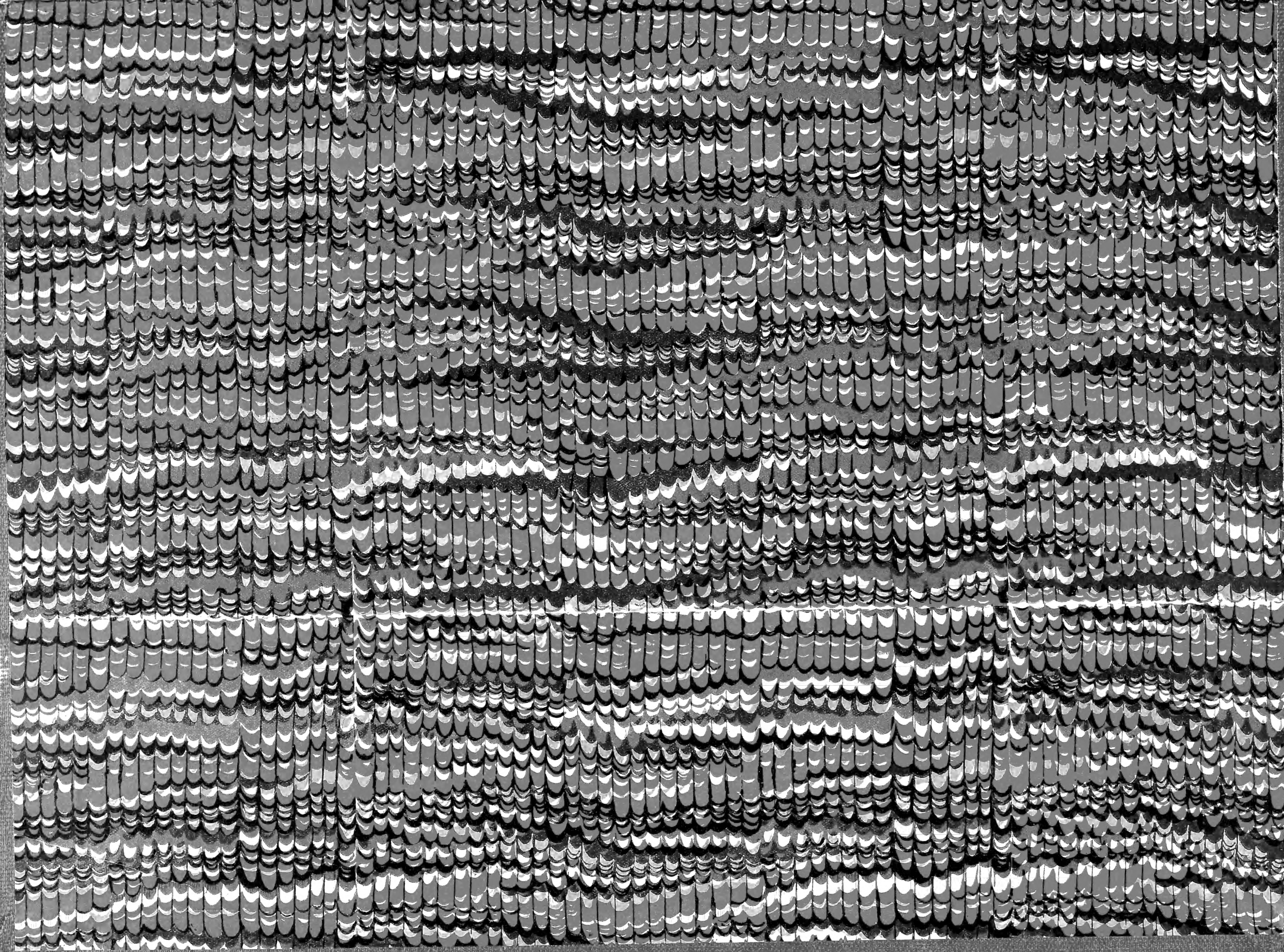

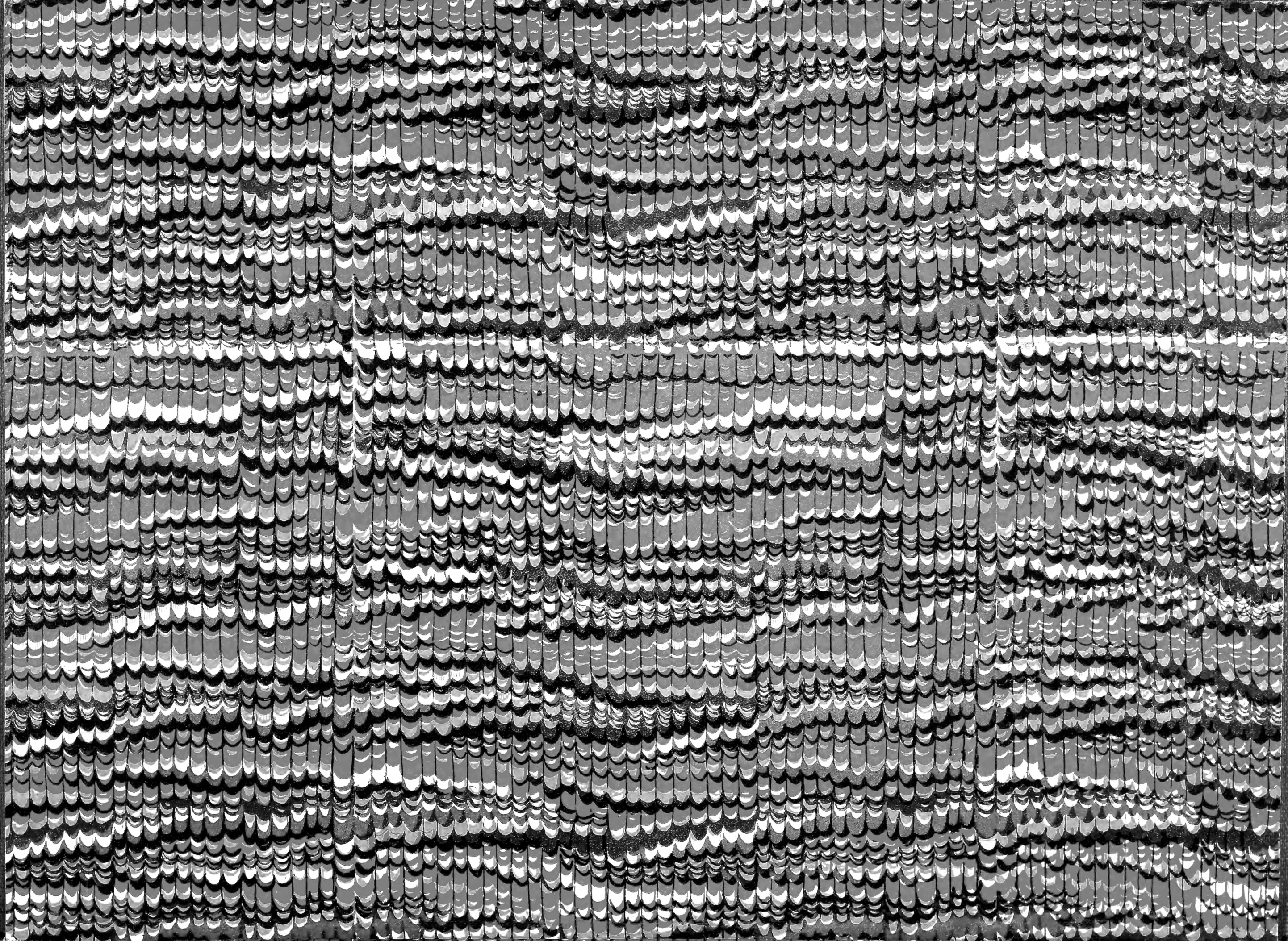

DEN NORSKE NORDHAVS-EXPEDITION
1876—1878.

XXV.

ZOOLOGI.

THALAMOPHORA.

VED

HANS KIÆR.

MED 1 PLANCHE OG 1 KART.

CHRISTIANIA.
GRØNDAHL & SØNS BOGTRYKKERI.
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I COMMISSION HOS H. ASCHEHOUG & Co.

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THE NORWEGIAN NORTH-ATLANTIC EXPEDITION
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ZOOLOGY.

THALAMOPHORA.

BY

HANS KIÆR.

WITH 1 PLATE & 1 MAP.

CHRISTIANIA.
PRINTED BY GRØNDAHL & SØN.
1899.

Som Grundlag for min Bearbeidelse af Nordhavsexpeditionens Thalamophorer forelaa der en særdeles righoldig Samling af Bundprøver. Efter Konference med Hr. Prof. G. O. Sars, for hvis velvillige Hjælp ved flere Anledninger jeg her udtaler min Tak, har jeg dog ikke fundet det nødvendigt at gjennemgaa alle Bundprøverne, da de nemlig ofte er tagne med forholdsvis korte Mellemrum og saaledes Faunaen kunde formodes at være meget ensartet paa de Stationer, der laa i hinandens Nærhed. Dette har ogsaa vist sig at være Tilfældet ved den foreløbige Undersøgelse, som jeg foretog af ca. 100 Bundprøver fra alle Dele af Nordhavet. Disse Bundprøver var fordelt saaledes:

Fra Sognefjorden	1	Bundprøve
„ det graa Ler langs Norges Kyst	34	Bundprøver
„ - „ - ved Beeren Eiland	3	„
„ - „ - Spidsbergen	11	„
„ - „ - Ian Mayen	4	„
„ - „ - Island	4	„
„ - „ - Færøerne	1	„
„ Overgangsleret	14	„
„ Biloculinaleret	23	„
„ Rhabdamminaleret	8	„
Tilsammen	103	Bundprøver

Ved den foreløbige Undersøgelse er Bundprøverne behandlet paa følgende Maade: Det Kvantum, der skulde undersøges, i Regelen 3—4 cm.$_3$, blev opblødt og udrørt i Vand, hvorpaa den grumsede Vædske frasiltes gjennem en fin Sil af ca. 0.08 mm.s Maskevidde. Det tilbageblevne undersøgtes under Mikroskopet.

Paa Grundlag af de Erfaringer, som ovennævnte Fremgangsmaade gav, udvalgtes nu et begrændset Antal af de paa Arter og Exemplarer rigeste Bundprøver, ialt 19, ligelig fordelt over alle Lersorter. Disse Bundprøver er fra følgende Stationer: 9, 92, 255, 135, 192, 262, 268, 287, 342, 368, 355, 353, 296, 214, 40, 48, 231, 223, 37.

Disse 19 Bundprøver blev behandlet efter den af Dr. Madsen beskrevne Methode [1], hvortil $^1/_4$ eller $^1/_2$ Liter af

[1] V. Madsen, Istidens Foraminiferer i Danmark og Holsten. Kjøbenhavn. 1895.

A particularly large collection of bottom-samples formed the basis for my investigation of the Thalamophora of the North Atlantic Expedition. After consultation with Prof. G. O. Sars, for whose ready assistance on several occasions I would here express my thanks, I have not considered it necessary to go through all the samples, as they were often taken at comparatively short intervals, and the fauna might naturally be supposed to be very homogeneous at stations lying near to one another. This has also proved to be the case in the preliminary examination that I made of about 100 bottom-samples from all parts of the North Sea. These samples were distributed as follows:

From Sognefjord	1	sample
„ the gray clay along the Norw. coast	24	samples
„ - „ - near Bear Island	3	„
„ - „ - „ Spitsbergen	11	„
„ - „ - „ Jan Mayen Island	4	„
„ - „ - „ Iceland	4	„
„ - „ - „ Faröe Islands	1	„
„ - transition clay	14	„
„ - Biloculina „	23	„
„ - Rhabdammina clay	8	„
Total	103	samples

In the preliminary investigation, the samples were treated in the following manner: the quantity to be examined, generally 3 or 4 cubic cm. was softened and stirred up in water, and the muddy liquid strained through a fine sieve, whose meshes measure about 0.08 mm. in width. What was left was examined under the nicroscope.

With the experience gained from the above method of procedure as a basis, a limited number of samples in which species and specimens were most abundant, were then selected — 19 in all, distributed equally among all kinds of clay. These samples were from the following stations: 9, 92, 255, 135, 192, 262, 268, 287, 342, 368, 355, 353, 296, 214, 40, 48, 231, 223 and 37.

These 19 samples were treated according to the method described by Dr. Madsen [1], in which from $^1/_4$ to $^1/_2$

[1] V. Madsen, Istidens Foraminifera i Danmark og Holsten. Copenhagen. 1895.

Bundprøven blev benyttet. Denne Methode viste sig at give udmærkede Resultater.

Som Prøve paa de forskjellige Lersorters Fauna skal her opregnes de Arter, der ved Dr. Madsens Methode er fundet i 5 Bundprøver, nemlig 1 fra Biloculinaleret, 1 fra Overgangsleret, 1 fra det graa Ler langs Norges Kyst, 1 fra Rhabdamminaleret og 1 fra det graa Ler ved Spidsbergen. Disse Bundprøver er ikke netop af de paa Arter og Exemplarer rigeste, men udvalgt saaledes, at de ialmindelighed forekommende Arter saavidt mulig kommer med. De er fra følgende Stationer: 9, 135, 296, 268, 368.

Foruden Bundprøverne havdes ogsaa en hel Del Tuber med Thalamophorer fra Skrabningerne. Disse Tuber indeholdt ofte en stor Mængde af de større og mere iøinefaldende Arter[1]. Da der ikke fandtes nogen saadan Prøve fra Skrabningerne fra det graa Ler, skal der her blot gives en Fortegnelse over de Arter, der ved Skrabningerne er fundet paa 2 Stationer, nemlig en fra Biloculinaleret (Station 40) og en fra Rabdamminaleret (Station 274).

a litre of the sample was used. This method proved to be productive of excellent results.

The species found by Dr. Madsen's method in 5 bottom-samples will here be considered as samples of the fauna of the different kinds of clay, viz. 1 from Biloculina clay, 1 from transition clay, 1 from the gray clay along the coast of Norway, 1 from the Rhabdammina clay, and 1 from the gray clay at Spitzbergen. These samples are not of the richest in species and specimens, but are chosen so as to include the species of most general occurrence. They are from the following stations: 9, 135, 296, 268 and 368.

In addition to the bottom-samples, there were also a number of tubes containing Thalamophora from dredgings. These tubes often contained a considerable number of large and conspicuous species[1]. As there was no such sample from dredgings from the gray clay, a list will only be given of the species found in dredging at 2 stations, namely, one from the Biloculina clay (Station 40), and one from the Rhabdammina clay (Station 274).

Station 9.

v == very common meget almindelig
c == common almindelig.
n == not common ikke almindelig.
r == rare, sjelden.

Biloculina simplex (r), *elongata* (r), *sphaera* (r), *Quinqueloculina seminulum* (r), *agglutinans* (r), *Gaudryina chilostoma* (r), *Bolivina dilatata* (r), *Bulimina elipsoides* (r), *marginata* (r), *Normanni* (r), *Cassidulina laevigata* (n), *Nodosaria communis* (r), *laevigata* (n), *scalaris* (r), *Lagena marginata* (n), *distoma* (r), *gracillima* (r), *semistriata* (r), *hexagona* (r), *Polymorphina rotundata* (r), *Uvigerina pygmaea* (v), *angulosa* (n), *Truncatulina lobatula* (n), *Anomalina coronata* (r), *Globigerina bulloides* (n), *inflata* (r), *Pullenia sphaeroides* (r), *Sphaeroidina bulloides* (r), *Nonionina umbilicatula* (n), *scapha* (r), *stelligera* (v), *Operculina ammonoides* (c).

Station 135.

Ammodiscus incertus (r), *Nodulina scorpiura* (n), *guttifera* (n), *Quinqueloculina seminulum* (n), *Bolivina punctata* (n), *Cassidulina laevigata* (c), *Virgulina schreibersiana* (r), *Nodosaria calomorpha* (r), *Glandulina laevigata* (r), *Lagena laevis* (r), *distoma* (n), *hexagona* (r), *striata* (r), *sulcata* (r), *var. interrupta* (r), *marginata* (n), *acuta* (n), *Uvigerina angulosa* (n), *Haplophragmium latidorsatum* (c), *nanum* (n), *Truncatulina lobatula* (n), *Wüllersdorfii* (n), *Anomalina grosseruga* (c), *Pulvinulina punctulata* (n), *Rotalia orbicularis* (n), *Discorbina vilardeboana* (r), *Globigerina bulloides* (v), *pachyderma* (v), *Orbulina universa* (r), *Pullenia sphaeroides* (n), *Nonionina umbilicatula* (n), *Polystomella striatopunctata* (r).

[1] Alle smaa Exemplarer var i Regelen fjernede.

Station 296.

Reophax difflugiformis (r), *Nodulina guttifera* (n), *Biloculina laevis* (c), *Nodosaria calamorpha* (n), *Lagena laevis* (c), *apiculata* (c), *marginata* (c), *feildeniana* (c), *Cristellaria crepidula* (r), *Haplophragmium globigeriniforme* (n), *latidorsatum* (c), *pseudospirale* (c), *anceps* (n), *Truncatulina Wüllersdorfi* (c), *Anomalina grosseruga* (c), *Pulvinulina punctulata* (n), *Rotalia orbicularis* (n), *Discorbina araucana* (n), *Globigerina bulloides* (v), *pachyderma* (v).

Station 268.

Rhabdammina abyssorum (r), *Hyperammina ramosa* (n), *Bulimina elipsoides* (n), *Virgulina schreibersiana* (r), *Nodosaria calomorpha* (r), *Glandulina laevigata* (r), *Lagena laevis* (n), *distoma* (r), *gracilis* (r), *marginata* (n), *lagenoides* (r), *striatopunctata* (r), *Uvigerina pygmaea* (r), *Haplophragmium canariense* (r), *Truncatulina lobatula* (n), *ungeriana* (r), *Nonionina scapha* (n), *umbilicatula* (n), *stelligera* (n), *Polystomella striatopunctata* (r), *arctica* (c).

Station 368.

Bulimina elipsoides (n), *Virgulina schreibersiana* (r), *Nodosaria pauperata* (r), *Glandulina laevigata* (r), *Lagena laevis* (r), *distoma* (r), *striata* (r), *sulcata* (r), *marginata* (n), *orbignyana* (r), *globosa* (r), *acuta* (r), *striatopunctata* (r), *Cristellaria rotulata* (r), *Uvigerina pygmaea* (r), *Rupertia stabilis* (r), *Truncatulina lobatula* (r), *refulgens* (n), *Pulvinulina Karstenii* (n), *Globigerina bulloides* (c), *pachyderma* (c), *Pullenia sphaeroides* (r), *Nonionina umilicatula* (n), *turgida* (r), *scapha* (r), *Polystomella striatopunctata* (r), *arctia* (r).

[1] All small specimens were, as a rule, removed.

Station 40.

Astrorhiza arenaria (c), *crassatina* (c), *Cornuspira foliacea* (c), *Hyperammina elongata* (r), *Biloculina laevis* (v), *arctica* (r), *sphaera* (n), *Textularia agglutinans* (n), *Nodosaria communis* (r), *panperata* (n), *Glandulina laevigata* (c), *aequalis* (n), *Vaginulina costata* (n), *Polymorphina angusta* (r), *acuta* (n), *Haplophragmium latidorsatum* (v), *Planorbulina Wüllersdorfii* (c).

Station 274.

Astrorhiza crassatina (c), *Psammosphaera fusca* (n), *Tholosina bulla* (c), *Rhabdammina abyssorum* (v), *discreta* (n), *Hyperammina arborescens* (r), *Nodulina scorpiura* (c), *Biloculina simplex* (r), *Miliolina tricarinata* (r), *seminulum* (r), *Valvulina conica* (r), *Nodosaria obliqua* (r), *Haplophragmium crassimargo* (r), *Truncatulina lobatula* (c).

Paa Hydroider fra Nordhavsexpeditionen saaes mange Exemplarer af Rupertia og Truncatulina fastheftede. Desuden var ofte en Mængde Thalamophorer hørende til en hel Del Arter infiltrede i Hydroidernes traade.

I Nordhavsexpeditionens Plankton fandtes ingen pelagiske Thalamoporer. Derimod har jeg fundet mange Exemplarer af Globigerina bulloides i Plankton, der paa Foranstaltning af dr. Hjort blev taget mellem Trondhjem og Island i April—Juni 1898 [1]. Disse Globigeriner fandtes dels med dels uden Pigger dog sjelden i betydeligt Antal i hver Planktonprøve.

Foruden Thalamophorer saaes i Bundprøverne ofte mange uorganiske Levninger af andre Dyreformer. Dog kunde ingen Radiolarier opdages, skjønt enkelte Arter af disse undertiden forekommer i Plankton fra Nordhavet, saaledes optræder Acanthonia echinoides Haeckel af og til i uhyre Mængde i Plankton fra Norges Vestkyst, medens en anden Art Acanthostaurus pallidus Haeckel er meget sjeldnere.

Bemærkninger til Tabellen.

Følgende Oplysninger er nødvendige til Forstaaelse af Tabellen:

De under hver Rubrik opførte Tal betegner Antallet af Stationer, hvorfra en Bundprøve eller en Prøve fra Skrabningerne er undersøgt.

Jeg har inddelt de forskjellige Lersorter ialt i 16 Underafdelinger for at vise Thalamopharernes geografiske og bathrymetriske Udbredelse og ikke fordi der altid raader nogen væsentlig Forskjel inden hver af disse Underafdelingers Fauna. Det graa Ler er ved Hjælp af den 63de Breddegrad og den 19de Længdegrad delt i 3 Dele, hvoraf den sydlige omfatter 10, den nordlige 20 og den østlige 5 Stationer. Af Overgangsleret og Biloculinaleret har jeg adskilt 3 Partier, et sydligt og et nordligt, der har sin naturlige Grændse i Tværryggen mellem det norske og det svenske Dyb, samt et østligt Parti mellem Rhabdamminaleret og de to nævnte Havdyb. Rhabdamminaleret er delt i 2 Dele ved den 19de Længdegrad.

[1] Den nordligste Station var fra 69° 40 N. B. 11° 30 L. W. 5. 6. 1898. Vandets Temperatur + 0,8.

Many specimens of Rupertia and Truncatulina attached were to Hydroida from the North Atlantic Expedition. There were frequently moreover, a number of Thalamopora, belonging to a great many species, entangled in the filaments of the hydroids.

There were no pelagic Thalamophora in the North Atlantic Expedition's plankton. On the other hand, I found many specimens of Globigerina bulloides in plankton which, under Dr. Hjort's direction, was taken between Trondhjem and Iceland, between the months of April and Juni 1896 [1]. These Globigerina were found both with and without spines, but unusually in large numbers in every plankton sample.

Besides Thalamophora, many inorganic remains of other animal forms were frequently seen in the bottom-samples. No Radiolaria, however, could be discovered although a few species sometimes occur in plankton from the North Sea. In this way Acanthonia echinoides Haeckel now and then appears in immense numbers in plankton from the west coast of Norway, while another species. Acanthostaurus pallidus Haeckel is far less frequent.

Remarks on the Table.

The following information is necessary to an understanding of the table:

The figure under each head denotes the number of stations from which a bottom-sample or a sample from the dredgings has been examined.

I have divided the various kinds of clay into 16 subdivisions in all, in order to show the geographic and bathymetric distribution of the Thalamophora, and not becoause there is always some essential difference in the fauna of each of these sub-divisions. The gray clay is divided, by the aid of the 63rd parallel of latitude, and 19th of longitude, into 3 parts. of which the southern one includes 10, the northern 20, and the eastern 5 stations. I have divided the transition clay and the Biloculina clay into 3 divisions, one southerly and one northerly, which having their natural boundaries in the cross ridge between the Norway and the Swedish deep., and an easterly division between the Rhabdammina clay and the two abovementioned deeps. The Rhabdammina clay is divided into two parts by the 19th parallel of longitude.

[1] The most northerly station was 69° 40 N. Lat. & 11° 30 W. Long. Juni 5, 1898. Temperature of water: 0.8°.

Under Gjennemlæsningen af Tabellen maa der lægges Mærke til, at der fra det graa Ler blot haves Bundprøver, medens der fra de øvrige Lersorter ogsaa findes Prøver fra Skrabningerne.

Arterne er opført efter Rhumblers nye System (L. Rhumbler, Entwurf eines natürlichen Systems der Thalamophoren, Nachrichten der k. Ges. d. Wiss. Goettingen 1895, Heft. 1, p. 50—98).

In a perusal of the table, it should be observed that there were only bottom-samples from the gray clay, while from the other kinds of clay, there were samples of dredgings as well.

The species are classed according to Rhumbler's new system (L. Rhumbler, Entwurf eines natürlichen Systems der Thalamophoren Nachrichten der k. Ges. d. Wiss. Goettingen 1895, Part I. pp. 50—98)

s = south, syd.
n = north, nord.
e = east, øst.
w = west, vest.

		Sognefjord.	Graat Ler. Grey Clays.								Rhabdammin. Clay.		Overgangsler. Transition Clay.			Biloculinler. Biloculina Clay.		
			Norge. Norway.			Beeren Eiland.	Spidsbergen.	Jan Mayen.	Island.									
			s	n	e						e	w	s	e	n	s	e	n
	Stationernes Antal	2	10	20	5	3	12	4	4		9	2	7	7	3	15	6	4
1	*Astrorhiza arenaria* Norman . . .	1										1		1		1		
2	„ *crassatina* Brady						3				1	2	1	2		2	1	
3	*Saccamminna sphaerica* M. Sars .	2									1							
	Psammosphaera fusca E. Schulze	2									1	1	2					
4	*Stortosphaera albida* E. Schulze .	1																
5	*Thurammina papillata* Brady . .													1				
6	*Reophax difflugiformis* Brady . .	1			1			1				1	1		2		1	
7	*Tholosina bulla* Brady	1									1	1						
8	*Crithionina abyssorum* n. sp. . . .												1	1		1	1	
9	*Bathysiphon filiformis* M. Sars .	1																
10	*Botellina labyrinthica* Brady . . .											1						
11	*Webbina clavata* Park & Jones .	2		1		1						1						
12	*Rhabdammina abyssorum* Sars . .	1		1	1	2					5	2		3	1		1	
13	„ *discreta* Brady										1	1					1	
14	*Hyperammina elongata* Brady . .							1				1	1	1		2		
15	„ *arborescens* Norman . .										1	1						
16	„ *ramosa* Brady	2									1		1	2				
17	*Ammodiscus incertus* d'Orb. . . .			1									1		1			
18	„ *tenuis* Brady													1				
19	*Gordiammina charoides* Park & Jones	1																
20	*Cornuspira carinata* Costa												1					
21	„ *foliacea* Phil	1		1									1	1		2		
22	„ *striolata* Brady												1	2				
23	*Patellina corrugata* Will													1				
24	*Nodulina scorpiura* Montfort . . .		1	2	2		1	1			1	2	4	2	2			
25	„ *guttifera* Brady.												2		2	2	1	1
26	„ *pilulifera* Brady											1			2			
27	„ *sabulosa* Brady										1	1	1			1		
28	*Ashemonella catenata* Norman . .	1																
29	*Biloculina laevis* Defrance												3	3	1	11	4	4
30	„ *simplex* d' Orb	1	1	2							1	2		1				
31	„ *elongata* d'Orb	1	2	1				1						1	1	1		1
32	„ *arctica* Goës															1	1	1
33	„ *depressa* d'Orb													1				
34	„ *sphaera* d'Orb	1	1	2									1	2		2		
35	*Triloculina oblonga* Montag													1				
36	„ *valvularis* v. Reuss . .			1		1						1		1				
37	„ *bucculenta* Brady . . .		1			1						1	1	2				
38	„ *trigonula* Lmk.												1	1				
39	„ *tricarinata* d'Orb. . . .		2								2	2	2	1	1	1		
40	*Quinqueloculina seminulum* Lin. .		2	4	3	2	1	1	2		1	2	5	1		5		
41	„ *agglutinans* Park&Jones		2	4	1			1	1									
42	„ *subrotunda* Montag. . .													1				
43	„ *angulata* Will													1				

s = south, syd.
n = north, nord.
e = east, øst.
w = west, vest.

		Sognefjord.	Graat Ler. Grey Clays. Norge. Norway. s	Norge. Norway. n	Norge. Norway. e	Beeren Eiland.	Spidsbergen.	Jan Meyen.	Island.	Rhabdamminaler. e	Clay. w	Overgangsler. s	Transition Clay. e	Transition Clay. n	Biloculinler. s	Biloculina Clay. e	Biloculina Clay. n
44	*Ophtalmidium tumidulum* Brady .												1				
45	*Spiroloculina limbata* d'Orb . . .												1				
46	*Bigenerina digitata* d'Orb.			1													
47	„ *nodosaria* d'Orb			1													
48	*Textularia agglutinans* d'Orb . . .	2		1								2	1		2		1
49	„ *intermedia* Goës	1									1						
50	„ *aspera* Brady.	1									1						
51	„ *Williamsoni* Goës. . . .												1		1		
52	*Bigenerina Sarsi* n. sp.			1									1				
53	*Gaudryina chilostoma* Reuss . . .		1	5							1	1	1	1			
54	*Verneuilina polystropha* Reuss . .												1				
55	*Valvulina conica* Park. & Jones .	1			1					1							
56	„ *fusca* Will	1		1										1			
57	*Bolivina punctata* d'Orb.			2	2	1		1		1		1	1	1			
57	„ *dilatata* v. Reuss. . . .		6	4	2								2				
59	*Bulimina elipsoides* Costa		3	3	3		2			1	1		1				
60	„ *marginata* d'Orb	1	3	3	1			1									
61	„ *subcylindrica* Brady . .			1									1				
62	„ *subteres* Brady												1				
63	„ *Normani* Goës		1														
64	„ *convoluta* Williams . . .												1				
65	*Virgulina schreibersiana* Czjz . . .			1	3	1	1	3	1	1	1	2					
66	*Cassidulina laevigata* d'Orb	1	6	15	4	2	8	2	3	6	1	4	4	2	3		
67	„ *crassa* d'Orb	1		3		1	3	1		2		1	1	2			1
68	*Nodosaria communis* d'Orb		1	1									1		1		1
69	„ *pauperata* d'Orb		1		1		1	1		1	1	1		1	3		2
70	„ *calomorpha* v. Reuss . .			1						1		3	1			1	
71	„ *inflexa* Reuss			2	1												
72	„ *scalaris* Batsch		1	3									1				
73	„ *mucronata* Neugeb . . .											1			1		
74	„ *obliqua* Lin									1		2					
75	*Glandulina laevigata* d' Orb . . .	1	1	2			2	1		1		1	1	2	1		
76	„ *aequalis* v Reuss. . . .							1			1	2	1	1	1	1	
77	*Vaginulina laevigata* Roem			1					1			2					
78	„ *linearis* Montag											1					
79	„ *costata* Batsch, ...												1		2		
80	*Lagena laevis* Walk. & Boys . . .			1	1	1	2		1	2		3		1	2	1	1
81	„ *gracilis* Williams			1				1		1		1	1	1	2		2
82	„ *distoma* Park. & Jones		2	2			1	1		1		1					
83	„ *globosa* Walk. & Jac .			1			1	1	1			1	1	1			
84	„ *gracillima* Seg		2	2	1	1	1					1		1	1		
85	„ *semistriata* Williams . .		1									1	1		2		
86	„ *acuticosta* Reuss												1				
87	„ *striata* d'Orb			2	1		2		1			3	1				1
88	„ *sulcata* Walk. & Jac .			2			1					2	1				1
89	„ *curvilineata* Balkw. & Millet												1				
90	„ *apiculata* Reuss						1	1				2			3	1	1
91	„ *hexagona* Will		1	1			1		1			3	1	1	2		1
92	„ *williamsoni* Alcock. . .		1										1				
93	„ *squamosa* Montag . . .			1		1						1	1		1		1
94	„ *clavata* d'Ob							1							1		
95	„ *hispida* v. Renss			1									1				
96	„ *feildeniana* Brady . . .								1			1			1	1	
97	„ *striatopunctata* Park. & Jones			1						2							
98	„ *marginata* Walk. & Boys		2	4	2	1	2	1	1	2		3	1	3	3	1	2
99	„ *trigona-marginata* Park. & Jones														1		

s = south, syd.
n = north, nord.
e = east, øst.
w = west, vest.

		Sognefjord.	Graat ler. Grey Clays. Norge. Norway. s	Norge. Norway. n	Norge. Norway. e	Beeren Eiland.	Spidsbergen.	Jan Mayen.	Island.	Rhabdammina-ler. e	Clay. w	Overgangsler. s	Transition Clay. e	— n	Biloculinler. s	Biloculina Clay. e	n
100	*Lagena lucida* Will												1				
101	„ *acuta* Reuss						1	1				2	1	1	1		
102	„ *staphyllearea* Schwag .								1			2		1			1
103	„ *orbignyana* Seg.			1			1					1	1	2	1		1
104	„ *alveolata* Brady											2					
105	„ *lagenoides* Will			1						1		1		1			
106	*Cristellaria rotulata* Lmk.	2		4		1	2			1	1	1	1				
107	„ *crepidula* Ficht. & Moll			2								2	1	1			
108	*Polymorphina gibba* d'Orb																1
109	„ *rotundata* Bornem . . .		1					1					2				
110	„ *angusta* Egger														1		
111	„ *acuta* Roem.												1		1		
112	„ *oblonga* d'Orb.												1				
113	„ *compressa* d'Orb												1				
114	*Sagrina dimorpha* Park. & Jones			1													
115	*Uvigerina pygmaea* d'Orb.	2	6	14	1	1	1	2	2	3		2	1				
116	„ *angulosa* Will		3	12	2	1	1	1	1	2		2					
117	*Haplophragmium canariense* d'Orb			2	1		1	1		1	1		1	1			
118	„ *crassimargo* Norman . .									1							
119	„ *latidoratum* Bornem . .	2	2	4		1	3			2	1	9	5	3	11	3	3
120	„ *nanum* Brady.			1		1		1				1		1			
121	„ *globigeriniforme* Park. & Jones.						1	1				1	1			1	
122	„ *pseudospirale* Will . . .														1	1	
123	„ *glomeratum* Brady . . .							1									
124	„ *anceps* Brady							1									
125	*Trochammina inflata* Montag. . .							1									
126	„ *nitida* Brady						1										
127	„ *vesicularis* Goës . . , .					1											
128	„ *squamata*												1				
129	*Rupertia stabilis* Wallich					2	1				1	2	1	1			
130	*Truncatulina lobatula* Walk. & Jac.	1	8	15	5	2	9	2	4	6	2	2	4	3	3	1	1
131	„ *refulgens* Montfort . . .	2	6	13	3	3	6	2	1	6	1	2	2	1	1	3	
132	„ *Wüllersdorfii* Schwag .											3	5	2	11	3	3
133	„ *akneriana* d'Orb			6								1	2	2	1		
134	„ *ungeriana* d'Orb		3	5		2	1				1		1		1		
135	*Planorbulina mediterranea* d'Orb												1				
136	*Anomalina coronata* Park. & Jones	1	1	2		1							2				
137	„ *ariminensis* d'Orb . . .			1													
138	„ *grosseruga* Gümb. . . .											1	1	1	2	1	1
139	*Pulvinulina punctulata* d'Orb. . .					1				2		2	1	1	1	1	1
140	„ *concentrica* Park. & Jones												1				
141	„ *Karsteni* v. Reuss . . .				1		5			5		2	1	2			1
142	*Rotalia soldanii* d'Orb.			1													
143	„ *orbicularis* d'Orb	1		1				1				1	3	2	3	1	2
144	*Discorbina globularis* d'Orb . . .			1									1		1	1	1
145	„ *vilardeboana* d'Orb. . .											1			1		
146	„ *araucana* d'Orb											1			3	2	1
147	„ *obtusa* d'Orb												1				
148	„ *berthelothiana* d'Orb . .												1				1
149	„ *rosacea* d'Orb.												1				
150	*Globigerina bulloides* d'Orb		7	20	2	2	7	4	3	6		7	7	3	15	6	4
151	„ *pachyderma* Ehrenb . .		4	12	2	2	7	2	2	6		7	7	3	15	6	4
152	„ *inflata* d'Orb		2	1								1					
153	*Orbulina universa* d'Orb		1	1								2	1		1		
154	*Pullenia sphaeroides* d'Orb	1	5	5	3	1	3	2	2	2		3	2	1			1
155	„ *quinqueloba* Reuss . . .	1	1	4		2							1				
156	*Sphaeroidina bulloides* d'Orb . . .		2	3													

	s = south, syd. n = north, nord. e = east, øst. w = west, vest.	Sognefjord.	Graat ler. Grey Clays. Norge. Norway. s	n	e	Beeren Eiland.	Spidsbergen.	Jan Mayen.	Island.	Rhabdammina-ler. Clay. e	w	Overgangsler. Transition Clay. s	e	n	Biloculinler. Biloculina Clay. s	e	n
157	*Nonionina umbilicatula* Montag .	1	6	12	4	2	10	2	4	6	1	3	2	2	3	1	
158	„ *depressula* Walk. & Jac.					1				1			1				
159	„ *stelligera* d'Orb		1				1	1				1	1	1			
160	„ *pompilioides* Ficht. & Moll			1													
161	„ *scapha* Ficht & Moll .		4	5	4	1	4	1	1	1	1	1	1				
162	„ *turgida* Will						1		1				1				
163	*Polyotomella striatopunctata* Ficht. & Moll			3		1	3			2	1	3	1	1			
164	„ *arctica* Park. & Jones .						1		1	1				1			
165	„ *subnodosa* Münster . . .						1					1					
166	*Operculina ammonoides* Gron . . .	1	5	10	4												

Chrithionina abyssorum n. sp.

Kugleformet eller oval, med ugjevn, graa Overflade, hvori undertiden er fastheftet Svampespikler, der stritter i alle Retninger. Væggen hvid, tyk. Det indre Kammer indeholdende en mere eller mindre fast, kornet Masse. (Se Planchen Figg. 1—4).

Paa 2 Stationer meget vidt fra hinanden, nemlig Station 35 og Station 295 fandtes endel kugleformede eller ovale Klumper, i Regelen mere eller mindre dækkede af udstraalende Svampespikler, radiært kan det ialfald ikke altid kaldes, det ser meget mere ud som om de strittede ud til alle Kanter, idet nogle er temmelig lange, andre afbrukne et Stykke fra eller helt inde ved Roden, hvor de viser sig som en mørk Ring med en lys Prik i Midten. Disse Spikler har i det indre af Klumpens hvide, løse Vægge tabt sin Konsistens og fuldstændig smeltet sammen med det øvrige Materiale, ganske fint, glindsende Sand, til en kompakt Masse.

Det ydre har en skidden graa Kulør, modsat *Tholosina bulla*, der er mere hvidlig, og undertiden sees hvide skalfragmenter fastheftede til Ydervæggene. Brudfladerne derimod ligner aldeles paafaldende *Tholosina bulla*.

Materialet er som før nævnt af en hvid Konsistens, dog sees paa nogle Exemplarer den yderste 3die Del eller Halvdel af Væggens Gjennemsnit at være graa.

I Klumpees Indre sees der altid en mere eller mindre fast, kornet og gulbrun Masse. Undertiden danner denne en løs, af mange smaa Mellemrum afbrudt Substans, der fylder hele den indre Hulhed eller ogsaa viser den sig som en kompakt, afrundet Blok af et forholdsvis lidet Volum.

Paa to andre Stationer, nemlig 87 og 326, fandtes nogle andre Klumper, der adskiller sig fra de ovenfor omtalte derved at Svampespiklerne mangler, Væggenes Brud-

Chrithionina abyssorum n. sp.

Spherical or oval, with uneven, gray surface, on which there are sometimes sponge spicules sticking out in all directions. Wall white, thick. The inner chamber containing a more or less firm, granular mass. (See plate, figs. 1—4).

At 2 stations, at a great distance from one another, namely Station 35 and Station 295, a number of sperical, or oval lumps were found, generally more or less covered with outward-streaming sponge spicules, which could not always, at any rate, be said to be radial; they appear rather to bristle out in all directions, some being long, others broken off a little way from, or close to the root, where they look like a dark ring with a light dot in the centre. In the interior of the white, loose partitions of the lump, these spicules have lost their consistency, and become completely merged in the other material, very fine, glittering sand, into a compact mass.

The exterior is of a dirty gray colour, unlike *Tholosina bulla*, which is whiter, and fragments of shell are sometimes seen attached to the outer walls. Fractured surfaces, on the other hand, bear a most striking resemblance to *Tholosina bulla*.

The material, as before mentioned, is of a white consistency, although in some specimens, the outermost $^1/_3$ or $^1/_2$ of the section of the wall is found to be gray.

In the interior of the lump there is always a more or less firm, granular, yellowish brown mass. Sometimes this is a loose substance, interrupted by a number of small intervals, and filling the entire inner cavity; or it appears in the form of a compact, rounded block of comparativelly small bulk.

At 2 other stations, wiz. 87 and 326: were found other lumps differing from those already mentioned, in the absence of sponge spicules, and in the fact that the frac-

flader er graa og den indre kornede Masse sort. Protoplasmaet i disse Klumper har rimeligvis i lang Tid været dødt og som Følge deraf er de nævnte Forandringer indtraadt.

I Prøven fra Station 295 fandtes ogsaa Skaller af andre Thalamophorer, saaledes 2 Exemplarer af *Haplophragmium latidorsatum* og 1 af *Biloculina laevis* indkittede i Ydervæggen af en *Crithionina abyssorum*.

Goës beskriver fra Vestkysten af Centralamerika[1]) en nærstaaende Form, C. *rugosa*, der adskiller sig fra C. *abyssorum* ved sin rynkede Overflade og uregelmæssige Form.

Biloculina laevis Defrance.

(Fig. 15—16).

Pyrgo laevis Defr., 1824, Dict. Sc. Nat. 32, p. 273.
„ — De Blainville, 1825, Manuel de Malacologie, p. 482, pl. LXII bis. fig. 2.
Biloc. amphiconica var. platystoma Reuss, 1867, Steinsaltzablag. Wieliczka. Wien. Ak. Sitz. Ber. 55, p. 67 pl. 1. fig. 8.
„ ringens Brady, 1884, Chall. Rep. 9. p. 137.
„ depressa „ — „ - „ - 140.
„ laevis „ — „ - „ - 146, pl. 2, fig. 14. (?).
„ Sarsi Schlumberger, 1891, Biloc. grands fonds, Mem. Soc. Zool. France 4, p. 166 pl. IX. fig. 55—59.
„ laevis Goës, A., 1892, Artic. and Scand. Foraminifera, K. Sv. Vet. Acad. Handl. Bd. 25 No. 9. p. 119, pl. XXIV. fig. 914—918.

Der synes at være forskjellige Meninger, om hvilken Art eller hvilke Arter det er, som har en saa kolossal Udaredelse over Nordhavets Dybder, som Schmelck angiver i sin Afhandling om Havbundens Afleiringer.

Baade Brady og Schlumberger har havt en Prøve af Biloculinaer fra det norske Nordhav til Undersøgelse. Den første henfører Størsteparten af disse til B. Ringens og en Del til B. Depressa. Schlumberger har blot fundet 1 Art, hvilken han benævner B. Sarsi. Goës har i sit Materiale fra de store Havdyb ved Spidsbergen blot seet 1 Art, B. laevis[2].

Brady og Goës er af den Anskuelse, at den fossile Art Pyrgo laevis Defrance er identisk med en nu paa de store Havdyb forekommende Form.

De væsentligste Invendinger mod denne Anskuelse synes mig at være:

[1] Goës, 1896, The Foramlnifera, Rep. Dredg. Op. Albatross, XX. Bull. Mus. Comp. Zool. Harv. Coll. Vol. XXIX No. 1, P. 24, Pl. II, Fig. 3—4.

[2] Jeg forbigaar her nogle andre Arter, som Goës opfører fra Havet ved Spidsbergen, nemlig B. depressa, abyssorum og arctica, dels fordi de let lader sig adskille fra B. laevis, dels fordi de ifølge Goës findes paa et mindre Dyb end denne Art.

tured surfaces of the wall are gray, and the interior, granular mass black. The protoplasm in these lumps has probably long been dead, and the above changes have taken place in consequence.

In the sample from Station 295, there were also shells of other Thalamophora e. g. 2 specimens of *Haplophragmium latidorsatum* and 1 *Biloculina laevis*, embedded in the outer wall of a *Crithionina abyssorum*.

Goës describes, from the west coast of Central America[1], a nearly allied form, C. *rugosa*, which differs from C. *abyssorum* in its wrinkled surface and irregular form.

Biloculina laevis Defrance.

(Fig. 15—16.)

Pyrgo laevis Defr., 1824, Dict. Sc. Nat. 32, p. 273.
„ — De Blainville, 1825, Manuel de Malacologie, p. 482, pl. LXII bis. fig. 2.
Biloc. amphiconica var. platystoma Reuss. 1867, Steinsaltzablag. Wieliczka. Wien. Ak. Sitz. Ber. 55, p. 67. pl. 1. fig. 8.
„ ringens Brady, 1884, Chall. Rep, 9. pr. 137.
„ depressa „ — „ - „ - 140.
„ laevis „ — „ - „ - 146, pl. 2. fig. 14. (?).
„ Sarsi Schlumberger, 1891, Biloc. grands fonds, Mem. Soc. Zool. France 4, p. 166 pl. IX. fig. 55—59.
„ laevis Goës, A., 1892, Arctic. and Scand. Foraminifera, K. Sv. Vet. Acad. Handl. Bd. 25. No. 9. p. 119, pl. XXIV. fig. 914—918.

There seems to be a difference of opinion as to which species it is that have such an exceedingly wide distribution in the North Sea depths as Schmelck states in his treatise on the ocean bed deposits.

Booth Brady and Schlumberger have had a sample of Biloculina from the Norwegian North Atlantic, for the purpose of investigation. Brady refers the greater number of these to B. ringens, and a few to P. depressa. Schlumberder has only found one Species, which he calls B. Sarsi. Goës has only seen 1 species, B. laevis[2], in his collection from the great ocean-depth at Spitzbergen.

Brady and Goës are of opinion that the fossil species, Pyrgo laevis Defrance, is identical with a form now occurring in the great ocean depths.

The chief objections to this view seem to me to be:

[1] Goës, 1896, The Foraminifera, Rep. Dredg. Op. Albatross XX. Bull. Mus. Comp. Zool. Harv. Coll. Vol. XXIX, No. 1, p. 24, Pl. II. figs. 3—4.

[2] I here pass over some other species, which Goës mentions from the sea near Spitzbergen, viz. B. depressa, abyssorum and arctica, partly because they are easily distinguished from B. laevis, partly because, according to Goës, they are found at a depth that is not so great as that at which the latter species is found.

I. Pyrgo laevis adskiller sig fra den ovennævnte recente Art ved en noget mere hvælvet Form.

II. Pyrgo laevis er blot fundet i de tertiære Afleiringer ved Paris, hvilke rimeligvis er dannede paa forholdsvis grundt Vand.

Hertil skal jeg bemærke følgende: Schlumberger har som bekjendt paavist, at der inden de enkelte Arter af Biloculiner findes en A-form og en B-form, der væsentlig adskiller sig fra hinanden ved de indre Kammeres Anordning. Af de mere end 100 Expl. af Biloculiner fra det norske Nordhav, gjennem hvilke jeg har gjort Snit for at kunne se deres indre Bygning, har jeg væsentlig fundet A-formen og sjeldnere B formen. Denne sidste adskiller sig fra A-formen ialmindelighed ogsaa ved enkelte ydre Kjendetegn, nemlig ved en noget betydeligere Størelse, mere hvælvede segmenter og mindre stærkt fremtrædende Kjøl, egenskaber, som denne B-form har tilfælles med Pyrgo laevis. Dog skal det bemærkes, at Pyrgo laevis ogsaa synes at have mere hvælvede Segmenter end B-formen. Paa den anden Side er der en anden fossil Art Biloculina amphiconica Reuss, fundet i de tertiære Afleiringer ved Wien, der saa afgjort ligner A-formen fra det norske Nordhav, at der her ikke længer kan være Tale om, at skjelne mellem fossile og recente Arter. Rimeligvis har saaledes Defrance fundet B-formen og Reuss A-formen af en og samme Art, der altsaa endnu lever paa de store Dyb i de arktiske Have.

Schlumbergers B. Sarsi og Goës's B. laevis kan paa ingensomhelst Maade skilnes fra hinanden, hvad disse Forfatteres Afbildninger og Beskrivelser godtgjør. Af de tidligere fremførte Grunde mener jeg, at man er berettiget til at benævne den i Norhavet fundne Form Biloculina laevis.

De af Brady i det nordlige Atlanteøhav fundne Exemplarer af B. laevis synes at være meget abnormt dannede, hvis de overhovedet kan henføres til denne Art. Blandt alle de Biloculiner fra det norske Nordhav, som jeg har havt til Undersøgelse, har jeg ikke fundet et eneste Exemplar, der endog tilnærmelsesvis ligner de af Brady afbildede Exemplarer af B. laevis De er ogsaa alle dannede efter en ganske anden Formtypus end Bradys Exemplarer. Hos disse sidste kan man ifølge Brady tydelig skjelne mellem 2 ligeløbende Kjøle, idet de 2 sidste Segmenters Bremmer er frie. Hos Nordhavsexpeditionens ligesom ogsaa hos Goës's Exemplarer er altid[1] det sidste Segments Rand voxet udover den yderste Rand af det næstsidste Segment, saaledes at denne er fuldstændig skjult. Kort sagt, Bradys Exemplarer er 2-kjolede, medens de i Nordhavet fundne er 1-kjølede Pyrgo laevis synes ogsaa at være 1-kjølet, hvad Blainvilles Tegning ikke aldeles tydelig viser, ialfald synes det næst sidste Segments Rand at være dækket af det sidste Segment. Hvad der paa Tegningen synes at danne en Kjøl No. 2, er rimelig-

[1] Paa fig. 915 hos Coës kan det ikke bestemt afgjøres om der her ikke foreligger et 2-kjølet Exemplar. En Slibning er her nødvendig.

I. Pyrgo laevis differs from the above mentioned recent species in having a more vaulted shape.

II. Pyrgo laevis is only found in the tertiary deposits near Paris, which have probably been formed in comparatively shallow water.

To this I will add that Schlumberger, as is well known, has shown that in the different species of Biloculina, there is an A-form and B-form, which differ from one another principally in the arrangement of the inner chambers. Out of the 100 or more Biloculina specimens from the Norwegian North Atlantic of which I have made sections to enable me to see their internal structure. I have principally found the A-form, and less frequently the B-form. The latter also generally differs from the A-form in certain external distinguishing features, more especially in tis somewhat larger size, its more vaulted segments, and its less strongly marked keel, features which this B-form has in common with Pyrgo laevis. I must, however, be observed that Pyrgo laevis also seems so have more vaulted segments than the B-form. On the other hand, another fossil specis, Biloculina Amphiconica Reuss, was found in the Tertiary deposits at Vienna, bearing such a strong resemblance to the A-form from the Norwegian North Atlantic, that there can be no longer any question here of destinguishing between fossil and recent species. It is thus probable that Defrance has found the B-form and Reuss the A-form of the same species, which thus still lives at great depths in the Arctic Ocean.

Schlumberger's B. Sarsi and Goës's B. laevis can in no way be distinguished from one another, a fact which is proved by the illustrations and descriptions of the above-named writers. For reasons already given, I consider it justifiable to designate the form found in the North Sea, Biloculina laevis.

The specimens of B. laevis found by Brady in the North Atlantic, seem to be of a very abnormal formation, if indeed they can be placed in this species at all. Among all the Biloculina from the Norwegian North Atlantic, which I have had for investigation, I have not found a single specimen which resembles even approximately the specimens of B. laevis figured by Brady. They are also all formed after an altogether different type form to that of Brady's specimens. In the latter according to Brady, it is easy to distinguish between the two parallel keels, the rims of the last two segments being free. In the North Atlantic Expedition, and also in Goës's, the margin of the last segment has always[1] grown out over the extreme margin of the penultimate segment, so as to hide it completely. In short, Brady's specimens have 2 keels, while those found the North Atlantic have 1 keel. Pyrgo laevis also seems to have 1 keel, a circumstance which is not shown at all clearly in Blainville's drawing. At any rate, the margin of the penultimate segment seems to be covered by the last segment. What appears in the

[1] In Goës's fig. 915 it cannot be certainly determined whether the specimen represented may not be double-keeled. A section is required here.

vis blot Afslutningen af det sidste Segments ombøiede Rand.

Bigenerina Sarsi n. sp.

Fig. 5—6.

Af Sand; mere eller mindre sammentrykt, tungeformet eller næsten aflangt triangulær, Spiralen 4—6-kamret, Aabningen som hos Textularia; skiddengraa.

Som bekjendt er der inden Slægten Biloculina paavist Tilstedeværelsen af en A-form og en B-form, der tilsammen danner ea Art. Der findes ogsaa inden Bigenerina Sarsi 2 konstante Former, der har saa mange Egenskaber fælles, at de knapt kan karakteriseres som 2 særegne Arter, desuden frembyder de i sin indre Bygning megen Lighed med den Dannelsesmaade, der ligger til Grund for de saakaldte A- og B-former hos Biloculina.

A-formen begynder med et forholdsvis stort Embryonalkammer, der har en Vidde af 0.06 mm. De fire følgende Kamre tiltager raskt i Størrelse og afslutter Spiralen, hvorpaa den biseriske Bygningsmaade begynder med smale og aflange Kamre, der efterhaanden voxer betydeligt i Vidde, men derimod forholdsvis ubetydeligt i Længde. 0.52 mm. Station 192.

B-formen har et meget mindre Embryonalkammer end A-formen. Det har nemlig blot en Vidde af 0.024. Spiralen dannes af 5—6 Kamre, der er forholdsvis ligesaa ubetydelige som det første Kammer. De følgende Kamre tiltager langsomt saavel i Vidde som i Længde. De er meget talrigere end hos A-formen, hvorfor ogsaa B-formen opnaar en langt betydeligere Størrelse end A-formen. 0.92 mm. Station 255.

Lagena lucida Will.

Af denne Art fandtes et typisk Exemplar i Bundprøven fra Station 192. Tidligere har jeg i noget Materiale fra den norske Kyst, som Cand. Nordgaard sendte mig, fundet et par Exemplarer af en Varietet, hvilken jeg i Bergens Museums Aarbog for iaar[1] har beskrevet under Betegnelsen Lagena Nordgaardi nov. var. Disse Exemplarer er næsten kugleformede, medens Exemplaret fra Nordhavsexpeditionen er aflangt og fladtrykt paa Siderne. Alle disse Exemplarer viser den karakteristiske Hesteskoformede Fortykkelse paa begge Sider af Kjølen. Denne Fortykkelse er meget lidet ophøiet og deri samt i Mundaabningens Form og Beliggenhed adskiller disse Exemplører sig fra Lagena fasciata Egg. (Reuss, 1862, Die Foraminiferen-Familie der Lagenideen, Sitz. Ber. Akad. Wiss. Wien. Bd. XLVI, 1 Abt. p. 323, Pl. 2, fig. 24).

Thalamophorernes geografiske Udbredelse.

Søger man at faa et Overblik over Thalamophorernes Forekomst over alle de af Norhavsexpeditionen undersøgte

[1] Report on Norwegian marine investigations.

drawing to be a second keel is probably only the termination of the backward-curved margin of the last segment.

Bigenerina Sarsi n. sp.

Figs. 5—6.

Of Sand; more or less compressed, lingulate or almost an acute-angled triangle, the spirial 4—6-chambered, opening as in Textularia; of a dirty gray colour.

The presence of an A-form and a B-form, as is well known, has been demonstrated in Biloculina, the two forms making one species. In Bigenerina Sarsi there are 2 constant forms, which have so many characters in common, that they can scarcely be defined as 2 different species. Moreover, in their internal structure, they exhibit a great resemblance to the mode of development which is the foundation of the so-called A and B forms in Biloculina.

The A-form begins with a comparatively large embryonal chamber, with a width of 0.06 mm. The 4 succeeding chambers increase rapidly in size and terminate the spiral, whereupon the bi-serial mode of structure begins with narrow, oblong chambers, which gradually grow to a considerable widt, but, on the other hand, are of no great length. 0.52 mm. Station 192.

The B-form has a much smaller embryonal chamber than the A-form, having a width of only 0.024 mm. The spiral is formed of 5 or 6 chambers, which are relatively as small as the first. The next suceeding chambers increase slowly both in width and length. They are much more numerous than in the A-form, so that the B-form attains to a far larger size than the A-form — 0.92 mm. Station 255.

Lagena lucida Will.

A typical specimen of this species was found in the bottomsample from Station 192. I had previously found, among some specimens from the Norwegian coast, sent me by Mr. Nordgaard, a few specimens of a variety which I have described in the Bergen Museum Year-book for 1899[1] under the name Lagena Nordgaardi, nov. var. These specimens are almost spherical, while the specimen from the North Atlantic Expedition is oblong and compressed at the sides. All these specimens show the characteristic horse-shoe-shaped thickening on both sides of the keel. This thickening is of no great elevation. Together with the shape and position of the opening, it separates these specimens from Lagena fasciata Egg. (Reus, 1862, Die Foraminiferen-Familie der Lagenideen. Sitz. Ber. Akad. Wiss. Wien. Vol. XLVI, 1 Abt. p. 323, Pl. 2, fig. 24.

The Geographic Distribution of the Thalamophora.

In taking a survey of the occurrence of Thalamophora in all the ocean-depths investigated by the Norh Atlantic

[1] Report on Norwegian marine investigations.

Havdyb, lader der sig i det store og hele adskille 3 forskjellige Udbredelsescentrer, nemlig:

A. Det sydlige graa Ler, der omfattet Fjordene og Bankerne langs Norges Kyst omtrent til 19° Ø. L. samt det graa ler ved Island og Jan Mayen.

B. Det nordlige graa Ler, hvortil hører Fjordene og Bankerne langs Norges Kyst østenfor 19° Ø. L., ved Beeren Eiland og Spidsbergen samt Rhabdamminaleret.

C. Det brune Ler, der deles i det egentlige Biloculinler samt Overgangsleret.

Specielt adskiller Biloculinaleret sig fra det graa Ler i den Grad, at af de Arter, der er fundne paa den første Lersort er blot ca. $^2/_3$ fælles for begge. Af disse $^2/_3$ af Arter, der er fælles, har mange egentlig blot hjemme paa den ene Lersort og er blot enkeltvis fundne paa den anden.

Sognefjorden danner sammen med de øvrige dybe Fjorde i det vestlige Norge et eget Distrikt, hvis Fauna karakteriseres ved Forekomsten af enkelte større, mere iøinefaldende Former som Saccammina sphaerica, Batysiphon filiformis, Rhabdammina abyssorum og dens Følgesvend Tholosina bulla, endvidere Stortosphaera albida og Hyperammina ramosa. Nogle af de i Sognefjorden fundne Thalamophorer synes her at have Grændsen for sin Udbredelse mod Nord. Disse er: Stortosphaera albida, Bathysiphon filiformis, Gordiaminna charoides og Aschemonella catenata.

Sacsammina spharica forekommer i saadan Mængde paa de store Dyb i enkelte af de vestlandske Fjorde, at man kunde være fristet til at kalde det Mudder, hvori denne Dyreart lever, Saccamminamudder i Modsætning til det graa Ler paa Kystbankerne. Imidlertid synes dette Forhold ikke at være Tilfældet med Sognefjorden, da den eneste Prøve fra Skrabningerne i denne Fjord indeholder forholdsvis faa Exemplarer af Saccammina sphaerica, men derimod særdeles mange af Rhabdammina abyssorum. Dog kan Sognefjordens Mudder ikke kaldes Rhabdammina-mudder, da det savner den graagrønne Kulør, som er eiendommeligt for denne Lersort.

Det graa Ler langs Norges Kyst er med Undtagelse af den østlige Del rigt paa Thalamophorer, idet der her er fundet næsten Halvdelen af alle fra Norhavsexpeditionens materiale opførte Arter. De undersøgte Bundprøver er tagne paa ca. 100—400 Favnes Dyb, hvilket er Grunden til at enkelte Arter, der har hjemme paa ganske grundt Vand f. Ex. Rotalia beccari, ikke er komne med. De almindeligst forekommende Arter er: Uvigerina pygmaea og angulosa, Truncatulina lobatula og refulgens, Nonionina umbilicatula og scapha, Lagena marginata, Pullenia sphaeroides, Quinqueloculina seminulum, Globigerina bulloides, Bolivina dilatata, Bulimina elipsoides og marginata, samt Cassidulina laevigata[1]. Uvigerina pygmaea er især talrig tilstede paa de sydligere Dele af det graa Ler, saa man

[1] Disse Arter findes oftest i mange Exemplarer i hver af de i Tabellen angivne Bundprøver.

Expedition we find, in all, 3 different centres of distribution viz:

A. The southern gray clay, which includes the fjords and banks along the Norwegian coast, about as far as to 19 E. Long., and the gray clay near Iceland and Jan Mayen Island.

B. The northern gray clay, to which the fjords and banks along the Norwegian coast east of 19 E. Long., near Bear Island and Spitzbergen belong, and the Rhabdammina Clay.

C. The brown clay, which is divided into the Biloculina Clay, proper, and the Transition Clay.

The Biloculina Clay, in particular differs to such an extent from the gray clay that of the species found in the firstnamed clay, only about $^2/_3$ are common to both. Of these $^2/_3$ many have their home only on the one kind of clay, and are found very rarely on the other.

Sognefjord, together with the other deep fjords of Western Norway, forms a special district, whose fauna is characterised by the occurence of a few larger, more conspicuous forms. such as Saccammina sphærica. Bathysiphon filiformis, Rhabdammina abyssorum and its companion, Tholosina bulla, Stortosphæra albida and Hyperammina ramosa. Some of the Thalamophora found in the Sognefjord appear to have the northern limit for their distribution in this fjord. These are Stortosphæra albida, Batysiphon filiformis, Gordiammina charoides and Aschemonella catenata.

Saccammina sphærica occurs in such numbers in the great depths of some of the fjords of the west coast, that one is tempted to call the mud in which this species of animal lives — Saccammina mud, as opposed to the gray clay on the coast banks. This, however, dees not seem to be the case in the Sognefjord, as the one sample from dredgings in this fjord contained comparatively few specimens of Saccammina sphærica, but, on the other hand, very many of Rhabdammina abyssorum. The mud of the Sognefjord, however, cannot be called Rhabdammina mud, as the gray-green colour peculiar to this kind of clay, is absent.

The gray clay along the coast of Norway, with the exception of the eastern part, is rich in Thalamophora, almost half of the species mentioned from the North Atlantic Expedition collection having been found there. The bottom-samples examined were taken at a dept of from about 100 to 400 fathoms, which accounts for the fact that certain species, which have their homes in quite shallow water — e. g. Rotalia beccari — are not among them. The species most commonly occurring are Uvigerina pygmæa and augulosa, Truncatulina lobatula and refulgens, Nonionina umbilicatula and scapha, Lagena marginata, Pullenia spheroides, Quinqueloculina seminulum, Globigerina bulloides, Bolivina dilatata, Bulimina elipsoides and marginata, and Cassidulina laevigata[1]. Uvigerina pygmæa

[1] Numerous specimens of these species will generally be found in each of the bottoms-samples given in the table.

kunne have Grund til at kalde denne Strækning Uvigerinaler, især da denne Art her opnaar en betydelig Størrelse, medens den paa de nordlige og østlige Dele oftest er forholdsvis sjelden og degeneret.

Det graa Ler ved Jan Mayen og Island synes i det store og hele at have samme Karakter som Leret ved Norges Kyst. At en Art mangler snart her snart der beror vel oftest paa en Tilfældighed og berettiger saaledes ikke til at drage faste Slutninger med Hensyn til Arternes Udbredelse. Mange Thalamophorer er jo meget sparsomt repræsenteret paa de enkelte lokaliteter og kan vel ogsaa ved et Tilfælde overses ialfald de ubetydelige og mindre iøinefaldende Arter.

Som tidligere bemærket, har jeg delt det graa Ler i 2 forskjellige Udbredelsescentrer. Det nordlige af disse Centrer udmærker sig nemlig ved Forekomsten af nogle arktiske Former, der enten mangler eller ialfald optræder langt sparsommere paa det Omraade, der hører til det sydlige Centrum. Som saadanne kan nævnes: Astrorhiza crassatina, Lagena apiculata, Pulvinulina Karstenii, og Globigerina pachyderma. Paa den anden Side er der endel sydlige Arter, der inden det nordlige Centrums omraade enten aldeles mangler eller ialfald forekommer meget sparsomt og uden at opnaa sin fulde Størrelse, f. Ex. Bulimina marginata, Uvigerina pygmaea og angulosa, Operculina ammonoides. Forøvrigt synes Talamophorfaunaen over hele det graa Ler at være meget ensformig.

Rhabdamminaleret. Hvad der især karakteriserer denne Lersort er foruden dens graagrønne Kulør tillige dens Overflod paa Exemplarer af Rhabdammina abyssorum. Af de hyppigst forekommende Thalamophorer kan nævnes: Tholosina bulla, Cassidulina laevigata, Truncatulina lobatula og refulgens, Pulvinulina Karstenii, Nonionina umbilicatula, Quinqueloculina seminulum og tricarinata. Forresten synes de enkelte Arter ialmindelighed at forekomme meget spredt og i ringe Antal paa hver Lokalitet. Slægterne Lagena og Biloculiua, der ellers ialmindelighed er godt representeret, udmærker sig her ved sin Fattigdom paa Arter og Exemplarer.

Globigerina bulloides, pachyderma samt talrige Overgangsformer mellem disse to Arter er almindelige over hele det graa Ler. Paa den sydlige Del af Omraadet, specielt langs den norske Kyst synes de fleste Exemplarer at høre til Gl. bulloides og de nævnte Overgangsformer, medens Gl. pachyderma især er almindelig paa Rhabdamminaleret og ved Spidsbergen.

Overgangsleret er overordentligt rigt paa Thalamophorer. Specielt har jeg i en enkelt Bundprøve (fra Station 192) fundet en usædvanlig Mængde Arter, nemlig over Halvparten af samtlige i Nordhavsexpeditionens Materiale forekommende Arter. Grunden til dette rige Dyreliv er vel den, at saavel de paa det grundere Vand som de paa Havets Dybder levende Dyreformer her blander

is present in particularly large number in the southern portion of the gray clay, so that one might be tempted to call this region Uvigerina Clay, especially as that species here attains a considerable size, while in the northern and eastern parts it is often comparatively rare and degenerated.

The gray clay near Jan Mayen Island and Iceland, seems, on the whole, to have the same character as the clay on the Norwegian coast. That a species is absent now in one place, now in another, must generally be due to chance, and therefore does not justify the drawing of decided conclusion with regard to the distribution of the species. Many Thalamophora, indeed, are very poorly represented in certain localities, and may even happen to be overlooked, at any rate smaller and less conspicuous species.

As previously méntioned, I have divided the gray clay into 2 different centres of distribution. The more northerly of these two centres is characterised by the occurrence of some arctic forms, which are either absent, or at any rate appear far less frequently, in the region belonging to the southern centre. Among these may be named Astrorhiza crassatina, Lagena apiculata, Pulvinulina Karstenii and Globigerina pachyderma. On the other hand there are some southern species which are either altogether absent from the field of the northern centre, or at any rate are vere scarce, and do not attain to their full size. e. g. Bulimina marginata, Uvigerina pygmæa and augulosa, Operculina ammonoides. Moreover, the Thalamophora fauna throughout the gray clay, seems to be very homogeneous.

The Rhabdammina Clay. That which, in addition to its gray green colour, especially characterises this kind of clay, is its superabundance of specimens of Rhabdammina abyssorum. Among the Thalamophora most freqently occurring, we may mame Tholosina bulla, Cassidulina laevigata, Truncatulina lobatula and refulgens, Pulvinulina Karstenii, Nonionina umbilicatula, Quinqueloculina seminulum and tricarinata. The different species appear generally to be very scarce, and in small numbers at each locality. The genera Lagena and Biloculina, which are elsewhere well represented, are here characterised by their poverty of species and specimens.

Globigerina bulloides, pachyderma, and numerous transition forms between these two species are general throughout the gray clay. In the southern portion of the region, especially along the Norwegian coast, most of the specimens seem to belong to Gl. bulloides and the abovementioned transition forms, while Gl. pachyderma is especially common in the Rhabdammina Clay and off Spitzbergen.

The transition clay is exceedingly rich in Thalamophora. In one sample (from Station 192), I have found an unusual number of species, that is to say, more than half the species occurring in the North Atlantic Expedition collection. The reason for this luxuriant animal life is probably that the animal forms, both in the shallower water, and in the occean depths, mingle here, and find the

sig og finder gunstige existensbetingelser. Foruden de i Bundprøverne fra det graa Ler og fra Biloculinaleret observerede Arter, er her fundet enkelte sydlige Former som Ophthalmidium tumidulum, Thurammina papillata, Trochammina squamata, Ammodiscus tenuis, Textularia Williamsoni, Nodosaria mucronata, Vaginulina costata og linearis, Patellina corrugata, Triloculina trigonuta, Quinqueloculina angulata, Lagena curvilineata, alveolata, Planorbulina mediterranea, Pulvinulina concentrica, Discorbina rosacea.

Biloculinaleret er saa udtømmende behandlet af Schmelck, at jeg her væsentlig blot behøver at henvise til hans Afhandling. Her skal blot nævnes de paa Biloculinaleret og Overgangsleret almindeligst forekommende Arter. Som saadanne kan nævnes Biloculina laevis, Globigerina bulloides og pachyderina, Haplophragmium latidorsatum, Trucatulina Wüllersdorfi, Rotalia orbicularis samt Lagena apiculata. Det brune Ler synes at have en meget ensformig Fauna. Vistnok er der endel Arter, der ikke findes paa den nordlige Del af denne Lersort, men forøvrigt er der meget liden Forskjel inden dens enkelte Dele. Overgangsleret adskiller sig væsentlig fra Biloculinleret ved Forekomsten af Arter, der egentlig har hjemme paa forholdsvis grundt Vand. Den østlige Del af det brune Ler har ingen særegen Fauna. Dog er her Rhabdammina abyssorum fundet enkeltvis paa nogle faa Stationer.

Biloculina laevis findes over hele denne Area [1], men er aldrig meget talrig paa hver enkelt Lokalitet, medens de forskjellige Globigerina Arter altid er tilstede i stor Mængde. Hovedmassen dannes af Globigerina pachyderma, der forekommer i store, smukke Exemplarer, medens Glob. bulloides og Overgangsformerne, hvilke ogsaa er meget talrige, synes at være smaa og lidet udviklede.

Fra de store Havdyb og ind mod Kysterne aftager Globigerinaerne jevnt i Antal, indtil de nær land og inde i fjordene omtrent er forsvundne.

[1] Det brune Ler i det hele taget.

conditions of existence favorable. In addition to the species from the gray clay and from the Biloculina Clay, observed in the samples, a few southern forms are found such as, Opthalmidium tumidulum, Thurammina papillata Trochammina squamata, Ammodistus tenuis, Textularia Williamsoni, Nodosaria mucronata, Vaginulina costata and linearis, Patellina corrugata, Triloculina trigonula, Quinqueloculina angulata, Lagena curvilineata, alveolata, Planorbulina concentrica, Discorbina rosacea.

The Biloculina Clay has been so exhaustively treated of by Schmelck, that I need really only refer the reader to his paper. I will only name the most generally occurring species in the Biloculina Clay and the Transition Clay. Among these may be named Biloculina laevis, Globigerina bulloides and pachyderma, Haplophragmium latidorsatum, Truncatulina Wüllersdorfi, Rotalia orbicularis and Lagena apiculata. The brown clay appears to have a very homogeneous fauna. It is true, there are a few species which are not found in the northern portion of this kind of clay, but beyond that, there is very little difference between its separate parts. The Transition Clay differs principally from the Biloculina clay in the occurrence of species which really inhabit comparatively shallow water. The eastern part of the brown clay has no special fauna, but the Rhabdammina abyssorum is found occasionally at a few stations.

Biloculina laevis is found over the whole of this area [1], but is never very numerous in any one locality, while the various Globigerina species are present in great numbers. The bulk of them is made up of Globigerina pachyderma, of which large and beautiful specimens are found, while Glob. bulloides and the trasition forms, which are also very numerous, seem to be small and not greatly developed.

From the great depths of ocean and in towards the coast the Globigerina decrease in number, until they almost disappear near the shore and in the fjords.

[1] The brown clay generally.

Forklaringen til planchen. Description of the plate.

Fig. 1—4. *Crithionina abyssorum* n. sp.
„ 5. *Bigenerina Sarsi* n. sp. B-form.
„ 6. — „ - „ A-form.
„ 7. *Globigerina* sp., station 317, 1 Expl.
„ 8. *Lagena sulcata* var. a. orale pol. b. aborale pol.
„ 9. *Lagena sulcata* var.
„ 10. „ „ (abnorm).
„ 11. „ „ —
Fig. 12—14. *Triloculina valvularis.*
„ 15. *Biloculina laevis*, B-form.
„ 16. „ „ A-form.
„ 17. *Polymorphina* sp., station 192.
„ 18—19. *Vaginulina costata.*
„ 20. *Nodosaria pauperata.*
„ 21. *Lagena* sp.

H. Kiœr, del.

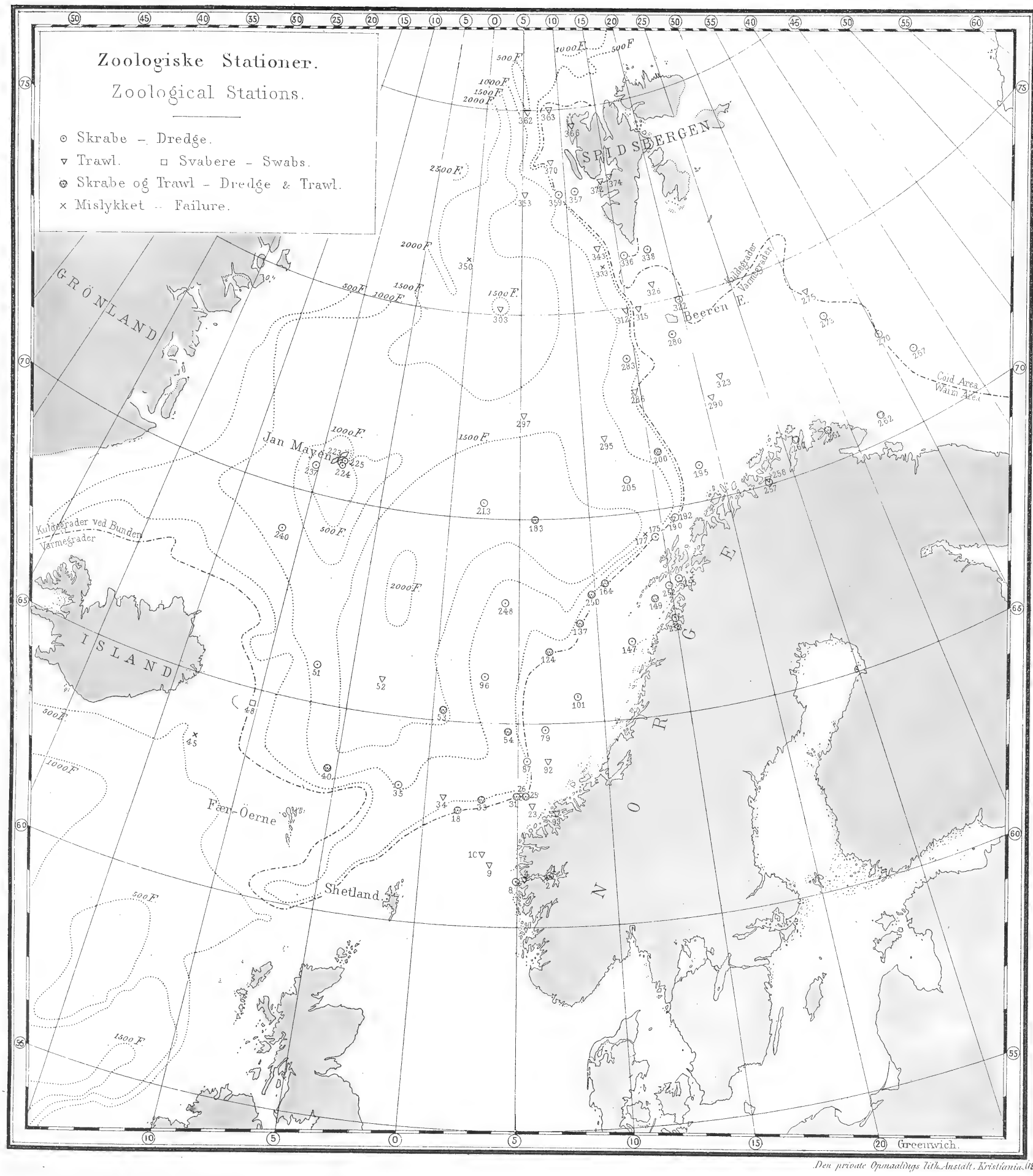
lith. Anst. Julius Klinkhardt, Leipzig.

Trykfeil og Rettelser.

Pag.	1,	Linie	11	fra oven	tilføi: Se Prof. Mohns Kart over Nordhavets Dybder (H. Mohn, Nordhavets Dybder, Temperatur og Strømninger, 1887. Den norske Nordhavsexpedition).
„	1,	„	16—19	fra oven	staar: Spidsbergen, Jan Mayen, Island, Færøerne, læs: ved Spidsbergen, ved o. s. v.
„	8,	„	21	- neden	„ : Udaredelse, læs: Udbredelse.
„	9,	„	34	- oven	„ : Atlanteøhav, læs: Atlanterhav.
„	13,	„	7	- neden	„ : Exemplarer, læs: Exemplarer (0.3 mm).
„	7,	„	9	- „	„ : Klumpees, læs: Klumpens.
„	7,	„	17	- oven	„ : Chrithionina, læs: Crithionina.

Errata.

Pag.	1,	line	11	from the top,	add: „Look: Chart of the Depths of the Northern Ocean (H. Mohn, The Northern Ocean, Its Depths, Temperature and Circulation. The Norwegian North Atlantic Expedition).
„	1,	„	15	„ - „	for „24“ read „34“.
„	2,	„	4	„ - bottom	- „umilicatula“ read „umbilicatula“.
„	7,	„	17	„ - top	- „Chrithionina“ read „Crithionina“.
„	8,	„	33	„ - „	- „North Sea“ read „North Atlantic“.
„	9,	„	18	„ - „	- „I“ read „It“.
„	13,	„	7	„ - bottom	- „specimens“ read „specimens (0.3 mm).



Den private Opmaalings Tith. Anstalt, Kristiania. 1860.

THE NORWEGIAN NORTH-ATLANTIC EXPEDITION
1876—1878.

XXV.

ZOOLOGY.

THALAMOPHORA.

BY

HANS KIÆR.

WITH 1 PLATE & 1 MAP.

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