

MEDDELELSER OM GRØNLAND

UDGIVNE AF

KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND

Bd. 100 · Nr. 2.

TREÅRSEXPEDITIONEN TIL CHRISTIAN DEN X's LAND 1931-34

UNDER LEDELSE AF LAUGE KOCH

INVESTIGATIONS ON SHALLOW WATER
ANIMAL COMMUNITIES IN THE FRANZ
JOSEPH FJORD (EAST GREENLAND) AND
ADJACENT WATERS

BY

G U N N A R T H O R S O N

WITH 4 FIGURES IN THE TEXT AND 3 PLATES

KØBENHAVN

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1933

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I. INTRODUCTION

The material which forms the basis of this treatise was collected in the area of Franz Joseph Fjord, East Greenland, in the period from August, 1931, to August, 1932, and thus represents two consecutive years, so that the erection of the animal communities is not based on the observations of one single summer. The actual shallow water investigation comprises 150 bottom samples secured by means of the $\frac{1}{10}$ square metre Petersen grab in the Solitærbugt, Ella Island, and in Carl Jacobsen Bay, Ymer Island. All the samples were taken from a motorboat in September, 1931. Further, 242 dredge-hauls were made on shallow water partly in the Solitærbugt, Ella Island, and partly at Cape Hedlund in Kempe Fjord. The dredge hauls were made partly in September and October, 1931, partly in May, June, July, and August, 1932. In addition to the purely quantitative investigation the collections through this long space of time naturally afforded good opportunities for making observations on the growth and reproduction of the bottom invertebrates. These subjects will be dealt with in greater detail in a subsequent paper. Further, the "Godthaab", in the summer of 1932, took some samples with the Petersen grab and dredgings on shallow water in several places within this fjord complex, and this material, too, has been used.

Without the great help I have received from various quarters it would have been impossible for me to publish the results at this time. I am especially indebted to the radio operator of the Ella Island Radio-station, Mr. DE LEMOS, for his invaluable assistance during the numerous repairs made on the motorboat, and to the geodesists of the same station, mag. scient. SIMONSEN and Mr. STENØR, for much good advice and help in measuring the bathymetrical curves. My thanks are due to Lieutenant-Colonel BRUHN of the Geodetic Institute for the air photographs which have formed the basis of the map of Cape Hedlund. I have also received much help in the determination of the various animal groups. Thus mag. scient. Mrs. E. WESENBERG-LUND has worked out large portions

of the Polychaete material, Mr. S. HEDING has determined the echinoderms, cand. mag. K. STEPHENSEN the most important crustaceans, and stud. mag. KRAUSE the material of Nephtys. I beg all these specialists to accept my most cordial thanks for their valuable help. Further, I wish to express my sincere thanks to Dr. R. SPÄRCK for all his help and for good cooperation during the summer of 1932, and to mag. scient. MARIE JØRGENSEN, who has assisted me throughout the autumn in sorting the very large material. Finally, I am indebted to Dr. LAUGE KOCH for enabling me to join the expedition and for the great interest he has taken in my work.

II. COMMUNITIES AND ZONES OF THE CLAY BOTTOM

In East Greenland the communities of the clay bottom on shallow water are rather difficult to keep distinct. Thus at depths between the shore and 50 m only two communities are met with: The *Macoma calcaria*-community — where *Macoma calcaria* is found in nearly all the bottom samples at depths between 3 and 45 m — and the *Arca-Astarte-crenata*-community with *Axinus flexuosus*, inhabiting the bottom at depths between ca. 45 and 200 m. Quantitatively these two communities are very distinctly separated — thus *Macoma calcaria* is absolutely dominating in number and weight in the first community — but near the coast as well as at greater depths (down to c. 70 m) e. g. *Macoma calcaria* and *Axinus flexuosus* are found living together, but only in the way, that near the coast *Macoma calcaria* and at greater depth *Arca glacialis*, *Astarte crenata*, and *Axinus flexuosus* are the dominating forms as regards number and weight. Before discussing these results more closely, an orientation concerning the bathymetrical conditions in the Solitærbugt, Ella Island, may appropriately be given, since the majority of the bottom-samples originate from this locality. Here the coast slopes so steeply towards the deep that even at a distance of about 450 m from the shore the depth is 150 m. (This will appear distinctly from the bathymetrical curves on the map in fig. 1). Coast zones quite like or even steeper than this were encountered wherever investigations were made in the fjord complex. It is evident that in so narrow an area of shallow water the animal communities will be more difficult to distinguish from each other than on the extensive level bottom areas occurring e. g. in the North Sea and in the inner Danish waters. Further, the differentiation of the various communities in the regions in question is rendered somewhat difficult by the rich epifauna, which may in places completely camouflage the clay bottom communities over wide stretches. In spite of these difficulties the comprehensive

material derived from the same depths but from different localities presented so many essentially common features and such equally distinct deviations from samples taken at other depths that, with regard to the distribution of the animal forms in shallow water at the *Macoma calcaria* community, three different zones were distinctly recognisable, zones which could be found again, though with certain modifications, everywhere in the fjord complex near the shore. As we are here concerned with the next largest fjord complex of the world, and moreover with an Arctic area where hardly any quantitative ecological investigations have been made, these zones will now be subjected to a closer examination. In order to elucidate the distribution of the animals within the various zones I give a large number of tables¹⁾, distributed in the following way. For each zone all the bottom samples from the Solitærbugt have been tabulated, and further a similar table gives the bottom samples from Carl Jacobsen Bay. These tables form the basis on which the various zones have been erected. As a supplement to the bottom samples another table gives, for each zone, the dredge-hauls made in the Solitærbugt and a similar table records the dredging results from Cape Hedlund in Kempe Fjord. Finally, a table, also for each zone, gives the shallow water dredgings made during the summer trip of the "Godthaab" in 1932 in quite different parts of the fjord complex. Further, plates from the three zones of the *Macoma-calcaria*-community illustrate the number of animals and their distribution within 0.25 sq.m of bottom in each particular zone. These plates have been elaborated on the basis of the average numbers of all bottom samples derived from the Solitærbugt. The reason why the illustrations have been made to represent exactly 0.25 sq.m of bottom is that in this way they are directly comparable with the illustrations and results given in PETERSEN's fundamental works (PETERSEN 1918)²⁾.

1. The *Macoma-calcaria*-community.

A. The *Astarte borealis* zone with *Pectinaria*.

Depths: 3 to about 12—14 m.

Tables 1, 2, 3, 4, and 5. Plate 1.

As indicated by the name of the zone, the most characteristic animal within this zone besides *Macoma calcaria* is *Astarte borealis*. In the Solitærbugt this species was so common that the average number for a bottom sample of a sq.m was 90 specimens (weight 35—40 gr pr. sq.m). The most important accompanying animal is probably *Pectinaria granu-*

¹⁾ Tables 1, 6, and 11 are found after the text.

²⁾ The animal-communities at greater depths as well as bathymetry and hydrography will be discussed in greater detail in a paper by R. SPÆRCK (1933).

lata (average: 20 individuals per sq.m sample; weight 6—7 gr), but this species also frequently occurs in the surrounding zone. Of other accompanying species especially characteristic of the *Astarte borealis* zone may be mentioned *Priapulius caudatus*, *Nereis zonata*, and *Harmothoe imbricata*. The latter species is possibly most closely related to the epifauna of the *Astarte borealis* zone (especially *Desmarestia*, which is inseparably associated with the level sea bottom at this depth). Of negative characters typical of this zone should especially be mentioned that Ophiures (*Ophiecten sericeum*) are rather uncommon. To the *Desmarestia* epifauna also belongs the small snail *Margarita groenlandica*. Further, the following lamellibranchs are of frequent occurrence here as well as within the other zones, viz. *Macoma calcaria* (found in nearly all the samples; weight ca. 30 gr pr. sq. m.) *Saxicava arctica* (everywhere an epifauna animal attached to stones and small inequalities of the bottom), *Mya truncata*, *Astarte banksi*, *Astarte elliptica*, and *Axinus flexuosus*.

As will appear from the tables, the characterisation of the zone given here agrees excellently with the conditions prevailing in the greater part of the fjord complex. The samples from the Solitærbugt, Cape Hedlund, Carl Jacobsen Bay (Ymer Island), and Dusén Fjord all of them give the same result¹).

In the interior of Franz Joseph Fjord including the Isfjord and the adjacent part of the outer Franz Joseph Fjord this zone seems to have almost disappeared. At any rate *Astarte borealis*, the animal that is typical of this zone within the greater part of the fjord complex, is absent here. Another circumstance indicating that here the *Astarte borealis* zone has been nearly quite displaced by the succeeding zone (the lower *Ophiecten*-Zone with *Pectinaria*) is that *Ophiecten sericeum*, which normally is entirely absent from the *Astarte borealis* zone, has here made its way into the quite shallow water. (Thus a dredge haul from the Isfjord at 2,5—5 m depth contained 5 specimens of *Ophiecten*). Another proof of the disappearance of the costal zone from the inner parts of the fjords is the frequent occurrence of *Portlandia arctica* in quite shallow water in the Isfjord (9—15 m dredge haul with 20 *Portlandia arctica*). In the remaining part of the fjord complex *Portlandia arctica* is most frequent at depths of more than 20 m. The cause of the disappearance of this zone in the interior of the fjord complex is rather difficult to discover. It is within these parts of the complex that the huge glaciers originating from the inland ice descend into the fjords, and possibly the cause of

¹) Also AD. JENSEN's list of the localities of *Astarte borealis* in this and the Scoresby Sound fjord complexes confirms the view that the species is a typical coastal form. (Deepest locality: the mouth of Forsblad Fjord, 3—14 fms, and Hurry Inlet, 10 fms).

Table 2. Carl Jacobsen Bay, Ymer Island.
The first column shows the number of the individuals,

	2 m Sandy Clay 2-9-31 St. 24		2½ m Clay 1-9-31 St. 3		3 m Clay 1-9-31 St. 1		3 m Clay Algae 2-9-31 St. 11		3½ m Clay 1-9-31 St. 2		4 m Clay Algae 2-9-31 St. 12	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
<i>Myriotrochus rinki</i> STEENSTRUP	..	..	..	..	20	1,00	..	..	..	..	..	..
<i>Ophiocten sericeum</i> (FORBES)	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pectinaria granulata</i> L.....	..	..	..	..	..	..	..	..	10	1,00	..	..
<i>Ammotrypane aulogaster</i> RATHKE	..	..	..	..	..	..	..	..	..	..	..	..
<i>Nereis zonata</i> MGRN.	..	..	..	..	10	1,35	10	3,10	10	3,25	10	1,05
<i>Harmothoë imbricata</i> (L.).	..	..	..	..	..	..	..	..	..	..	..	..
<i>Aricia</i> (cuvieri?).....	10	0,25	..	..	..	..	40	0,75	..	..	..	..
<i>Phyllodoce groenlandica</i> ØRSTED.....	..	..	..	..	..	..	..	..	..	..	..	..
<i>Terebellides stromi</i> SARS	..	..	..	..	150	3,50	20	0,45	110	3,40	40	0,90
<i>Maldanidae</i>	..	..	..	..	..	..	20	0,30	50	0,60	..	..
<i>Polychaeta</i>	..	..	60	1,10	270	6,15	..	..	90	2,50	90	0,35
<i>Priapulius caudatus</i> (LAM.).....	..	..	10	0,80	..	..	10	0,80	..	..	..	..
<i>Nemertini</i>	..	..	..	..	..	..	..	..	10	1,90	..	..
<i>Margarita groenlandica</i> (CHEMN.)	..	..	..	..	..	..	..	..	..	..	..	..
<i>Natica groenlandica</i> (BECK)	..	..	..	..	..	..	..	..	..	..	..	..
<i>Bela tenuicostata</i> (M. SARS).....	..	..	40	1,00	..	..	..	..	..	..	..	..
<i>Bela</i> sp.	..	..	..	..	..	..	..	..	..	..	..	..
<i>Cylichna reinhardti</i> (MØLLER)	..	..	..	..	..	..	..	..	..	..	..	..
<i>Cylichna alba</i> (BROWN).....	..	..	40	0,80	50	0,20	20	0,25	..	..	..	..
<i>Utriculus pertenuis</i> (MIGH.).....	..	..	..	..	10	0,20	..	..	..	..	..	..
<i>Philine ossian-sarsi</i> FRIELE	..	..	..	..	20	0,20	..	..	..	..	..	..
<i>Astarte borealis</i> (CHEMN.)	40	14,10	..	..	..	..	10	0,05	..	..	..	..
<i>Astarte elliptica</i> (BROWN)	..	..	..	..	..	..	..	..	..	..	..	..
<i>Modiolaria laevigata</i> (GRAY).....	..	..	..	..	..	..	..	..	..	..	..	..
<i>Axinus flexuosus</i> (MTG.)	..	..	..	..	10	0,10	10	0,05	..	..	10	0,25
<i>Macoma calcaria</i> (CHEMN.).....	10	0,05	..	..	..	..	..	..	..	..	..	..
<i>Mya truncata</i> LINNÉ	50	1,45	100	1,60	180	4,10	30	0,60	10	0,10	..	..
<i>Saxicava arctica</i> (LINNÉ).....	..	..	..	..	10	0,80	..	..	..	..	..	..
<i>Cardium ciliatum</i> FABRICIUS	..	..	..	..	..	..	..	..	..	..	..	..
<i>Philomedes globosus</i> LILJEBORG.....	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphipodae</i>	..	..	10	0,10	10	0,05	..	..	10	0,05	..	..
Total weight of samples per sq.m..... in gr	15,85		5,40		17,65		6,35		12,80		2,55	

Bottom-samples. The *Astarte-borealis-Pectinaria*-Zone.
the second column the weight in gram per sq.m.

4 m Sandy ClayAlgae 2-9-31 St. 25		5 m Clay 1-9-31 St. 4		5 m ClayAlgae 1-9-31 St. 5		5 m Clay 1-9-31 St. 6		6 m Clay 1-9-31 St. 7		6 m Clay 2-9-31 St. 8		6 m Clay 2-9-31 St. 9		6 m Clay 2-9-31 St. 10		7 m Clay 2-9-31 St. 13		8 m Clay 3-9-31 St. 35		9 m Clay 2-9-31 St. 26	
Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
80	3,65	30	2,00	20	0,30	30	2,00	20	0,30	50	3,75	20	0,65	10	0,25	..	..	30	0,95	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	1,45	..	..	..	..	..	..	..	..	10	6,90	10	4,25	20	13,50	..	..	20	11,20	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	0,95	..	..	20	5,50	30	5,75	10	0,60	50	2,00	..	..	10	2,05	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	0,25	50	0,85	..	..	30	0,45	..	..	..	..	30	0,45	..	..	..	..	20	0,45	50	0,90
..	..	..	..	..	..	..	..	10	0,50	10	0,50	10	3,50	10	1,50	..	..	..	..	..	..
50	1,05	40	1,90	..	..	20	0,50	10	0,20	10	0,25	..	..	10	0,25	..	..	..	..	10	0,25
10	0,20	10	0,15	20	0,35	80	1,30	40	0,65	..	..	..	..	..	..	..	..	..	..	80	1,20
60	0,80	110	0,90	30	1,10	70	1,25	20	0,25	40	0,75	40	2,75	40	1,70	70	0,75	30	0,85	120	1,50
10	0,25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,70	..	..	10	1,40
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	1,55	..	..
..	..	..	..	10	0,40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10	0,10	..	..	10	0,05	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	20	0,40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,55	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	1,70
..	..	..	..	20	0,30	10	0,10	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	10	0,05	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,05
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	10	14,90	10	0,05	40	9,25	20	13,75	70	28,10	30	6,35	50	38,50	..	..	60	16,30	..	..
..	..	10	0,05	10	0,50	..	..	..	..	..	..	..	..	..	..	..	..	40	10,10	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
40	0,15	40	0,80	..	..	..	..	10	0,25	10	0,50	..	..	..	..	..	..	10	0,15	..	..
20	0,10	..	..	..	..	..	..	10	0,02	..	..	..	..	..	..	..	..	..	..	10	0,02
320	4,35	60	2,65	80	0,20	30	0,30	50	0,35	60	1,60	20	1,15	..	..	10	0,05	..	..	..	..
10	0,30	..	..	30	1,80	10	0,02	10	1,80	30	4,75	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	8,45	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	0,10	..	..
..	..	10	0,02	30	1,90	..	..	40	1,25	30	0,65	..	..	10	0,35	..	..	60	1,70	60	1,45
13,60		24,27		12,85		20,92		19,92		49,70		19,10		58,10		1,50		52,35		8,47	

Table 3. Solitærbugt, Ella Island.

The columns show the

	3—3 m Clay, Algae (Desmarestia, Fucus) 24-5-32 St. 248	5—5 m Clay, Desmarestia 15-9-31 St. 149	2—7 m Desmarestia 2-7-32 St. 282
<i>Myriotrochus rinki</i> STEENSTRUP	..	3	..
<i>Ophiocten sericeum</i> (FORBES)	..	..	15
<i>Ophiura robusta</i> AYRES	..	..	..
<i>Amphiura</i> sp.	..	..	..
<i>Stephanasterias albula</i> (STIMPSON)	..	..	..
<i>Pectinaria granulata</i> L.	34	98	16
<i>Ammotrypane aulogaster</i> RATHKE	..	..	..
<i>Nereis zonata</i> MGRN.	..	..	1
<i>Harmothoë imbricata</i> (L.)	34	2	..
<i>Terebellides</i> sp.	..	..	..
<i>Flabelligera affinis</i> (SARS)	3	..	..
<i>Polychaeta</i>	..	11	..
<i>Nemertini</i>	1	..	..
<i>Bryozoans</i>	2	..	..
<i>Margarita groenlandica</i> (CHEMN.)	212	..	2
<i>Bela tenuicostata</i> (BECK)	1	..	..
<i>Buccinum hydrophanum</i> HANCOCK	..	..	1
<i>Moelleria costulata</i> (MØLL.)	..	..	..
<i>Rissoa Jan-mayeni</i> FRIELE	..	..	..
Egg-capsules of <i>Bela</i> sp.	..	..	..
<i>Utriculus</i> sp.	1	..	..
<i>Astarte borealis</i> (CHEMN.)	107	26	3
<i>Astarte elliptica</i> BROWN	2	6	7
<i>Astarte banksi</i> (LEACH)	6	2	9
<i>Modiolaria laevigata</i> (GRAY)	18	9	1
<i>Axinus flexuosus</i> (MTG.)	5	..	..
<i>Macoma calcaria</i> (CHEMN.)	1	..	2
<i>Mya truncata</i> LINNÉ	96	14	1
<i>Saxicava arctica</i> (L.)	511	25	1
<i>Cardium ciliatum</i> FABRICIUS	..	1	4
<i>Cardium groenlandicum</i> (CHEMN.)	..	1	..
<i>Pecten islandicus</i> MÜLL.	..	..	..
<i>Philomedes globosus</i> (LILJEBORG)	..	..	..
<i>Nebalia</i> sp.	..	..	..
<i>Amphipodae</i>	..	1	..
<i>Gammaracanthus</i> sp.	1	..	..
<i>Spirontocharis</i> sp.	1	..	25
<i>Sclerocrangon</i> sp.	..	..	1
<i>Ascidiae</i>	..	..	..
<i>Cottus scorpius</i> L.	4	5	..

II Animal Communities in the Franz Joseph Fjord and Adjacent Waters. 13

Dredge-hauls. The *Astarte-borealis-Pectinaria*-Zone.
number of the individuals.

3—7 m Fucus, Desmarestia 26-8-32 Summer st. 131	4—8 m Clay, Desmarestia, Fucus 6-8/6-32 St. 249	7—9 m Stones, Fucus 1-7-32 St. 271	8—10 m Clay, Desmarestia 5-7-32 St. 295	9—9 m Desmarestia, Clay 18-9-31 St. 174	9—10 m Clay, Desmarestia 15-9-31 St. 154	11—12 m Fucus and Desmarestia 8-7-32 St. 300	10—15 m Fouled Fucus 5-7-32 St. 298
1	1	..	3	2	..	..	..
1	..	3	..	..	..	..	1
..	..	1	..	..	..	..	..
..	..	..	..	..	..	2	..
1	..	..	..	..	..	10	..
33	106	..	24	16	2	2	60
..	..	..	..	..	..	1	..
..	ca. 30	..	1	..	..	..	ca. 90
ca. 60	ca. 100	1	19	..	1	15	5
1	..	..	..	..	..	..	..
1	..	1	..	..	..	..	..
14	12	..	7	3	..	..	ca. 50
2	5	..	..	1	..	5	7
..	..	..	..	..	..	..	..
42	75	..	9	1	..	10	..
3	..	..	1	2	..	..	..
..	..	..	..	..	..	..	..
..	..	..	1	..	..	..	..
..	..	..	..	..	..	..	1
..	+	..	..	..	..	..	..
..	..	..	..	..	..	..	..
1	146	..	45	47	1	ca. 25	1
..	2	..	44	21	3	ca. 50	4
..	7	..	37	2	1	17	2
28	166	34	12	1	..	4	18
11	2	..	..	2	..	..	..
6	2	..	6	2	..	15	1
120	154	..	9	2	1	1	7
107	286	11	40	10	2	..	13
..	..	..	2	..	..	1	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	1	..
..	..	..	..	2	..	..	6
1	2	..	..	..	..	..	..
5	3	..	..	2	..	..	..
2	2	..	..	..	..	..	..
21	31	..	5	4	1	5	..
..	1	..	..	..	..	..	..
..	1	..	3	1	1	3	..
2	5	4	2	..	..	..	1

Tabel 4. Cape Hedlund, Kempe Fjord. Dredge-hauls.
The *Astarte-borealis-Pectinaria*-Zone.

The columns show the number of the individuals.

	7-7 m Sand, Fucus & Desmarestia 15-7-32 St. 364	7-10 m Clay & Fucus 12-7-32 St. 333	7-11 m Clay & Fucus 18-7-32 St. 392	9-12 m Clay, Fucus & Desmarestia 17-7-32 St. 386	8-13 m Desmarestia, Fucus, red Algae 17-7-32 St. 386	8-14 m Clay, Desmarestia, Fucus, red Algae 17-7-32 St. 384	11-12 m Clay 10-7-32 St. 315	12-12 m Sandy Clay, Desmarestia 10-7-32 St. 307	5-4 m Clay, Fucus 10-7-32 St. 314
<i>Actiniae</i>	..	..	..	1	..	..	..	..	..
<i>Spongiae</i>	..	..	..	..	..	..	..	1	..
<i>Ophiocten sericeum</i> (FORBES).....	..	2	..	..	..	3	8	ca.25	..
<i>Stephanasterias albula</i> (STIMPSON).....	..	..	..	..	..	..	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O. F. MÜLLER).....	..	..	..	..	..	1	..	..	..
<i>Pectinaria granulata</i> L.	13	6	ca.50	1	ca.50	ca.50	3	55	1
<i>Nereis zonata</i> MGRN.....	4	..	4	4	3	15	..	3	..
<i>Harmothoe imbricata</i> (L.).....	..	..	3	1	5	..	..	3	5
<i>Harmothoe</i> sp.....	..	..	1	..	..	8	..	..	..
<i>Flabelligera affinis</i> (SARS)	..	..	..	..	2	..	..	..	..
<i>Polychaeta</i>	..	..	..	..	2	3	..	3	1
<i>Nemertini</i>	..	2	..	2	..	1	..	..	..
<i>Margarita groenlandica</i> (CHEMN.) ..	1	2	3	20	14	17	..	..	1
<i>Buccinum hydrophanum</i> HANCOCK ..	..	2	1	1	1	1	4	1	..
<i>Buccinum</i> sp.	..	..	..	..	..	..	..	1	..
Egg-capsules of <i>Buccinum</i> sp.....	..	..	..	..	..	..	..	..	..
<i>Trichotropis borealis</i> (BROD. & SOWB.).....	..	..	..	..	..	..	..	1	..
<i>Sipho</i> sp.....	..	..	..	..	..	..	..	2	..
<i>Astarte borealis</i> (CHEMN.).....	31	88	ca.50	..	2	4	5	2	10
<i>Astarte elliptica</i> BROWN.	..	22	ca.50	..	..	6	20	5	..
<i>Astarte banksi</i> (LEACH)	..	2	..	..	2	4	..	..	..
<i>Modiolaria laevigata</i> (GRAY)	2	..	9	14	20	12	..	..	11
<i>Axinus flexuosus</i> (MTG.).....	..	..	..	..	1	..	..	..	..
<i>Macoma calcaria</i> (CHEMN.)	..	3	..	2	5	10	11	32	1
<i>Mya truncata</i> L.	..	..	2	54	8	3	..	4	..
<i>Saxicava arctica</i> (L.).....	3	..	ca.100	10	24	16	1	4	2
<i>Cardium ciliatum</i> FABRICIUS.....	..	..	..	6	..	13	..	2	..
<i>Pecten islandicus</i> MÜLL.....	..	..	..	..	3	4	..	..	..
<i>Diastylis</i> sp.	..	..	..	..	..	..	..	..	..
<i>Amphipodae</i>	..	1	..	..	..	..	..	..	..
<i>Spirontocharis</i> sp.	3	8	2	1	..	8	4	..	3
<i>Sclerocrangon</i> sp.	..	2	2	1	1	1	3	1	..
<i>Chaetonymphon hirtipes</i>	1	..	..	..	..	..	..	..	..
<i>Cottus scorpius</i> L.	1	2	1	..	1	..	..	2	1

Table 5. Different Localities in the Fjords. Dredge-hauls.
The *Astarte-borealis-Pectinaria*-Zone.

The columns show the number of the individuals.

	Eleonora Bay 3 1/2—12 m Clay, Fucus, Laminaria & Desmarestia 5-8-32 St. 37	Franz-Joseph Fjord, near the Engdal 2—4 m Clay 7-8-32 St. 55	Isfjord near the Haredal 2 1/2—5 m Clay, Fucus, Laminaria 7-8-32 St. 62	Isfjord near the Haredal 9—15 m Clay 7-8-32 St. 61	The head of Dusen Fjord 1—2 1/2 m Clay, Fucus 9-8-32 St. 74	The head of Dusen Fjord 5—11 m Clay, Fucus, Desmarestia 9-8-32 St. 75	The head of Dusen Fjord 5—19 m Clay, Desmarestia 9-8-32 St. 78
<i>Myriotrochus rinki</i> STEENSTRUP...	4	..	..	6	..	..	..
<i>Ophiocten sericeum</i> (FORBES).....	6	..	5	ca.50	..	12	2
<i>Ophiura robusta</i> AYRES	..	..	..	..	..	..	..
<i>Pectinaria granulata</i> L.	2	..	1	8	2	..	11
<i>Nereis zonata</i> MGRN.....	..	..	..	..	..	..	10
<i>Harmothoë imbricata</i> (L.).....	15	..	9	7	9	2	30
<i>Flabelligera affinis</i> (SARS)	2	..	3	..	..	..	..
<i>Maldanidae</i>	..	..	..	..	..	..	1
<i>Polychaeta</i>	..	..	1	..	..	6	..
<i>Phascolion strombi</i> (MONT.).....	..	..	..	..	..	..	..
<i>Piscicola</i> sp.	1	..	..	..	..	..	..
<i>Nemertini</i>	1	..	1	2	..	..	1
<i>Margarita groenlandica</i> (CHEMN.) ..	53	..	..	3	..	..	4
<i>Bela tenuicostata</i> (BECK)	..	..	1	..	..	2	..
<i>Buccinum hydrophanum</i> HANCOCK.	1	..	..	..	..	..	..
<i>Buccinum</i> sp.	9	..	..	..	..	..	..
Egg-capsules of <i>Bela</i> sp.....	2	..	..	..	..	..	..
<i>Astarte borealis</i> (CHEMN.).....	..	..	..	..	..	3	12
<i>Astarte elliptica</i> BROWN	..	..	..	..	..	1	14
<i>Astarte banksi</i> (LEACH)	4	..	6	4	..	..	5
<i>Modiolaria laevigata</i> (GRAY)	40	..	..	22	..	5	21
<i>Azinus flexuosus</i> (MTG.).....	1	..	..	..	..	..	..
<i>Macoma calcaria</i> (CHEMN.)	2	..	3	28	..	..	5
<i>Mya truncata</i> L.	1	8	..	2	..	..	9
<i>Saxicava arctica</i> (L.).....	68	..	..	18	..	2	1
<i>Portlandia arctica</i> (GRAY)	..	..	..	20	..	..	..
<i>Nucula tenuis</i> MTG.....	..	..	..	..	..	..	5
<i>Cardium ciliatum</i> FABRICIUS	4	..	..	..	..	..	..
<i>Pecten groenlandicus</i> CHEMN.....	1	..	..	..	..	..	..
<i>Amphipodae</i>	..	..	7	64	3	..	1
<i>Gammaracanthus</i> sp.	..	..	..	..	12	..	1
<i>Mysis</i> sp.	1	..	..	..	..	..	..
<i>Spirontocharis</i> sp.	10	..	..	2	..	1	..
<i>Sclerocrangon</i> sp.	3	..	..	2	..	..	..
<i>Cottus scorpius</i> L.	5	..	7	2	..	1	..

*) Further 2 *Arca pectunculoides* and 1 *Leda pernula*.

the disappearance of the common coastal zone, and the fusion of the following zones is to be sought in different conditions connected with this fact and possibly even with the temperature (SPÄRCK 1933)¹). Another possibility is that the hydrographical conditions at a period of the year during which they have not been investigated, e. g. during the breaking up of the large rivers, which takes place while the sea ice still covers the fjord, have been quite diverse, and essentially different from the part of the fjords nearer to the sea.

It is characteristic of the *Astarte borealis* zone that it is the area, where myriads of young, especially of *Lamellibranchiata*, are growing up. The large number of *Astarte borealis* in St. 55, table 1, when compared with the weight, clearly testifies to this. The same applies to species like *Mya truncata* — of 96 specimens of *Mya truncata* derived from one dredge in the Solitærbugt on May 24, 1932, at a depth of 3,5 m the 90 were less than 10 mm in length — *Saxicava arctica* — of 511 specimens derived from the same dredge, 433 did not attain a length of 10 mm — *Astarte banksi*, *Astarte elliptica*, *Pectinaria granulata* etc.

The *Astarte borealis* zone is no tide-water community such as for instance the *Macoma baltica* community in some boreal seas. At depths not exceeding 3 m below the low water mark, no animals will, as a rule, occur. (The few individuals that have been found at depths of 2 m have always proved to be extremely mobile and highly migratory forms). The absence of animals at depths from 0 to 3 m is generally explained as being due to the ice-foot, and as regards the whole tide water zone from the high-water mark to the low-water mark the ice-foot affords sufficient explanation thereof²). As regards the area at a depth of 0—3 m conditions are different. In the Solitærbugt the maximum thickness of the ice-foot was 2 m, and thus it cannot be responsible for the absence of animals down to a depth of 3 m. As the bottom temperature of the water from the coast to a depth of 25 m is negative (about $-1,5^{\circ}$ C.) throughout the period from October to the end of June, it cannot be the cold from the ice that causes the absence of animals. There is, however, some factor at work which prevents marine animals from subsisting so near the coast, and the effects of this factor are traceable even beyond a depth of 3 m. At a depth of 5 m (table 1, St. 54), in $\frac{1}{10}$ sq.m bottom sample, there were five dead ad. *Mya truncata*, still with the remains of meat and siphons, but only one living individual in the whole sample. Another $\frac{1}{10}$ sq.m bottom sample, at 5 m depth (table 1, St. 56) contained three adult dead *Mya truncata* of the same aspect as those just mentioned,

¹) Thus even bottom-samples from the *Arca-Astarte crenata* community in the locality by the Waltershausen-Glacier showed great weights of *Portlandia arctica*.

²) A similar effect of the ice-foot is known also in certain years from boreal waters and a high death percentage has been ascertained (H. BLEGVAD, 1929, pp. 201—205).

and five living specimens. In a $\frac{1}{10}$ sq.m bottom sample, at 6 m depth (table 1, St. 58), there occurred one ad. and two juv. *Mya truncata* and two dead ad. *Astarte borealis*, likewise with meat remains (the sample contained only one living *Mya*). At still greater depths no such mortality was observed. The direct effect of the ice-foot is, of course, quite excluded at depths of 5—6 m. Here, however, an essential cause of the mortality (presumably the main cause) is the fresh water. During spring time (in 1932 the period from about May 20th to the 2nd or 3rd of June) during the melting of the fjord ice and the considerable afflux of fresh water from the rivers, the water was almost entirely fresh even to a depth of 3 m (salinity about 3—4 ‰). Animals taken from depths of 6—8 m and placed in aquaria with water of this concentration of salt immediately showed a decrease in their metabolism and as a rule died about 24 hours later. This layer of fresh water will, as a rule, persist for about two weeks, and will be fatal to the majority of animals with which it comes in touch.

In the *Astarte borealis* zone the temperature of the water in the summer months is far above zero (in July—August the temperature at the surface is 8°—c. 12°, and below, to a depth of about 15 m, there is a layer of fjord-water with positive temperature (SPÄRCK 1933)). However, even before the temperature becomes positive, the main period of reproduction within this zone begins. The *Polychaeta* are the first to start (spawning was observed in *Pectinaria granulata* and *Harmothoe imbricata* on the 24th and 25th of May respectively, and a large number of adult individuals all showed maturity. On the 8th of June myriads of spawning *Nereis zonata* were observed, and on the 7th and 8th of June many *Saxicava arctica* were spawning in aquaria. *Astarte borealis* does not spawn until late in the year. As late as October many individuals were found to have their ovaries filled with mature eggs. The same applies to *Astarte elliptica*.

Associated with the *Astarte borealis* zone are further various types of epifaunas. The epifauna of the level sea-floor is principally a *Desmarestia* epifauna, the type of animals affixed to stones and rocks is the *Fucus*- and the *Laminaria*-epifaunas. These epifaunas will be described in greater detail below pp. 53—62).

If we compare this *Astarte borealis* zone with the animal communities in other places where quantitative bottom samples have been taken, it will be found that this zone together with the two following zones — which three zones together form the *Macoma calcaria* community — on the whole shows a certain resemblance e.g. to the *Macoma calcaria* community at the Faroes and Iceland (SPÄRCK 1928). The resemblance to the communities known from other Arctic localities and

the communities in the Baltic and the Belt Sea will be mentioned below (pp. 43—52).

To draw a comparison between the total weight of animals in a square metre of the *Astarte borealis* zone it will be necessary to disregard *Saxicava arctica*, which must be considered an epifauna animal¹). On the basis of the bottom samples of the Solitærbugt the average weight for a square metre has been computed to be 111 gr (including *Saxicava* 145 gr.). If we compare this number with the weights of the coastal communities at the Faroes and Iceland (computed on the basis of the averages of the weights given in the tables from the *Macoma calcaria* community by SPÄRCK 1929), we shall find, at the Faroes, an average weight of 279 gr pr. sq.m, and at Iceland 548 gr pr. sq.m. Both these numbers far exceed the weight of the *Astarte borealis* zone, and the same is the case with PETERSEN's samples from the *Macoma*-communities in the Belt Sea and the Baltic (c. 300 gr. pr. sq.m) (cfr. pp. 50—52). Despite this fact, the *Astarte borealis* zone may show a rather considerable weight, which far exceeds that of the following two zones when the weight of the *Saxicava* is deducted.

B. The Lower *Ophiecten* Zone with *Pectinaria*.

Depths: 12—14 to about 23—25 m.

Tables 6, 7, 8, 9, and 10. Plate 2.

The most conspicuous difference between this zone and the *Astarte borealis* zone is the occurrence here of *Ophiures*. In the Solitærbugt *Ophiecten sericeum* occurred in this zone in a number of 30 specimens per sq.m. *Pectinaria granulata* presented the same frequency here as in the *Astarte* zone (20 specimens per sq.m). Further, two crustaceans begin to be prominent, viz. the small ostracod *Philomedes globosus* (100 specimens per sq.m) and *Diastylis* sp. (10 specimens per sq.m). First of all, in contrast to the preceeding zone, *Astarte borealis* is absent (in a dredge some few specimens of this species may, however, occur), and *Priapulus caudatus*, *Nereis zonata*, and *Harmothoe imbricata* have also completely disappeared. Thus this zone is easily distinguishable from the *Astarte borealis* zone, as a glance at pls. 1 and 2 will plainly show. Less pronounced, however, is the distinction between the *Ophiecten* zone with *Pectinaria* and the adjacent zone in deeper water, but this question will be dealt with under the description of the latter zone. In addition to the animals already mentioned as characteristic of the

¹) ZENKEWITCH in computing the weights of different animal groups in the Danish animal communities (ZENKEWITSCH 1927, p. 61) (in a similar way as done here as regards *Saxicava*) has left out of consideration the weights of *Mytilus* and *Modiola*.

zone, there occur, of course, first of all *Macoma calcaria* (72 specimens — weight c. 30 gr — pr. sq.m), *Astarte elliptica* and *Astarte banksii* (20—30 specimens of each per sq.m), *Saxicava arctica* (42 specimens per sq.m), *Axinus flexuosus* (20 specimens per sq.m), *Mya truncata* (10 specimens per sq.m), *Aricia (cuvieri?)* (11 specimens per sq.m), etc.

This zone seems to be distributed throughout the fjord complex. In all places where samples were taken (Carl Jacobsen Bay at Ymer Island, Cape Hedlund in Kempe Fjord, Musk-ox Fjord, Eleonore Bay, the interior of Franz Joseph Fjord, the head of Dusén Fjord, the mouth of Dusén Fjord) these agreed exactly with the samples from the Solitær-bugt. In the interior of Franz Joseph Fjord and the Isfjord this zone has partially replaced the *Astarte borealis* zone in the way that the *Astarte* zone has been reduced and the *Ophiecten-Pectinaria* zone has made its way into more shallow water.

In the *Ophiecten-Pectinaria* zone the temperature of the water during the summer months lies about zero, though in the greater part of the zone it is slightly above. (As to the deeper part of the fjord-water layer, cfr. SPÄRCK 1933). At greater depths than ca. 25 m the temperature is below zero all the year round, and this constant negative temperature seems to be of a rather great influence on the animal life of the bottom. Thus the extreme limit of the *Ophiecten-Pectinaria* zone lies just between 20 and 25 m, and consequently seems to be dependent on the positive summer temperature.

Within the *Ophiecten* zone spawning seems to occur later in the year than in the *Astarte* zone, which agrees well with the fact that here the summer warmth reaches the bottom at a later date than within the *Astarte* zone. Thus *Ophiecten* does not spawn until the end of July (at this time larvæ were first observed in the plankton), and for this species the great spawning does not take place until October—November. *Pectinaria granulata* also spawns later at this depth than in more shallow water; individuals with mature eggs were encountered even at the beginning of July.

With the *Ophiecten-Pectinaria* zone several different epifaunas are associated. Thus the *Desmarestia* epifauna extends to this depth, too, but here the dominating animal of the fauna does not, as in lower water, seem to be *Margarita groenlandica*, but *Modiolaria laevigata*. Also the *Fucus* epifauna with *Laminaria* may occur at these depths, but if so, always affixed to rocks and stones. At the transition between the *Ophiecten-Pectinaria* zone and the deeper *Ophiecten* zone the red algæ epifauna attains its largest distribution, with *Pecten islandicus* and *Strongylocentrotus droebakiensis* as the characteristic forms. All these epifaunas will be discussed at length below (pp. 53—62).

Within the *Ophiecten-Pectinaria* zone *Saxicava arctica* plays a still

Table 7. Carl Jacobsen Bay, Ymer Island.

The first column shows the number of individuals,

	13 m Clay 2-9-31 St. 14		13 m Clay 2-9-31 St. 21		14 m Clay 2-9-31 St. 28		14 m Clay 3-9-31 St. 32		16 m Clay, Algae 2-9-31 St. 20	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
<i>Myriotrochus rinki</i> STEENSTRUP	..	..	..	..	80	15,40	..	..	10	0,90
<i>Eupyrgus scaber</i> LÜTKEN	..	..	..	..	10	1,05	..	..	..	..
<i>Ophiecten sericeum</i> (FORBES)	20	0,75	..	..	10	0,30	10	0,25	..	..
<i>Pectinaria granulata</i> L.	..	..	..	..	40	23,80	10	8,00	..	..
<i>Ammotrypane aulogaster</i> RATHKE	..	..	..	..	10	0,95	..	..	..	..
<i>Nereis zonata</i> MGRN.	..	..	..	..	..	..	..	..	..	..
<i>Polynoidae</i>	..	..	..	..	..	..	..	..	..	..
<i>Aricia</i> (cuvieri?)	..	..	..	..	..	..	..	..	..	..
<i>Phyllodoce groenlandica</i> ØRSTED	..	..	..	..	..	..	..	..	..	..
<i>Nephtys ciliata</i> (MÜLL.)	..	..	..	..	..	..	..	..	..	..
<i>Terebellides stromi</i> SARS	..	..	..	..	..	..	..	..	..	..
<i>Maldanidae</i>	..	..	..	..	..	..	..	..	..	..
<i>Polynoidae</i>	70	2,30	..	..	..	..	10	0,10	60	1,35
<i>Priapulus caudatus</i> (LAM.)	10	1,15	..	..	..	..	..	..	..	..
<i>Nemertini</i>	10	0,30	10	99,40	..	..	20	5,05	..	..
<i>Margarita groenlandica</i> (CHEMN.)	10	2,45	..	..	..	..	..	..	..	..
<i>Natica groenlandica</i> (BECK)	..	..	..	..	..	..	..	..	..	..
<i>Bela tenuicostata</i> (M. SARS)	..	..	..	..	..	..	..	..	..	..
<i>Bela bicarinata</i> (COUTH.)	..	..	..	..	..	..	..	..	..	..
<i>Bela</i> sp.	..	..	..	..	..	..	..	..	..	..
<i>Buccinum hydrophanum</i> HANCOCK	..	..	..	..	..	..	..	..	..	..
Egg-capsules of <i>Sipho</i> sp.	..	..	..	..	..	..	..	..	..	..
<i>Cylichna reinhardti</i> (MØLLER)	..	..	..	..	..	..	..	..	..	..
<i>Cylichna nitidula</i> LOVÉN	..	..	..	..	..	..	..	..	..	..
<i>Astarte borealis</i> (CHEMN.)	..	..	..	..	..	..	..	..	10	34,85
<i>Astarte banksi</i> (LEACH)	..	..	..	..	20	16,10	..	..	..	..
<i>Macoma calcaris</i> (CHEMN.)	40	3,70	..	..	40	49,80	20	34,25	..	..
<i>Mya truncata</i> L.	..	..	10	46,35	..	..	..	..	40	0,30
<i>Saxicava arctica</i> L.	30	58,20	20	67,90	140	364,00	10	1,10	20	2,50
<i>Modiolaria laevigata</i> GRAY	10	2,00	10	3,30	10	0,25	..	..	..	..
<i>Modiolaria nigra</i> GRAY	10	8,40	..	..	..	..	..	..	..	..
<i>Cardium ciliatum</i> FABRICIUS	..	..	10	31,55	..	..	..	..	..	..
<i>Axinus flexuosus</i> (MTG.)	..	..	..	..	..	..	..	..	..	..
<i>Pecten groenlandicus</i> (CHEMN.)	..	..	..	..	..	..	..	..	..	..
<i>Lyonsia arenosa</i> MØLLER	..	..	..	..	..	..	..	..	..	..
<i>Phiolmedes globosus</i> (LILJEBORG)	..	..	..	..	..	..	..	..	..	..
<i>Copepodes</i>	..	..	..	..	..	..	..	..	..	..
<i>Nebalia</i>	..	..	..	..	..	..	..	..	..	..
<i>Mysidae</i>	..	..	..	..	..	..	..	..	..	..
<i>Diastylis</i>	..	..	10	0,10	..	..	..	..	..	..
<i>Amphipodae</i>	10	0,05	..	..	..	..	..	..	..	..
<i>Sclerocrangon</i>	..	..	..	..	..	..	..	..	..	..
<i>Ascidiae</i>	..	..	..	..	20	15,50	..	..	..	..
Total weight of samples per sq.m,... in gr	79,30		248,60		486,15		43,75		39,90	

The *Ophiecten-Pectinaria*-Zone. Bottom-samples.
the second column the weight in gram per sq.m.

16 m Clay 3-9-31 St. 31		18 m Clay 2-9-31 St. 19		19 m Clay, Algae 2-9-31 St. 27		19 m Clay 2-9-31 St. 15		20 m Clay 2-9-31 St. 17		20 m Clay 2-9-31 St. 30		20 m Clay 3-9-31 St. 34		21 m Clay 2-9-31 St. 18		24 m Clay 2-9-31 St. 29	
Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
20	0,95	..	..	..	..	..	..	..	..	40	4,30	..	..	..	..	..	..
..	..	..	..	..	..	..	..	10	0,15	..	..	10	0,20	..	..	10	0,10
..	..	140	17,80	10	0,55	..	..	10	0,50	30	6,10	30	2,05	20	1,50	20	5,50
..	..	20	12,70	..	..	..	..	..	..	30	9,35	..	..	..	..	..	..
..	..	..	..	10	1,70	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	7,65
..	..	..	..	..	..	..	..	10	0,30	..	..	..	..	..	..	..	..
..	..	30	0,55	..	..	20	0,40	..	..	10	0,20	10	0,25	..	..	10	0,25
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	10	7,80	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,25	..	..
..	..	..	..	..	..	..	..	70	1,20	..	..	..	..	..	..	80	1,35
210	3,40	40	0,70	80	10,45	140	8,40	280	9,20	130	5,55	110	3,05	20	0,30	180	10,05
20	0,20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	20	0,65	..	..	..	..
..	..	10	1,90	..	..	..	..	..	..	..	..	..	..	30	7,40	..	..
..	..	..	..	..	..	..	..	..	..	..	..	10	1,05	..	..	..	..
10	0,25	..	..	..	..	10	0,05	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	20	0,40	10	0,10	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,15
..	..	..	..	..	..	..	..	..	..	10	1,20	..	..	..	..	..	..
..	..	10	0,50	10	0,05	..	..	..	..	..	..	..	..	10	1,65	..	..
20	0,25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,05	..	..
20	10,65	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
60	2,20	..	..	..	..	..	..	..	..	..	..	20	0,90	..	..	10	9,75
..	..	20	10,75	..	..	70	41,50	..	..	..	..	80	67,65	40	16,75	40	20,60
40	0,45	..	..	..	..	..	..	10	0,05	..	..	30	43,00	..	..	..	..
..	..	160	257,10	10	27,00	40	107,50	40	81,15	10	0,20	120	278,65	110	67,00	140	377,60
..	..	..	..	20	24,75	..	..	..	..	10	0,25	..	..	10	0,45	..	..
..	..	..	..	..	..	20	15,30	10	0,45	..	..	100	38,35	..	..	..	..
..	..	10	0,65	..	..	10	27,90	10	45,25	..	..	10	21,35	..	..	..	..
10	0,10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	10	1,60	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	10	0,15	..	..	..	..	10	0,90	..	..	..	..	..	..	..	..
..	..	10	0,02	..	..	10	0,02	70	0,25	10	0,02	120	0,50	..	..	20	0,20
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	0,10
..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	0,40	..	..
20	0,35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	50	0,50	30	0,10	30	0,25	..	..	40	0,50
..	..	10	0,02	..	..	10	0,05	30	0,80	..	..	10	0,20	90	0,65	20	0,20
..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	9,60	..	..
..	..	10	3,75	..	..	..	..	310	70,20	..	..	130	64,65	10	69,90	20	8,65
21,80		297,49		72,30		201,12		211,30		27,35		522,75		176,90		442,65	

Table 8. Solitærbugt Ella Island.

The columns show the

	10—18 m Mud and fouling Desmarestia 19-9-31 St. 185	13—13 m Clay, Desmarestia 17-9-31 St. 169	11—20 m Desmarestia, Laminaria, Stones, Shells 20-9-31 St. 193
<i>Actiniae</i>	..	..	..
<i>Myriotrochus rinki</i> STEENSTRUP	..	..	3
<i>Ophiocten sericeum</i> (FORBES)	3	7	131
<i>Ophiura robusta</i> AYRES	..	..	15
<i>Ophiura</i> sp.	..	..	..
<i>Amphiura</i> sp.	..	..	..
<i>Stephanasterias albulata</i> (STIMPSON)	..	3	1
<i>Solaster papposus</i> (L.)	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O. FR. MÜLLER)	1	..	8
<i>Pectinaria granulata</i> L.	47	4	7
<i>Nereis zonata</i> MGRN.	1	..	..
<i>Harmothoe</i> sp.	4	..	2
<i>Gattyana cirrosa</i> (PALL.)	8	15	..
<i>Polychaeta</i> sp.	12	5	..
<i>Piscicola</i>	..	..	..
<i>Nemertines</i>	1	..	..
<i>Margarita groenlandica</i> (CHEMN.)	3	72	1
<i>Natica groenlandica</i> (BECK)	..	..	..
<i>Bela tenuicostata</i> (M. SARS)	..	2	..
<i>Bela pyramidalis</i> (STRØM)	..	..	..
<i>Bela bicarinata</i> (COUTH.)	..	..	..
<i>Buccinum hydrophanum</i> HANCOCK	..	..	1
<i>Buccinum</i> sp.	..	..	..
<i>Sipho</i> sp.	1	..	..
Egg-capsules of <i>Sipho</i> sp.	..	..	..
<i>Tectura virginea</i> (MÜLL.)	..	..	..
<i>Lepeta coeca</i> (MÜLL.)	..	..	..
<i>Cylichna reinhardti</i> (MØLLER)	..	..	..
<i>Astarte borealis</i> (CHEMN.)	1	5	5
<i>Astarte elliptica</i> BROWN	3	46	4
<i>Astarte banksi</i> LEACH.	..	9	6
<i>Macoma calcaria</i> (CHEMN.)	24	2	2
<i>Mya truncata</i> L.	3	1	..
<i>Saxicava arctica</i> L.	5	16	4
<i>Modiolaria laevigata</i> GRAY	2	..	..
<i>Cardium ciliatum</i> FABRICIUS	2	2	1
<i>Axinus flexuosus</i> MTG.	..	..	..
<i>Pecten groenlandicus</i> CHEMN.	..	..	..
<i>Pecten islandicus</i> MÜLL.	..	..	..
<i>Leda pernula</i> MÜLL.	..	..	..
<i>Arca pectunculoides</i> SCACCHI	..	..	1
<i>Portlandia intermedia</i> M. SARS	..	..	..
<i>Philomedes globosus</i> LILJEBORG	..	5	..
<i>Diastylis</i>	..	..	1
<i>Gammaracanthus</i> sp.	..	..	..
<i>Amphipodae</i>	..	..	3
<i>Spirontocharis</i> sp.	1	29	23
<i>Sclerocrangon</i> sp.	..	..	..
<i>Chaetonymphon hirtipes</i>	..	..	..
<i>Nymphon</i> sp.	..	..	..
<i>Ascidiae</i>	..	1	..
<i>Cottus scorpius</i> L.	1	1	..

Dredge-hauls. The *Ophiocten-Pectinaria*-Zone.

number of the individuals.

13—15 m Clay, Desmarestia 2-7-32 St. 283	13—19 m Clay and plenty of Desmarestia 18-9-31 St. 175	14—14 m Clay, Desmarestia 10-10-31 St. 247	14—22 m Clay and plenty of Desmarestia 10-10-31 St. 246	18—18 m Clay, Stones, Shells 16-9-31 St. 156	20—21 m Desmarestia, Shells 18-9-31 St. 176	20—22 m Desmarestia, Laminaria, Stones, Shells 16-9-31 St. 158	21—22 m Laminaria, Shells, Stones 27-9-31 St. 239	22—24 m Laminaria, Shells, Stones 19-9-31 St. 186
..	..	..	..	..	..	..	1	1
..	..	..	..	3	1	..	..	4
..	4	1	..	53	131	32	202	66
..	2	..	..	1	21	..	2	..
..	..	..	..	..	..	1	..	..
..	..	..	..	..	1	..	..	..
..	..	..	..	..	4	..	..	..
..	1	..	..	..	..	..	..	..
..	6	..	..	1	8	..	6	2
6	1	2	..	8	4	6	..	18
1	..	..	1	..	..	..	..	..
3	1	..	5	..	1	..	..	..
..	2	..	2	3	2	1	3	2
..	2	4	..	17	1	1	17	1
..	..	..	..	..	..	2	..	..
1	..	1	..	..	..	..	..	..
..	13	3	21	..	6	7	..	..
..	..	1	..	..	..	..	..	1
..	1	2	..	..	1	..	..	..
..	..	..	1	..	..	..	..	..
..	..	1	..	..	..	..	..	..
..	1	..	2	1	4	1	7	1
..	..	..	..	..	..	..	1	..
..	..	..	..	..	1	..	2	1
..	..	..	..	2	2	..	..	..
..	..	..	..	..	1	..	..	..
..	..	..	..	..	..	..	1	..
..	2	..	1	..	..	..	..	..
3	2	..	..	9	..	..	..	..
1	8	2	..	30	6	9	1	3
..	..	1	..	23	7	5	6	2
..	11	..	..	2	..	7	5	4
1	1	1	..	..	..	1	1	4
6	8	2	..	11	19	34	23	6
2	3	..	..	..	..	..	..	..
..	1	..	..	1	1	15	10	3
..	1	..	..	..	..	..	21	..
..	..	..	..	..	5	..	..	..
..	..	..	..	..	1	..	..	..
..	..	..	..	..	..	..	1	1
..	..	..	..	..	..	..	3	..
..	..	..	1	..	..	..	..	..
..	..	..	..	..	..	..	..	..
2	..	..	1	..	1	1	..	..
..	..	..	..	..	..	..	..	..
3	33	1	..	..	..	24	19	5
..	1	..	1	..	51 3	2	2	..
..	..	..	1	..	..	..	1	..
..	..	..	1	..	..	..	..	..
..	..	..	3	..	..	..	1	..
1	..	..	4	..	..	1	..	..

Table 9. Cape Hedlund, Kempe Fjord.

The columns show the

	12—15 m Clay, Desmarestia 10-7-32 St. 323	14—14 m Clay, Algae 10-7-32 St. 317	14—15 m Clay, Shells 12-7-32 St. 313	14—15 m Clay, Desmarestia, Fucus 10-7-32 St. 330
<i>Actiniac</i>	..	..	..	..
<i>Myriotrochus rinki</i> STEENSTRUP.....	..	..	..	..
<i>Ophiecten sericeum</i> (FORBES).....	ca. 10	5	ca. 20	ca. 25
<i>Ophiura robusta</i> AYRES.....	..	..	..	..
<i>Amphiura</i> sp.	..	..	..	..
<i>Stephanasterias albula</i> (STIMPSON).....	..	..	..	..
<i>Asterias</i> sp.	1	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O. FR. MÜLLER).....	..	..	..	..
<i>Pectinaria granulata</i> L.....	10	4	36	37
<i>Nereis zonata</i> MGRN.	1	1	..	..
<i>Harmothoe</i> sp.....	..	8	..	..
<i>Gattyana cirrosa</i> (PALL.).....	..	..	1	..
<i>Terebellides</i> sp.	..	6	..	..
<i>Polychaeta</i>	..	1	2	5
<i>Phascolion strombi</i> (MONT.).....	..	..	..	..
<i>Nemertini</i>	..	2	..	..
<i>Margarita groenlandica</i> (CHEMN.).....	1	1	..	1
<i>Bela tenuicostata</i> (M. SARS).....	..	1	..	..
<i>Buccinum hydrophanum</i> HANCOCK.....	5	1	5	..
<i>Buccinum</i> sp.....	..	..	..	..
<i>Sipho</i> sp.	..	..	..	1
Egg-capsules of <i>Sipho</i> sp.	..	..	..	..
<i>Trichotropis borealis</i> BROD. & SOWB.	17	1	2	..
<i>Astarte borealis</i> (CHEMN.).....	..	17	..	10
<i>Astarte elliptica</i> BROWN.....	1	82	2	17
<i>Astarte banksi</i> LEACH.	6	12	29	4
<i>Macoma calcaria</i> (CHEMN.).....	20	25	12	20
<i>Tellini loveni</i> STEENSTRUP.....	..	..	..	..
<i>Mya truncata</i> L.....	3	2	7	7
<i>Saxicava arctica</i> L.....	3	1	6	7
<i>Modiolaria laevigata</i> GRAY.....	1	..	..	..
<i>Cardium ciliatum</i> FABRICIUS.....	11	..	4	4
<i>Cardium groenlandicum</i> (CHEMN.).....	2	..	1	1
<i>Leda permla</i> MÜLL.....	..	..	..	1
<i>Arca pectunculoides</i> SCACCHI.....	..	..	..	..
<i>Diastylis</i> sp.....	1	..	..	..
<i>Spirontocharis</i> sp.....	..	1	1	..
<i>Sclerocrangon</i> sp.....	3	..	..	1
<i>Cottus scorpius</i> L.....	1	..	..	..

Dredge-hauls. The *Ophiecten-Pectinaria*-Zone.
number of the individuals.

14—17 m Clay, Shells, Stones 12-7-32 St. 330	15—16 m Clay, Shells, Stones 12-7-32 St. 339	15—17 m Clay, Shells, Stones 10-7-32 St. 316	16—19 m Clay, Shells, Stones 11-7-32 St. 325	18—18 m Clay, Desmarestia 13-7-32 St. 350	18—18 m Clay, Fucus, Laminaria 15-7-32 St. 369	16—20 m Shells, Red Algae 17-7-32 St. 383	18—19 m Clay, Desmarestia 12-7-32 St. 338	19—21 m Clay, Stones 11-7-32 St. 327	22—24 m Clay, Shells, Stones 12-7-32 St. 328
..	..	..	2	..	..	..	..	..	2
ca. 10	6	ca. 20	ca. 25	many	38	1	19	36	ca. 25
..	..	..	..	..	..	1	..	..	..
..	1	..	..	..	..	..	..	1	..
..	..	..	..	2	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	2	..	1	..	..	2	..	..	..
41	7	ca. 40	12	..	4	2	7	..	1
..	..	..	..	..	..	18	..	..	..
..	..	4	..	1	..	1	..	..	..
2	2	3	..	..	2	4	..	..	1
..	..	..	..	..	..	..	..	..	..
1	..	7	5	..	3	2	..	..	5
..	..	2	..	..	..	2	2	2	..
..	..	..	2	..	..	..	..	..	..
..	..	..	..	..	..	1	..	..	..
..	..	..	..	..	..	..	..	..	..
3	..	6	5	4	2	7	2	..	4
3	..	..	..	..	..	1	..	..	..
..	..	2	3	1	1	2	..	..	3
..	1	1	..	..	..	..	..	..	1
28	11	2	27	5	..	..	..	1	1
..	..	1	..	..	..	3	..	..	..
1	2	3	3	1	2	3	..	1	1
13	26	18	37	12	6	1	3	10	6
33	20	51	17	40	16	12	20	13	13
..	1	..	..	..	..	..	..	..	..
4	4	10	6	7	1	1	2	..	4
6	2	7	6	1	1	11	4	2	5
..	..	..	..	..	..	6	..	..	..
11	6	17	6	4	9	2	7	3	4
..	1	1	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
1	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
..	..	..	..	1	1	..	2	1	..
..	..	2	..	..	..	..	..	1	..
..	..	..	1	..	..	..	..	1	..

Table 10. Various Localities in the Dredge-hauls.
The *Ophiecten-Pectinaria*-Zone.

The columns show the number of the individuals.

	3-8-32 Musk-ox Fjord near Mt. Anker Valley 17—21 m Red Clay, Stones Summer st. 18	5-8-32 Eleonora Bay 15—27 m Clay, Laminaria, Desmarestia, Red Algae Summer st. 39	7-8-32 Franz Joseph Fjord near Engdalen 13—18 m Fine grey Clay Summer st. 52	9-8-32 The head of Dusen Fjord 10—18 m Clay, Laminaria, Des- marestia Summer st. 76	9-8-32 The head of Dusen Fjord 10—19 m Clay, Desmarestia Summer st. 79	9-8-32 The head of Dusen Fjord 15—19 m Clay, Desmarestia Summer st. 77	12-8-32 The Mouth of Dusen Fjord near Cape Graah 16—20 m Clay, Desmarestia Summer st. 89	The Mouth of Dusen Fjord near Cape Graah 15—30 m Clay, Desmarestia, red Algae Summer st. 87
<i>Spongiae</i>	+	..	..	..	..	..	..	..
<i>Actiniae</i>	..	1	..	..	..	..	..	..
<i>Myriotrochis rinki</i> STEENSTRUP	..	25	ca.50	..	1	4	..	..
<i>Ophiecten sericeum</i> (FORBES)	8	ca.160	ca.50	11	5	25	10	ca.20
<i>Ophiura robusta</i> AYRES	..	1	..	..	..	..	..	1
<i>Ctenodiscus crispatus</i> (BRUZ.)	..	..	..	..	..	1	..	1
<i>Asterias</i> sp.	..	..	..	..	..	1	..	1
<i>Strongylocentrotus droebakiensis</i> (O. FR. MÜLLER)	1	2	..	..	2	1	..	2
<i>Antedon</i> sp.	35	..	..	..	..	..	..	1
<i>Pectinaria granulata</i> L.	..	..	12	..	19	1	3	..
<i>Nereis zonata</i> MGRN.	1	..	..	..	3	..	..	..
<i>Harmothoe imbricata</i> (L.)	..	..	..	2	..	..	..	..
<i>Harmothoe</i> sp.	4	1	1	..	..	..	..	..
<i>Gattyana cirrosa</i> (PALL.)	..	2	..	..	ca.20	..	..	5
<i>Flabelligera affinis</i> (SARS)	..	..	..	1	..	..	..	..
<i>Brada</i> sp.	1	..	..	..	..	..	1	..
<i>Polychaeta</i>	1	..	1	2	..	1	2	1
<i>Nemertini</i>	..	..	..	..	1	..	..	..
<i>Margarita groenlandica</i> (CHEMN.)	5	4	..	..	..	..	..	7
<i>Natica groenlandica</i> (BECK)	..	..	..	..	..	..	1	..
<i>Bela tenuicostata</i> (M. SARS)	..	..	..	..	1	..	..	..
<i>Buccinum hydrophanum</i> HANCOCK	1	17	3	..	..	..	..	1
<i>Buccinum</i> sp.	..	3	..	1	..	..	..	2
<i>Sipho</i> sp.	..	2	..	..	..	..	..	..
Egg-capsules of <i>Sipho</i> sp.	1	4	..	..	..	..	..	2
<i>Trichotropis borealis</i> BROD. & SOWB.	..	..	..	1	1	..	..	..
<i>Moelleria costulata</i> (MØLL.)	..	..	..	..	..	..	..	1
<i>CYLICHA reinhardti</i> (MØLLER)	..	..	..	..	5	..	..	1
<i>Astarte borealis</i> (CHEMN.)	..	..	..	3	7	5	5	2
<i>Astarte elliptica</i> BROWN	..	3	..	3	7	5	3	5
<i>Astarte banksi</i> LEACH	..	17	..	3	7	..	1	..
<i>Macoma calcaria</i> (CHEMN.)	..	1	24	..	10	1	9	2
<i>Mya truncata</i> L.	1	1	..	..	3	..	1	3
<i>Saxicava arctica</i> L.	991	106	1	..	1	..	6	9
<i>Modiolaria laevigata</i> (GRAY)	136	91	1	2	2	..	2	1
<i>Modiolaria nigra</i> (GRAY)	..	..	..	..	..	..	7	..
<i>Cardium ciliatum</i> FABRICIUS	..	12	..	..	..	..	8	2
<i>Cardium groenlandicum</i> (CHEMN.)	..	3	..	..	..	..	..	..
<i>Pecten groenlandicus</i> CHEMN.	..	120	..	..	..	..	11	110
<i>Venus fluctuosa</i> GOULD	..	3	..	..	..	..	..	..
<i>Leda pernula</i> MÜLL.	..	..	..	..	..	..	2	3
<i>Arca pectunculoidae</i> SCACCHI	..	11	..	..	..	..	..	..
<i>Portlandia arctica</i> (GRAY)	2	20	25	..	..	..	..	..
<i>Nucula tenuis</i> MTG.	..	..	..	..	31	..	6	7
<i>Diastylis</i>	..	1	..	..	..	..	..	..
<i>Amphipodae</i>	..	1	..	..	1	1	..	1
<i>Spirontocharis</i> sp.	1	16	..	3	..	..	..	5
<i>Sclerocrangon</i> sp.	..	7	..	..	..	..	1	..
<i>Ascidiae</i>	many	17	..	..	..	..	..	..
<i>Cottus scorpius</i> L.	..	..	2	..	1	..	..	..

greater part than in the *Astarte* zone (in the Solitærbugt averagely 121,97 gr per sq.m). If we deduct this weight from the otherwise rather high average weight of the whole zone (206,25 gr per sq.m), the average weight of the *Ophiecten-Pectinaria* zone proper will be 84,28 gr per sq.m, i. e. a considerably lower weight than that of the preceeding zone. The community living in the Danish waters at depths corresponding to those at which the *Ophiecten-Pectinaria* community occurs in East Greenland, viz. the *Abra* community with *Echinocardium*, *Astarte*, and *Macoma calcaria*, has a weight (about 100—125 gr per sq.m, see PETERSEN 1913, App. p. 29, and 1918, pl. 2) nearly corresponding with that of the *Ophiecten-Pectinaria* zone. The average weights from Iceland and the Faroes used for comparison with the *Astarte borealis* zone (see p. 8), must also be compared with the *Ophiecten-Pectinaria* zone, since the Iceland-Faroe *Macoma calcaria* community corresponds to both in bathymetrical distribution. The weight figures of these communities (Iceland 279,0 gr per sq.m, the Faroes 548,0 gr per sq.m) far exceed those of the *Ophiecten-Pectinaria* zone.

C. The deeper *Ophiecten* Zone.

Depths: 23—25 to about 45 m.

Tables 11, 12, 13, 14, and 15. Plate 3.

As already stated, this zone, in contrast to the preceeding one, is difficult to characterise, because it does not differ essentially from the preceding zone, and does not present any single type animal. In addition to the numerous *Ophiecten sericeum* (44 specimens per sq.m) the zone is characterised by a number of lamellibranchs, none of which are particularly numerous, but which taken together are typical of this zone in contrast to the preceding one. Such lamellibranchs are: *Pecten groenlandicus* (4 specimens per sq.m), *Portlandia lenticula* (4 specimens per sq.m), *Neaera obesa* (8 specimens per sq.m), *Tellina moesta* (4 specimens per sq.m), and the *Ophistobranchiata*: *Cylichna reinhardti* (4 specimens per sq.m). As characteristic accompanying animals of this zone may be mentioned *Leda pernula* and *Portlandia intermedia*. *Cardium ciliatum*, which is of rather frequent occurrence in this zone (see pl. 3), is probably also more frequent in the two preceding zones than the fragments in the bottom samples would seem to show; the dredge tables Nos. 8 and 9 are at least indicative hereof. As a "negative character" of the deeper *Ophiecten* zone may be mentioned the complete absence of *Pectinaria granulata*. Otherwise the same forms occur as in the *Ophiecten-Pectinaria* zone and in about the same number, thus first of all *Macoma calcaria* (32 specimens — ca. 35 gr — per sq.m), *Astarte elliptica* and *Astarte banksi* (28 and 16 specimens per sq.m respectively), *Saxicava*

Table 12. Carl Jacobsen Bay, Ymer Island. Bottom-samples.
The deeper *Ophiecten*-Zone.

The first column shows the number of individuals, the second shows the weight in gram per sq.m.

	24 m Clay 2-9-31 St. 29		25 m Clay, Algae 2-9-31 St. 23		27 m Clay, Algae 3-9-31 St. 33		30 m Clay 2-9-31 St. 16		30 m Clay, Algae 2-9-31 St. 22	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
<i>Eupyrus scaber</i> LÜTKEN.....	10	0,10	20	1,80	..	..	..	..	..	..
<i>Ophiecten sericeum</i> (FORBES).....	20	5,50	..	..	..	..	..	..	..	..
<i>Nereis zonata</i> MGRN.....	10	9,85	..	..	..	..	..	..	..	..
<i>Aricia (cuvieri?)</i>	10	0,20	..	..	..	..	..	..	..	..
<i>Maldanides</i> sp.....	80	1,35	30	0,55	..	..	20	0,30	..	..
<i>Polychaeta</i> sp.....	180	8,30	50	1,20	220	13,40	90	1,95	50	1,35
<i>Nemertines</i>	..	..	10	35,50	..	..	..	..	..	..
<i>Astarte banksi</i> (LEACH)	10	9,75	20	4,40	..	..	..	..	..	..
<i>Macoma calcaria</i> (CHEMN.)	40	..	20	27,25	20	15,10	..	..	30	47,30
<i>Saxicava arctica</i> L.	140	377,60	30	40,20	20	47,10	..	..	..	..
<i>Modiolaria laevigata</i> (GRAY)	..	..	20	1,70	..	..	..	..	10	1,05
<i>Modiolaria nigra</i> (GRAY).....	..	..	10	2,30	70	..	..	..	..	..
<i>Cardium ciliatum</i> FABRICIUS.....	..	..	10	7,40	10	28,70	..	..	..	..
<i>Philomedes globosus</i> LILJEB.	20	0,20	20	0,05	30	0,15	..	..	10	0,02
<i>Copepodæ</i>	20	0,10	10	0,02	..	..	..	..	..	..
<i>Diastylis</i>	40	0,50	20	0,10	..	..	..	..	10	0,05
<i>Amphipodæ</i>	20	0,20	10	0,02	..	..	..	..	..	..
<i>Ascidia</i>	20	8,60	..	..	10	0,20	..	..	..	..
Total weight of sample per sq.m, gr.	422,25		122,49		104,65		2,25		49,77	

arctica (64 specimens per sq.m), *Axinus flexuosus* (12 specimens per sq.m), *Mya truncata* (12 specimens per sq.m), etc. As to Polychaetes and crustaceans the zone agrees almost perfectly with the preceding one.

The five bottom samples taken from this zone in Carl Jacobsen Bay, Ymer Island, have struck a *Desmarestia* epifauna, which is evidenced by the occurrence of *Modiolaria laevigata* and *Modiolaria nigra*, and thus give no impression of the zone. On the whole, dredging is rather unsuited for ascertaining the occurrence of this zone, as the small mollusks (*Portlandia lenticula* and *Næra obesa*) will get out of the nets before they reach the surface of the water. In these dredges *Pecten groenlandicus* is thus the most unmistakable indicator of the zone together with the accompanying *Leda pernula*. The immense numbers in which *Pecten groenlandicus* occurs in the dredges from the Solitærbugt are astonishing (table 13). At Cape Hedlund this zone is also distinctly represented,

there being, however, a marked tendency to immigration on both sides between this zone and the deeper-lying neighbouring community (the *Arca-Astarte crenata* community). Thus *Pecten groenlandicus* is by far not so frequent here as in the Solitærbugt, and *Arca glacialis* everywhere extends into the deeper *Ophiecten* zone.

As was the case with the preceding zones, conditions in the interior of Franz Joseph Fjord including the Isfjord differ essentially from those of the remaining part of the fjord area (see table 15). *Pecten groenlandicus* is very scarce, *Leda* is fairly common, but the most typical feature is the vast number of *Portlandia arctica*, which, as already stated (see p. 9) spreads to the *Astarte*—*Pectinaria* zone. The interior of Franz Joseph Fjord and the Isfjord on the whole shows a simplification of the zones, there being here practically only one zone, viz. a modification of the two *Ophiecten* zones with frequent occurrence of *Portlandia arctica*, with a bathymetrical extension from the coast to about 45 m depth.

In Dusén Fjord, however, we again encounter the deeper *Ophiecten* zone in its typical composition, in which it seems to occur along the greater part of the coasts of Northeast Greenland.

As in AD. JENSEN's publication (1905) we find the same localities indicated under the various species of *Lamellibranchiata*, it is possible to reproduce a list of the *Lamellibranchiata* occurring in two localities south of the Franz Joseph Fjord area, viz. Hurry Inlet (depth 20 m) and Cape Dalton (depth 18—22 m). From the localities which agreed exactly in depth with the deeper *Ophiecten* zone, no lists could be obtained, but as regards depth, the two localities in question are situated precisely in the transitional area between the *Ophiecten*—*Pectinaria* zone and the deeper *Ophiecten* zone, and thus deserve interest. The samples showed:

Hurry Inlet, 20 m depth, clay.

Arca glacialis, **Dacrydium vitreum*, *Modiolaria laevigata*, **Pecten groenlandicus*, *Astarte banksi*, *Astarte borealis*, *Astarte elliptica*, **Tellina moesta*, *Tellina loveni*, *Venus fluctuosa*, **Cardium ciliatum*, *Cardium groenlandicum*, *Mya truncata*, *Saxicava arctica*, *Lyonsia arenosa*, *Thracia truncata*, *Pandora glacialis*.

Cape Dalton, 18—22 m depth, fine clay with small stones.

Nucula tenuis, **Leda pernula*, **Portlandia frigida*, **Dacrydium vitreum*, *Modiolaria laevigata*, **Pecten groenlandicus*, *Astarte banksi*,

¹⁾ In the period from January to July, 1932, hydrographical investigations at 0—50 m. depth were made every two weeks. These investigations showed the lowest annual bottom temperature to occur in the month of May, and at that time, therefore, careful temperature registrations were made at various depths, and from these the numbers given here originate.

Table 13. Solitærbugt, Ella Island.
The columns show the

	23—29 m Clay, Stones 18-9-31 St. 172	24—28 m Clay, Shells, Stones 19-9-31 St. 187	25—27 m Shells, Stones, Laminaria, Desmarestia 17-9-31 St. 170	25—31 m Clay, Shells, Gravel 18-9-31 St. 177	28—28 m Clay, Shells 22-9-31 St. 206	28—30 m Laminaria, Desmarestia 20-9-31 St. 192	28—31 m Clay, Stones, Algae 23-9-31 St. 210
<i>Actiniae</i>	..	..	..	..	..	..	..
<i>Eupyrgus scaber</i> LÜTKEN	..	..	..	..	..	..	..
<i>Myriotrochus rinki</i> STP.	..	..	..	1	..	..	..
<i>Ophiocten sericeum</i> (FORBES)	113	106	132	43	137	127	119
<i>Ophiura robusta</i> AYRES	1	1	..	..	..	..	3
<i>Strongylocentrotus droebakiensis</i> (O. F. MÜLLER) ..	..	1	3	6	1	4	..
<i>Antedon</i> sp.	..	..	..	..	..	1	..
<i>Pectinaria granulata</i> L.	..	1	..	1	..	1	..
<i>Pectinaria hyperborea</i> MGRN.	..	..	..	..	..	..	..
<i>Harmothoe</i> sp.	..	1	..	..	2	..	1
<i>Gattyana cirrosa</i> (PALL.)	..	2	..	..	..	..	..
<i>Onuphis conchylega</i> SARS	..	..	..	..	..	..	..
<i>Lanice conchylega</i>	..	1	..	..	..	..	..
<i>Polychaeta</i>	6	..	..	..	..	3	1
<i>Phascolion strombi</i> (MONT.)	..	..	..	..	..	..	2
<i>Nemertini</i>	..	..	..	..	..	2	..
<i>Bryozoa</i>	..	..	..	..	..	..	..
<i>Margarita groenlandica</i> (CHEMN.)	..	1	1	6	..	4	..
<i>Natica groenlandica</i> (BECK)	..	..	..	..	..	..	..
<i>Buccinum hydrophanum</i> HANCOCK	..	3	1	1	1	2	6
<i>Buccinum</i> sp.	..	..	..	..	..	..	..
<i>Sipho</i> sp.	..	..	..	1	..	..	..
<i>Trichotropis borealis</i> BROD. & SOWB.	..	..	..	..	..	1	..
<i>Velutina laevigata</i> (PENNANT)	..	..	..	..	2	..	..
<i>Lepeta coeca</i> (MÜLLER)	..	..	..	..	..	..	..
<i>Cylichna reinhardti</i> (MØLLER)	..	..	..	1	..	..	..
<i>Cylichna</i> sp.	..	..	..	..	..	..	1
<i>Chiton</i> sp.	..	..	..	3	..	..	..
<i>Astarte elliptica</i> BROWN	2	3	3	9	5	15	6
<i>Astarte banksi</i> (LEACH)	2	4	1	7	3	19	..
<i>Macoma calcaria calcaria</i> (CHEMN.)	1	2	1	2	..	3	2
<i>Tellina moesta</i> DESH.	..	..	1	..	1	1	..
<i>Mya truncata</i> L.	..	..	1	..	..	..	..
<i>Saxicava arctica</i> L.	3	7	10	36	17	20	8
<i>Cardium ciliatum</i> FABR.	4	4	11	2	3	8	2
<i>Pecten groenlandicus</i> (CHEMN.)	11	21	21	42	41	41	17
<i>Dacrydium vitreum</i> (MØLLER)	..	..	..	..	..	..	..
<i>Neera obesa</i> LOVÉN	..	..	..	..	..	..	..
<i>Leda pernula</i> MÜLL.	..	..	..	..	..	2	1
<i>Arca pectunculoides</i> SCACCHI	..	3	4	1	..	6	1
<i>Arca glacialis</i> GRAY.	..	..	..	..	..	2	4
<i>Portlandia frigida</i> (TORELL)	..	..	..	..	..	..	..
<i>Portlandia lenticula</i> (MØLLER)	..	..	..	..	..	..	..
<i>Portlandia arctica</i> (GRAY)	..	..	..	..	..	1	..
<i>Nucula tenuis</i> MTG.	..	..	..	..	..	..	..
<i>Philomedes globosus</i> LILJEB.	..	..	..	..	..	1	..
<i>Diastylis</i> sp.	2	..	1	..	..	1	..
<i>Amphipodae</i>	..	..	..	..	2	..	..
<i>Spirontocharis</i> sp.	5	3	4	16	4	10	5
<i>Sclerocrangon</i> sp.	..	..	..	..	..	..	..
<i>Chaetonymphon hirtipes</i>	..	..	..	..	..	3	..
<i>Nymphon</i> sp.	..	..	2	..	..	..	..
<i>Ascidiae</i>	1	..	1	..	..	..	1
<i>Cottus scorpius</i>	..	..	..	..	1	..	..

Dredge-hauls. The deeper *Ophiocten*-Zone.
number of the individuals.

30—31 m Clay, Stones 25-9-31 St. 220	31—40 m Shells, Stones 24-9-31 St. 213	32—38 m Clay, Stones, Algae 22-9-31 St. 205	34—35 m Clay, Shells, Stones 22-9-31 St. 208	34—38 m Clay, Shells, Stones 22-9-31 St. 207	37—37 m Clay, Gravel 26-9-31 St. 218	38—41 m Stones 25-9-31 St. 219	38—44 m Desmarestia, Laminaria 25-9-31 St. 222	41—41 m Clay, Stones, Desmarestia 25-9-31 St. 223	41—42 m Clay, Stones 24-9-31 St. 212	43—44 m Stones 25-9-31 St. 224	44—44 m Stones, Shells, Laminaria 24-9-31 St. 215	46—50 m Clay, Stones, Laminaria 24-9-31 St. 216
..	..	1	..	3	..	..	..	1	1	..	..	..
..	..	1	..	..	..	..	..	..	1	..	..	..
81	134	113	73	42	74	111	113	159	47	88	127	79
1	1	9	1	3	1	1	19	1	..	2	1	1
..	..	14	4	..	4	1	7	3	..	2	..	1
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	1	..	..	..	..	..	1
..	..	..	1	2	1	..	..	..	..	1	..	..
..	..	..	..	..	..	..	..	..	..	1	..	..
9	11	2	..	..	..	..	..	..	..	..	..	..
..	..	..	7	4	3	4	..	..	3	4	1	5
..	..	..	1	..	..	..	..	..	..	..	..	..
1	..	1	..	..	..	..	..	..	..	..	..	..
..	..	2	2	..	..	2	..	..	3	10	..	..
..	..	..	..	..	..	..	1	3	..	..	..	..
..	1	2	..	2	..	1	..	..	1	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	1
..	..	..	..	3	..	3	..	2	1	..	..	..
..	..	..	..	..	..	..	1	..	..	..	1	..
..	1	2	2	..	3	2	..	5	3	8	..	..
..	..	..	..	..	..	1	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..
..	8	5	5	8	1	5	4	12	24	2	1	..
..	2	2	1	1	..	1	..	1	3	2	..	..
1	1	..	1	..	..	..	..	2	1	..	..	1
1	1	..	..	1	..	..	..	..	1	..	..	..
2	9	6	5	3	1	3	..	2	2	2	1	10
..	2	..	2	1	..	..	..	1	..	..	9	..
27	72	49	116	310	17	51	48	64	22	41	67	92
..	..	..	..	..	..	..	1	..	..	..	..	..
..	..	..	..	..	..	..	2	..	..	..	..	..
..	..	..	3	1	4	..	1	1	4	1	..	1
16	1	3	2	1	9	29	4	35	13	36	3	..
..	..	..	1	..	..	..	1	..	..	..	..	..
..	..	..	..	..	..	..	..	..	2	..	..	..
..	1	..	..	..	..	..	..	..	..	..	..	..
2	..	..	4	2	3	6	3	7	6	7	3	..
1	..	..	..	..	..	..	..	..	..	..	1	4
1	2	8	2	..	1	..	17	1	2	1	3	5
..	..	..	..	..	..	..	13	..	1	..	..	..
..	..	1	..	4	..	..	..	..	..	1	5	..
..	3	..	..	..	2	..	2	1	..	..	..	..
3	..	..	1	..	1	3	1	2	1	2	..	1
..	1	..	2	..	2	..	..	..	..	..	..	..

Table 14. Cape Hedlund, Kempe Fjord. Dredge-hauls.
The deeper *Ophiocen*-Zone.

The columns show the number of the individuals.

	22—34 m Clay 14-7-32 St. 360	25—29 m Clay, Gravel 10-7-32 St. 312	25—30 m Clay, Fucus and other Algae 18-7-32 St. 390	26—35 m Clay, Stones 17-7-32 St. 381	27—34 m Clay, Rocks, Algae 16-7-32 St. 378	28—30 m Clay, Fucus 16-7-32 St. 375	30—30 m Clay, Stones 15-7-32 St. 365	33—35 m Clay 10-7-32 St. 309	35—40 m Clay, Gravel 12-7-32 St. 340	38—40 m Clay 10-7-32 St. 310
<i>Spongiae</i>	..	..	1	..	..	..	..	..	..	1
<i>Actiniae</i>	..	..	1	..	..	..	..	..	..	..
<i>Ophiocen sericeum</i> (FORBES).....	30	ca.50	4	9	13	12	34	52	5	ca.100
<i>Ophiura robusta</i> AYRES.....	..	..	..	..	1	..	..	..	..	..
<i>Stephanasterias albula</i> (STIMPSON) ..	..	..	6	..	3	1	..	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O. F. MÜLLER)	5	1	..	..	3	1	1	..	1	..
<i>Pectinaria granulata</i> L.	..	..	2	..	2	1	..	..	..	..
<i>Harmothoe</i> sp.....	..	..	..	..	..	..	..	..	..	..
<i>Nereis zonata</i> MGTN.....	..	..	6	..	..	1	..	..	..	..
<i>Flabelligera affinis</i> (SARS)	..	..	3	..	2	2	..	..	..	..
<i>Polychaeta</i>	..	1	3	1	2	..	..	..	1	..
<i>Phascolion strombi</i> (MONT.).....	..	..	1	..	4	2	..	..	..	2
<i>Nemertini</i>	..	..	5	..	..	..	..	..	..	..
<i>Bryozoa</i>	..	..	1	..	..	..	..	..	..	..
<i>Margarita groenlandica</i> (CHEMN.)... ..	..	..	29	..	2	9	..	..	..	..
<i>Natica groenlandica</i> (BECK).....	..	..	..	..	..	..	..	..	..	2
<i>Buccinum hydrophanum</i> HANCOCK ..	3	..	..	..	1	..	..	1	1	..
<i>Sipho</i> sp.....	1	1	..	1	..	1	1	1	2	..
<i>Trichotropis borealis</i> BROD. & SOWB.	..	..	..	..	..	1	..	..	..	..
<i>Velutina laevigata</i> PENNANT	..	..	1	..	..	..	..	..	..	..
<i>Lepeta coeca</i> (MÜLLER).....	..	..	..	..	..	..	1	..	..	..
<i>Siphonodentalium vitreum</i> (M. SARS)	..	..	..	..	1	..	..	..	..	1
<i>Astarte borealis</i> (CHEMN.).....	..	..	..	1	2	2	..	..	..	..
<i>Astarte banksi</i> (LEACH)	1	7	..	..	..	1	1	..	..	..
<i>Astarte elliptica</i> BROWN.....	17	9	..	2	3	3	..	3	7	5
<i>Macoma calcaria</i> (CHEMN.)	3	1	1	1	1	..	..	..	3	..
<i>Tellini moesta</i> DESH.	1	..	..	1	2	..	..	1	1	5
<i>Mya truncata</i> L.	1	..	6	..	..	..	..	..	..	..
<i>Saxicava arctica</i> L.	1	9	35	2	2	1	1	..	1	2
<i>Cardium ciliatum</i> FABR.....	3	5	..	..	..	..	4	..	1	..
<i>Pecten groenlandicus</i> (CHEMN.)	..	..	5	2	1	..	1	..	..	3
<i>Pecten islandicus</i> MÜLLER	..	..	29	..	2	..	..	..	..	..
<i>Leda pernula</i> MÜLL.	..	..	1	1	1	..	..	1	1	..
<i>Modiolaria laevigata</i> GRAY.....	..	..	26	4	9	2	..	..	..	..
<i>Arca glacialis</i> GRAY.....	1	4	5	4	6	4	1	13	26	167
<i>Portlandia intermedia</i> M. SARS	..	..	1	..	..	..	..	..	..	..
<i>Tanais</i> sp.....	..	2	..	..	..	..	1	..	..	..
<i>Spirontocharis</i> sp.	3	..	2	..	1	1	..	..	..	..
<i>Sclerocrangon</i> sp.	..	1	..	..	1	1	..	..	1	1
<i>Chaetonymphon hirtipes</i>	..	2	..	1	..	..	1	1	..	..
<i>Nymphon</i> sp.	..	..	..	..	..	..	..	1	..	..
<i>Ascidiae</i>	..	..	5	1	3	..	..	..	..	1
<i>Cottus scorpius</i> L.	1	..	1	..	..	..	..	..	..	..

Astarte elliptica, *Axinus flexuosus*, **Macoma moesta*, *Venus fluctuosa*, *Mya truncata*, *Saxicava arctica*, *Thracia truncata*, *Pandora glacialis*.

Despite the fact that these samples are derived from the transitional area between the two *Ophiecten* zones, they show distinct points of similarity to the deeper *Ophiecten* zone. All the species in the above list marked with an asterisk are forms typical of this zone. From this we may infer that the deeper *Ophiecten* zone is commonly distributed in Northeast Greenland even outside Franz Joseph Fjord and the adjacent waters.

In the deeper *Ophiecten* zone the temperature of the water is negative in the summer and in the winter as well, and this fact probably accounts for the sudden appearance of so many typically Arctic lamellibranchs (e. g. *Pecten groenlandicus* and the various forms of *Portlandia*). On July 24, 1932, the following temperatures were registered in the Solitærbugt: at 25 m depth, $\div 1^{\circ}$, at 35 m depth, $\div 1,48^{\circ}$, and at 50 m depth, $\div 1,71^{\circ}$. (The corresponding minimum temperatures measured on May 9th—14th were as follows: at 26 m depth, $\div 1,57^{\circ}$, at 29 m depth, $\div 1,62^{\circ}$, and at 50 m depth, $\div 1,66^{\circ}$).

Passing outward from the coast, the deeper *Ophiecten* zone, as already stated (p. 19), is the first zone occurring at constantly negative temperatures, i. e. in the polar current water, from where temperatures have been measured in several localities in the fjords during the summer of 1932 (SPÄRCK 1933).

As will be evident from the paper just cited, the negative temperature rather closely follows the 20 m curve, and it is about this point that the inner limit of the deeper *Ophiecten* zone must be drawn.

At present very little is known about the spawning in this zone. As early as June 24th *Pecten groenlandicus* was observed with swollen ovaries, but the eggs were far from being loose, and no doubt spawning would not take place until one month later. About July 15th *Næra obesa* were found with free eggs between the shells, and as regards the epifauna-animal associated with this zone, *Strongylocentrotus droebakiensis*, the first larvæ were found in the plankton on July 25th.

With the deeper *Ophiecten* zone, too, an epifauna is associated, even if at this depth it is not of the same importance as in the two preceding zones. The *Desmarestia* epifauna is not particularly dominant, more frequent is a red algæ epifauna with *Laminaria*, in which the most common animal is *Strongylocentrotus droebakiensis*. At these depths the *Fucus* epifauna only occurs near steep rocky shores.

In the deeper *Ophiecten* zone, too, *Saxicava arctica* plays a large role with regard to the total weight. The average weight per sq. m for this zone is 256,18 gr, of which 157,12 gr falls on *Saxicava*. If the latter weight is deducted, we shall have for the deeper *Ophiecten* zone proper

Table 15. Various Localities in the Fjords. Dredge-hauls.
The deeper *Ophiecten*-Zone.

The columns show the number of the individuals.

	27—34 m Franz-Joseph Fjord near the Engdal Clay 7-8-32 Summer st. 51	32—37 m Franz-Joseph Fjord near the Engdal Clay 7-8-32 Summer st. 50	36—45 m Franz-Joseph Fjord near the Engdal Clay, Laminaria 7-8-32 Summer st. 53	27—30 m Isfjord near the Haredal Clay, Desmarestia 7-8-32 Summer st. 63	30—35 m Isfjord near the Haredal. Clay 7-8-32 Summer st. 64	30—30 m The head of Dusen Fjord. Rocks, Clay, Sand 9-8-32 Summer st. 80	26—40 m The mouth of Dusen Fjord, near Cape Grahn. Clay, Stones, Desmarestia 12-8-32 Summer st. 88
<i>Actiniae</i>	3	1	3	..	..	..	..
<i>Ophiecten sericeum</i> (FORBES)....	ca.100	40	ca.20	5	ca.30	12	ca.20
<i>Ophiura robusta</i> AYRES	..	..	..	..	..	1	..
<i>Myriotrochus rinki</i> STP.	ca.20	10	8	2	20	1	..
<i>Strongylocentrotus droebakiensis</i> (O. F. MÜLLER).....	..	..	2	..	..	..	..
<i>Pectinaria granulata</i> L.	1	..	..	..	..	..	1
<i>Harmothoe</i> sp.	1	..	2	..	2	..	..
<i>Nereis zonata</i> MGRN.	..	..	..	1	..	..	..
<i>Gastjana cirrosa</i> (PALL.)	..	..	..	..	..	..	1
<i>Lanice conchylega</i>	..	..	..	..	..	..	..
<i>Polychaeta</i>	10	..	2	ca.25	ca.50	3	4
<i>Phascolion strombi</i> (MONT.)....	..	..	..	..	..	1	1
<i>Nemertini</i>	..	..	1	..	..	..	..
<i>Bryozoa</i>	..	..	..	..	..	4	..
<i>Margarita groenlandica</i> (CHEMN.)	..	..	..	..	1	..	..
<i>Natica groenlandica</i> (BECK)....	..	..	..	..	..	..	1
<i>Buccinum hydrophanum</i> HANCOCK	1	1	1	..	..	..	..
<i>Buccinum</i> sp.	..	..	2	..	..	..	..
<i>Sipho</i> sp.	6	2	3	..	..	..	..
<i>Velutina laevigata</i> (PENNANT)...	..	2	..	..	..	..	..
<i>Lepeta coeca</i> (MÜLLER).....	..	..	..	..	..	..	1
<i>Cylichna reinhardti</i> (MØLLER) ...	..	2	..	..	..	..	..
<i>Cylichna</i> sp.	2	..	..	..	..	..	..
<i>Astarte elliptica</i> BROWN	..	..	..	..	..	1	26
<i>Astarte banksi</i> (LEACH)	2	7	7	..	..	..	..
<i>Macoma calcaria</i> (CHEMN.)	12	16	3	8	14	..	6
<i>Mya truncata</i> L.	2	2	3	1	4	..	..
<i>Saxicava arctica</i> L.	104	86	34	31	81	..	15
<i>Cardium ciliatum</i> FABR.	7	7	..	2	18	..	6
<i>Cardium groenlandicum</i> CHEMN..	..	..	..	..	5	..	..
<i>Pecten groenlandicus</i> CHEMN.	..	..	..	..	2	..	8
<i>Leda pernula</i> MÜLL.	3	3	5	..	..	..	12
<i>Modiolaria laevigata</i> (GRAY)....	3	3	1	7	9	..	1
<i>Modiolaria nigra</i> (GRAY).....	..	..	..	..	..	..	1
<i>Nucula tenuis</i> MTG.	..	..	..	..	..	..	3
<i>Arca glacialis</i> GRAY.	..	..	..	..	..	..	2
<i>Portlandia arectia</i> (GRAY)	41	29	28	8	74	..	..
<i>Philomedes globosus</i> LILJ.	1	..	..	..	..	..	..
<i>Amphipodae</i>	..	..	..	..	3	..	1
<i>Spirontocharis</i> sp.	3	2	4	..	..	..	2
<i>Sclerocrangon</i> sp.	..	..	1	..	..	..	1
<i>Ascidiae</i>	1	2	2	..	1	..	..
<i>Cottus scorpius</i>	..	..	..	..	1	..	1

99,06 gr per sq.m, i.e. a weight lying midway between the weights of the two preceding zones. The peculiar feature of the deeper *Ophiecten* zone being the occurrence of such a large number of typically Arctic animals, a comparison with a boreal animal community and its total weight will give no satisfactory result.

2. The *Arca-Astarte-crenata*-community.

Depth about 45 m to about 200 m.

Tables 16, 17, and 18.

Outside the *Macoma-calcaria*-community we find another community, which is treated in greater detail in a paper by SPÄRCK (1933). The type animals are *Arca glacialis* and *Astarte crenata*, in the inner part of the area together with *Astarte elliptica* and *Pecten groenlandicus* the only lamellibranchs that are really numerous in the dredges. The bottom samples have, however, shown that *Axinus flexuosus* is abundant in this zone also. (In the dredges this species was washed out of the nets before reaching the surface of the water). Further it is a typical feature of the *Arca-Astarte crenata* zone that the lamellibranch *Saxicava arctica*, which is associated with the level sea-floor and which is so immensely dominating in other zones, is here of quite subordinate importance. (In all the eleven dredges mentioned in table 17, only one *Saxicava arctica* occurred). *Ophiecten sericeum* still occurs, but does not approximately play the same role as in the two preceding zones¹). The Polychaetes and Prosobranchs are of little importance in this zone, with the exception only of the snail *Lepeta coeca*, which, like *Strongylocentrotus droebakiensis*, forms an epifauna on the stones. If we look at the dredge tables Nos. 17 and 18, we shall note how poor in species this community is compared with the *Astarte-Pectinaria* zone and the two *Ophiecten* zones of the *Macoma*-community, it being rather characteristically and sharply delimited from these zones.

From the Solitærbugt some few bottom samples from this community are at hand (table 16). Two of the samples are derived from the transition zone between the deeper *Ophiecten* zone and the *Arca-Astarte crenata* community, and are, consequently, still rather rich in animals (table 16, St. 122).

The *Arca-Astarte crenata* community is commonly distributed throughout the fjord area. In all places where samples were taken at greater depths than 45 m, this zone was met with. Even in the interior

¹) As this zone is poorer in animals than the preceding ones, the dredges here were always made over far larger areas, and the numbers mentioned in the dredges, also for *Ophiecten sericeum*, are therefore too big compared with the tables from the other zones.

Table 16. Solitærbugt, Ella Island. Bottom-samples.

The *Arca-Astarte-crenata*-Zone.

The first column shows the number of individuals, the second the weight in gram per sq.m.

	45 m		45 m		60 m	
	Solitærbugt by the Delta, Clay, Stones 24-8-32 St. 122A		Solitærbugt by the Delta, Clay, Stones 24-8-32 St. 122B		Solitærbugt Stones, Gravel 24-8-32 St. 128	
	Number	Weight	Number	Weight	Number	Weight
<i>Ophiocten sericeum</i> (FORBES)	30	2,00	100	4,00	30	2,00
<i>Ophiures</i> sp.	10	0,50	..	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O.D. MÜLLER)	10	220,00	10	48,50	..	..
<i>Harmothoe</i> sp.	10	0,20	..	..	..	..
<i>Nereides</i>	20	1,20	..	..	..	..
<i>Nephtys</i> sp.	..	..	..	..	..	..
<i>Terebellides</i>	..	..	..	..	..	..
<i>Polychaeta</i>	30	7,10	60	0,50	..	..
<i>Phascolion strombi</i> (MONT.)	10	0,30	10	0,10	..	..
<i>Nemertini</i>	10	0,10	..	..	..	..
<i>Margarita groenlandica</i> (CHEMN.)	20	0,20	..	..	..	..
<i>Lepeta coeca</i> (MÜLLER)	..	..	10	2,30	..	..
<i>Cylichna</i> sp.	..	..	10	0,30	..	..
<i>Astarte elliptica</i> BROWN	..	..	..	..	10	20,50
<i>Astarte crenata</i> GRAY	20	0,20	..	..	20	14,50
<i>Azinus flexuosus</i> MONT.	70	1,80	..	..	..	..
<i>Dacrydium vitreum</i> (MÖLLER)	20	0,30	..	..	..	..
<i>Pecten groenlandicus</i> CHEMN.	10	0,10	..	..	..	..
<i>Leda pernula</i> MÜLLER	10	8,00	..	..	..	..
<i>Arca glacialis</i> GRAY	30	28,10	10	6,50	..	..
<i>Portlandia frigida</i> (TORELL)	10	0,10	..	..	..	..
<i>Portlandia arctica</i> GRAY	..	..	..	..	10	0,20
<i>Philomedes globosus</i> LILJEBORG	30	0,20	..	..	..	..
<i>Diastylis</i> sp.	10	2,70	10	1,80	..	..
<i>Amphipodae</i>	..	..	..	..	..	..
<i>Tanais</i> sp.	..	..	..	..	..	..
<i>Chaetonymphon hirtipes</i>	..	..	..	..	..	..
<i>Ascidiae</i>	10	35,00	..	..	..	..
<i>Astorrhiza</i>	..	..	..	..	..	..
<i>Nodulina</i>	..	..	..	..	..	..
Total weight of sample per sq.m, gr	308,10		64,00		7,30	

of Franz Joseph Fjord, where conditions, as a rule, differ from those of the remaining fjord area, we find *Arca glacialis* in the bottom samples. Concerning the localities at Cape Hedlund and in the Solitærbugt

I shall refer to tables 17 and 18, and for the other localities to table 3 in the paper by SPÄRCK (1933).

Also outside Franz Joseph Fjord and the adjacent waters this zone may be found in Northeast Greenland. A collocation after AD. JENSEN's list of lamellibranchs (1905) of the species from Hurry Inlet (by Scoresby Sound) gave the following result:

Hurry Inlet, 95 m. Clay with Stones.

<i>Astarte crenata</i> (numerous specimens)	<i>Arca glacialis</i> (80 specimens)
<i>Saxicava arctica</i> (2 specimens)	<i>Leda pernula</i> (17 specimens)
<i>Axinus flexuosus</i> (6 specimens)	<i>Portlandia intermedia</i> (9 specimens)
<i>Dacrydium vitreum</i> (20 specimens)	<i>Portlandia lenticula</i> (30 specimens)
<i>Neæra obesa</i> (5 juv. specimens)	<i>Portlandia frigida</i> (12 specimens)

A more obvious corroboration of the occurrence of the community in the Scoresby Sound district can hardly be imagined. In this list *Arca glacialis* and *Astarte crenata* are numerically the absolutely dominating forms (the occurrence of the community outside Greenland will be discussed below, pp. 43—52).

Table 17. Solitærbugt, Ella Island.

The columns show the number

	48—52 m Clay, Stones, Shells 23-6-32 St. 253	55—55 m Clay, Stones, Shells 23-6-32 St. 267	55—65 m Clay, Stones 28-6-32 St. 265
<i>Spongiae</i>	..	..	..
<i>Hydroidea</i>	..	..	..
<i>Anthozoa</i>	..	1	..
<i>Ophiocten sericeum</i> (FORBES).....	ca. 50	ca. 30	ca. 50
<i>Ophiura robusta</i> AYRES	..	..	..
<i>Ophiures</i> sp.	..	..	..
<i>Strongylocentrotus droebakiensis</i> (O. F. MÜLLER)	..	2	4
<i>Antedon</i> sp.....	..	..	..
<i>Nephthys ciliata</i> (MÜLL.)	..	..	..
<i>Polynoides</i>	..	..	..
<i>Onuphis conchylega</i> SARS.....	1	..	..
<i>Polychaeta</i>	3	2	..
<i>Phascolion strombi</i> MONT.	2	..	..
<i>Bryozoa</i>	+	..	..
<i>Natica groenlandica</i> (BECK).....	1	..	..
<i>Buccinum hydrophanum</i> HANCOCK.....	..	..	..
<i>Sipho</i> sp.....	1	1	..
<i>Lepeta coeca</i> (MÜLLER).....	..	2	2
<i>Siphonodentalium vitreum</i> (M. SARS)	..	..	..
<i>Astarte elliptica</i> BROWN.....	18	19	2
<i>Astarte crenata</i> GRAY.....	10	5	3
<i>Macoma calcaria</i> (CHEMN.)	..	..	..
<i>Saxicava arctica</i> L.	..	..	..
<i>Pecten groenlandicus</i> CHEMN.....	34	5	5
<i>Pecten islandicus</i> MÜLLER	..	..	..
<i>Portlandia arctica</i> (GRAY)	..	..	..
<i>Portlandia lenticula</i> MØLLER.....	..	..	..
<i>Arca glacialis</i> GRAY.....	120	27	14
<i>Diastylis</i> sp.	..	1	..
<i>Amphipodae</i>	1	..	..
<i>Spirontocharis</i> sp.	..	..	..
<i>Chaetonymphon hirtipes</i>	1	..	1
<i>Nymphon</i> sp.	1	..	..
<i>Ascidiae</i>	..	..	..

Dredge-hauls. The *Arca-Astarte-crenata*-Community.

of the individuals.

62—64 m Shells, Gravel 8-7-32 St. 301	60—70 m Clay, Stones 23-6-32 St. 257	70—80 m Clay, Stones 5-7-32 St. 297	75—85 m Clay, Stones 1-7-32 St. 278	80—85 m Stones, Algae 2-7-32 St. 288	80—90 m Stones, Shells 28-6-32 St. 269	85—95 m Clay, Stones 28-6-32 St. 264	85—95 m Clay, Stones 5-7-32 St. 296
..	..	..	..	..	..	..	..
..	..	..	..	..	..	+	..
..	..	..	..	..	..	1	1
13	70	4	ca. 15	ca. 10	10	16	ca. 15
5	..	..	..	..	..	..	..
1	..	..	..	..	..	..	..
6	..	1	5	2	10	..	..
..	..	..	..	1	..	..	..
..	..	..	1	..	..	..	..
1	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	3	..	..	2	..	2	2
..	..	..	..	..	..	..	..
..	+	..	..	1	..	..	+
..	..	..	..	..	..	..	1
..	1	..	..	..	..	..	..
..	..	..	..	..	..	..	..
2	..	6	..	4	6	1	..
..	..	..	..	..	..	1	..
13	5	6	2	3	1	1	2
22	3	7	1	5	35	14	6
1	..	..	..	..	..	..	..
..	1	..	..	..	..	..	..
..	16	1	..	3	2	..	1
1	..	..	..	..	..	..	..
..	..	..	..	..	..	1	2
..	1	..	..	1	..	..	..
52	11	12	4	30	26	21	84
..	2	..	1	..	..	..	..
..	..	..	..	..	..	..	..
..	1	..	1	..	..	..	..
..	2	..	..	..	..	..	..
..	..	..	..	..	1	..	4
..	..	1	..	3	+	2	4

Table 18. Cape Hedlund, Kempe Fjord. Dredge-Hauls.
The *Arca-Astarte-crenata*-Community.

The columns show the number of the individuals.

	57—60 m Clay 12-7-32 St. 331	59—63 m Clay 13-7-32 St. 346	60—63 m Clay 15-7-32 St. 367	67—75 m Clay, Stones 13-7-32 St. 347	70—85 m Clay, Stones 14-7-32 St. 356	82—90 m Clay, Gravel 14-7-32 St. 355	85—90 m Clay 10-7-32 St. 320
<i>Spongiae</i>	..	1	..	..	..	..	..
<i>Hydroidea</i>	..	..	..	1	..	..	..
<i>Actiniae</i>	..	..	..	..	..	..	1
<i>Ophiocten sericeum</i> (FORBES).....	11	5	51	20	82	50	ca.125
<i>Ophiura robusta</i> AYRES	..	..	1	1	..	1	1
<i>Ophiures</i> sp.	..	4	..	4	..	..	..
<i>Antedon</i> sp.	..	..	1	2	..	..	..
<i>Pectinaria (hyperborea?)</i>	1	..	..	..	..	..	..
<i>Nephthys ciliata</i> (MÜLL.)	..	..	..	..	1	..	..
<i>Onuphis conchylega</i> SARS.....	..	..	..	..	1	..	..
<i>Phascolion strombi</i> MONT.	..	1	..	..	..	..	..
<i>Bryozoa</i>	+	+	..	+	+	+	..
<i>Buccinum hydrophanum</i> HANC. ...	1	..	..	..	..	..	..
Egg-capsules of <i>Sipho</i> sp. (M. Sars)	..	..	..	2	..	2	..
<i>Siphonodentalium vitreum</i>	..	..	..	..	..	1	..
<i>Astarte elliptica</i> BROWN.....	4	..	1	..	..	..	..
<i>Astarte crenata</i> GRAY	4	10	2	6	7	22	2
<i>Pecten groenlandicus</i> CHEMN.....	..	2	..	..	..	1	1
<i>Arca glacialis</i> GRAY	48	20	149	15	16	32	16
<i>Tanais</i> sp.	..	..	1	..	..	..	1
<i>Chaetonymphon hirtipes</i>	..	..	2	..	..	..	..
<i>Nymphon</i> sp.	1	2	1	1	2	..	3
<i>Ascidiae</i>	3	..	1	1	+	+	..
<i>Cottus scorpius</i> L.	..	2	..	..	..	..	..

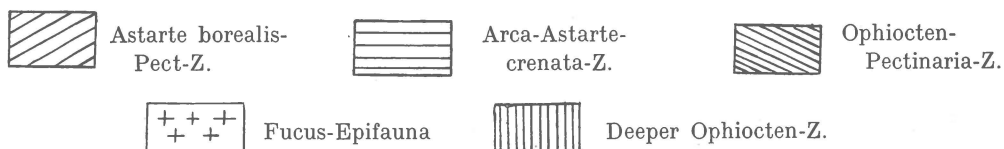
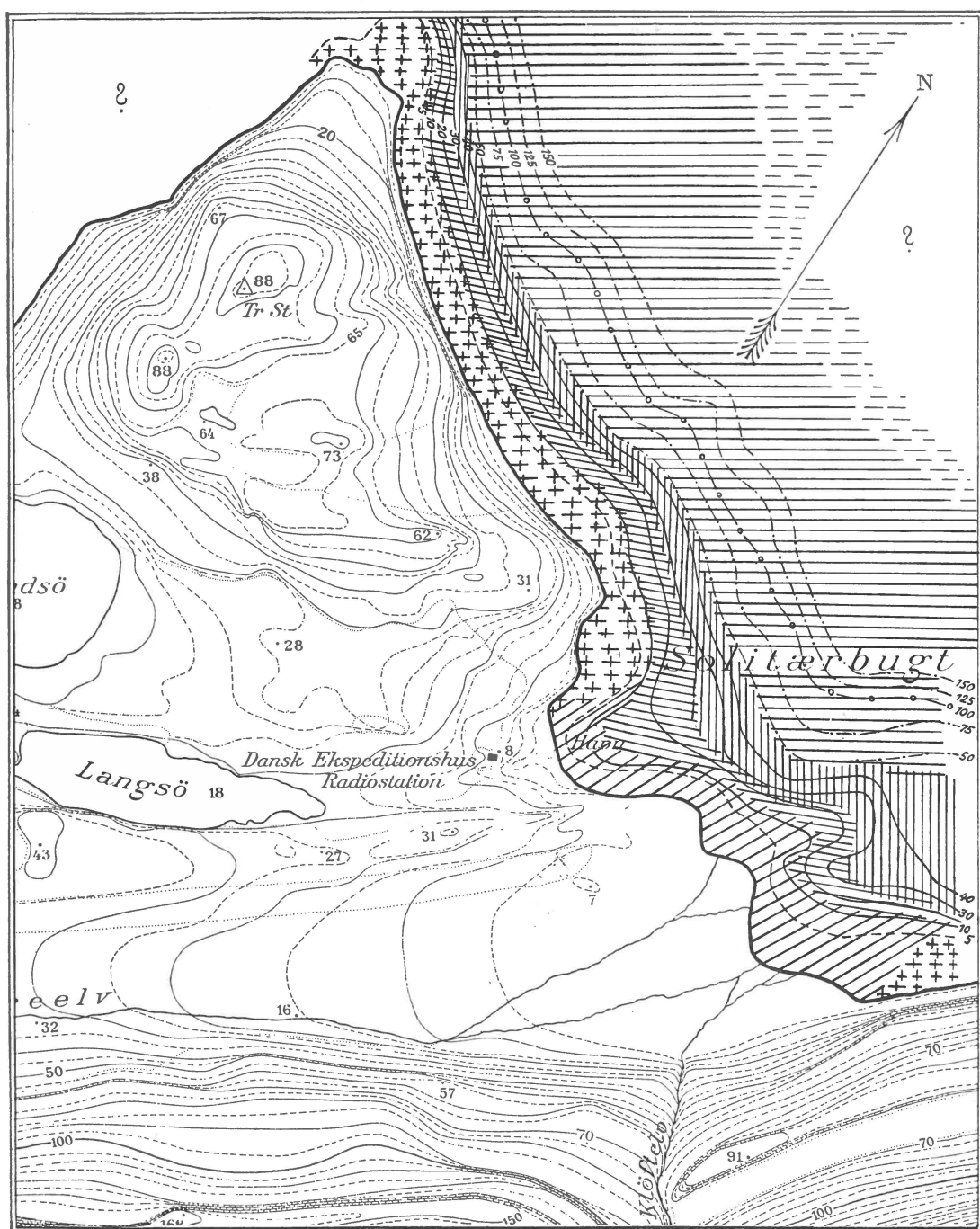


Fig. 1. Solitærbugt, Ellsø.

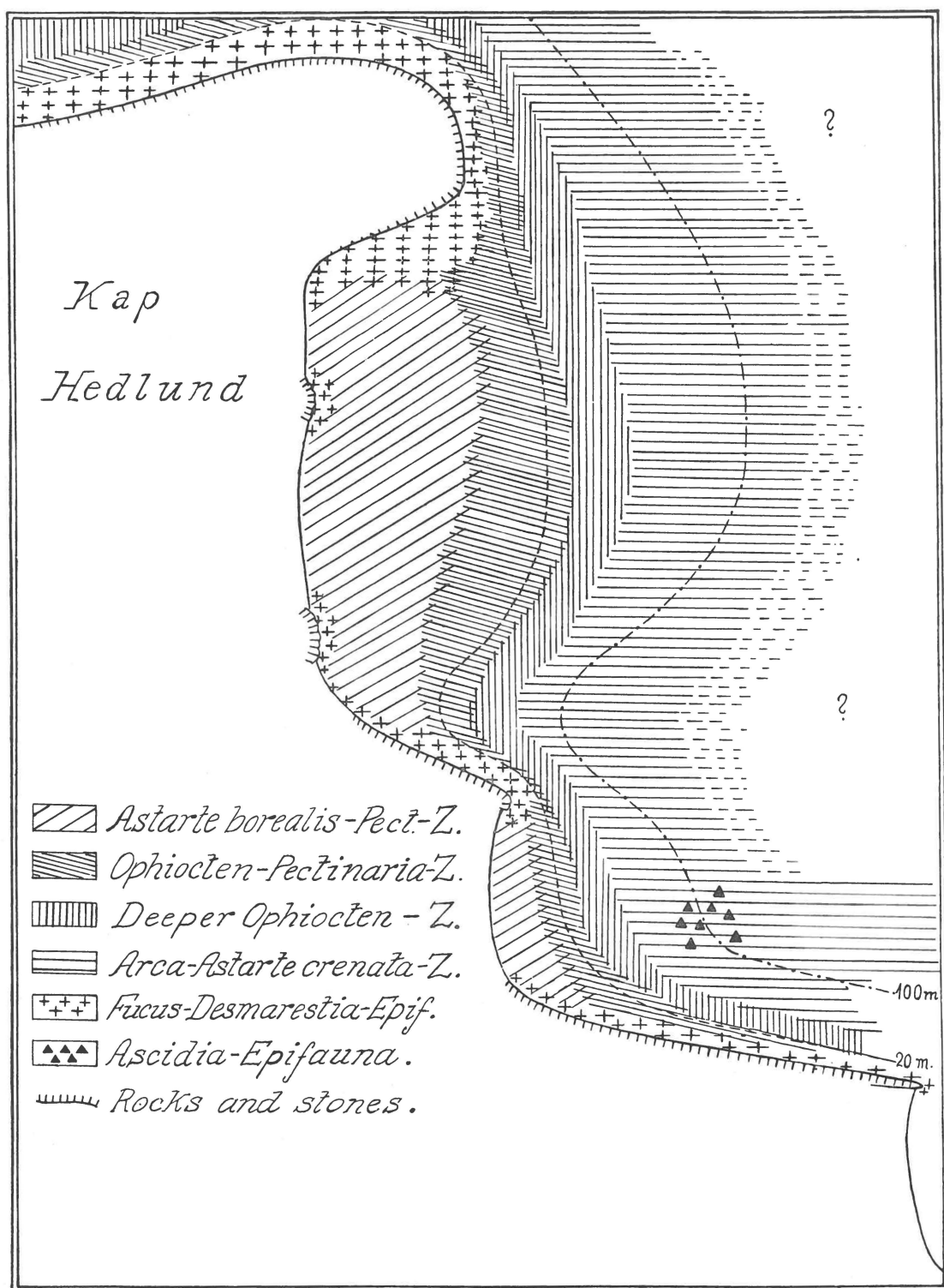


Fig. 2.

III.

A COMPARISON BETWEEN THE SHALLOW WATER ANIMAL COMMUNITIES IN EAST GREENLAND AND THOSE OF OTHER ARCTIC SEAS

In the discussion of the East Greenland animal communities and animal-zones that have been erected it has been pointed out that these may also be met with outside the Franz Joseph Fjord complex, thus e. g. in the Scoresby Sound fjord complex and in the pack-ice belt along the East Greenland coast. Next it will be of interest to examine whether these zones may be generalised over extensive Arctic areas or must be considered local phenomena.

Investigations by means of bottom samples have formerly been carried out in Arctic regions. Thus during the summer of 1925 an investigation with bottom samples was carried out in the Storfjord, Spitzbergen (77°—78° N. lat. 20° E. long. (see BROZKY 1930, p. 60), and a similar investigation is recorded from the Spitzbergen bank (75°—76° N. lat. 19°—24° E. long.), likewise made in the summer of 1925 (see IDELSON 1930, p. 44). Finally, a series of investigations was made in the Barents Sea in 1924 and a similar series in the White Sea in the summer of 1926, both of which have been published by ZENKEWITSCH (1927, p. 1). The same author has later made an investigation in the sea region about the Kanin peninsula (68°00'—69°10' N. lat. 41°—44° E. long.) (ZENKEWITSCH 1930, p. 1). A comparison of the results of these investigations with the results from East Greenland will be attempted in the following.

When a comparison is to be made, based on these scattered bottom-sample results, agreement as regards the character of animal-communities can be expected only in the main features. It is evident, however, that these communities, distributed over so vast areas as those dealt with here, will be found in several different modifications, so that for instance the East Greenland zones of the *Macoma-calcaria*-community will be rather difficult to recognise.

The main result of this comparison is briefly this: the *Macoma-calcaria*-community is found at all the Arctic localities from which quantitative bottom-samples are known as well as from Iceland and the Faroes. The *Arca-Astarte crenata* community is known from the Storfjord (Spitzbergen), the Spitzbergen banks, but seems to be entirely absent from the Barents Sea. Concerning the different zones of the *Macoma-calcaria*-community, the *Astarte borealis*-*Pectinaria*-zone is known from greater depths in the Barents Sea, the two *Ophiecten*-zones cannot be kept distinct, but are known as living together in the Storfjord (Spitzbergen) and the Barents Sea. These main results will now be discussed more closely.

The Storfjord, East Spitzbergen¹). The conditions in this locality probably agree most closely with the results from East Greenland. As, however, only 18 samples are available from the Storfjord, it will be evident that the individual zones could not possibly be kept distinct. With the East Greenland results in mind, much information hitherto obscure may be obtained from BROTZKY's paper. BROTZKY writes as follows about the investigation: "the bottom-fauna in the explored part of the Storfjord, as mentioned already, strikes one by the uniformity of its constitution. Altogether, this part can be considered as inhabited by a single bottom-fauna complex, in which the leading forms are *Astarte borealis* and *Ast. montagui*, *Tellina calcaria*, *Nucula tenuis*, *Maldane sarsi*, *Ophiecten sericeum*, *Strongylocentrotus droebakien-sis*" (BROTZKY 1930, p. 6). This list clearly testifies to unmistakable similarity to the East Greenland *Ophiecten* zones of the *Macoma-calcaria*-community, and since all the available samples from the Storfjord, where these lamellibranchs predominate, are derived from depths ranging from 51 to 90 m, it further shows that here the *Ophiecten* zones extends to considerably deeper water than within the greater part of the East Greenland fjord complex. A further peculiarity of this zone in the Storfjord is the occurrence of *Astarte borealis*; it was, however, by far not so numerous here as in the *Astarte borealis* zone in East Greenland (the Storfjord: 15 individuals per sq.m, the Solitærbugt, East Greenland: 88 individuals per sq.m). The circumstance that the *Ophiecten* zone in the Storfjord extends to deeper water vividly recalls the conditions in the interior of Franz Joseph Fjord. From the locality in the interior of Franz Joseph Fjord off the Engdalen, 50—55 m, a dredge of the following content is at hand: *Actina* sp., *Ophiecten sericeum*, *Myriotrochus rinki*, *Leda pernula*, *Macoma calcaria*, *Portlandia arctica*,

¹) Besides these bottom-sample results, even the Mollusca from the Ice-Fjord, Spitzbergen (cfr. ODHNER 1915) show similarity to the East Greenland communities. But as these Mollusca have been sampled by dredging — not quantitative — they will not be closely dealt with here.

Saxicava arctica, *Sipho* sp., and *Cylichna reinhardti*. In this sample neither *Arca glacialis* nor *Astarte crenata*, otherwise typical of this depth in East Greenland, have as yet occurred, and another circumstance which confirms the similarity between the interior of Franz Joseph Fjord and the Storfjord is the frequent occurrence of *Portlandia arctica* in both places (BROTZKY 1930, p. 60).

At greater depths in the Storfjord this difference will be eliminated, and here, exactly as within the whole area of Franz Joseph Fjord (including the inner parts), the *Arca-Astarte crenata* community occurs in its most typical development, as will appear from the following facts. BROTZKY (l. c.) mentions the dredging stations 204—206, which, as a glance at his map (fig. 1) will show, occur at depths beyond the 100 m curve, and gives the following particulars about the results: "...instead of *Astarte borealis* and *Astarte montagui*, *Astarte crenata* is the leading Lamellibranchiata".

As regards station 202 (just outside the 50 m curve) he states that "... an original fauna was discovered, characterized by masses of *Onuphis conchylega*, *Pecten groenlandicus*, and *Arca glacialis*".

These examples thus show with sufficient clarity that we are here concerned with modifications of the *Arca-Astarte crenata* community, modifications that may easily be recognised in the East Greenland fjord complexes.

As results of this comparison may be mentioned that the communities common in East Greenland (the *Macoma calcaria* community and the *Arca-Astarte crenata* community) are distinctly recognisable in the Storfjord, but that here, as in the inner parts of Franz Joseph Fjord, a displacement of the zones to greater depths has taken place.

The Spitzbergen banks. From this locality, at depths ranging from 67 to 95 m — i.e. depths corresponding exactly to those at which the *Arca-Astarte crenata* zone occurs in East Greenland — altogether four stations comprising seven bottom samples are recorded (each of them $\frac{1}{10}$ sq.m). The type animals of these samples are stated to be: *Macoma calcaria*, *Astarte crenata*, *Ophiura robusta*, *Ophiopholis aculeata*, *Strongylocentrotus droebakiensis*, and *Thelepus circinnatus*. The other lamellibranchs contained in these samples were: *Astarte banksi*, *Ast. elliptica*, *Astarte borealis* (only in one sample), *Nucula tenuis*, *Leda pernula*, *Axinus flexuosus*, *Mya truncata*, *Saxicava arctica*, and *Modiolaria laevigata*. In reality this community corresponds rather well to the *Arca-Astarte crenata* community in East Greenland (the only difference being that *Arca glacialis* seems to be entirely absent in this place, and that *Ophiocten sericeum* is replaced by *Ophiura robusta*). *Strongylocentrotus droebakiensis* and *Ophiopholis aculeata* are, of course, to be regarded as epifauna-animals.

The *Macoma-calcaria*-community was, however, not recognised on the Spitzbergen bank. The few stations on the Spitzbergen bank, which were taken at depths (40 m and 36 m) where the shallow water zones of East Greenland might be expected to be represented, have all of them struck an epifauna-area and thus supply no information about the level sea floor. Very possibly, however, an investigation of the level ground in more shallow water will reveal similar zones as at East Greenland. The unmistakable occurrence of the *Arca-Astarte crenata* zone might suggest this.

The Barents Sea. In the deep channel south of Novaya Zemlya (150—200 m depth) we find an animal community characterised by the presence of the following species: *Cardium ciliatum*, *Macoma calcaria*, *Portlandia arctica*, *Phascolosoma margaritaceum*, *Priapulus caudatus*, *Scalibregma inflatum*, *Ophiosten sericeum*, and *Eupyrus scaber*. This zone does not correspond directly to any of the East Greenland zones (thus in East Greenland *Priapulus caudatus* is characteristic of the *Astarte borealis-Pectinaria* zone). At this depth in East Greenland we find the *Arca-Astarte crenata* community, which seems to be entirely absent from the Barents Sea. The community should more probably be compared with a mixture of the East Greenland *Ophiosten* zones of the *Macoma calcaria* community, which here, as in the Storfjord, Spitzbergen, has made its way into deeper waters.

Nor do the results from depths ranging from 50 m to 130 m in the Barents Sea correspond to those from East Greenland. In the Barents Sea the type animals at this depth are as follows: *Cardium ciliatum*, *Astarte borealis*, *Ast. banksi*, *Macoma calcaria*, *Maldane sarsi*, and *Rhodine gracilior*. The zone chiefly recalls the shallow water zone of East Greenland (*Astarte borealis-Pectinaria* zone), but *Priapulus caudatus*, so characteristic of this zone in East Greenland, is here of quite subordinate importance, while *Pectinaria granulata* is entirely absent, but so much is at any rate certain, that even here we find a modification of the *Macoma calcaria* community.

The "littorale, sandige Bodenarten" (ZENKEWITSCH 1927, p. 60) are obscured in the Barents Sea by a vigorous epifauna, but the lists of the bottom samples (l. c. p. 24) show no slight similarity to the *Astarte borealis-Pectinaria* zone of the *Macoma calcaria* community overgrown with *Desmarestia* in East Greenland¹⁾. Thus animals at this depth in the Barents Sea comprised the following lamellibranchs: *Cardium groenlandicum*, *Mya truncata*, *Astarte* sp. (very numerous), *Margarita groenlandica*, *Natica clausa*, *Bela* sp., *Natica groenlandica*, and *Cylichna*

¹⁾ This is of fairly great interest, as sandy bottom has not been found in East Greenland.

reinhardtii, all of them (with the exception of *Natica clausa*) also of common occurrence in shallow water in East Greenland.

The comparison between the animal communities in East Greenland and those of the Barents Sea thus gives the following results, taking East Greenland as the point of departure:

The East Greenland deep water community (*Arca-Astarte crenata* community) is entirely absent from the Barents Sea and is replaced, with certain modifications, by the East Greenland *Ophiecten* zones of the *Macoma calcaria* community (the *Ophiecten-Pectinaria* zone and the deeper *Ophiecten* zone), which thus in the Barents Sea extend to far greater depths than at East Greenland. Something similar applies to the East Greenland shallow water zone (the *Astarte borealis-Pectinaria* zone), which in the Barents Sea, in various modifications and mixed with an epifauna, extends from the coast to a depth of 130 m.

The White Sea. ZENKEWITSCH's results from this locality show much greater deviations from the East Greenland conditions than did those from the Barents Sea. In the White Sea so many species not occurring in East Greenland have been added to the type animals (e.g. *Yoldia hyperborea* and *Ophiacantha bidentata*) that a comparison is very difficult, and further the zones which are so distinctly delimited at East Greenland and Spitzbergen, here seem to be more mixed.

At depths from 50 to 120 m there occurs a zone with *Astarte borealis*, *Yoldia hyperborea*, *Maldane sarsi*, *Ophiacantha bidentata*, and *Leda pernula*, in which the East Greenland *Astarte borealis-Pectinaria* zone may perhaps be distinguished (if so, as in the Barents Sea, in deep water). At corresponding depths in other parts of the White Sea there occurs a zone possibly identical with the deeper *Ophiecten* zones of East Greenland. The resemblance between the zones in the White Sea and the East Greenland zones is, however, so inconsiderable that a closer comparison will be without interest.

The sea region about the Kanin Peninsula. In this district (68°—69° N. lat., 41°—44° E. long.) only three stations have been taken at depths ranging between 55 and 60 m (Sts. 700, 702, and 704, ZENKEWITSCH 1930, p. 22). The depths of these stations correspond to the bathymetrical distribution of the East Greenland *Arca-Astarte crenata* community.

Even here we find a — very modified — *Macoma calcaria*-community, but without the East Greenland zones.

The community attached to the sand, mentioned by ZENKEWITSCH (depth 20 to about 60 m, Sts. 712, 729, 730), also differs very much in its composition from the East Greenland—Spitzbergen communities. As an example it may be mentioned that here the boreal form *Cyprina islandica* is one of the leading species, which is not known with certainty

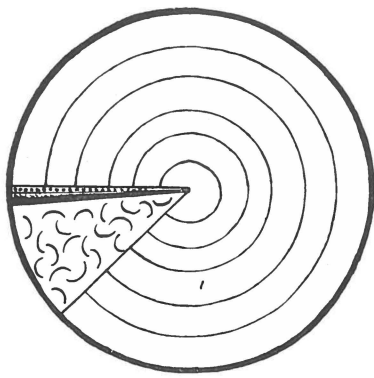
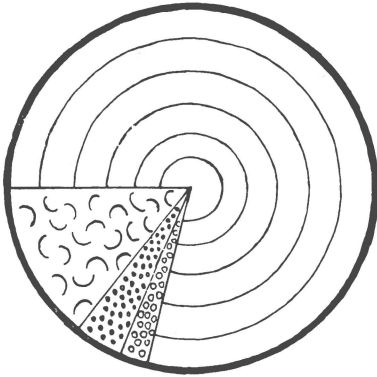
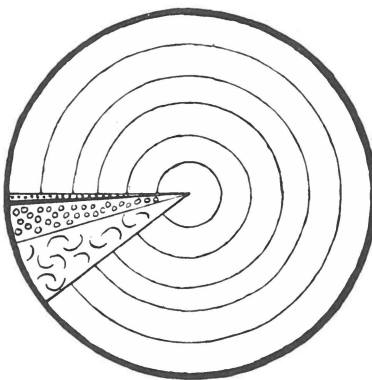
*a**Lamellibranchs**Polychaeta**B**Echinodermata**Crustacea**C**Gastropoda*

Fig. 3.

from Greenland. Consequently a comparison here cannot give a positive result either.

A character which all northern animal communities seem to have in common, in contrast to the real boreal communities (at least those known from the Danish waters), is the general dominance in weight of the lamellibranchs in the Arctic samples in contrast to the equally dominating weight of the echinoderms in the Danish samples, which has already been pointed out by ZENKEWITSCH (1927, p. 30). To render it possible to draw a comparison with these results, a graphical representation of the weight-relations between the various animal groups within three of the East Greenland zones computed on the basis of the average weight per m is given in fig. 3 of this paper. In fig. 3, *A* marks the *Astarte borealis*-*Pectinaria* zone, *B* the *Ophiecten*-*Pectinaria* zone, and *C* the deeper *Ophiecten* zone. For checking I shall here give the average percentage weight of the three graphically represented zones.

The *Astarte borealis*-*Pectinaria* zone: *Lamellibranchiata* (87, 78 %), *Gastropoda* (0,73 %), *Polychaeta* (11,23 %), *Gephyrea* (0,13 %), *Crustacea* (0,13 %).

The *Ophiecten*-*Pectinaria* zone: *Lamellibranchiata* (79,24 %), *Echinodermata* (2,36 %), *Polychaeta* (14,18 %), *Crustacea* (4,22 %).

The deeper *Ophiecten* zone: *Lamellibranchiata* (90,04 %), *Gastropoda* (0,27 %), *Echinodermata* (3,32 %), *Polychaeta* (5,86 %), *Crustacea* (0,32 %), *Ascidia* (0,19 %).

In Danish waters a similar immense predominance of the lamellibranchs is known from the Baltic only (ZENKEWITSCH 1927, p. 30), and if we compare ZENKEWITSCH's graphic representation of the Baltic with conditions in the East Greenland zone 1 (fig. 3A), we shall find quite conformable percentages. Thus the *Astarte borealis*-*Pectinaria* zone in East Greenland even qualitatively shows similarity to the samples derived from the Baltic (see p. 51), but this agreement in weight percentages is not to be regarded as a proof of the Arctic relict character of the Baltic zone, as the main cause seems to be that the echinoderms are kept out from the Baltic on account of the slight salinity of the water.

IV. THE SIMILARITIES BETWEEN THE *ASTARTE BOREALIS* ZONE AND THE ANIMAL COMMUNITIES IN THE BELT SEA AND THE BALTIC

Even from boreal waters quantitative bottom samples are known, which show the greatest similarity to the *Astarte borealis* zone in East Greenland. The result of such samples from the Belt Sea and the Baltic have been published by C. G. JOH. PETERSEN (1913 Appendix p. 29, Nr. 6a and p. 50 Nr. 14). As this resemblance is of a rather great interest, PETERSEN's lists will be given below:

The Belt Sea, E. of Vresen, 23 m. Date: 10-4-1911, detritus, sand. Average number and weight of a square metre drawn upon the basis of 50 bottom samples (each of $\frac{1}{10}$ sq.m).

	Number	Weight, gr.
<i>Macoma calcaria</i>	19,2	15,72
<i>Astarte banksi</i>	29,0	6,48
<i>Astarte borealis</i>	18,4	17,40
<i>Astarte elliptica</i>	0,6	0,08
<i>Cyprina islandica</i>	1,0	74,10
<i>Modiolaria laevigata</i>	0,2	0,02
<i>Buccinum undatum</i>	0,2	2,62
<i>Maldanidae</i>	Fragm.	0,04
<i>Terebellidae</i>	3,6	0,90
Other <i>Polychaeta</i>	1,4	2,30
<i>Nemertini</i>	0,2	0,02
<i>Ophioglypha albida</i>	17,2	3,88
<i>Asterias rubens</i>	0,2	0,12
<i>Echinus miliaris</i>	0,4	0,72
<i>Gammaridae</i>	0,6	0,02
<i>Diastylis</i> sp.	1,2	0,04
<i>Ascidiae</i>	4,2	0,98
		125,44

13 miles E.S.E. of Høje Møen, 40 m. Date: 29-5-1911. Average number and weight of a square metre drawn upon the basis of 25 bottom samples (each of $\frac{1}{10}$ sq.m).

	Number	Weight, gr
<i>Macoma baltica</i>	14,4	21,56
<i>Astarte borealis</i>	238,8	17,20
<i>Astarte</i> sp.	263,6	161,60
<i>Mytilus edulis</i>	0,8	0,20
<i>Aricia armiger</i>	Fragm.	0,08
<i>Terebellidae</i>	26,0	2,00
<i>Priapulus caudatus</i>	0,4	0,04
<i>Gephyrea</i> sp.	6,4	0,32
<i>Gammaridae</i>	0,8	0,04
<i>Diastylis</i> sp.	2,0	0,08
<i>Ascidiae</i> juv.	?	10,80
		303,92

The similarity between the Greenland *Astarte borealis* zone and the samples from the Baltic and the Belt Sea are, in reality, astounding. Here we find again *Macoma calcaria*, *Astarte borealis*, *Astarte banksi*, *Ast. elliptica*, *Modiolaria nigra*, *Priapulus caudatus*, *Aricia* (in the Baltic *armiger*, in East Greenland *cuvieri* (?)), and finally *Terebellidae*. In the average of 25 other samples from the Baltic (PETERSEN l. c. No. 5) *Harmothoë* sp. also occurs, in all probability *Harmothoë imbricata* (the most common Baltic form) and thus the same species that is typical of the East Greenland *Astarte borealis* zone. In the Baltic *Macoma calcaria* is replaced on shallow water by *Macoma* (*Tellina*) *baltica*, which is entirely absent in East Greenland, but at greater depth *Macoma calcaria* is found even in the Baltic. The modified form of the *Macoma* community of the Danish seas occurring in the Baltic and the Belt Sea thus seems to be a kind of Arctic relict community, and this also agrees well with the many other relicts or pseudorelicts known from these localities (*Phoca foetida*, *Cottus quadricornis*, *Idothea entomon*, *Harmothoë sarsi*, etc.). It should, however, be noted that PETERSEN's samples especially from the Baltic are derived from comparatively deep water (about 40 m), while the corresponding zone in East Greenland is a coast zone. (Moreover it is a well-known fact that forms which are coast forms in the inner Danish waters, occur at great depths in the Baltic (e.g. *Mytilus edulis*, *Macoma baltica*, and *Cardium edule*)).

In addition to the bottom samples taken by the Danish Biological Station in the Belt Sea and the Baltic, publications on qualitative investigations in the Baltic are further available from Swedish and

German quarters (THULIN 1922, HESSLE 1923, HAGMEIER 1930). PETERSEN's samples mentioned above are derived from the area commonly termed the Arkona Basin. From the more southerly area, too, the Basin of Bornholm, investigations are available, which all point in the same direction as the samples from Møen. HAGMEIER thus gives a list of the animals taken in the Bornholm basin at eight different stations (1930, p. 165). This list comprises the following species: *Macoma baltica*, **Macoma calcaria*, **Astarte borealis*, *Harmothoe sarsi*, **Scoloplos armiger*, **Aricidea suecica*, **Terebellides strømi*, *Pygospio elegans*, **Nemertines*, **Halicryptus spinulosus*, *Priapulus caudatus*, *Pontoporeia affinis*, **Pontp. femorata*, *Bathyporeia pilosa*, **Diastylis rathkei*, *Mysis mixta*, and *Edwardsia* sp. Of these forms, those marked with an asterisk occurred in at least half of the samples. Like PETERSEN's samples from the Belt Sea and Møen, these samples show an astonishing agreement with conditions in the *Astarte borealis*-*Pectinaria* zone at East Greenland. However, where the Baltic passes into the Gulf of Bothnia, this community seems to disappear completely. Thus THULIN mentions only four forms as commonly occurring in the Gothland basin, viz. *Harmothoe sarsi*, *Halicryptus spinulosus*, *Pontoporeia femorata*, and *Macoma baltica* (THULIN 1922, p. 7). As also pointed out by THULIN (l. c.), the main reason for this is doubtless the slight salinity of the water in the inner parts of the Gulf of Bothnia.

The very interesting quantitative investigations carried out by BLEGVAD (1922, 1928, 1930), BROCK (1927), DAVIS (1923, 1925), FORD (1923), GISLEN (1931), HAGMEIER (1923, 1930), SHELLFORD (1925), SPÄRCK (1931), STEPHEN (1923), and VATOVA (1931) all showed conditions deviating so considerably from those observed during the Arctic investigations that no relation to them could be found.

V. THE EPIFAUNISTIC ZONES

To facilitate the understanding of the epifaunas associated with the shallow water communities in the Franz Joseph Fjord complex, it will be convenient to distinguish between a level-bottom epifauna and an epifauna especially associated with the vegetation.

1. The Epifauna of the Vegetation.

A. The *Desmarestia* epifauna is the only distinct epifauna on the clay bottom of East Greenland. If we compare this epifauna with similar faunas in the boreal seas, we shall find the closest resemblance in the *Zostera* region. As already stated, this epifauna obscures the conditions within the communities of the clay bottom, especially the *Astarte borealis*-*Pectinaria* zone, and, of course, also the opposite is the case, since dredges from the *Desmarestia* epifauna will always contain "actual bottom animals". As type animals associated with *Desmarestia* must be mentioned in the first instance *Margarita groenlandica* (far commoner than *Margarita helicina*, which, however, also occurs), *Modiolaria laevigata*, large numbers of young *Saxicava arctica* and *Mya truncata* attached to the algæ, and some *Nemertines*. A few typical examples of such samples of the *Desmarestia* epifauna will be adduced below¹). All the samples are from the Solitærbugt, Ella Island.

May 24, 1932. 3 m depth, vast numbers of *Desmarestia*; dredge: 212 *Margarita groenlandica*, 18 *Modiolaria laevigata*, 511 *Saxicava arctica* juv., 96 *Mya truncata* juv., 2 *Bela* sp.

June 6, 1932. 4—8 m depth. Large numbers of *Desmarestia*; dredge: 75 *Margarita groenlandica*, 166 *Modiolaria laevigata*, 286 *Saxicava arctica* juv., 154 *Mya truncata* juv., 5 *Nemertines*.

Sept. 17, 1931. 13—13 m depth. An abundance of *Desmarestia*; dredge:

¹) In the following lists of epifaunas only the epifauna animals are indicated while all the level bottom animals in the dredges are omitted.

72 *Margarita groenlandica*, 3 *Stephanasterias albula*, 2 *Bela tenuicostata* (16 *Saxicava arctica* ad.).

Sept. 15, 1931. 13—24 m depth. Large numbers of *Desmarestia*; dredge: 5 *Margarita groenlandica*, 1 *Buccinum groenlandicum*.

Sept. 17, 1931. 23—28 m depth. Large numbers of *Desmarestia*; dredge: 1 *Margarita groenlandica*, 3 *Strongylocentrotus droebakiensis*.

These examples show the character of the *Desmarestia* epifauna at various depths. They further show that although actual plains overgrown with *Desmarestia* may still be found at a depth of 30 m, we can hardly at this depth speak about a *Desmarestia* epifauna, since at this depth the belt of vegetation is extremely poor in animals. (However, in Carl Jacobsen Bay, Ymer Island, some *Modiolaria laevigata* and *Modiolaria nigra* still seem to occur at a depth of 24—30 m (see table 12)). At the same time it will be seen that the optimum belt for *Modiolaria laevigata* in the *Desmarestia* zone of the Solitærbugt occurs at depths of 5—10 m. In the Solitærbugt a *Desmarestia* zone with three specimens of *Margarita groenlandica* has been encountered as far out as at 40 m depth (see table 13, St. 223). Mixed with the *Desmarestia* zone (as also with the *Fucus* zones) we often find rather large growths of *Laminaria*, but all the available dredges have shown that this does not in any way change the composition of the epifauna.

The *Desmarestia* epifauna is distributed over large stretches of the examined fjord area, where it attains a considerable density, especially in bays with shallow water. At Cape Hedlund, where it was of less density than in the Solitærbugt, it was mixed almost exclusively with *Fucus* (and red algæ). In Eleonore Bay there occurred a mixed *Desmarestia*, *Laminaria*, and *Fucus* vegetation. Here a dredge at 3,5—12 m depth gave the following result: 53 *Margarita groenlandica* and 40 *Modiolaria laevigata*, and a dredge at 15—27 m (*Desmarestia*, *Laminaria*, red algæ) gave 4 *Margarita groenlandica* and 91 *Modiolaria laevigata*.

This epifauna is also developed in Dusén Fjord. In the dredges from the bottom of Dusén Fjord there occurred in a rich *Desmarestia* vegetation, at 9—15 m depth, 4 *Margarita groenlandica* and 21 *Modiolaria laevigata*. In this locality the *Desmarestia* epifauna has been found down to a depth of 19 m only, while at the mouth of Dusén Fjord it may still be traced at depths from 26 to 40 m.

As was the case with the clay zones, the *Desmarestia* epifauna in the interior of Franz Joseph Fjord and the Isfjord exhibits peculiar features. Although a fairly large number of dredgings were made in shallow water in these places, *Desmarestia* was found to occur in only one dredge, and in very small number. In this part of the fjord area the zone seems to be almost entirely lacking.

The immense production of *Desmarestia* in the calm bays is of great importance even beyond the zone in which it takes place, since it supplies large quantities of organic matter to the bottom detritus, which covers the fjord bottom in shallow water. Thus the bottom may in some places be found to be covered with decaying *Desmarestia*, and such places are favourite habitats for various *Polychaeta*. A dredge on such bottom in the Solitærbugt, 10—18 m depth, on September 19, 1931, thus gave i. a. 47 *Pectinaria granulata*, 12 Polynoids, one very big *Nereis* sp. and 12 other *Polychaeta*. Similar conditions are known from the *Fucus* zone, and will be more fully discussed under the description of this zone. But on the level sea-floor, too, *Desmarestia* frequently occurs as a constituent of the usual bottom detritus.

In March, 1932, a sounding of the sea-floor in the Solitærbugt was made through holes in the ice (this sounding forms the basis of the bathymetrical curves of the bay, see fig. 1), and at the same time the glass tube constructed by C. G. JOH. PETERSEN (1911, p. 13) was employed — here, however, with a diameter of only 12 mm — to secure samples of the bottom material. Subsequently the samples were taken to the laboratory, and the composition of the detritus was examined under the microscope. Since these investigations are of interest for the whole animal life dependent on the amount of detritus, the most important samples will be briefly characterised below. All the following samples are derived from the Solitærbugt:

- 18 m depth: 1 mm detritus, many lumps of excrements, few diatoms and foraminifera, unmistakable branches of *Desmarestia*. Beneath the detritus, light-brown clay underlain by greyish-black tough clay.
- 33 m depth: $\frac{1}{2}$ mm detritus, many diatoms, several partially decayed remains of *Desmarestia*. Beneath the detritus 47 mm light brown clay, etc.
- 37 m depth: $\frac{1}{2}$ mm detritus, many lumps of excrements, some distinct remains of algæ (*Desmarestia*?). Some few diatoms. Beneath the detritus 54 mm of light brown clay.
- 38 m depth: 1 mm detritus, small algæ, many lumps of excrements and diatoms, 1 tintinnid, many unmistakable algæ remains (*Desmarestia*?). 54 mm light brown clay.
- 39 m depth: $1\frac{1}{2}$ mm detritus, occasional lumps of excrements, many diatoms, unmistakable remains of algæ. 56 mm brownish-yellow clay.
- 39 m depth: 1 mm detritus, some few lumps of excrements, many diatoms, 1 Nematod, occasional unmistakable remains of algæ (*Desmarestia*).

- 39 m depth: 1 mm detritus, occasional lumps of excrements and diatoms, distinct remains of algæ. 44 mm light brown clay.
- 40 m depth: 1 mm detritus, many diatoms, occasional distinct remains of algæ and lumps of excrements. 58 mm light brown clay.
- 40 m depth: 1 mm detritus, many diatoms and distinct algæ remains (*Desmarestia*?), 1 Nematod. 36 mm light brown clay, beneath this 21 mm light grey clay followed by 17 mm light brown clay.
- 53 m depth: $1\frac{1}{2}$ mm detritus, many lumps of excrements and diatoms, occasional well preserved algæ remains (*Desmarestia*?). 66 mm light brown clay.
- 58 m depth: $1\frac{1}{2}$ mm detritus, many diatoms, distinct algæ remains. 50 mm light brown clay.
- 86 m depth: 1 mm detritus, many diatoms and lumps of excrements, distinct algæ remains (*Desmarestia*?). 54 mm light brown clay.
- 89 m depth: $1\frac{1}{2}$ mm detritus, many lumps of excrements, occasional distinct algæ remains (*Desmarestia*?). Some diatoms. 60 mm light brown clay.
- 110 m depth: $1\frac{1}{2}$ mm detritus, distinct algæ remains, a few diatoms and *Peridinees*. 68 mm light brown clay.

In addition to the samples mentioned above, microscopical examinations of eight further samples have been made, all of which lacked distinct plant remains. Thus *Desmarestia* remains were found in 64 per cent. of the samples collected down to 110 m depth. From this it will be evident that the *Desmarestia* is of great importance for the invertebrates by serving not only as a base for an epifauna, but also as a producer for a rather large part of the detritus of the level sea-floor on shallow water. Concerning the detritus-content of the level sea-floor at greater depths cfr. SPÄRCK (1933).

B. The *Fucus* epifauna occurs everywhere in shallow water along the coast, attached to the rocks and stones. Thus it corresponds fairly well with the *Desmarestia* epifauna on the level sea-floor, and comprises in the main the same epifaunas as the latter, with the addition, however, of three new type animals, viz. the echinoderms *Stephanasterias albula*, *Strongylocentrotus droebakiensis*, and *Ophiura robusta*, all of which are particularly common in this zone in slightly deeper water. A few samples will illustrate the character of the zone:

The Solitærbugt, at Cape Oswald, 7—9 m, July 5, 1932. Large numbers of *Fucus*. Dredge: 131 *Modiolaria laevigata*, 3 *Margarita groenlandica*.

The Solitærbugt, at Cape Oswald, 30—35 m, June 10, 1932. Large

numbers of *Fucus*. Dredge: 69 *Margarita groenlandica*, about 10 *Margarita cinerea*, 106 *Ophiura robusta*, 38 *Stephanasterias albula*, 167 *Strongylocentrotus droebakiensis*, *Hydroids*, *Spongia*.
 Cape Hedlund, Kempe Fjord, 18—20 m, July 11, 1932. Large numbers of *Fucus*. Dredge: 3 *Strongylocentrotus droebakiensis*, 5 *Stephanasterias albula*, 4 *Buccinum hydrophanum*.

As will be seen, the *Fucus* epifauna may vary rather considerably both according to depth and locality, and its composition is also highly dependent on the surrounding animal communities, it being the growth zone for a number of young of species from the surrounding zones. A particularly beautiful example hereof was observed at Cape Hedlund, where the highly developed red algæ epifauna in deeper water formed the habitat of a large colony of the lamellibranch *Pecten islandicus*. In accordance herewith, vast numbers of young of this species were found to be affixed to the *Fucus* in the shallow water. Thus a dredge haul from Cape Hedlund at the mouth of Rhedin Fjord, at 7—10 m, only July 18, 1932, with an abundance of *Fucus*, yielded about 125 *Pecten islandicus* juv. (5—7 mm width), and a dredge haul in the same locality, 30—25 m depth, (clay, *Fucus*, and red algæ), yielded 29 young individuals of this species.

The *Fucus* epifauna in various modifications seems to be distributed throughout the investigated fjord area. From Eleonore Bay it is known from depths of from 3½ to 12 m. In the Isfjord, where the *Desmarestia* epifauna was very scarce, the *Fucus* fauna proved to be well developed¹⁾, and the same was the case at the bottom of Dusén Fjord, at Cape Hedlund, Carl Jacobsen Bay, Maria Island, etc.

At Cape Hedlund, at depths of about 25—30 m, large masses of decaying algæ were found, of which the *Fucus* remains formed a very essential part. In the Solitærbugt also, opposite Cape Oswald, at 10—15 m depth, there was a locality with decaying *Fucus*. A dredge haul in this place on July 5, 1932, yielded about 60 *Pectinaria granulata*, about 90 *Nereis zonata*, 5 *Harmothoe imbricata*, about 50 *Polychaeta* sp. This shows that such localities are the favourite haunts of *Polychaeta* (cf. the *Desmarestia* epifauna, p. 55).

As shown by the *Desmarestia* samples (pp. 55—56), no distinct remains of *Fucus* occurred in the detritus at greater depths. Apparently it decays more rapidly than the *Desmarestia*, and further it must be assumed to have first passed through the intestinal canal of the epifauna animals before it reaches these depths. An investigation of the contents of the stomach in specimens of *Strongylocentrotus droebakiensis* taken

¹⁾ In the interior of Franz Joseph Fjord dredge hauls were not made on stony bottom or rocks, so the *Fucus* epifauna may have been overlooked here.

on *Fucus* gave the following result: Of 28 specimens examined, 14 contained exclusively large masses of bitten-off *Fucus*, 9 specimens contained a mixture of *Fucus* and detritus lumps, and 5 specimens exclusively detritus. Thus immense quantities of *Fucus* must pass the intestinal canals of these animals in the course of the year, and in this way are more rapidly transformed into detritus. As, on the whole, the production of *Fucus* takes place over an area at least as extensive as that covered by *Desmarestia*, *Fucus*, too, must necessarily contribute considerably to the organic matter on which the animal life of the level sea-floor depends.

C. The red algæ epifauna is, as a rule, the epifauna that occurs at the greatest depths. Not until we reach depths where the *Desmarestia* and *Fucus* epifaunae have almost disappeared, does the red algæ epifauna attain its greatest development. Some dredges from the Solitærbugt and Cape Hedlund will elucidate the character of this epifauna:

The Solitærbugt, Ella Island.

- Depth: 22—35 m, Sept. 21, 1931. Stones. Great masses of red algæ: 8 *Strongylocentrotus*, 12 *Ophiura robusta*, 1 big *Ophiur* sp., 1 *Antedon* sp., *Bryozoans*, *Spongia*, 2 *Buccinum hydrophanum*, 7 *Margarita groenlandica*, 1 *Sipho* sp., 1 *Tectura virginea*, 1 *Pecten islandicus*.
- Depth: 28—29 m, Sept. 20, 1931. Red algæ, *Desmarestia*, *Laminaria*, stones, shells: 26 *Strongylocentrotus*, 12 *Ophiura robusta*, 15 *Margarita groenlandica*, 4 *Buccinum hydrophanum*, 1 *Buccinum groenlandicum*, 1 *Tectura virginea*, 1 *Lepeta coeca*, 3 *Pecten islandicus*.
- Depth 28—31 m, Sept. 27, 1931. Stones. Quantities of red algæ. 13 *Strongylocentrotus*, 1 *Solaster papposus*, 8 *Ophiura robusta*, 1 big *Ophiur* sp., *Bryozoans*, 3 *Chiton albus*, 3 *Lepeta coeca*, 1 *Tectura virginea*, 1 *Buccinum hydrophanum*, 3 *Margarita groenlandica*.
- Depth: 35—37 m, Sept. 20, 1931. Stones. Quantities of red algæ. 10 *Strongylocentrotus*, 12 *Ophiura robusta*, 1 big *Ophiura* sp., *Bryozoans*, 1 *Sipho* sp., 3 *Margarita groenlandica*, 2 *Lepeta coeca*, 2 *Pecten islandicus*.
- Depth: 80—85 m, July 2, 1932. Stones. Red algæ: 2 *Strongylocentrotus*, 1 *Antedon* sp., 4 *Lepeta coeca*, *Bryozoans*.

Cape Hedlund, Kempe Fjord.

- Depth: 16—20 m, July 17, 1932. Red algæ. Shells. 2 *Strongylocentrotus*, 1 *Ophiura robusta*, 1 *Margarita groenlandica*, 7 *Buccinum hydrophanum groenlandicum*, 2 *Sipho* sp.
- Depth: 19—23 m, July 17, 1932. Red algæ. Clay. 1 *Strongylocentrotus*,

5 *Ophiura robusta*, 2 *Buccinum hydrophanum*, 3 *Margarita groenlandica*, 5 *Modiolaria laevigata*, 2 *Pecten islandicus*.

As the red algæ are attached to the stones, it is, of course, not always easy to decide how much of the epifauna is attached to the stones and how much to the algæ. If we consider the epifauna as a whole, the following animal forms prove to be especially characteristic of this epifauna: *Antedon* sp., *Tectura virginea*, and *Pecten islandicus* ad. The remaining forms met with are more markedly general epifauna animals which occur in the other algal vegetations, too. However, the large Bryozoan colonies and the Spongies must also be considered type animals of this epifauna which, as shown by the dredge samples listed above, may extend as far outwards as to depths of more than 80 m. In the Solitærbugt, Ella Island, the red algæ epifauna does not, apparently, attain its full development until about 25 m depth, and as a characteristic zone it only persists to about 40 m depth. At greater depths it is, as a rule, scattered and without any quantitative importance. At Cape Hedlund the red algæ epifauna may be encountered as near the coast as at about 15 m depth, but here it is most frequently mixed with *Desmarestia* and *Laminaria*.

Compared with the epifaunas described above the red algæ epifauna only occupies a very small area of the sea bottom. First, this epifauna, like the *Fucus*, is attached to stones or rocks, and secondly, to develop properly it requires certain depths to a far greater extent than *Fucus*. As even the transparency of the water is very slight, the localities fit for red algæ are rather uncommon. Apart from the Solitærbugt and Cape Hedlund this epifauna is only known from comparatively few places within the fjord complex¹). Thus it was found, mixed with *Desmarestia* and *Laminaria*, at depths ranging from 25 to 27 m in Eleonore Bay and — likewise mixed with *Desmarestia* — at depths between 15 and 30 m at the mouth of Dusén Fjord. At the head of this fjord, where dredge hauls were made as far out as 30 m depth, no red algæ epifauna was found, although the bottom exhibited both stones and rocks (the *Fucus* epifauna was here well developed). That the investigations in the interior of Franz Joseph Fjord did not bring to light any red algæ epifauna may be due to the circumstance that all the dredge hauls were made on clay bottom (the *Fucus* epifauna also is unknown from this locality).

¹) It is, perhaps, the comparatively rare occurrence of a true red algæ growth which explains why such a big lamellibranch as *Pecten islandicus* has not hitherto been found alive in the East Greenland waters. This species seems to be closely attached to the red algæ epifauna, and is so far known from the Solitærbugt and Cape Hedlund only — the two explored localities where the red algæ epifauna attained its greatest distribution.

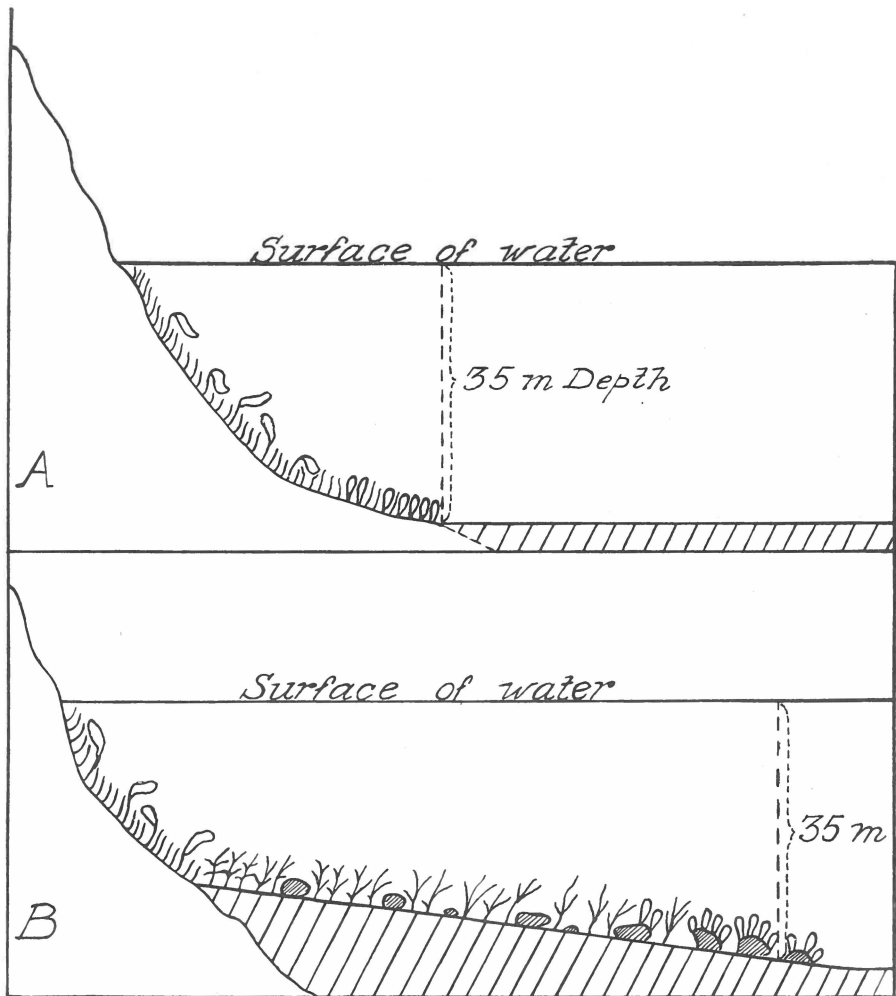
*Fucus**Desmarestia**Laminaria**Red Algae**Stones**Clay*

Fig. 4.

The significance of the red algæ epifauna as a producer of detritus on the shallow water clay bottom is doubtless a point of subordinate importance. Even in places where this red algæ vegetation attains its greatest development, we cannot speak about such algæ meadows as are formed by the *Desmarestia* and the *Fucus*, but only about a fairly scattered and low vegetation attached to stones or rocks. As the area occupied by this epifauna, in contrast to the areas of the preceding epifaunas, is of very limited extent, we may doubtless in the main disregard its rôle as a producer of detritus.

D. In the two localities (the Solitærbugt and Cape Hedlund) where the conditions of the epifaunas have been most closely investigated, we often find a mixture of the *Fucus*, the *Desmarestia*, and the red algæ epifaunas. These areas with a mixed vegetation were most frequently encountered where the sea-floor sloped steeply from the coast to greater depths, and were of a very varying composition, according as rocks, stones or clay were dominant in the particular area. Fig. 4 gives a diagram of the conditions prevailing at Cape Hedlund near the mouth of Rhedin Fjord. *A* indicates a locality where a rock wall continues directly into the sea, and not until a depth of 35 m is it covered with clay. In such places the *Fucus* epifauna (mixed with *Desmarestia*) extends down to about 30 m depth, where the red algæ epifauna begins, to be replaced soon afterwards by clay and the associated *Arca-Astarte crenata* community. The *Desmarestia* epifauna is entirely absent here. At the point where the rock wall meets with the clay bottom, large masses of decaying algæ may frequently be found, originating from the *Fucus* on the rock walls. *B* shows the conditions in a locality where the rock wall is covered with clay (with stones) even at inconsiderable depths. Where the clay begins, the *Fucus* epifauna is replaced by a rich *Desmarestia* epifauna, which, at a depth of 30 m, passes evenly into the red algæ epifauna, to end soon afterwards in the *Arca-Astarte crenata* community. It is noteworthy that even if the stones on the clay bottom afford an excellent base for the *Fucus* epifauna, on the stony clay bottom this will never extend to the great depths at which it may occur when attached to a rock wall.

Finally it is to be pointed out, that in East Greenland no special epifauna is attached to the *Laminaria* vegetation, which is here inhabited by the animals living in the surrounding vegetation-zones.

2. The Epifauna of the Sea Bottom.

A. The *Saxicava* epifauna in a way belongs to the epifauna of the level sea-floor, since *Saxicava* occurs wherever the bottom exhibits small irregularities or stones. As already stated in the description of

the clay bottom communities, this epifauna occurs with great frequency as far outwards as 50 m depth, where it soon decreases in quantity, to become of quite subordinate importance in still deeper water. In suitable places *Saxicava* may form enormous lumps, since gradually the new individuals will attach themselves to the old, and in this way epifauna lumps come into existence, exclusively attached to the *Saxicava* species proper — a phenomenon which may be observed in boreal seas as regards *Modiola modiolus* and *Mytilus edulis* on soft bottom (PETERSEN 1918, pp. 13—15). As this epifauna has been repeatedly mentioned in the preceding sections, only one fact illustrating its occurrence will be given here, viz.: a dredge haul from Musk-ox Fjord off the Mt. Anker Valley, at 17—21 m depth, on August 3, 1932, red clay with fairly big stones, yielded 974 individuals of *Saxicava arctica*, all of which were completely entangled with each other by the Byssus threads. The distribution of the age groups was as follows:

Breadth of shell more than 30 mm	1 specimen
— — 20—30 mm	195 specimens
— — 10—20 mm	198 —
— — 0—10 mm	580 —

The large number of young whose shells were less than 10 mm broad shows that the young individuals settle down directly in the epifauna after the larval stages. In places where the epifauna is more scattered, as in the Solitærbugt, the immense growth of young seems to take place almost exclusively in quite shallow water associated with the *Desmarestia* and *Fucus* epifaunas (see pp. 53 and 57), while here only small numbers of young are found in deeper water. The spreading to greater depths of these young, which live on *Desmarestia* and *Fucus*, must thus be supposed to take place by transportation with decaying or detached algæ.

The *Ascidia* epifauna. At greater depths than 70 m there occurs a peculiar epifauna attached to stones and consisting of various *Ascidia* (*Molgula*, *Dendrodoa*, *Ascidia prunum*, *Ascidia callosa*, and *Ascidia gelatinosa*). As this deep water fauna rather falls outside the scope of this paper, it will not be further dealt with here.

VI. ON THE DISTRIBUTION OF THE ANIMAL COMMUNITIES OFF THE RIVER MOUTHS

Three of the localities where, in the summer of 1932, a series of investigations were made with dredgings in shallow water, viz. Eleonore Bay, Franz Joseph Fjord towards the Engdal, and the Isfjord by the Haredal, were characteristic by the fact that here the large rivers debouched into the fjords. These rivers, which still contained water as late as the month of August, must in the spring have transported hugh masses of water originating from the melting of the snow into the fjords. With this fact in mind, two sections with dredges squarely on the coast were made in all three localities, one immediately in front of the river mouth, the other at a distance of about 100 m from the mouth but parallel to the first one. The results were rather astonishing, and for this reason the contents of the dredges from these three localities will be given below:

Eleonore Bay, August 5, 1932.

Ca. 100 m North of the river mouth.		Just off the river mouth
3 $\frac{1}{2}$ —2 $\frac{1}{2}$ m.	Sandy clay: <i>Molgula crystallina</i> .	
3 $\frac{1}{2}$ —12 m.	Clay, <i>Fucus</i> , <i>Laminaria</i> , <i>Desmarestia</i> : <i>Cardium ciliatum</i> , <i>Macoma calcaria</i> , <i>Pecten groenlandicus</i> , <i>Saxicava arctica</i> , <i>Astarte banksi</i> , <i>Modiolaria laevigata</i> , <i>Margarita groenlandica</i> , <i>Buccinum hydrophanum</i> , <i>Bucc. groenlandicum</i> , <i>Spirontocharis</i> , <i>Sclerocrangon</i> , <i>Myriotrochus</i> , <i>Harmothoë</i> sp.	
15—27 m.	Clay, <i>Laminaria</i> , red algæ, some <i>Desmarestia</i> : <i>Cardium ciliatum</i> , <i>Card. groenlandicum</i> , <i>Pecten groenlandicus</i> , <i>Saxicava arctica</i> , <i>Modiolaria laevigata</i> , <i>Astarte banksi</i> , <i>Ast. elliptica</i> , <i>Venus</i> sp., <i>Portlandia arctica</i> , <i>Arca pectunculoides</i> , <i>Mya truncata</i> , <i>Buccinum hydrophanum</i> , <i>Bucc. groenlandicum</i> , <i>Sipho</i> sp., <i>Strongylocentrotus</i> , <i>Ophiocten sericeum</i> , <i>Myriotrochus</i> , <i>Harmothoë</i> , <i>Sclerocrangon</i> , <i>Spirontocharis</i> , <i>Ascidia callosa</i> .	2 $\frac{1}{2}$ —28 m. Gravel and big stones. (2 dredges). No animals.
38—65 m.	Brown clay, big stones: <i>Saxicava arctica</i> , <i>Sipho</i> sp., <i>Ophiocten sericeum</i> (large quantities), <i>Spirontocharis</i> , <i>Sclerocrangon</i> , <i>Cottus</i> sp.	

Interior of Franz Joseph Fjord near the Engdal, Aug. 6, 1932.

Ca. 100 m West of the river mouth.	Just off the river mouth
13—18 m. Gray clay: <i>Portlandia arctica</i> , <i>Macoma calcaria</i> , <i>Astarte banksi</i> , <i>Buccinum hydrophanum</i> , <i>Ophiecten sericeum</i> , <i>Myriotrochus rinkii</i> , <i>Pectinaria granulata</i> , <i>Cottus</i> sp.	
27—37 m. (2 dredges), Brown clay: <i>Saxicava arctica</i> , <i>Cardium ciliatum</i> , <i>Mya truncata</i> , <i>Portlandia arctica</i> , <i>Tellina moesta</i> , <i>Astarte banksii</i> , <i>Leda pernula</i> , <i>Buccinum hydrophanum</i> , <i>Sipho</i> sp., <i>Velutina laevigata</i> , <i>Cylichna reinhardtii</i> , <i>Ophiecten sericeum</i> , <i>Myriotrochus rinkii</i> , <i>Spirontocharis</i> .	3½—7 m dredge filled with stones. No animals.
36—45 m. Brown clay: <i>Saxicava arctica</i> , <i>Portlandia arctica</i> , <i>Macoma calcaria</i> , <i>Astarte banksi</i> , <i>Mya truncata</i> , <i>Buccinum groenlandicum</i> , <i>Sipho</i> sp., <i>Strongylocentrotus droebakien-sis</i> , <i>Myriotrochus rinkii</i> , <i>Ophiecten sericeum</i> .	34—38 m dredge filled with gravel and stones. No animals.
50—55 m. Brown clay: <i>Saxicava arctica</i> , <i>Portlandia arctica</i> , <i>Macoma calcaria</i> , <i>Leda pernula</i> , <i>Sipho</i> sp., <i>Cylichna reinhardtii</i> , <i>Myriotrochus rinkii</i> , <i>Ophiecten sericeum</i> .	

Isfjord by the Haredal, August 7, 1932.

Ca. 100 m Southwest of the river mouth.	Just off the river mouth
2½—5 m. Stones, <i>Fucus</i> , <i>Laminaria</i> : <i>Macoma calcaria</i> , <i>Astarte banksi</i> , <i>Bela tenuicostata</i> , <i>Ophiecten sericeum</i> , <i>Amphipodes</i> , <i>Harmothoe</i> sp., <i>Nemertines</i> , <i>Polychaeta</i> sp., <i>Pectinaria granulata</i> , <i>Cottus</i> sp.	
9—15 m. Gray, brown clay: <i>Mya truncata</i> , <i>Macoma calcaria</i> , <i>Saxicava arctica</i> , <i>Portlandia arctica</i> , <i>Modiolaria laevigata</i> , <i>Astarte banksi</i> , <i>Margarita groenlandica</i> , <i>Myriotrochus rinkii</i> , <i>Ophiecten sericeum</i> , <i>Amphipodes</i> , <i>Sclerocrangon</i> , <i>Spirontocharis</i> , <i>Pectinaria granulata</i> , <i>Harmothoe</i> sp.	3½—37 m (2 dredges) the dredge filled with stones and gravel. No animals.
27—35 m. Brown clay, <i>Desmarestia</i> (2 dredges): <i>Saxicava arctica</i> , <i>Portlandia arctica</i> , <i>Cardium ciliatum</i> , <i>Card. groenlandicum</i> , <i>Macoma calcaria</i> , <i>Modiolaria laevigata</i> , <i>Pecten groenlandicus</i> , <i>Ophiecten sericeum</i> , <i>Myriotrochus rinkii</i> , <i>Annelids</i> .	
55—59 m. Brown clay: <i>Saxicava arctica</i> , <i>Portlandia arctica</i> , <i>Modiolaria laevigata</i> , <i>Myriotrochus rinkii</i> , <i>Polychaeta</i> sp., <i>Cottus</i> sp.	

As will appear from these dredges, bottom animals are totally lacking in all the samples which were taken immediately opposite the river mouths from the coast to at least 38 m depth. If one compares them with the dredges taken about 100 m from the river mouths, one is astonished to see the vast number of animals occurring in the samples. The causes why the fjord bottom immediately in front of the river mouths is so absolutely devoid of animal life may be the following: 1) a continuous motion and rotation of the bottom material brought about by the stream of water from the rivers. It should, however, be remarked that it seems very improbable that at a depth of about 40 m the water torrent should still cause such great movements in the bottom material as to exclude all animal life. 2) The large masses of fresh water supplied from the rivers may perhaps, at certain periods of the year, give rise to a fresh bottom current and in this way kill the animals. If such fresh water is conveyed into salt water, it will, of course, under normal conditions form a surface layer, owing to its lower specific gravity, but anyone who has experienced the breaking up of the large rivers in East Greenland, is aware that it takes place while the unbroken fjord ice still covers the fjords. The large amounts of fresh water which are emptied into the fjords at an enormous pressure, are thus forced in below the ice, and under such conditions it is highly probable that the fresh water is pressed towards the bottom and there forms a fresh water current. If such a fresh water layer is present at the bottom for a period of only about 3—4 days annually, it will be able to kill all animal life (for further details, see p. 17). The most probable explanation of the absence of animal life would seem to be a cooperation of the two factors: the rotation of the bottom material and the deadly influence of the fresh water. Probably there will also be other factors (e. g. the question of nutrition), but these were not closely investigated.

It would seem as if the after-effects of this can be traced to still greater depths. A tremendous river fell into the Renbugt, Isfjord, and immediately off its mouth a bottom sample was taken at 210 m depth ($\frac{1}{5}$ sp.m). The bottom material consisted of gravel and stones. This sample showed the lowest total weight (0,35 gr per sq.m) on the whole ascertained at this depth within the whole fjord complex, and it would therefore be only natural to combine it with the total absence of animal life in shallow water.

VII. SUMMARY

This treatise is based on material collected in the Franz Joseph Fjord area and the adjacent waters in the summers of 1931 and 1932, and comprises 150 bottom samples ($\frac{1}{10}$ sq.m Petersen grab) and 242 dredgings from the localities: the Solitærbugt, Ella Island—Carl Jacobsen Bay, Ymer Island and Cape Hedlund, Kempe Fjord. Further, in the summer of 1932, bottom samples and dredges, scattered over the remaining part of the fjord complex, were taken from the research vessel "Godthaab".

1. Communities of the Clay Bottom.

I. The *Macoma-calcaria*-community. Inhabiting depths between 3 and 45 m. Characteristic animal: *Macoma calcaria*. This community showed three rather distinct animal-zones.

A. The *Astarte borealis*-*Pectinaria*-Zone. Ca. 3—14 m depth. Tables 1, 2, 3, 4, 5. Plate 1. Characteristic animals: *Astarte borealis*, *Pectinaria granulata*, *Priapulus caudatus*, *Nereis zonata*, *Harmothoe imbricata*. Ophiures (*Ophiecten sericeum*) rather uncommon. Zone of common occurrence within the fjord complex, only in the interior of Fr. Joseph Fjord and the Isjord has it partially disappeared. No tide water community is present, partly as a consequence of the ice-foot, partly of the fresh water, which — originating from the melting of the snow in the spring — kills the animals. Summer-temperature of water positive. Average weight of available samples (exclusive of *Saxicava arctica*) c. 110 gr per sq.m.

B. The lower *Ophiecten* Zone with *Pectinaria*. C. 14—25 m depth. Tables 6, 7, 8, 9, 10. Plate 2. Characteristic animals: *Ophiecten sericeum*, *Pectinaria granulata*, *Philomedes globosus*, *Diastylis* sp. The zone is of common occurrence everywhere in the fjord complex, only in the interior of Fr. Joseph Fjord does it occur in much shallower water than is otherwise the case. Summer-temperature positive, but only slightly above zero. Average total-weight of the available samples (excl. *Saxicava*) ca. 80 gr per sq.m.

C. The deeper *Ophiecten* Zone. Ca. 25—45 m depth. Tables 11, 12, 13, 14, 15. Plate 3. No type animal particularly abundant, except *Ophiecten sericeum*. Many characteristic *Lamellibranchiata* (*Pecten groenlandicus*, *Portlandia lenticula*, *Neæra obesa*, *Macoma moesta*), none of them particularly abundant. Zone known from the greater part of the fjord complex, in the interior of Franz Joseph Fjord in a modification, in which *Portlandia arctica* is very frequent. Even known from more southerly localities in East Greenland. Temperature of water negative the whole year round. Average total weight for the various samples was (excl. *Saxicava*) ca. 100 gr per sq.m.

II. The *Arca-Astarte-crenata*-community. Inhabiting depths from ca. 45 to ca. 200 m. Characteristic animals: *Arca glacialis*, *Astarte crenata*, *Axinus flexuosus*. *Ophiecten sericeum* less frequent than in the preceding zones. As a whole the zone is very poor in species. Weight varying very much at different depths. Occurs throughout the fjord complex, but in the interior of Franz Joseph Fjord it does not extend into such shallow water as in other localities. Even known from more southerly localities. Temperature negative and constant all the year round.

III. The *Macoma-calcaria*-community is known from all Arctic and several boreal localities, from which bottom-samples are known (the *Astarte borealis*-zone is known from greater depths in the Barents Sea, the two *Ophiecten*-zones cannot be kept distinct, but are known from the Storfjord (Spitzbergen) and the Barents Sea). The *Arca-Astarte-crenata*-community is known from the Storfjord (Spitzbergen) and the Spitzbergen banks, but seems to be entirely absent from the Barents Sea.

A dominating weight percentage of *Lamellibranchiata* seems to be a typical feature of all Arctic animal-communities on shallow water (the Barents Sea as well as East Greenland), while in real boreal (in this case Danish) waters the *Echinodermata* show the dominating weight percentage (except in the Baltic, where the results are very similar to those known from the Arctic waters).

The animal community living at greater depths in the Baltic and at some localities in the Belt Sea with regard to characteristic animals shows an astounding similarity to the East Greenland *Astarte-borealis-Pectinaria*-zone (of the *Macoma-calcaria*-community) (cfr. further pp. 50—52), so that it may be suggested, that these community in the Belt Sea and the Baltic should be regarded as an Arctic relict community.

2. The Epifaunistic Zones.

I. Epifauna of the Vegetation.

A. The *Desmarestia* Epifauna is to East Greenland what the *Zostera* Epifauna is to boreal seas. Characteristic animals: *Margarita groenlandica*, *Modiolaria laevigata*, *Saxicava arctica* juv., *Mya truncata*

juv. Depths from 3 to about 30 m. Despite an abundance of *Desmarestia*, the epifauna at depths about 30 m is very poor. Common in the greater part of the fjord complex; only in the interior of Franz Joseph Fjord is it nearly lacking. Concerning the detritus of the sea bottom on shallow water, the *Desmarestia* is a very important producer.

B. The *Fucus* Epifauna. Characteristic animals: the same forms as attached to the *Desmarestia*, and further the Echinoderms *Stephanasterias albula*, *Strongylocentrotus droebakiensis*, and *Ophiura robusta*. Depth c. 3 m to about 35 m. The young species of animals characteristic of the surrounding epifauna-zones will often be found to be attached to the *Fucus* (cfr. *Pecten islandicus* p. 57). The *Fucus*-Epifauna is known from all parts of the fjord area. The production of *Fucus* is very considerable, and seems of great importance to the organic matter in the detritus.

C. The Red Algae Epifauna. Characteristic animals: *Antedon* sp. *Tectura virginea*, *Pecten islandicus* ad., *Strongylocentrotus*, *Bryozoans* and *Spongia*. Depths from ca. 15—80 m. Main Distribution between 24 and 40 m. Only known from a few scattered localities. The importance as a producer of detritus is rather slight.

Various types of mixed epifaunas are shown in Fig. 4.

II. Epifauna of the sea bottom.

A. The *Saxicava*-Epifauna. Characteristic animal: *Saxicava arctica*. Attached to small inequalities and stones of the level sea bottom; found in all zones of the *Macoma-calcaria*-community, but only of slight importance in the *Arca-Astarte-crenata*-community. Corresponds to the *Modiola*- and *Mytilus*-Epifauna of the boreal seas.

B. The *Ascidia*-Epifauna. Characteristic animals: various *Ascidiae* of the genera *Molgula*, *Dendrodoa*, and *Ascidia*. Attached to stones at greater depths (70—150 m).

3. The Distribution of the animal communities off the river mouths.

Dredgings are available from three localities, where large rivers debouched into a bay, viz. Eleonore Bay, the interior of Franz Joseph Fjord opposite the Engdal, and the Isfjord off the Haredal. In all three localities series of dredgings made in front of the river mouth (3—38 m) showed that the bottom was completely devoid of animals, while all the dredges made at a distance of 100 m from the river mouth abounded in animals. It is to be supposed, that the rotation of the bottom-material in connection with the fresh-water from the rivers (which kills the animals) is the cause of the complete want of animals in front of the river mouths.

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Table 1. Solitærbugt, Ellæ. Bottom-samples. The *Astarte-borealis-Pectinaria*-Zone. The first column shows the number of the individuals, the second column the weight in gram per sq.m.

[illegible]

Table 6. Salitærbugt, Ella Island. Bottom-samples. The *Ophiecten-Pectinaria*-Zone.

The first column shows the number of the individuals, the second column the weight in gram per sq.m.

[illegible]

EXPLANATION OF PLATES

Plate 1.

The *Astarte-borealis-Pectinaria*-zone (*Macoma-calcaria*-community). Diagram showing the number of the different invertebrates inhabiting 0,25 sq.m of sea-bottom at depths between 3 and 14 m in the Solitærbugt, Ella Island.



Macoma calcaria: Ind. 8, W. 6,960 gr.



Astarte borealis: Ind. 22, W. 8,602 gr.



Pectinaria granulata: Ind. 4, W. 1,532 gr.



Astarte elliptica: Ind. 3, W. 2,355 gr.



Astarte banksi: Ind. 2, W. 0,296 gr.



Mya truncata: Ind. 5, W. 6,035 gr.



Saxicava arctica: Ind. 5, W. 8,390 gr.



Axinus flexuosus: Ind. 7, W. 0,238 gr.



Margarita groenlandica: Ind. 3, W. 0,202 gr.



Nereis zonata: Ind. 2, W. 0,428 gr.



Harmothoe imbricata: Ind. 2, W. 0,732 gr.



Aricia (cuvieri?): Ind. 1, W. 0,032 gr.



Terebellides stromi: Ind. 2, W. 0,042 gr.



Maldanidae: Ind. 2, W. 0,026 gr.



Polychaeta: Ind. 10, W. 0,330 gr.



Priapulus caudatus: Ind. 1, W. 0,037 gr.



Amphipodae: Ind. 4, W. 0,030 gr.



Philomedes globosus: Ind. 3, W. 0,006 gr.

Total weight ca. 36 gr.

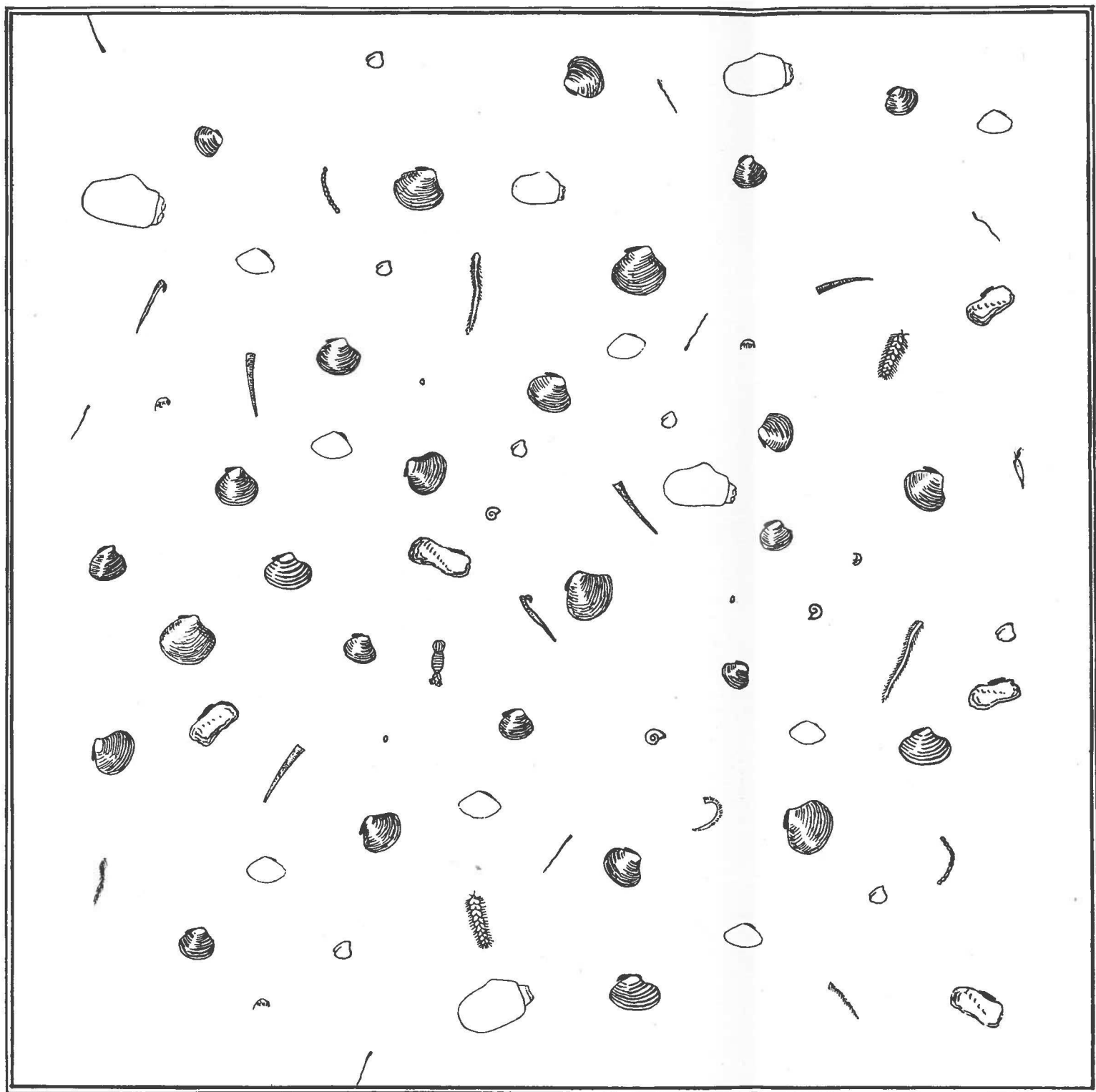
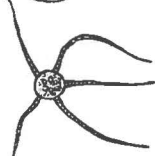


Plate 2.

The *Ophiecten-Pectinaria*-Zone (*Macoma-calcaria*-community). Diagram showing the number of the different invertebrates inhabiting 0,25 sq.m of sea-bottom at depths between 14 and 25 m in the Solitærbugt, Ella Island.

	<i>Macoma calcaria</i> : Ind. 18, W. 7,398 gr.
	<i>Ophiecten sericeum</i> : Ind. 7, W. 0,497 gr.
	<i>Pectinaria granulata</i> : Ind. 4, W. 1,708 gr.
	<i>Astarte elliptica</i> : Ind. 6, W. 6,090 gr.
	<i>Astarte banksi</i> : Ind. 6, W. 1,188 gr.
	<i>Mya truncata</i> : Ind. 2, W. 1,890 gr.
	<i>Saxicava arctica</i> : Ind. 11, W. 30,492 gr.
	<i>Axinus flexuosus</i> : Ind. 5, W. 0,135 gr.
	<i>Aricia (cuvieri?)</i> : Ind. 3, W. 0,054 gr.
	<i>Terebellides strómi</i> : Ind. 2, W. 0,060 gr.
	<i>Maldanidae</i> : Ind. 2, W. 0,036 gr.
	<i>Polychaeta</i> : Ind. 24, W. 1,128 gr.
	<i>Amphipodae</i> : Ind. 3, W. 0,048 gr.
	<i>Diastylis</i> : Ind. 3, W. 0,015 gr.
	<i>Philomedes globosus</i> : Ind. 25, W. 0,825 gr.
	Total weight ca. 52 gr.

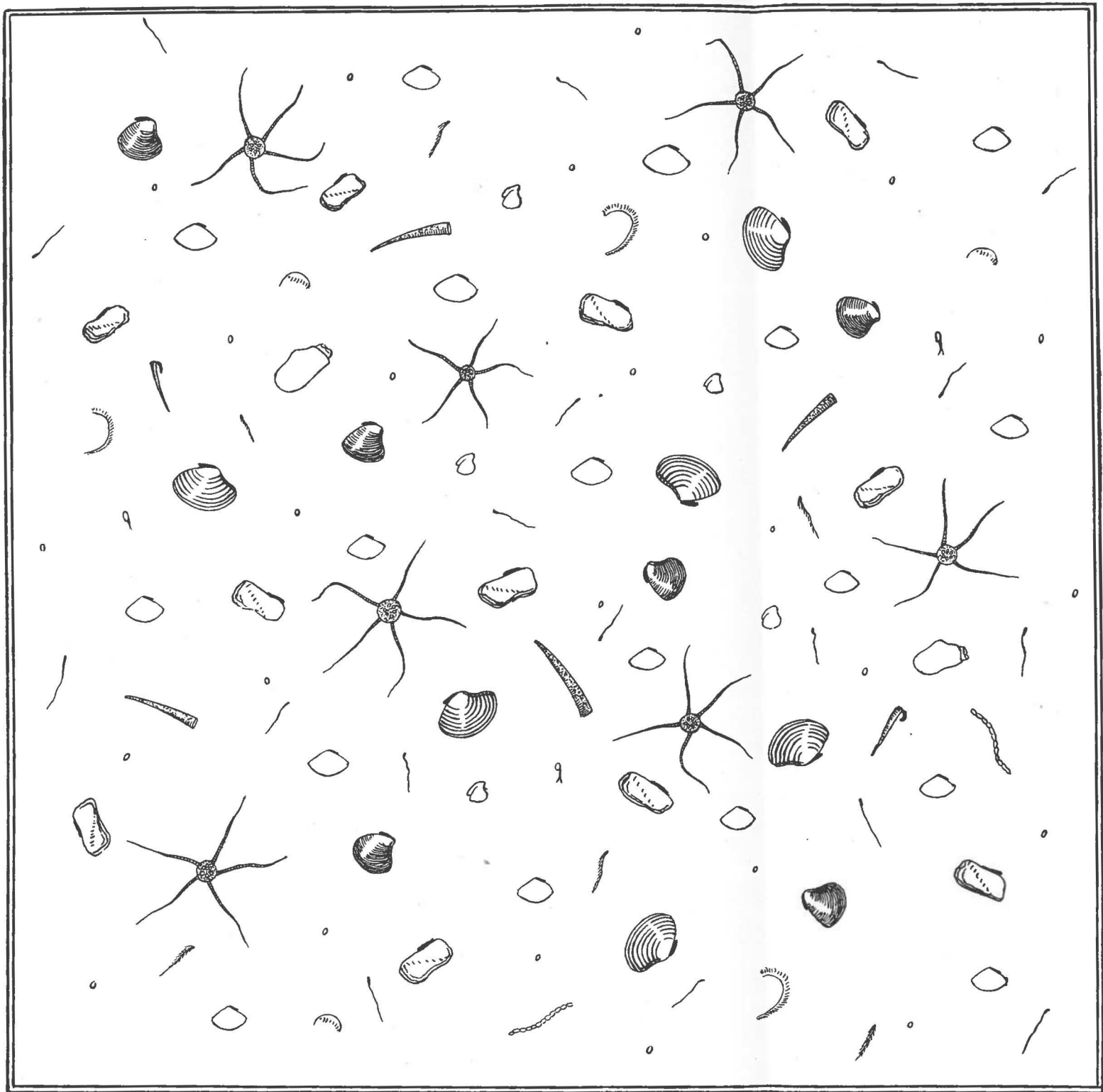
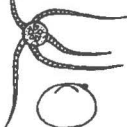
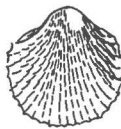


Plate 3.

The deeper *Ophiecten*-Zone (*Macoma-calcaria*-community). Diagram showing the number of the different invertebrates inhabiting 0,25 sq.m of sea-bottom at depths between 25 and 45 m in the Solitærbugt, Ella Island.

	<i>Macoma calcaria</i> : Ind. 8, W. 8,728 gr.
	<i>Ophiecten sericeum</i> : Ind. 11, W. 0,814 gr.
	<i>Macoma moesta</i> : Ind. 1, W. 0,050 gr.
	<i>Pecten groenlandicus</i> : Ind. 1, W. 0,547 gr.
	<i>Cardium ciliatum</i> : Ind. 1, W. 3,020 gr.
	<i>Portlandia lenticula</i> : Ind. 1, W. 0,041 gr.
	<i>Neæra obesa</i> : Ind. 2, W. 0,018 gr.
	<i>Cylichna reinhardti</i> : Ind. 1, W. 0,065 gr.
	<i>Astarte elliptica</i> : Ind. 7, W. 6,797 gr.
	<i>Astarte banksi</i> : Ind. 4, W. 0,936 gr.
	<i>Mya truncata</i> : Ind. 3, W. 1,917 gr.
	<i>Saxicava arctica</i> : Ind. 16, W. 39,280 gr.
	<i>Axinus flexuosus</i> : Ind. 3, W. 0,039 gr.
	<i>Aricia (cuvieri?)</i> : Ind. 1, W. 0,018 gr.
	<i>Terebellides stromi</i> : Ind. 2, W. 0,070 gr.
	<i>Polychaeta</i> : Ind. 19, W. 1,349 gr.
	<i>Amphipodae</i> : Ind. 4, W. 0,048 gr.
	<i>Diastylis</i> : Ind. 7, W. 0,161 gr.
	<i>Philomedes globosus</i> : Ind. 25, W. 0,100 gr.
	<i>Ascidiae</i> : Ind. 1, W. 0,047 gr.
	Total weight ca. 65 gr.

