalik); *Sipho curtus* 12 m (Ellaø); *Chryso-domus ossiani* 23—28 m (Kap Hedlund); *Volutopsis norvegica* 15—18 m (Fame Øer); *Buccinum belcheri* 5 m (Kangerdlugs-suak); *Buccinum ovum* 6—9 m (Hurry Fjord); *Buccinum micropoma* 3—4 m (Amdrup Havn); *Buccinum finmarchianum* 5—8 m (Naparssarsuak); *Trophon fabricii* 6—8 m (Tasiusak); *Bela violacea* 0—4 m (Danmarks Havn); *Bela simplex* 3 $\frac{1}{2}$ —4 $\frac{1}{2}$  m (Hurry Fjord); *Bela decussata* 3 $\frac{1}{2}$ —4 m (Miki's Fjord).

It is a well known fact that several Arctic prosobranchs live in shallow water in the most high-arctic part of their area of distribution, and that they occur deeper and deeper the more southwards they live. A typical illustration of this was given by a comparison of the vertical distribution of the 59 prosobranch-species common to N. and E. Iceland and Spitzbergen (THORSON 1941, p. 127). At N. and E. Iceland 11 of these (= 18.6 %) occur at depths of less than 10 m, while at Spitzbergen 28 species of the same group (= 47.6 %) occur inside the 10 m contour. When Arctic species occur in quite shallow water, it must be a sign that the area in question is high-arctic, and the large number of East Greenland prosobranchs found in more shallow water confirms the assertion on p. 159 that the East Greenland prosobranch fauna is among the most high-arctic in the North-Atlantic. Out of the 27 species mentioned above 18 are pan-arctic, 4 high-arctic, and 2 cosmopolitan, while 3 are low-arctic, e. g. 24 of the 27 species are in the Arctic more or less associated with negative temperatures. It will be seen that nearly all the localities from which the most shallow finds originate are situated along the outer coast or in the outer parts of the fjords, e. g. in those areas where the fjord-water layer has its smallest extent and in which the Polar-current layer accordingly is nearest to the surface. This constantly negative water at small depths will no doubt be more pronounced along East Greenland, which is directly washed by the East-Greenland current, than at Spitzbergen, where the influence of the Gulfstream is also traceable in the surface.

## 2. Ecological Remarks.

### A. Distribution of East Greenlandic prosobranchs within the animal communities.

During the last ten years about 500 samples have been taken with the Petersen grab within the area from Clavering Ø in the N. to (and including) Scoresbysund in the S. To this may further be added about 340 dredge-hauls. Hence, the animal communities in these areas—especially in the large fjords—are better known than in any other coast stretch at Greenland (cf. SPÄRCK 1933, THORSON 1933 and 1934). BERTELSEN (1937) has worked up the animal-communities at Kangerdlugssuak and Angmagssalik, mainly on the basis of dredge-hauls, and found for the areas proper fairly close agreement to the conditions known for Franz Joseph Fjord and Scoresbysund. Furthermore, HOLGER MADSEN (1936) gives the outlines for the East Greenlandic tidal-zone communities.

On the basis of this rather extensive literature, which has not been cited under "East Greenland records" for each single species, it seems possible to sketch in rough outlines the ecology of the East Greenland prosobranchs.

#### Infauna-prosobranchs.

The communities of the level sea-bottom known from East Greenland comprise: 1) The *Macoma-calcaria* community (4—45 m, clay-bottom); 2) The *Arca-Astarte-crenata* community (40—550 m; clay bottom); 3) The *Foraminifera* community (50—780 m, clay bottom), and 4) The *Venus-fluctuosa* community (9—20 m, sand bottom).

The *Macoma* community may be divided into four or five zones, which, however, are of slight value as far as the prosobranchs are concerned, the same species of which seem to occur within all zones of the community. The type-prosobranch here is *Lunatia pallida*, probably the principal enemy of the lamellibranchs at these depths. Other species commonly met with are: *Bela violacea* (in THORSON's lists from 1933—34 partly mentioned as *Bela tenuistriata*), *Bela pyramidalis*, *Bela trevelyana*, *Trichotropis borealis*, *Velutina velutina*, *Rissoa jan-mayeni*, and *Moelleria costulata*. Also *Buccinum hydrophanum* is frequently met with, but this species seems to be frequent in the epifauna as well. As will be seen, the carnivorous species dominate (*Natica*, *Bela Buccinum*), and—taken as a whole—form the overwhelming element among all East Greenlandic prosobranchs (see pp. 173—175).

In the *Arca-Astarte-crenata* community this tendency is still more clear. *Lunatia pallida* is frequent here too, and the same is the case with *Buccinum hydrophanum*. A new element of great significance in these depths is the species of *Sipho*, the dominants being *S. curtus* and *S. is-*

*landicus*: large carnivorous species which occur in abundance, and the shells of which form the substratum almost the only one for Hydroids, Bryozoans and Actinians (especially *Allantactis parasitica*). These large *Sipho*'s, which are able to crawl rather quickly, will no doubt be a weighty factor as consumers in this poorly populated community (The only non-carnivorous prosobranch commonly met with here is *Alvania jan-mayeni*).

The *Foraminifera* community is poor in prosobranchs; the *Sipho* species alone seem to occur regularly, but sparsely.

The *Venus* community, associated with sandy bottom in shallow water near the outer coasts, shows features quite other than the clay bottom communities described above. Dominants here are: *Bela simplex* (as *Bela violacea* in THORSON 1934), *Bela exarata*, *Lunatia pallida*, *Buccinum micropoma* and *Buccinum ovum*. Here again the only non-carnivorous species normally met with is *Alvania jan-mayeni*.

Quantitatively, the prosobranchs are of slight significance only on the level bottom of the East Greenlandic seas. They are greatly exceeded in weight as well as in number by Lamellibranchs, Polychaetes and Echinoderms. As to the large species of *Buccinum* and *Sipho*, their density on the bottom is so sparse and scattered, that they will not be represented in the majority of the samples taken with the Petersen grab. But, vagabonds as they are, they will search for food over wide areas of the bottom and no doubt play a greater part as an infauna element than is evident from the quantitative lists available.

#### Epifauna-prosobranchs.

The epifauna communities have been separated into two different categories, viz. 1) The epifauna of the vegetation and 2) the epifauna of the sea-bottom. The latter category, viz. the *Saxicava* epifauna and the *Ascidia* epifauna, contains no prosobranchs at all and will not be dealt with here. The epifauna of the vegetation has at Ellæ been separated into a *Desmarestia* epifauna associated with the "*Desmarestia* meadows" on the clay-bottom in shallow water (similar to the boreal *Zostera* meadows) and a *Fucus* epifauna associated with *Fucus* and *Laminaria*, which cover the stone reefs in shallow water along the coasts. The third type, finally, the Red Algae epifauna, is associated with red algae, *Lithothamnion* and stones at somewhat greater depths (THORSON 1933, pp. 67—68, SPÄRCK 1933, pp. 31—32). The later examination of the animal-communities in Scoresbysund (THORSON 1934, pp. 54—55) and Kangerdlugssuak (BERTELSEN 1937, p. 34 to 43) has shown that the *Desmarestia*-, and the *Fucus*-epifauna often are confluent, and so are their prosobranch fauna's. The type animal is *Margarita groenlandica*, which

in vegetations where the epifauna is at its height, may occur in hundreds or even thousands of specimens per sp. m. Also *Margarita helicina* occurs in numbers especially on *Fucus* along the outer coasts, and *Margarita cinerea*, although less common, is also a type animal for this epifauna. The *Margarita* species are in the arctic shallow watered algal zones what *Littorina*, *Lacuna*, and partly *Rissoa* are in the boreal *Zostera*-, and *Fucus* vegetations. Here too *Buccinum hydrophanum* is commonly met with.

The red algae epifauna has as typical prosobranchs *Buccinum belcheri* and (in the S.) *Buccinum groenlandicum*. The stones or rocks to which the red algae adhere are often covered with crusts of *Lithothamnion*, among which the Arctic Patellids *Lepeta coeca* and *Acmaea rubella* have their main occurrence. Also in the red algae epifauna *Buccinum hydrophanum* is a common animal, while the *Sipho* species mainly seem to inhabit the level sea bottom.

The epifauna of the tidal zone along the Sydøstkyst, viz. *Littorina saxatilis*, *Onoba aculeus* and *Homalogyra atomus* has already been mentioned on p. 162.

#### B. Enemies.

The enemies, e. g. the animals which use prosobranchs as food, may in East Greenland be divided into three elements, viz. the fishes, the birds (especially the ducks), and the mammals (walrus and bearded seal).

The fishes at Iceland play a most essential part as consumers of prosobranchs. Thus, no fewer than 21 species of prosobranchs are known from fish-stomachs (THORSON 1941, p. 130). In East Greenland the fishes seem to play only a very insignificant part as consumers of prosobranchs. Iceland is rich in fishes, East Greenland very poor both in species and in specimens. Most frequent along the whole coast are *Cottus scorpius*, *Cottus quadricornis*, *Gadus saida*, and *Salmo alpinus*. Observations from the "Danmark Expedition" have proved that the stomachs of all these four species contained Amphipods, Mysids, Calanids, and Chaetopods, but not a single mollusk (FRITZ JOHANSEN 1912). Specimens of *Cottus scorpius* and *Cottus quadricornis* examined in Arctic America, however, had in their stomachs specimens of *Margarita* and *Acmaea*, and of *Cylichna* respectively (DALL 1919). The species in question may thus also eat prosobranchs. The only prosobranch known at East Greenland from a fish stomach, viz. *Buccinum groenlandicum*, was found in a Greenland shark (*Somniosus microcephalus*) at Angmagssalik. As such sharks are rather common even in the large fjords, they will probably be of some importance as enemies to the prosobranchs. During the warmer climatic conditions prevailing in the Arctic in the years round 1930 several animals occurred along the Greenland coasts which normally

are absent from these latitudes. Thus, the common cod (*Gadus callarias*) occurred in numbers off S.E. Greenland and Jan Mayen. At certain times and certain localities this species is known to feed partially or exclusively on mollusca. Prof. AD. S. JENSEN has kindly informed me that a stock of cod from Amituasuk at Frederikshaab district, W. Greenland (captured 11.—16.7.1909) contained i. a. *Littorina*, *Lacuna*, *Buccinum* and "small gastropoda sp." in their stomachs. They will accordingly be enemies also to the East Greenlandic prosobranchs. Taken as a whole, however, it may be stated that the fishes are of slight significance as consumers of prosobranchs in East Greenland.

The birds, especially the ducks, use prosobranchs as a main element in their food. In our material are two finds of *Margarita cinerea*, two finds of *Lunatia tenuistriata* and a single find of *Buccinum ovum*, all from stomachs of eider-ducks in East Greenland. The species of prosobranchs eaten, as well as the biology of the eider-ducks in question, prove that only the fauna in rather shallow water is used as food by the ducks, and as these birds furthermore are absent from the Greenland areas during eight or nine months of the year, their significance as consumers is hardly large.

The third element, which probably must be regarded as the main consumer of the East Greenlandic prosobranch fauna consists of walruses (*Trichechus rosmarus*) and bearded seal (*Erignathus barbatus*). Their food is known to be mollusca and crustacea, which they collect on the bottom and crush with their rugged grinders. No observations are known from East Greenland, but in stomachs of *Erignathus barbatus* from Arctic America have been found: *Margarita helicina*, *Margarita* sp. *Buccinum* sp., and large clusters of eggs of *Buccinum* and other prosobranchs (DALL 1919).

At Iceland it was often found that prosobranchs had been attacked, bored and eaten by *Natica*. At Iceland this was recorded for *Lunatia pallida* (1 find); *Lunatia tenuistriata* (1 find); *Trophon clathratus* (several finds); *Trophon truncatus* (several finds); *Metzgeria pusilla* (6 finds); *Volutomitra groenlandica* (1 find); *Bela pyramidalis* (several finds); and *Bela pingeli* (1 find) (THORSON 1941). In the huge East Greenland collections of prosobranchs not a single find is known in which a prosobranch shell has been bored by a *Natica*. It is known, however, that the newly laid egg capsules of *Sipho curtus* and *Sipho islandicus* in East Greenland often are bored by *Natica* and emptied of their content of nurse eggs and young, and the same is probably the case with the egg clusters of *Buccinum* (THORSON 1935, p. 12 and 17).

### C. Feeding habits and nutrition:

According to the summary given by ANKEL (1938) on the feeding habits and nutrition of the prosobranchs, it seems possible roughly to classify the prosobranchs into the following groups (the East Greenlandic genera belonging to each of them are given in brackets):

1) Carnivora. (*Amauropsis*, *Lunatia*, *Natica*, *Velutina*, *Marsenina*, *Onchidiopsis*, *Trophon*, *Sipho*, *Chrysodomus*, *Volutopsis*, *Neptunea*, *Buccinum*, *Bela*, and *Raphitoma*).

2. "Grassers" ("Weidegänger" of ANKEL). (*Acmaea*, *Lepeta*, *Margarita*, *Solariella*, *Littorina*, *Onoba*, *Homalogyra*).

3) Plankton-feeders. (*Turritella*).

4) Commensals, semi-commensals, and parasites: (*Entocolax*).

5) Plant-feeders. Unknown from East Greenland (Examples are *Lacuna* and *Helcion*).

6) Clay-feeders. (*Turritella*?, which here will be treated as a plankton-feeder).

Moreover, the N.E. Greenland prosobranch-fauna contains several genera, the mode of feeding and the nourishment of which are still unknown, viz. *Scissurella*, *Puncturella*, *Moelleria*, *Cyclostrema*, *Capulacmaea*, *Alvania*, *Cingula*, *Menestho*, *Liostomia*, *Turritellopsis*, *Trichotropis*, *Admete*, *Volutomitra*, and *Pyrene*.

The genera whose feeding habits are known, comprise 56 species of the 79 species known living from East Greenland. The relative distribution of these 56 species is:

Carnivora . . . . .	43	species	=	76½	per cent.
Grassers . . . . .	11	—	=	20	- - .
Plankton-feeders	2	—	=	3½	- - .

The carnivora thus form about three-fourths of all East Greenlandic species, but it is possible that this figure is somewhat too high, as the genera unknown as to feeding habits may possibly comprise a couple of "grassers" (*Alvania*? *Cingula*?, *Moelleria*?). Other genera within these unknown groups will, however, probably feed on animal food (*Admete*?, *Pyrene*?, *Trichotropis*??, *Volutomitra*??) and, according to these suggestions, it seems likely that the percentage given above for carnivora is of a correct magnitude. As was to be expected, the "grassers" will inhabit the shallow water areas, while the carnivorous forms are absolute dominants at greater depths.

Already when working up the prosobranchs of Iceland (THORSON 1941, pp. 131—133, fig. 14) the increasing number of carnivora from S. towards N. and E. was pointed out and figured in a graph, with East

Greenland as the northernmost point. Our recent, much more exhaustive knowledge of the East Greenland prosobranch fauna has confirmed the outlines given in 1941.

A tendency which was already distinct among the Icelandic prosobranchs and which also reaches its summit in East Greenland, is the decreasing number of commensals and semi-commensals from boreal seas towards the N., where they are totally absent from East Iceland and East Greenland (THORSON 1941, pp. 132—33). Genera such as *Odostomia*, *Brachystomia*, *Chemnitzia*, *Eulimella* etc. seem to be quite unknown in the whole Arctic area. A striking example of this is *Pelseneeria stylifera*, living in boreal seas on the species *Strongylocentrotus droebachiensis* and here met with rather commonly. At East Greenland *Strongylocentrotus droebachiensis* is among the most common echinoderms, often covering the rocks in thousands at a depth of 5 to 10 m. At Ellø hundreds of these animals were captured and examined as to *Pelseneeria*, but in vain. Probably the absence of this species in spite of the abundance of its host must be connected with its ectoparasitism and its pelagic larval stage (LEBOUR 1932, ANKEL 1938). Only the entoparasitic *Entocolax ludwigi*, associated with the high-arctic host *Myriotrochus rinki*, and with a non-pelagic or very shortened development, is at home in East Greenlandic waters.

#### D. Reproduction and larval development.

In the present day the egg capsules and larval development are known for 37 East Greenlandic prosobranchs, which use the following types of reproduction (in species marked by an asterisk the development is known from East Greenland while the development of the other species is known from other Arctic localities.

1) Eggs with a small amount of yolk and with primitive pelagic larval stages. This method of reproduction is unknown from East Greenland.

2) Eggs with a small amount of yolk laid in larger or smaller coherent masses. Only a few of the eggs in each mass develop, and use the undeveloped eggs (nurse eggs) for food. The larvae may:

A. Pass through a short pelagic stage. Unknown from East Greenland, or

B. Hatch in the crawling stage, viz. by *\*Sipho lachsis*, *Sipho tortuosus*, *\*Sipho islandicus*, *\*Sipho curtus*, *\*Parasipho krøyeri*, *\*Chrysodomus ossiani*, *\*Volutopsis norwegia*, *\*Neptunea despecta*, *\*Buccinum hydrophanum*, *\*Buccinum belcheri*, *\*Buccinum groenlandicum*, *\*Buccinum ovum*, *\*Buccinum micropoma*, *Buccinum glaciale*, *Buccinum finmarchianum*, and *Buccinum terrae novae*.

3) Eggs with a large amount of yolk which develop directly into a free-living bottom stage or possibly with a very shortened pelagic stage, viz. \**Margarita groenlandica*, \**Margarita helicina*, \**Margarita cinerea*, \**Onoba aculeus*, \**Trichotropis borealis*, \**Trichotropis conica*, \**Trophon clathratus*, \**Trophon fabricii*, \**Admete viridula*, \**Bela violacea*, \**Bela pyramidalis*, \**Bela exarata*, \**Bela simplex*, \**Bela nobilis*, \**Raphitoma amoena*, and \**Pyrene rosacea*.

4) Eggs with a considerable amount of yolk surrounded by a white-like substance, which is devoured by the embryo. The young hatch in the crawling stage, viz. \**Amauropsis islandica*, \**Lunatia pallida*, and \**Natica clausa*.

5) Eggs developed inside the body of the mother animal, either in the pallial cavity (internal brood-protection) or directly in the ovary or the oviduct (viviparity). The larvae may:

A. Pass through a pelagic stage. Unknown from East Greenland, or

B. Hatch in the crawling stage, viz. by \**Acmae rubella* and \**Littorina saxatilis*.

Besides the 37 species mentioned here, a comparison of apices has shown that *Solariella obscura* (cf. p. 29), and *Lunatia tenuistriata* (p. 153), in all probability have a non-pelagic development in East Greenland. Thus, for 39 East Greenlandic species, e. g. 49 per cent. of the whole stock of living East Greenlandic prosobranch species, it is known that the young hatch in the crawling stage without the slightest trace of a pelagic life.

The other 51 per cent. of the species are unknown as to their mode of reproduction, but 10 to 70 plankton-hauls (vertical hauls from bottom to surface at Ellaø, Franz Joseph Fjord (gauze No. 12))—were taken for each month throughout the year, and the plankton was examined alive immediately after having been collected, but proved to be absolutely free from larvae of prosobranchs. Hence, not a single observation of a pelagic larval development is known among East Greenlandic prosobranchs.

Two species of prosobranchs occurring at East Greenland are, however, in boreal seas known to reproduce by pelagic larvae, viz. *Velutina velutina*, and *Bela trevelyana*. The larva of *Velutina velutina* (LEBOUR 1937, and refound several times in Øresund, Denmark) is an *Echinospira* larva especially fitted for a long pelagic life. As the adult species is rather abundant at Ellaø in Franz Joseph Fjord, from where the plankton-series are available, and as a larva so characteristic has hardly been overlooked in the samples, it seems likely that the larval development of this species in East Greenland is another than in boreal

seas,—a conjecture which is supported by the shape and size of the embryonic whorls of East Greenlandic specimens. The hitherto unpublished pelagic larva of *Bela trevelyana*, well known from Danish seas, is most characteristic: A large shell with a coarse structure, a jelly-like, thick, bilobed velum with warts and with a broad purplish band of pigment along the margin. Such a larva, if captured in East Greenland, would have been easily perceptible among the plankton, but has never

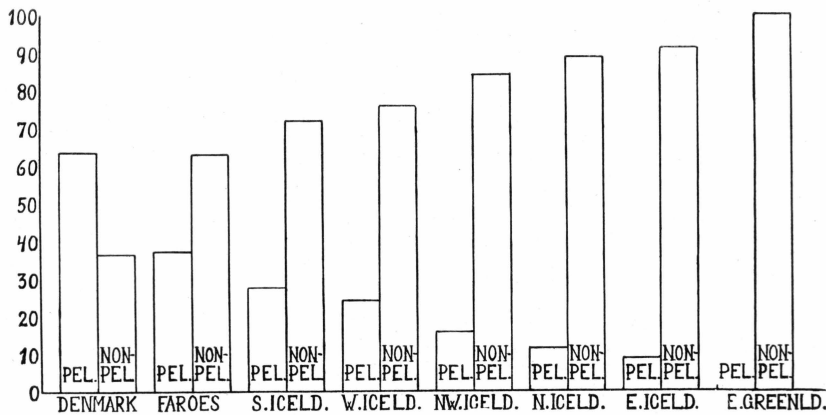


Fig. 28. Graphs showing the relative distribution of species with a pelagic and those with a non-pelagic larval development within the prosobranch faunas of Denmark, the Faroes, South Iceland, W. Iceland, Northwest Iceland, North Iceland, East Iceland, and East Greenland (from THORSON 1941, p. 135, fig. 15).

been seen in spite of the adults occurring in the locality. In Danish waters too, however, only very large larvae are known, viz. larvae which probably have a short pelagic life only, and it therefore seems likely that the pelagic development in East Greenland is quite suppressed.

In the Iceland Zoology a series of graphs was given showing the relative proportions between species with a pelagic and those with a non-pelagic larval development within the prosobranch-faunas of Denmark, the Faroes, Iceland and N.E. Greenland (THORSON 1941, p. 135, fig. 15). The exhaustive observations now available as to the East Greenland prosobranchs have not in the slightest degree altered the result given in that paper, and as the graphs are very instructive as to the equal transition from pelagic to non-pelagic development when moving from boreal towards high-arctic areas, it will be republished in the present paper (fig. 28).

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