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UDGIVNE AF

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6. OG 7. THULE EXPEDITION TIL SYDØSTGRØNLAND 1931—33

LEADER: KNUD RASMUSSEN

ECHINODERMS

BY

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WITH 6 FIGURES IN THE TEXT

KØBENHAVN

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BIANCO LUNOS BOGTRYKKERI A/S

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UDGIVET MED STØTTE AF CARLSBERGFONDET

I. INTRODUCTORY REMARKS

The present paper deals with the echinoderms of the 7th Thule-expedition. The greater part of the material is collected by Mr. BERTHELTSEN in the vicinity of Angmagssalik and at Kangerdlugssuak. In spite of the fact that the latter area was explored by the 2nd Scoresby-Sound expedition in 1932 the present collections are very valuable in many respects. Another, smaller, but non the less interesting part of the material at hand originates from the Lindenowfjord collected by Cand. mag. POUL M. HANSEN, when in 1932, in connection with the 7th Thule-expedition, he made some biological investigations in this interesting, southern East-Greenland Fjord. Besides these two rather large collections some few specimens collected by Mr. HEDEGAARD at Angmagssalik are included in the material at hand.

Our knowledge of the echinoderms from southern East-Greenland has hitherto been based mainly on the material collected by the 2nd Scoresby-Sound expedition during its visit to the region here dealt with. The more extensive collections of the 7th Thule-expedition prove our knowledge of the echinoderm fauna at Kangerdlugssuak to be fairly satisfactory. It may be mentioned that the present author, during his studies of the asterids from the Scoresby-Sound expedition, had the opportunity of showing these interesting forms to Mr. BERTELSEN and to ask him to give them his special attention during the expedition. So he did, and I therefore want to express my sincerest thanks to him in this place.

As the list of species from the three collections are not identical, and as furthermore the differences may be of zoogeographical interest it is preferred to give a list of species for each collector.

1. Species collected by Mr. BERTHELTSEN at Angmagssalik and Kangerdlugssuak.

The species which are exclusively taken at Angmagssalik are marked by an asterisk, and species exclusively taken at Kangerdlugssuak are marked by two asterisks.

Crinoidea.

***Heliometra glacialis* (Leach).

Asteroidea.

Ctenodiscus crispatus (Retzius).

***Pteraster pulvillus* (M. Sars).

***Henricia eschrichtii* v. *laevior* Michailovskij.

***Solaster syrtensis* Verrill.

Stephanasterias albula (Stimpson).

***Urasterias lincki* (Müller & Troschel).

Leptasterias floccosa v. *crassa* Heding.

— *degerbolli* Heding.

* — *canuti* n. sp.

— sp.

Ophiuroidea.

Ophiacantha bidentata (Retzius).

Amphiura sundevalli (Müller & Troschel).

**Ophiopus arcticus* Ljungman.

**Ophiopholis aculeata* (Linné).

**Ophiura sarsi* Lütken.

* — *robusta* Ayres.

Ophiocten sericeum (Forbes).

Echinoidea.

Strongylocentrotus droebachiensis (O. Fr. Müller).

Holothurioidea.

Myriotrochus rinkii Steenstrup.

Trochostoma arcticum (v. Marenzeller).

**Eupyrigus scaber* Lütken.

2. Species collected by POUL M. HANSEN in the Lindenow Fjord.

Crinoidea.

Heliometra glacialis (Leach).

Asteroidea.

Henricia (*Spinohenricia*) *scabrior* Michailovskij.

Stephanasterias albula (Stimpson).

Leptasterias groenlandica Steenstrup.

Ophiuroidea.

Gorgonocephalus eucnemis Müller & Troschel.

Ophiacantha bidentata (Retzius).

Amphiura sundevalli (Müller & Troschel).
Ophiopholis aculeata (Linné).
Ophiura robusta Ayres.
Ophiocten sericeum (Forbes).

Echinoidea.

Strongylocentrotus droebachiensis (O. Fr. Müller).

Holothurioidea.

Thyonidium barthi Troschell.
Trochostoma thomsoni Danielssen & Koren.

3. Species collected by Mr. HEDEGAARD at Angmagssalik.

Crinoidea.

Heliometra glacialis (Leach).

Asteroidea.

Ctenodiscus crispatus Retzius.

Ophiuroidea.

Ophioscolex glacialis Müller & Troschel.
Ophiacantha bidentata (Retzius).
Ophiura robusta Ayres.

If these three lists are compared with the list of the species collected by the 2nd Scoresby-Sound expedition it appears that we have a rather satisfactory list of the littoral echinoderms from off Kangerdlugssuak, though we naturally cannot be certain as to the composition of the echinoderm fauna of the deeper water.

From Angmagssalik we have, besides the specimens taken by the collectors named above, a good deal of old specimens brought home to the Zoological Museum now and then. In spite of this it must be said that our knowledge of the echinoderm fauna of Angmagssalik is rather unsatisfactory, both as regards shallow and deeper water. This is the more deplorable as the material at hand shows that many of the species appear to have their zoogeographical limits in the neighbourhood of Angmagssalik.

As to the Lindenow Fjord the present collection, which is the first zoological collection made in this area, is too incomplete to give any clear picture of the fauna of the southernmost part of East Greenland. Nevertheless, the few specimens brought home by the 7th Thule-Expedition show definitely that the fauna here is decidedly more boreal

than is the fauna at Angmagssalik. Especially the presence of the west greenland species *Leptasterias groenlandica* shows the connection between the faunas of the two sides of the southern end of Greenland, and further, that the western fauna does extend around the southern end of Greenland continuing northwards along the eastern side, quite contrary to all expectations. However, the present material is too poor to settle this zoogeographical problem with absolute certainty. We must content ourselves with the fact that in Lindenow Fjord are found species hitherto known with certainty only from the west Greenland fauna, and for further elucidation of the problem we must await the publication of the material from the TROLLE-expedition, which during the summer 1935 made a thorough investigation of the Lindenow area.

II. SYNOPSIS OF THE SPECIES

Heliometra glacialis (Leach).

Lindenow Fjord	²⁸ / ₈ 32, 300 m	1 specimen
—	Off Narssak, 200—500 m	1 —
Uttenthal Sound,	²²⁻²⁸ / ₈ 33, 25—40 m, Clay	5 —
Angmagssalik	1931—32 (HEDEGAARD)	1 —

Ctenodiscus crispatus (Retzius).

HEDING 1935: Echinoderms p. 12—14. Medd. Grld. Bd. 104, 13.

LIEBERKIND 1935: Asteroidea I p. 30—35. Ingolf Exp. Bd. IV, 10.

Sermilik	²⁵ / ₇ 33, 100 m, Clay, Stones	1 specimen
Ikerasagssuak St.	12 ²⁷ / ₇ 33, 235 m, Soft Clay	2 —
Angmagssalik	1931—32 (HEDEGAARD)	2 —

Pteraster pulvillus M. Sars.

Uttenthal Sound St.	26 ¹⁸ / ₈ 33, c. 50 m	1 specimen
—	St. 28 ²³ / ₈ 33, c. 100 m	1 —

Henricia Gray.

HEDING 1935: Echinoderms p. 16—22.

As shown in my paper on the Echinoderms of the 2nd Scoresby-Sound expedition the genus *Henricia* ought to be divided into two groups: One including the species which, as *eschrichtii*, *curta*, and *sanguinolenta*, have paxillae and ventrolaterals, and the other including the species lacking these two features, in their place having single-pointed spines, as e. g. the species *scabrior*. The skeleton of the latter group is very reduced, consisting either exclusively of irregularly scattered dorso-laterals, or of such together with a few rudiments of ventrolaterals, whereas the skeleton of the first group consists of well developed, imbricating ventrolaterals, and well developed, usually reticulating dorso-laterals.

The material I had for description in 1935 did not include any

specimens of the latter group, and therefore I thought it unnecessary to treat the group more thoroughly at that time. In the last year, however, I have dealt with *Henricia* now and then, and thereby arrived to the conclusion that the two groups in reality ought to be separated, indeed, there seems to be no doubt that they represent two quite different genera; however, as there still remain some boreal forms not quite satisfactorily known, and which may perhaps cause some doubt as to the generic value of the difference, I prefer, for the present, to divide the genus into two subgenera. This division will clearly show the arrangement of the species within the genus.

Due to the most visible of the characters separating the two groups, the presence of real paxillae in the one and of spines covered with a rather thick skin in the other, I propose to name the subgenus comprising the species *sanguinolenta*: *Henricia*, and to the other subgenus, which comprises the species *scabrior*, I propose the name *Spinohenricia*.

Subgenus *Henricia* s. g. nov.

Diagnosis: Ventrolaterals present, well developed and imbricating. Dorsolaterals well developed, usually forming a reticulating skeleton. All the skeleton-plates of 1st and 2nd order with large, low warts carrying paxillae with from three to many (up to more than fifty) spines; the spines normally terminating in a small crown of spinules. Adambulacral spines usually arranged in an inner and an outer part, the outer part normally consisting of more than one row of spines.

Type: *Henricia* (*Henricia*) *sanguinolenta* (O. Fr. Müller).

Henricia (*Henricia*) *eschrichtii laevior* (Michailovskij).

HEDING 1935: Echinoderms p. 23—26, textfigs. 6—7.

Uttenthal Sound	St. 23 ¹¹ / ₈	33, 6—30 m, Clay, Algae...	1 specimen
—	— St. 26 ¹⁸ / ₈	33, 5—50 m, — — ...	1 —
—	— St. 28 ²⁸ / ₈	33, 8—60 m, — — ...	1 —

All the three specimens at hand agree even in details with the specimens described from the 2nd Scoresby-Sound Expedition.

Subgenus *Spinohenricia* s. g. nov.

Diagnosis: Ventrolaterals lacking, or, if present, quite rudimentary and not forming rows of imbricating plates. Dorsolaterals irregularly scattered, often more or less rudimentary, forming usually the base for only a single large spine, which in living and alcoholic specimens is covered by a rather voluminous sack, and when isolated is found to

terminate in a single "end-point" (seldom in a few spinules). Adambulacra each supplied with a single row of large spines.

Type: *Henricia* (*Spinohenricia*) *scabrior* (Michailovskij).

Henricia (*Spinohenricia*) *scabrior* (Michailovskij)?

HEDING 1935: Echinoderms p. 31—34, textfigs. 11, 1; 13, 9—11.

Lindenowfjord at Kuarmiut $30^{\circ}/_8$ 32, 10—75 m 1 specimen

The single specimen at hand measures about 40 mm in *R*. In alcohol the spines had a very striking appearance, by which it differed quite definitely from specimens of *laevior* (in alcohol), and when dried its spinous appearance agrees well with the specimen of *scabrior* mentioned in the paper on the 2nd Scoresby-Sound Expedition (op. cit. 1935 fig. 11. 1). It differs, however, from that specimen in the spines more frequently being connected two to three together into paxillae, but these paxillae are distinctly different from the ones of the subgenus *Henricia* in the spines each being included in a soft, voluminous sack (which naturally cannot be seen when the specimen is dried) and from typical specimens of *scabrior* in some of the spines being supplied with more than one spinule. Further the skeleton is not quite as reduced as is the case in the above named specimen (from the Danmark Expedition St. 72a) and it appears thus that this species is subject to rather much variation, if we have not here a separate form. As mentioned in Op. cit. 1935 there are reasons for the supposition that we have at least two different species of *Spinohenricia* at Greenland but due to the scarcity of material and the obvious great variation particularly of *scabrior*, it is for the present impossible both to distinguish between the different species and to clear up their distribution.

Solaster syrtensis Verrill.

HEDING 1935: Echinoderms p. 36—38, textfigs. 15—16.

Uttenthal Sound 2 specimens

In Op. cit. 1935 I stated that the East-Greenland "*Solaster glacialis*" most likely was identical with *Solaster syrtensis* Verrill, and that the two forms were specifically different. Further, I mentioned that the specimens of *Solaster* described by MORTENSEN, in the "Godthaab"-Echinoderms¹⁾ p. 17, as *S. glacialis*, had to be regarded as *S. syrtensis* on account of the paxillae in the actinal interradial area, though in the arrangement of the abactinal paxillae of the rays they resemble *glacialis*.

Owing to the rather small size of the specimen from Kangerdlugssuaq, taken by the Scoresby-Sound Expedition, it was, however, not

¹⁾ Medd. Grønland Bd. 79 Nr. 2.

possible to ascertain with certainty the actual relation of these forms. Therefore the presence of two rather large specimens from Uttenthal Sound (i. e. Kangerdlugssuak) in the collections of the 7th Thule-Expedition is of considerable interest.

These specimens measure 58 mm and 37 mm in *R* with a ray-disk proportion of 2.5 and 2.1. They have 8 and 9 rays. The paxillae are provided with fairly numerous spines (10—20), and though they are present in the brachial angles, there arranged in transverse rows towards the carinal area of the rays, they do not form longitudinal rows. The marginal paxillae are rather conspicuous and form a distinct fringe along the sides of the arms. The madreporites are large, supplied with a number of paxillae on their margin.

The paxillae of the rays as well as of the disc are placed on rounded plates (not cross-shaped plates as in *glacialis*), and the basal part of the paxillae, which in the small specimen from Kangerdlugssuak (2nd Scoresby-Sound Expedition) were merely small knobs, are in these larger specimens spine-like processes; only on the marginal plates these processes have a different form, they are here distinctly keel-shaped.

The plates proper do not imbricate as completely as in the small specimen previously described, there being room for nearly as many papulae as there are plates (this, however, does not hold good for the distal end of the rays, where papulae may be nearly absent). The actinal interbranchial area gives room for a number of normal, rounded plates with well developed paxillae.

As will be seen from this short description these large specimens differ in the same way from DANIELSEN & KOREN's description of *S. glacialis* as did the small specimen from Kangerdlugssuak (described in 1935). A comparison of the specimens at hand with the Thule-specimens from the "Godthaab"-Expedition, shows that the Thule-specimens are different in having the brachial paxillae more regularly arranged in longitudinal rows, with regularly arranged pores for the papulae. The two groups of specimens differ further and more definitely in the shape of the actinal interbranchial area. In specimens from Uttenthal Sound (Kangerdlugssuak) this area is rather wide, while in specimens from Thule it is so narrow that it gives quite a characteristic appearance to the actinal side (in the largest specimen, from Godthaab St. 87 this characteristic feature, however, is somewhat less pronounced than in the rest of the Thule-specimens). In these narrow interbranchial areae there is very little place for paxillae, yet the number of paxillae along the margin is rather high, being about five. In the Kangerdlugssuak-specimens there are normally 8—9 paxillae at the margin of the area, but in these specimens the paxillae are set rather wide apart.

Whether the ray-disk proportion is a characteristic feature of this

form or not, cannot be seen from the material at hand. It is much varying and, as seen from the tabel, not in correspondance with the size of the specimens.

Measurements of the specimens of *Solaster syrtensis*.

Locality	Number of rays	<i>R</i>	<i>r</i>	<i>R/r</i>
Kangerdlugssuak.....	9	17	7	2.4
Uttenthal Sound.....	8	58	23	2.5
— —	9	37	18	2.1
Thule, Godthaab St. 81	9	48	18	2.6
— — - -	9	48	18	2.6
— — - -	9	39	15	2.5
— — - 86	9	34	11	3.1
— — - -	9	21	7	3.0
— — - -	9	11	4	2.8
— — - 87	9	68	24	2.8
— — - -	10	46	17	2.7

Stephanasterias albula (Stimpson).

This species was taken in numerous specimens at the different localities of the expedition, i. e. Tasiussak — Sermilik — Íkátek — Ikerassauak — Kûngmiut — Uttenthal Sound. Usually there were taken only a few specimens in each haul (1—3), but in the Fucus at Sermilik and Kûngmiut there were taken numerous specimens in a single haul. This indicates that *Steph. albula* is rather common in the East Greenland water examined by the 7th Thule-Expedition, but normally it does not occur in larger quantities; only in exceptionally good localities, as in the two named fjords, there are really large populations.

In the Lindenow Fjord have been taken only six specimens, at kuarmiut $30/8$ 32.

Leptasterias groenlandica Steenstrup.

Lindenow Fjord at kuarmiut $30/8$ 32, 10—75 m 4 specimens

The four specimens at hand are the first real *L. groenlandica* which have been taken at East Greenland, and quite naturally they are from the most southern locality. The specimens belong to the *cribraria*-type with the dorsolaterals arranged in regular transverse rows and with thin and irregularly diplacanthid adambulacral spines. They agree very well with specimens from the south-end of West-Greenland.

This occurrence is very remarkable, as it shows a definite migration from West-Greenland round Cape Farewell to East-Greenland. As regards the distribution of *cribraria* in the East-Greenland seas we are

naturally unable to say much as long as we know but the one locality. There are, however, reasons for supposing that it may occur in such localities where a boreal species as *Ophiopholis aculeata* is able to live, which means that we may expect to find it in the vicinity of Angmagssalik. As a matter of fact the expedition has brought home a specimen from Tasiussak which cannot be identified as any of the other species known from East-Greenland. It is no distinct *cribraria*, but if it was found at the west coast nobody would have any doubt about its being a deviating specimen of *cribraria*. The locality Tasiussak has the objection that we do not yet know any *cribraria* from north of Lindenow Fjord, and if we were only certain that *cribraria* does not occur there we should be obliged to regard this specimen from Tasiussak as a strongly deviating *crassa*. As we, however, know a species as *Ophiopholis aculeata* to occur as far north as Angmagssalik, and may regard *cribraria* to be able to go as far into the real arctic as *Ophiopholis*, there are reasons for regarding the specimen at hand as a *cribraria*. Also it seems rather plausible that a specimen taken at the arctic limit of the species may be somewhat deviating from the boreal type.

This further shows that our knowledge of the *Leptasterias* in the surroundings of Angmagssalik is rather unsatisfactory, which is the more deplorable as we have probably here a zoogeographical limit between forms which, as *cribraria*, have arrived from the south and, as *crassa*, from the north. This naturally is yet a mere postulate, but the study of the variations within these forms shows a closer relation between the greater part of the East-Greenland *Leptasterias*, i. e. *crassa* and *floccosa*, than these have to other forms, especially to *cribraria*.

Leptasterias degerbølli Heding.

HEDING 1935: Echinoderms p. 56.

Uttenthal Sound St. 26 ²⁸/₈ 33 1 specimen

The 7th Thule-Expedition has taken only one specimen which can be referred to this species. That it, however, is not so rare at all is seen from the old collections of the Zoological Museum in Copenhagen, as these comprise specimens from Tasiussak, Rosenvinges Bay (Scoresby Sound), and Angmagssalik. Unfortunately these specimens differ rather much from the very characteristic type-specimen, and in several cases it is exceedingly difficult to separate *degerbølli* from *crassa* (especially in young specimens). It will, however, be the most natural course to maintain the species as the characteristic specimens are very distinctly different from the other species and there is a possibility of the difficult specimens being hybrids.

The specimen taken by the Thule-Expedition is rather characteristic.

and in any case no *crassa*. The carinals are by far not so regularly arranged as in the type, and the large dorsolateral open squares are irregular and disturbed by small plates. The general appearance of the specimen, the shape of the spines, and the skeleton afford, however, so good characters that the systematical place of the specimen appears to be beyond doubt.

Leptasterias floccosa crassa Hedding.

Leptasterias floccosa v. *crassa* HEDDING 1935: Echinodermes p. 54.

Uttenthal Sound, 0—25 m, Stones with Algae. several specimens

Most of the specimens at hand are very characteristic, either rather dotted with spines and pedicellariae or "fat" with short spines and few pedicellariae. There are, however, no distinct difference between the two sorts and in several cases it is evident that the difference is due to the preservation.

Leptasterias canuti n. sp.

Sermilik ²⁶ / ₇ 33, 5—7 m	21 specimens
Ikerasaussak ²⁹ / ₇ 33, c. 10 m	4 —
65°54' N. 37°40' W., leg. KRUSE (Øst-Grøn.-Exp.)	3 —

Diagnosis: Size small to medium. Rays five, slender, in mature specimens often somewhat swollen at the base. $R:r = 4-5$. Spines dorsally rather scarce, relatively small and terete. An irregular carinal row may now and then occur. Dorsolateral spines small or lacking. Ventrolateral spines long thin and terete, forming two regular rows; in the proximal part of the rays, however, they are often rather solid and then quite conical. Adambulacral spines thin and placed either singly (the most common case) or paired on the adambulacra. A regular alternation between monacanthid and diplacanthid plates does, however, not exist.

Crossed pedicellariae dorsally very scarce, nearly totally lacking on the disk. Ventrolaterally the crossed pedicellariae are found in regular clusters at the base (in dried specimens) of the spines. Adambulacral spines normally with one to two crossed pedicellariae on the outer side. When the adambulacral spines are paired there are also pedicellariae on the inner spine which is not much weaker than the outer. Large straight pedicellariae are normally lacking, but have been found to occur in a few large specimens, which, however, are not quite typical, resembling hybrids of this species with *L. floccosa crassa*.

The dorsal skeleton forms an irregularly arranged, but usually very dense layer, in which the carinal plates often can be seen as large, square plates with a central spine. Laterally there are two to three regular series of large ventrolaterals.

Discussion: The characteristic specimens of this species differ so definitely from all other forms of the genus *Leptasterias* that they leave no doubt about their representing a separate species. Other specimens may resemble more or less either *crassa* or *degerbolli* so that one may often be inclined to regard *canuti* as merely a hybrid between these two forms. There is, however, a fact which speaks rather pronouncedly against such a theory, viz. that the mainpart of the material has been

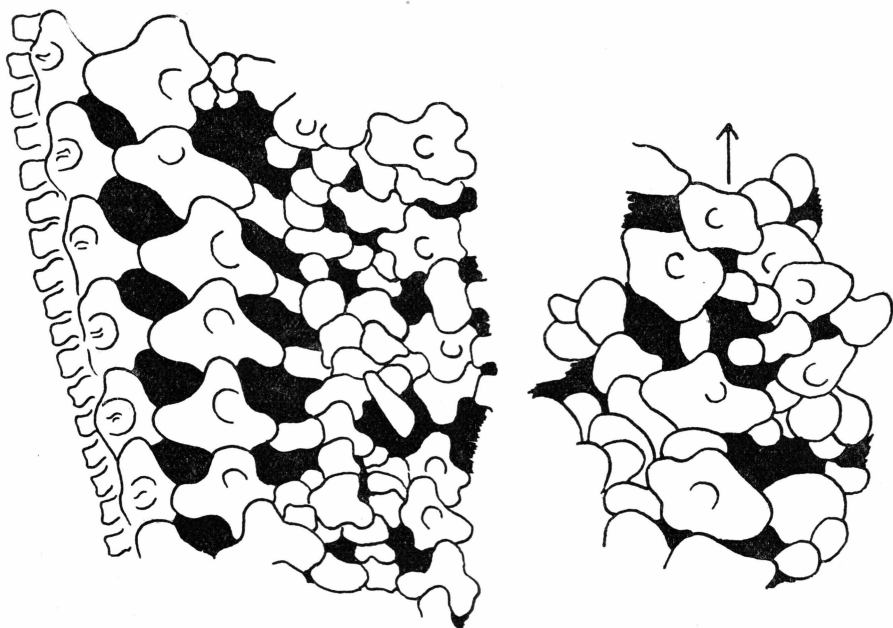


Fig. 1. *L. canuti* n. sp. Skeleton of rays, left-lateral view, right-carinal view. The arrow is pointing towards the disk. $\times 12$.

obtained from a locality from which neither of the two other species have been taken. Another supposition, which lays at hand and certainly will be used by many zoologists, is that the present form is but a local fenotype of a more widely distributed East-Greenland *Leptasterias*. This may be, but, as long as we know nothing whatever about the heredity of these forms and their variation in accordance with the ecology, we shall have to describe the forms we find in nature and thereupon try to elucidate their mutual relation. In any case *L. canuti* is a very characteristic form, easily recognized when typical specimens are at hand.

Leptasterias clavispinga n. sp.

Tasiussak $\frac{1}{6}$ 99, East-Greenland-Exp. 1898/99, 25—30 Fms. 4 specimens
 — $\frac{19}{4}$ 02, KRUSE (65°35' N.), 5—10 Fms. 1 —

Diagnosis: Size small, shape rather robust. Rays five. $R:r = 4-5$. Spines dorsally evenly scattered, not forming a distinct carinal row, laterally they usually form two regular rows. The dorsal spines are very short and thick, either cylindrical or distinctly clavate. Lateral spines very like the dorsal ones, only slightly longer. Adambulacral spines long and clavate. Large parts, often more than half the length of the rays, are monacanthid, but other parts are regularly diplacanthid.

Crossed pedicellariae are present in varying numbers, but usually

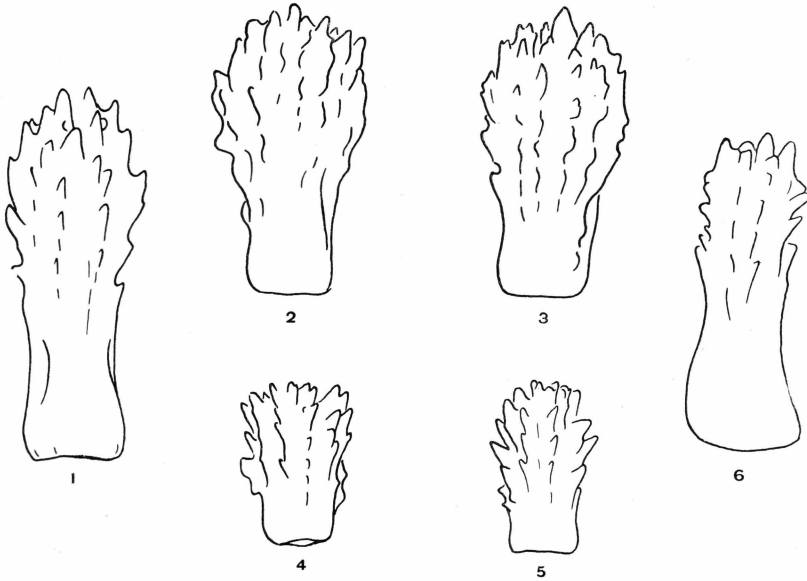


Fig. 2. *L. clavispinga* n. sp. 1—3 of the type, 4—6 of the specimen collected by KRUSE. 1 & 6 lateral spines, 2 & 5 carinal spines, 3 & 4 spines from disk. $\times 72$.

almost totally lacking dorsally, especially on the disk. On the adambulacral spines there may be large clusters.

Large, straight pedicellariae are not found.

The skeleton forms an irregular meshwork, often the single plates are quite isolated, not touching their neighbours. Carinal plates normally indistinguishable, but may now and then form a more or less distinct ridge on a single ray.

Discussion: This new species is very like the icelandic form *L. mülleri nobilis*, and very likely it may be regarded as an East-Greenland form of *mülleri*. In its general appearance it resembles very much the specimens of *islandica* found at the Faroes, but the existence of but one spine on each of the primary skeleton-plates appears to be a good character. However, the present specimens are all rather small, and there is the possibility that larger specimens may have secondary spines.

Therefore the question arises whether it is correct to establish an independent form (in this case described as a species) for the specimens at hand. To this I must say that the specimens in question are so definitely different from all other specimens known from Greenland — East as well as West — that we cannot regard them as merely an abnormality of any of those forms. If we regard them as identical with *islandica* (i. e. a juvenal form) there is at once intimated a zoogeographical connection between Iceland and Tasiussak which we cannot suggest without very urgent reasons, and all the reason we have is, that one characteristic form may perhaps prove to be identical with another, if it should be able to grow larger. Accordingly, I think it the more safe for the present to regard this thick-spined form as a real Greenland form, though future investigations probably may show that it is but an offshot of *islandica* or *mülleri*.

Urasterias lincki (M. & Tr.).

Uttenthal Sound St. 30 $28\frac{1}{8}$ 33, 20—25 m. 1 specimen

This single specimen is surprisingly large. *R* more than 200 mm. It is the only specimen of this species known from Kangerdlugssuak, so far the most southern East-Greenland locality for this species.

Gorgonocephalus eucnemis (M. & Tr.).

Lindenow Fjord $22\frac{1}{8}$ 32, 250 m. 2 specimens
 — — at Sangmissok. 1 —

Ophioscolex glacialis M. & Tr.

Kûngmiut 1932, 480 m, leg. HEDEGAARD 2 specimens

Ophiacantha bidentata (Retz.).

This species was taken in several hauls at the stations in Uttenthal Sound, Sermilik (Íkátek & Titekilâk), and Tasiussak by Mr. BERTHELSEN, in the Lindenow Fjord at Kuarmiut by POUL M. HANSEN, and at Angmagssalik by Mr. HEDEGAARD. Usually it was taken in rather shallow water (10—25 m) but now and then (Lindenow Fjord and Sermilik) it was found in depths of 200—300 m. The number of specimens pro station was usually small (1—5) but from Uttenthal Sound there are a few cases where a whole jar has been filled with specimens from a single haul.

The specimens vary very much, and the forma *arctica*, with two large tentacle scales at the first armpore, is quite numerable, somewhat around 30 % of the specimens may be referred to this form, but there seem also to occur all intermediate stages between this form and the typical *bidentata*.

Whether *f. arctica* merely is an abnormality of *bidentata*, as suggested by the present author in 1935 (unfortunately a slip in the proof reading has left textfig. 25 in HEDING 1935 with the name *glacialis* in stead of *arctica*), or it may be regarded as an independent form and the intermediate stages as hybrids is still uncertain. An examination of the occurrence of these two forms in a larger material may perhaps throw some light into this problem.

Amphiura sundevalli (M. & Tr.).

Sermilik (Ikátek) $27/7$ 33, 200 m	2	specimens
Behind Kùngmiut	2	—
Tasiussak $8/8$ 33, 45—50 m	1	—
Lindenow Fjord at kuarmiut $30/8$ 32	2	—

Ophiopus arcticus Ljungm.

Sermilik $27/7$ 33 (St. 11), 125 m	2	specimens
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This species is otherwise found rather commonly at the northern part of East-Greenland, it is therefore surprising to meet it in a locality as the Sermilik Fjord, where the littoral fauna is rather boreal. However, it was taken in the opening of the fjord, and the temperature of the water in this locality, St. 11, has not been recorded higher than 1.1 degree centigrade below the freezing point.

Ophiopholis aculeata (L.).

Sermilik St. 11 $27/7$ 33, 125 m	2	specimens
Lindenow Fjord (kuarmiut) $30/8$ 32	1	—

Ophiopholis aculeata has previously been taken at Angmagssalik and Tasiussak (cf. Conspectus Faunae Groenlandicae, Echinodermer p. 356). Due to a misprint it is lacking in Dr. MORTENSEN's list of the East-Greenland Echinoderms (The "Godthaab" Echinoderms) and as I in 1935 based my list partly on that of Dr. MORTENSEN the species is also lacking there (The Echinoderms of the 2nd Scoresby-Sound Expedition, HEDING 1935).

This species is widely distributed at West-Greenland and as it, as shown by the 7th Thule-Expedition, occurs also in the Lindenow Fjord we may suppose that it, like *Leptasterias groenlandica cribraria*, has migrated along the south-east coast to Angmagssalik. Naturally a closer examination of this coast would be of very high value, but that is still left for the future.

Ophiura sarsi Ltk.

MORTENSEN 1933: Ingolf Ophiuroidea p. 72.

Sermilik St. 9 ²⁵/₇ 33, 100 m, Stones and Clay, Temp. 0°.5 C. 1 specimen

This species has previously been taken in two specimens in Hurry inlet by the "East Greenland Expedition of 1900" (cf. Conspectus Faunae Groenlandicae, Echinodermer p. 348). In the same paper Dr. MORTENSEN records another locality (70°21' N. 8°25' W., 160 fms., RYDER 1891) as East-Greenland, but as this is on the shelf of Jan Mayen and separated from East-Greenland by rather deep water, it cannot be regarded as belonging to the real East-Greenland area.

The present specimen differs somewhat from typical specimens in the shape of the 1st ventral armplates, and (especially from the specimens from Hurry Inlet) in having very long papillae in the outer comb at the base of the arms. It is furthermore very conspicuous that these papillae are, by far, not all of the same length, one to three of the median ones at some of the arms being more than twice as long as the rest.

For the time being, *Ophiura sarsi* is known in only three specimens from two localities at East Greenland, and the supposition lies at hand that it is no real East Greenland species, but merely an occasional visitor, which at times may be carried to the Greenland Sea as a pelagic larva. This, however, cannot be the case, firstly, because there are no current which may be able to carry it to the Scoresby Sound (Hurry Inlet), and secondly, because the hydrographical conditions of Hurry Inlet are such that they cause the current to be always outgoing (cf. USSING and THORSON, Contrib. to the animal ecology of the Scoresby Sound Fjord Complex, Medd. Grønland Bd. 100, Nr. 3, 1934). When, on the other hand, the two fjords Sermilik and Hurry Inlet are compared it is striking how much their hydrographical conditions resemble each other, and based on this fact another theory might be suggested, viz. that *O. sarsi* should rather be regarded as a relict in these (and naturally also in other) fjords, which apparently have unusually good conditions for the life of more delicate species, as shown by THORSON (for the present partly unpublished).

Ophiura robusta Ayres.

MORTENSEN 1933: Ingolf Ophiuroidea p. 78.

G. THORSON 1934: On the reproduction and larval stages of the brittle stars *Ophiocten sericeum* and *Ophiura robusta*.

Sermilik (Titekilåk) St. 10 ²⁶ / ₇ 33, 5—7 m	1 specimen
Lindenow Fjord (kuarmiut) ³⁰ / ₈ 32, 10—75 m	11 —
Angmagssalik 1931—32 (HEDEGAARD)	1 —

Ophiocten sericeum (Forbes).

MORTENSEN 1933: Ingolf Oph. p. 96.

G. THORSEN 1934: On the reproduction and larval stages of the brittle stars *Ophiocten sericeum* and *Ophiura robusta*.

Tasiussak St. 7	$20/8$	33, 5—30 m	2 specimens
— St. 19	$9/8$	33, 10—50 m	4 —
— St. 21	$10/8$	33, 6—50 m	2 —
Uttenthal Sound St. 26	$18/8$	33, 50 m	1 —
— — St. 29	$21/8$	33, 40 m	6 —
— — St. 27	$22/8$	33, 30—40 m	4 —
— — St. 28	$23/8$	33, 15—100 m	1 —
— — St. 29	$25/8$	33, 0—25 m	1 —
— — St. 27	$27/8$	33, 5—7 m	1 —
— — St. 30	$23/8$	33, 5—14 m	8 —
Mikis Fjord St. 25	$17/8$	33, 0—14 m	6 —
Lindenow Fjord (kuarmiut)	$30/8$	32, 10—75 m	35 —
Nanusek Fjord	$28/8$	32, 150—175 m	7 —

Strongylocentrotus droebachiensis (O. Fr. M.).

HEDING 1935: Echinoderms p. 62.

Tasiussak St. 21	$9/8$	33, 100 m	1 specimen
— St. 23	$11/8$	33, 6—30 m	11 —
Sermilik St. 10	$26/7$	33, 5—7 m	1 —
Ikerasaussak St. 15	$29/7$	33, 0—10 m	1 —
Uttenthal Sound St. 26	$18/8$	33, 10—45 m	1 —
— — St. 28	$23/8$	33	4 —
Lindenow Fjord (kuarmiut)	$30/8$	32, 10—75 m	1 —

The specimens at hand belong all to the characteristic East-Greenland form with large globiferous pedicellariae.

Thyonidium barthii (Troschel).

Orcula Barthii, TROSCHER 1846. Neue Holothurien-Gattungen p. 64.

— — LÜTKEN 1857. Grønlands Echinodermer p. 9.

— — DUNCAN & SLADEN 1881. Mem. Ech. Arctic Sea p. 8.

?*Phyllophorus pellucidus* (Flemming) var. *Barthii*, KALISCHEWSKIJ 1907. Echinodermen Fauna der Sibir. Eismeres p. 5. Taf. I. Fig. 4 a—e.

Phyllophorus pellucidus var. *Barthii*, MORTENSEN 1910. Report on the Echinoderms of North East Greenland p. 283.

Phyllophorus pellucidus, MORTENSEN 1913. Conspectus Faunae Groenlandica p. 325.

Thyonidium pellucidum, MORTENSEN 1927. Echinoderms of the British Isles p. 411.

Phyllophorus pellucidus, DEICHMANN 1930. Holothurians of the Atlantic Ocean p. 145.

Thyonidium pellucidum part. MORTENSEN 1932. Echinoderms of the Godthaab Expedition 1928 p. 48.

Thyonidium pellucidum, HEDING 1935. Echinoderms of the Scoresby Sound Committee's 2nd East Greenland Expedition p. 7.

Lindenow Fjord at Kuarmiut, 10—75 m..... 2 specimens

The present specimens measure 50 and 28 mm in length and respectively 20 and 15 mm in diameter; both have the tentacles totally retracted. In general appearance they quite agree not only with Troschel's and Lütken's descriptions, but also with good specimens of *Thyonidium*

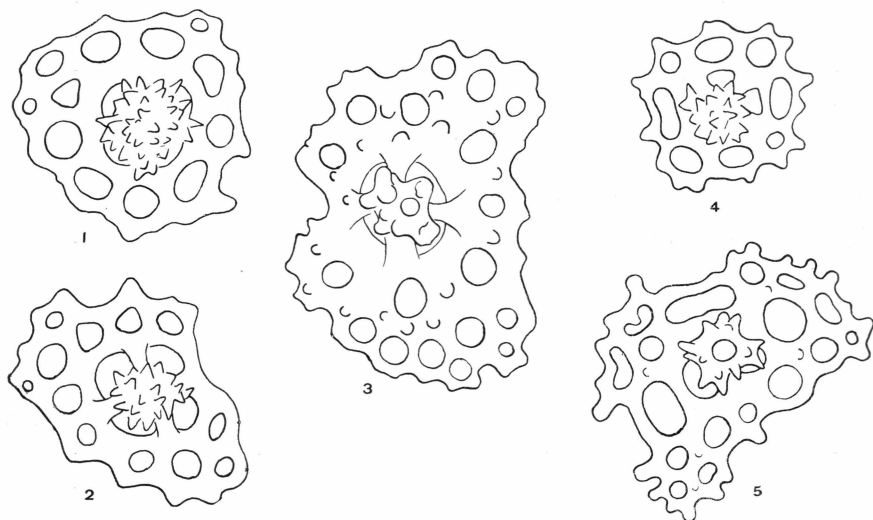


Fig. 3. *Th. barthii* Troschel. Calcareous deposits of specimen from West-Greenland, showing no clear difference between large and small tables.

pellucidum from Scandinavia. However, in the spicules of the body-wall they differ definitely from *Th. pellucidum*. All the various scandinavian formae of *pellucidum* are, in spite of great diversity, characterized in having but one type of calcareous deposits in the body-wall proper (cfr. Textfigure 5, 12—21) (another type is found in the introvert), but the specimens at hand very distinctly have two different types of spicules, one very much like the tables of *pellucidum*, and one much larger, with more irregularly scattered perforations, and usually with a few knobs or short spines on the surface.

A careful examination of all the Greenland specimens of *Thyonidium* (*Phyllophorus*) in the collection of the Zoological Museum of Copenhagen has shown it to be characteristic for all the East-Greenland specimens to have two distinctly different sorts of tables in the body-wall proper. The specimens from West-Greenland, however, are not quite so clear. Some specimens resemble rather those from East-Greenland and the

Lindenow Fjord, others certainly have two sorts of tables, but the difference is not so pronounced and the shape of the tables, large as well as small, is rather different from that of the tables in specimens from East Greenland (cfr. Textfig. 3). Finally, in a few specimens, especially small ones, there is no real difference between large and small tables. Now the question arises whether these varying forms represent the same species, and, in that case, whether they merely represent individual variations or they may perhaps be regarded as indicating different varieties or races, probably ecological forms. It is very deplorable that the material at hand (i. e. the collections of the Zoological Museum) is not sufficient for solving these problems, and, indeed, too scarce even as the base for a reasonable theory.

Regarding the identification of these Greenland *Thyonidium* which, as stated above, cannot be referred to the species *pellucidum*, there is no doubt that they represent the same as LÜTKEN's *Orcula Barthii* and MORTENSEN's *Phyllophorus pellucidus* var. *Barthii*, and that these latter both are the same as TROSCHEL's *Orcula Barthii*, or at least varieties thereof. Thus it must be regarded as a fact that the two species *barthii* and *pellucidum* are not synonymous, as has been maintained especially by DEICHMANN (cf. MORTENSEN: British Echinoderms p. 409 footnote and p. 411, and DEICHMANN: West-Atlantic Holothurians), and that *barthii* replaces *pellucidum* at Labrador, West-Greenland, and East-Greenland, and, according to KALISCHEWSKIJ, also in the Arctic Sea North of Siberia.

As concerns the generic place of the species *barthii* Troschel very serious difficulties seem to arise. In the "British Echinoderms" MORTENSEN distinguishes between the two genera *Phyllophorus* and *Thyonidium* (relying on DEICHMANN's examinations) and states that the two genera may be separated by the different arrangement of the tentacles. Both genera are said to have twenty tentacles, of which *Phyllophorus* has five in an inner circle and fifteen in an outer circle, and *Thyonidium* has ten in each circle. In 1930 DEICHMANN has partly abandoned the genus *Thyonidium* stating that: "The group might possibly be split into two: *Thyonidium* with tentacles distinctly in alternating pairs, and *Phyllophorus* with 15 outer and 5 inner tentacles, but our knowledge about these animals is still so imperfect that such a division is not at present desirable." In spite of this MORTENSEN in 1932 maintains the genus *Thyonidium*.

The examination of the two specimens from Lindenow Fjord gave in this respect the curious result that the larger one was found to have fifteen tentacles and the smaller one sixteen, and a revision of all the other specimens from Greenland showed that they had also but fifteen tentacles, which number must be regarded as the normal number for

the species *barthii*. This shows that Troschel's statement that *barthii* has fifteen tentacles is right and the supposition lies at hand that his genus *Orcula* ought to be reestablished, in spite of the fact that the name *Orcula* is preoccupied by a pulmonate Gastropod. In order to solve this problem I have examined all the specimens of *Thyonidium* and *Phyllophorus* in the Zoological Museum of Copenhagen, the Zoological Museum of Lund, and all the specimens collected in Kattegat by Prof. Jägerskiöld, Gothenburg. A full report of these examinations will be published before long in reports of the Zoological Museum of Gothenburg wherefore it is sufficient to give here the results in brief. The most perplexing result is that all the specimens of *pellucidum* examined, except two, have fifteen tentacles, the deviating two have fourteen and sixteen. Only very small specimens may have less than fifteen tentacles, but already at a length of 8 mm the number is normally fifteen. That it is not because the specimens are merely halfgrown is quite evident, as some are more than 25 cm in length, and a large part of the material consists of the same specimens as DEICHMANN examined some years ago and which she regarded as mature, therefore I have no doubt in stating that also *pellucidum* has but fifteen tentacles.

Regarding the number of tentacles in *pellucidum*. DEICHMANN in 1930 states that this species has 20 tentacles: "in 5 outer large pairs and 5 inner small pairs; the 2 tentacles in each inner pair are so closely placed that they may be mistaken for a single, deeply cleft tentacle, and such specimens have sometimes been referred to the genus *Orcula*, with 15 tentacles, which as far as I can see, has no real existence." This statement can only be based on insufficient examination of the specimens, as it is entirely wrong. I have, as stated above, examined the same specimens as used by DEICHMANN, and these specimens have all fifteen tentacles. To this DEICHMANN and others may naturally say that I have mistaken the two closely placed inner tentacles for a single more or less deeply cleft one, but this is not the case. The specimens have been examined in such a way as to leave no doubt at all about the validity of the results. Each tentacle has been traced to its root at the calcareous ring, and it was found that there were but fifteen insertions for the retractor muscles of the tentacles, furthermore the water vascular system has been injected in some of the specimens, and also by this method it was proved with certainty that there are no more than fifteen tentacles.

According to this there is no doubt that the genus *Orcula* Troschel is a synonyme of *Thyonidium* Düben & Koren, and that it may be regarded as an independent genus different from the genus *Phyllophorus*, which is said to have 20 tentacles. That in any case the species *communis* (Forbes) has 20 tentacles is certain and this is of some interest for the

Greenland Fauna as one of the "Godthaab" specimens described by MORTENSEN in 1932, p. 48, has 20 tentacles and therefore ought to be referred at least to the same genus as *communis*, if not to the same species. Regarding this specimen (the one from St. 112 — 76°37' N. 74°18' W., 580 m) MORTENSEN states: "The specimen from this latter locality is c. 60 mm long (tentacles retracted); the calcareous bodies have disappeared except in the introvert." This statement shows clearly that we here have a specimen closely allied to, if not identical with, *communis* (Forbes) which is characterized especially in having 20 tentacles and in lacking calcareous deposits in the body-wall except in the introvert.

Briefly summarising, the results of the examination of the Greenland *Phyllophoridae* are as follows:

1. There are found at least two different species at Greenland, *Thyonidium barthii* (Troschel) and *Phyllophorus commune* Forbes(?).
2. *Orcula Barthii* Troschel is a valid species different from *Thyonidium pellucidum* Düben & Koren, which latter species does not seem to occur at Greenland.
3. The genus *Orcula* Troschel is synonymous with the genus *Thyonidium* Düben & Koren, as characterized by its type-species *pellucidum*.
4. The genus *Thyonidium* Düben & Koren is a valid genus characterized in having 15 tentacles, scattered pedicells in the interambulacra, anal teeth, and (usually) many calcareous deposits in the body-wall. (TROSCHER states: "Papillae anales nullae" but as all the specimens examined have 5 distinct anal teeth, each with two "anal papillae" with sucking disk, this statement must be due to a mistake).
5. The species *communis* Forbes is characterized in having 20 tentacles, in having (in mature specimens) no calcareous deposits anywhere in the body-wall except in the introvert (and around anus?), wherefore it cannot be referred to the genus *Thyonidium*.

Description of the two specimens from the Lindenow Fjord. — Both the specimens are of the shape usual for a contracted *Thyonidium* and measure 50×20 mm and 28×15 mm. Their colour in alcohol is greyish brown. The pedicells are irregularly scattered all over the body leaving only the middle of the ambulacra free. The tentacles are totally retracted. The large specimen has 15 tentacles, 10 outer and 5 inner, and the small specimen has 16, one of the inner, the left ventral, being paired. The calcareous ring (Textfig. 4) consists of 10 pieces and is supplied with respectively 15 and 16 insertions for the muscoli retractor tentaculi. These insertions are arranged in such a way that the large tentacles of the outer circle are placed interradially, one on each side

of the interradians, and the five small tentacles of the inner circle are placed in the radii with their insertions on the top of the radials at the one side of the radial nerves, and always in such a way that they are all on the dorsal side of the nerve, except the mid-ventral one which is placed on the right side of the nerve. In the small specimen the 16th tentacle, in the left ambulacrum, is placed on the ventral side of the nerve, and due to its presence the whole radial piece is abnormally

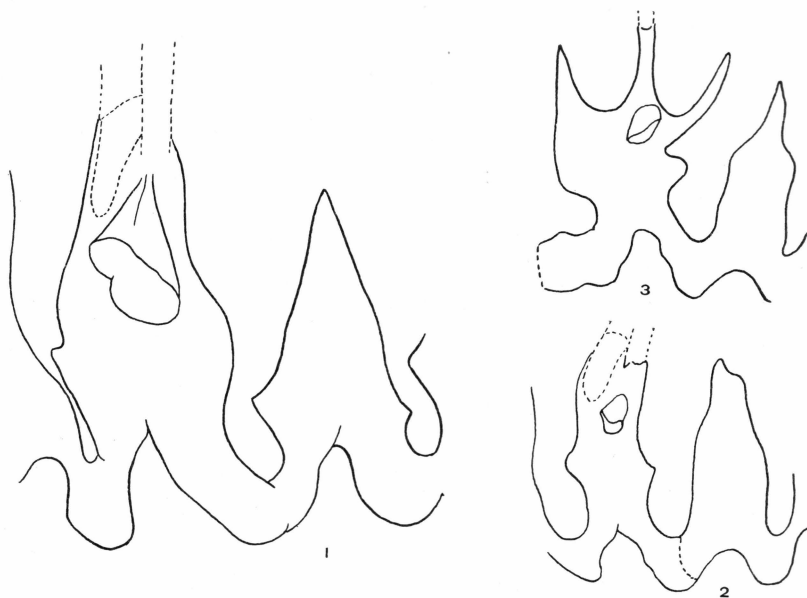


Fig. 4. *Th. Barthii* Troschel from Lindenowfjord.

1. Specimen I, right dorsal radial with right lateral interradius, showing the shape of anterior part of the radial with insertions for one radial tentacle (small tentacle), radial canal and retractor.
2. Specimen II, right dorsal radial showing the same features as 1.
3. Specimen II, left dorsal radial with mid-dorsal interradius, showing insertions for two radial (small) tentacles, one on each side of the radial canal.

developed (Textfig. 4, 3). In the anal aperture there are five distinct anal teeth and at the base of each there are two pedicells. These tooth-pedicells are not real anal papillae as they have a distinct, normally developed sucking disk. Thus in some degree TROSCHER is right in stating that the genus *Orcula* has no anal papillae, although most likely his "Papillae anales" should be translated as "anal teeth".

The calcareous deposits of the body-wall are definitely different from those in the introvert, which latter form large, rounded, polyporous plates with a short spire, quite as the calcareous deposits in the introvert of *pellucidum*. In the body-wall, however, there are two different sorts

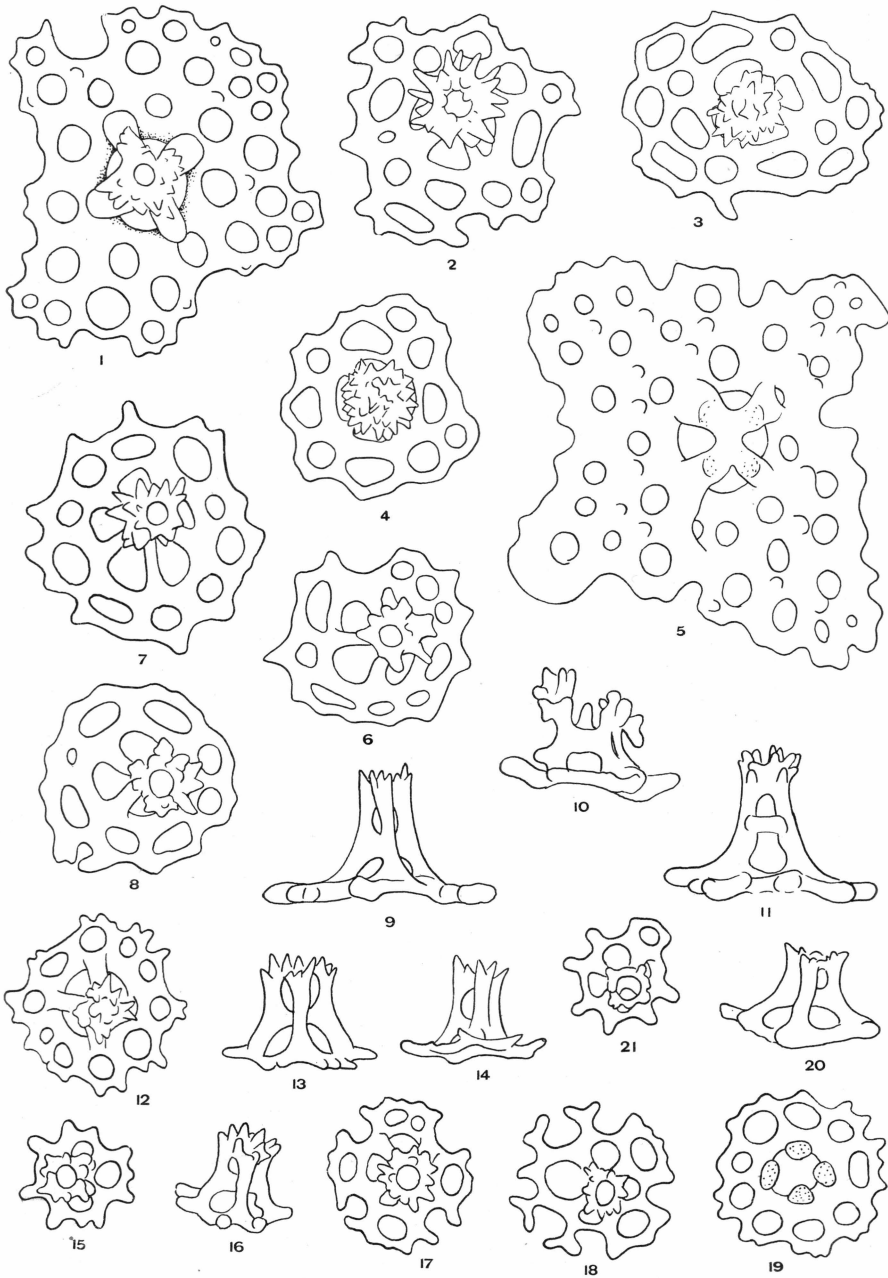


Fig. 5. Tables of *Th. barthii* (1—11) and *Th. pellucidum* (12—21). 1—4 Specimen I Lindenowfjord, 5—11 Specimen II Lindenowfjord, 12—14 Specimen from Hellebæk (Denmark), 15—17 another specimen from Hellebæk, 18—21 Specimen from Øresund (Hveen). Fig. 1 & 5 are the large plates characteristic for *Barthii*.

of plates: 1) small, rounded, smooth plates with 9—12 perforations and irregular margins, and 2) and large, polyporous, often triangular plates, frequently with small knobs on the surface. These peculiar, large plates are usually placed around the base of the pedicells. In the tentacles are found the normal fenestrated staves or oblong plates common to many *Phyllophoridae*.

Trochostoma thomsoni Danielsen & Koren.

Trochostoma thomsonii. HEDING 1935: Holothurioidea I of the Danish Ingolf Expedition p. 52—58. Pl. IV, 1—6; V, 1—5; VIII, 1.

Trochostoma thomsonii. HEDING 1935: Holothurien der Deutschen Tiefsee-Expedition p. 141. Taf. I, fig. 6.

Molpadia borealis — part. DEICHMANN 1936: The Arctic species of *Molpadia*, Ann. Mag. Nat. Hist. 10. Ser. Vol. 17. No. 100, XLIV p. 452—464. Textfig. 1—6.

Lindenow Fjord (1st northern branch) $22\frac{2}{3}$ 32, c. 250 m. 1 specimen

— — In the stomach of a *Macrurus fabricii*
 $3\frac{1}{9}$ 32..... 1 —

The specimen from the northern branch measures about 10 cm in length, and is well preserved with outstretched oral disk and tentacles; the other specimen measures 6 cm, but is not in a very good condition, due to the action of the digestive juices of the *Macrurus*.

The colour in alcohol is a pale greyish with a reddish tinge, due to fine red spots (phosphatic deposits). On the dorsal side of the anterior end it is rusty brown, owing to a dense cover of dirt. The calcareous deposits of the body-wall proper (Textfig. 6, 2) are tables with a three-armed disk (open meshes) and a short and spiny spire. In the "tail" the deposits are tables with a short spire and a disk of varying shape (Textfig. 6, 1), the most common of which is a fusiform rod with a few perforations (3—5) in the middle, but frequently are found tables resembling those of the body-wall, the disks having one to two meshes incomplete, and their lateral protuberances being very short or entirely lacking.

Concerning the determination of the specimens at hand I have no doubt that they do represent *Trochostoma thomsonii*, which hitherto has been unknown from the East Greenland Seas. We have thus, apart from *Eupyrgus scaber* Ltk., for the present no less than four species of Molpadids at East-Greenland, two species of *Ankyroderma* (*jeffreysi* and *affine*) and two species of *Trochostoma* (*thomsonii* and *arcticum*); but the questions whether *affine* is not a juvenile form of *jeffreysi*, or *arcticum* an ecological variety of *thomsonii*, are still unsettled. These problems will require a much larger material than the one at hand wherefore they shall be left for the time being. Only the question of the generic value of the two groups *Ankyroderma* and *Trochostoma* should be discussed

more thoroughly, on account of DEICHMANN recently, in a special paper, having tried to collect them as synonyms of the genus *Molpadia* (DEICHMANN Op. cit. 1936).

DEICHMANN's main-hypothesis (which she has adopted from H. L. CLARK) is that the anchors and the rosettes of racquet-shaped plates should be juvenile characters, which disappear in the mature (or at least in the senile) specimens, wherefore they cannot be regarded as of value for the classification of these animals. To this I should like to remark that juvenile characters may often be very valuable in the classification,

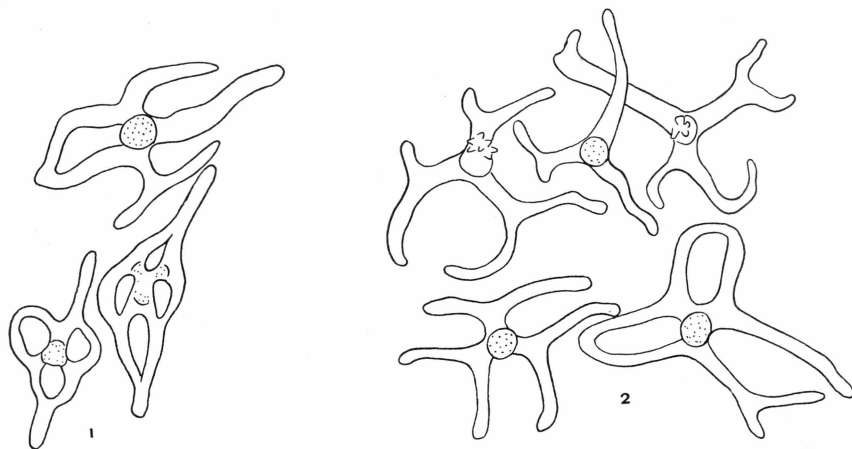


Fig. 6. *Trochostoma thomsonii* Dan. & Kor.

1. Calcareous deposits from tail. 2. Calcareous deposits from lateromedial part of body.

in spite of their absence in the mature specimen; and what CLARK and DEICHMANN in reality understand by senile specimens is problematic, as such large specimens normally have well developed gonads with eggs or sperma, i. e. they are not senile but only large, mature specimens.

Concerning the occurrence of the anchors and racquet-shaped plates within the molpadids we have the following facts:

1. The presence or absence of anchors and racquets are in large specimens with many phosphatic deposits very often difficult to ascertain, partly because they may be more or less worn off¹⁾, and partly because they may be hidden in the dense layer of phosphatic deposits.

¹⁾ Anchors and other features may naturally be regarded as present in a specimen (where this is taken as the representative of a species), even if they by rough handling or other mechanically dealing are worn off and therefore are lacking in the preserved specimen at hand. The only difficulty is, naturally, to ascertain that the specimen "has" the lacking characters.

2. Anchors and racquets do certainly occur in some mature specimens, and do lack in others.
3. Anchors and racquets, as well as tables, may be resorbed by help of the phosphatic bodies, and due to this they may be supposed to disappear in very large specimens, which has had these deposits as young.
4. Anchors and racquets may occur in very small specimens (less than one centimeter in length).
5. Anchors and racquets may lack in very small specimens, specimens with very few or quite without phosphatic deposits (cf. DEICHMANN 1936, p. 454: "One of these series (in size from 1—6 cm), from the Kara Sea, showed no trace of anchors and racquet-shaped plates . . .").

On basis of these facts CLARK and DEICHMANN come to the conclusion that anchors and racquets are juvenile characters of no value for the classification. If all the facts are taken into account this seems to be rather against the simple rules of logic. In any case their statement is merely a theory, entirely free from proofs.

I for my part, and many with me, draw the following conclusions from the cited facts: We have two series of specimens, each representing one or more species. The one series is characterized in lacking anchors and racquets, as well in small as in large specimens; the other is characterized in possessing anchors and racquets both in small and large specimens, though they may perhaps lack in very large, "senile" specimens. These two series may represent one or two genera, which the case may be cannot be seen simply from these facts, but untill proofs are on hand, which definitely show that the two genera really are synonymous, it would be preferable to keep them separate, even if we had no other features which indicated a generic difference.

It appears from DEICHMANN's paper that she thinks the specimens of "*Molpadia*" in the northern Atlantic and the Barent Sea may have (or always have?) anchors and racquets in the young stages, whereas the specimens from "the Kara Sea and vicinity" always lack such deposits. To this I can remark that the material collected by Dr. GORBUNOV in the Kara Sea and studied by me (not yet published) comprises a few specimens of good *Ankyroderma*. There is thus no reason to maintain CLARK's and DEICHMANN's supposition that we have no more than one genus "*Molpadia*" in the Arctic Sea (naturally apart from *Eupyrgus*). We must suppose there are two genera each with one or more species. That we have perhaps but two species in the arctic may be, but a much more thorough study of their variation in relation to their geographical distribution is required in order to solve this problem in a satisfactory way.

Trochostoma arcticum (v. Marczeller).

Trochostoma arcticum. HEDING 1935: Echinoderms — The Scoresby Sound Committee's 2nd East Greenland Expedition p. 66. Textfig. 28.

Trochostoma arcticum. HEDING 1935: Holothurioidea I of the Danish Ingolf Expedition p. 58. Textfig. XV, Pl. V fig. 8; Pl. VIII fig. 2.

Molpodia arcticum. DEICHMANN 1936: The arctic species of *Molpodia*. Ann. Mag. Nat. Hist. 10. Ser. Vol. 17, No. 100. XLIV.

Tasiussak St. 21 $\frac{9}{8}$ 33, 100 m 1 specimen

The present specimen has been preserved in acid fluid and has therefore only slight traces of the calcareous deposits. Due to this the determination is naturally rather uncertain, but as phosphatic deposits are lacking and the general appearance of the specimen is that of *arcticum* I have but little doubt in referring the specimen at hand to that species. As to the relation between *arcticum* and *thomsonii* as well as to the validity of the genus *Trochostoma* these problems are discussed thoroughly in the above description of *Tr. thomsonii*.

Eupyrgus scaber Lütken.

LÜTKEN 1857: Grønlands Echinodermata p. 23.

MORTENSEN 1903: Echinoderms from East Greenland p. 89.

H. L. CLARK 1907: Apodous Holothurians p. 179.

MORTENSEN 1913: Conspectus Faunae Groenlandicae p. 319.

HEDING 1935: Holothurioidea of the Ingolf Exp. Vol. IV, 9, p. 67—72, fig. XX; Pl. IV, fig. 10—11; Pl. VIII, fig. 11.

Tasiussak St. 19 $\frac{8}{8}$ 33, 5—12 m 1 specimen

The single, well preserved specimen brought home by the 7th Thule-Expedition is of peculiar interest, as the species hitherto has been known from East-Greenland in a single specimen only. The only locality, Hurry Inlet, where it was taken together with the only specimen of *Ophiura sarsi* known from the northern part of East-Greenland, indicated that *E. scaber* might be a more boreal species than hitherto supposed. Therefore the finding of it at Tasiussak is valuable, showing that *E. scaber* is a real East-Greenland species, hitherto, however, overlooked on account of its small size. It is distributed all over the whole arctic region, usually in shallow water, though it has been recorded from depths of about 500 m.

Myriotrochus rinkii Steenstrup.

HEDING 1935: Holothurioidea I of the Ingolf Expedition Vol. IV, 9, p. 19—22, Fig. III; Pl. I, fig. 4—7; Pl. II, fig. 1—4, 9—12, 23—25, 29—31.

HEDING 1935: Echinoderms of the Scoresby-Sound Committee's 2nd East Greenland Expedition p. 63—65, fig. 27. (A more extensive list of literature is given in the two papers cited.)

This species is in the material at hand represented by about 100 specimens taken at the stations 8 — 10 — 19 — 25 — 26 — 27 — 28 — 29 — 30, but as the material, after having been used for quantitative purposes, has been lumped together in a few jars according to the main localities it is not possible to give a detailed record for the different stations. The main localities are: Mikis Fjord — Uttenthal Sound (Kangerdlugssuak) — Tasiussak (Angmagssalik) — Ikerasaussak — Sermilik Titekilâk and Sermilik 2nd Eastern Fjord.

The material has been carefully examined, but on account of its being, in the main, rather unsatisfactorily preserved there has been no possibility of studying the anatomy more thoroughly (cf. HEDING 1935, 2 p. 65). However, the examination of the specimens at hand has shown the surprising fact that there are approximately 66 % male specimens, and but 33 % female. Further there has been found a few specimens infested with the parasitic Gastropod *Entocolax ludwigi* Voigt. This parasite will be treated in a separate paper in the results of the 7th Thule-Expedition.

III. REMARKS ON THE GENUS *LEPTASTERIAS*

Every zoogeographical study must be based on an exact and detailed knowledge of species, and even of the smallest varieties, as in ecology, a useless study without such information.

BROCH, Science No. 2144.

In the report of the Echinoderms collected by the 2nd Scoresby-Sound Expedition (Medd. Grønland Bd. 104 Nr. 13) I have tried to show that most of the *Leptasterias* specimens known from East-Greenland are not, as previously stated, *L. groenlandica* or *L. mülleri*, but an endemic form which, classificatorily seen, may be regarded as a variety *crassa* of *Leptasterias floccosa* (Levinson); and that a few specimens which differ distinctly from the majority, and cannot reasonably be referred to any of the known species, most naturally had to be described as a new and independent species, *L. degerbolli*.

The two forms *crassa* and *degerbolli* are, however, in young specimens rather difficult to separate, if it really is possible, and even in mature specimens the limits appear now and then to be rather fluent. In order to get an opportunity for investigating whether this is caused by hybridism, or, if not, whether the two forms are really not classificatorily different, I asked Mr. BERTELSEN to have his attention especially directed towards such small asterids during the 7th Thule-Expedition. This he did, and as the result he brought home a small, but very valuable collection of *Leptasterias* from the localities visited by the expedition.

The study of this collection shows, as it was to be expected, that most part of the specimens belong to *L. fl. crassa*, and a few to *L. degerbolli*, but the material does not give any more distinct limits between the two forms than we had already from the old collections. The collections of Mr. BERTELSEN include further some specimens, which are neither the one nor the other of the named forms, of these specimens especially one is surprising in resembling very closely *L. groenlandica cribraria*.

Confronted with the specimens at hand it would seem the easiest way to abandon the species *degerbolli* and lump all the specimens together

as one species with some local, or perhaps merely individual, variations. Variations of no interest neither for the classification nor for the zoogeography. Certainly this would be the easiest case, and after the rather rough personal criticism I have met for my dealing with the asteroids in the "Echinoderms of the 2nd Scoresby Sound Expedition" I must admit that I have been highly inclined to do so, and like the elder echinologists refer these East-Greenland *Leptasterias* to *L. mülleri* (Sars).

There is, however, a serious objection for doing so. It may be regarded as a matter of fact that the old "*Asterias mülleri*" covers more than one valid species. Nobody doubt for the present that at least *L. groenlandica* (Stp.) is distinctly different from *L. mülleri* (Sars) (cf. DJAKONOW 1930 and FISHER 1930) and yet, in spite of that, DJAKONOW is not able to find clear limits between *L. mülleri* and *L. hyperborea*. The usual theory is, however, that this latter form is a separate species (cf. e. g. W. FISHER 1930). Further the Faroe-specimens mentioned by DJAKONOW as resembling *arctica*, and which by LEVINSEN and HEDING are described as a separate form, *islandica*, certainly ought to be regarded as a valid species. Thus, in referring the East-Greenland *Leptasterias* to "*mülleri*", one is forced to find out to which of the "*mülleri*-species" they belong.

Leaving the aberrant specimens out of consideration, the larger part of the East-Greenland *Leptasterias* (i. e. *crassa* Hdg.) resembles the Norwegian *mülleri* (i. e. the true *mülleri* Sars) to a very high degree, and it might be tempting to refer them to this species and thereby get rid of all the complaints from the side of different scientists, who do not like what they call "species-making". There is, however, the objection for doing so, that there are differences between the Greenland and the Norwegian *Leptasterias*. Apparently these differences are very slight and many zoologists might be inclined to say that so slight differences cannot be regarded as anything but local variations. — If, however, they were really local variations of *mülleri* we should expect to find a gradual transition from the typical Norwegian form to the typical East-Greenland form, either at the Faroes-Iceland, or at Spitzbergen and north of the Norwegian Sea. Such a gradual transition does not exist. The Faroe-Iceland specimens, quite the contrary of being intermediate stages, deviate strikingly from both the mentioned forms, and according to v. HOFSTEN (Eisfjord-Echinoderms) the *Leptasterias* from Spitzbergen are either *groenlandica* (forma *spitzbergensis*) or good *hyperborea*.

As we thus have no geographical reasons for regarding the East-Greenland *Leptasterias* as the same form (species) as the Norwegian, and further the zoogeographical conditions in reality speak against such a supposition, we are forced to regard the apparently faint differences between these two groups of specimens as valid characters. The best of

these characters is, as far as I can see, the presence of secondary spines on the carinals and the upper ventrolaterals (occasionally also on the dorsolaterals) in the East Greenland form *crassa*. This features separates, as far as may be seen from the material at hand, *crassa* from *mülleri*, and unites *crassa* with *floccosa*, and thereby gradually with *groenlandica groenlandica* and *groenlandica cribraria*. Further it must be mentioned that *islandica* has also secondary spines. If we really may put some weight to this character of secondary spines being present or absent, it is obvious that *degerbølli* distinctly is another species than *crassa*, and that, by this character, it is closely connected with *mülleri*, *danica*, and perhaps *hyperborea*.

If it is really certain that we may use such more or less faint and often individually varying features of spinulation, skeleton, and arrangement of pedicellariae as characters of classificatory value, it is evident that we cannot merely unite all the East-Greenland specimens into one form (species or variety) but are forced to distinguish between several different ones, *crassa*, *degerbølli*, *canuti*, *clavispina*, and *cribraria*. These different forms are all found at Angmagssalik, but there can be little doubt that they have reached that locality by different ways. *L. crassa* is as stated a subspecies of *floccosa*, which is found in the Davis Strait, and as a matter of fact the East-Greenland specimens from the most northern localities are much more like the main-species than those from Kangerdlugssuak, indeed so much that a few specimens by Dr. MORTENSEN have been named *floccosa*? Due to this I have little doubt that *floccosa* has migrated from West Greenland-Labrador, north around Greenland to Scoresby Sound-Kangerdlugssuak and Angmagssalik, and there developed an endemic race.

Cribraria is commonly found at West-Greenland, especially in the southern part, and there mainly in the large Fjords. As to this species it seems more likely that it has migrated around the south end of Greenland to Lindenow Fjord, where it was taken by the 7th Thule-Expedition, and that it has its northern limit for the East Greenland at Tasiussak, where a single, atypical specimen has been taken. Very likely it is impossible for it to develop quite typically at this very arctic locality.

The third form which appears to be of special interest is the one described as *clavispina*. It is definitely related to the Iceland *Leptasterias*, either *islandica* or *nobilis*, but due to the poor condition of the specimens it is impossible to say to which of the two forms it is the closest related. In any case it differs clearly from all the other East-Greenland forms, and I have little doubt that it is either a variety of one of the Iceland forms, or merely a fenotypic appearance occurred by the extreme conditions of life.

The two last forms, *degerbølli* and *canuti*, appear to be endemic for

the middle part of East-Greenland, and there is a possibility of their being hybrids of the other three forms. Naturally it is impossible to make this out with certainty, at least not without a more extensive knowledge of their development and distribution. I have, however, little doubt that at least *degerbolli* hybridize with *crassa*, as there are found specimens which, in spite of the most carefull examinations, may be determined as well as one or as the other of these forms.

As a conclusion of these remarks it may be said that a carefull study of minute and often very variable features, and an establishing of a number of lower classificatory groups, named as species as long as we do not know anything about their affinity to each other, is the only way by which we may be able to understand the classification in connection with the zoogeography and the ecology, and in reality the only way to form a geography of marine specimens. Naturally the larger part of the established species will have to be abandoned when we have reached that knowledge of the forms, a certain ecological zoogeography included, which makes it possible to get a clear conception of the specific relation of all these forms. A knowledge which most likely will result in the establishing of circles of races.
