

Heliopora incrustans nov. sp.

With a Survey of the *Octocorallia*
in the Deposits of the Danian
in Denmark.

By

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Meddelelser fra Dansk geologisk Forening. Bd. 5. Nr. 8.

1917.

Albeit the knowledge of some of our *Octocorallia* from the cretaceous period is of ancient date (*Moltkia Isis* for instance, having been described by STEENSTRUP in 1847, and *Isis vertebralis* by HENNIG in 1899), it is nevertheless only the collections of recent years which have first brought to light the fact that there are in the Danian remains of a very considerable octocoral fauna, belonging to the following families:

Pennatulidæ E. & H., with the genus *Graphularia*.

Gorgonidæ E. & H., with the sub-families of *Gorgoninæ* (genera *Primnoa* Lamx, *Gorgonella* Val.) and *Isinæ* (genera *Isis* Lamx and *Moltkia* Stp.)

Helioporidæ Moseley, with the genus *Heliopora* Moseley.

The following species are now known:

1. *Graphularia Grönwalli* Br. Nielsen.

Fig. 1.

Gr. Grönwalli 1915. BR. NIELSEN: *Moltkia Isis* Stp., p. 8, Tab. III, Fig. 1—3¹⁾.

Only isolated fragments from the middle of the long calcareous axis are known. This is quadrilateral-prismatic, and almost rectangular in section. One of the long sides in the section is convex, the other either quite flat or slightly concave. The two shorter sides are slightly concave.

The ends of the axis are not known.

Younger Danian: Saltholmen, Faxø and Bredstrup. ^{1/4} Saltholm.



Fig. 1. *Graphularia Grönwalli*.

¹⁾ K. BRÜNNICH NIELSEN, 1914: *Moltkia Isis*, Steenstrup og andre *Octocorallia* fra Danmarks Kridtaflejringer. Mindeskrift i Anledning af Hundredaaret for JAPETUS STEENSTRUPS Fødsel. Kbhvn. I Halvbind.

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Crania-chalk: Harbour of Copenhagen, Vodrofgaard, Vestre Gasværk (The western gasworks of Copenhagen).

2. *Graphularia sulcata* Br. Nielsen.

Fig. 2.

Gr. sulcata 1913. BR. NIELSEN: *Moltkia Isis*, p. 8, Tab. III, Fig. 4-6.



Fig. 2. *Graphularia sulcata*.
3/4. Coral-chalk,
Faxø.

As in the case of the foregoing species, only fragments of the calcareous axis are known. The section is here likewise quadrilateral, but all four sides are concave.

The ends of the axis are not known.

Coral-chalk: Faxø.

Crania-chalk: Vestre Gasværk, Vodrofgaard.

3. *Graphularia irregularis* Br. Nielsen.

Fig. 3.

Gr. irregularis 1913. BR. NIELSEN: *Moltkia Isis*, p. 8, Tab. III, Fig. 7-12.

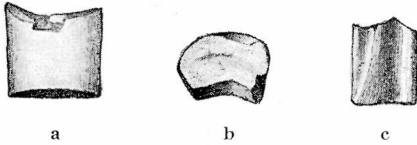


Fig. 3. *Graphularia irregularis*. 3/4. Vestre Gasværk, Copenhagen.
a and c lateral view, b surface of fracture.

Here likewise only fragments from the middle of the axis are known. Shape prismatic with rounded edges. Section irregular, rounded quadrilateral, trilateral or oval.

Crania-chalk: Harbour of Copenhagen, Vestre Gasværk.

4. *Primnoa costata* Br. Nielsen.

Fig. 4.

P. costata 1913. BR. NIELSEN: *Moltkia Isis*, p. 9, Tab. III, Fig. 13-26.

Fragments of branches or stems are known. They are brittle and far from durable. They are hollow, having originally confined a central horny axis. The pieces are

as a rule unbranched, the surface closely covered with broad, unbranched ribs, running longitudinally, and separated by deep furrows. At times there may also be a superficial cross-striped pattern. The central cavity is star-shaped in section, the hollow extending out into the broad ribs.

Younger Danian: Faxe, Rejstrup.



Fig. 5. *Gorgonella tenuis*. $\frac{2}{3}$ l. Kagstrup. (The figure taken from »Mindskrift for JAP. STENSTRUP». Tab. III, Fig. 27).

5. *Gorgonella tenuis* Br. Nielsen.

Fig. 5.

G. tenuis 1913. BR. NIELSEN: Moltkia Isis, p. 9, Tab. III, Fig. 27.

Fragments of stems and large branches are known. The axis is rather thin, irregular in section, composed of longitudinal, fused calcareous strings. The axis is ramified by the curving out of some of the chalk strings to the side, these continuing freely as a branch. The branches seem to have turned to all sides, so that this species will hardly have been fan-shaped.

Older Danian: Stevns, Kagstrup.

6. *Gorgonella torta* Br. Nielsen.

Fig. 6.

G. torta 1913. BR. NIELSEN: Moltkia Isis, p. 10, Tab. III, Fig. 28–31.

Fragments of the stem are known, but no root outgrowths. The stem is very massive. The single calcareous strings are not parallel, as in the foregoing species, but intertwine in a characteristic manner, much as does a climbing plant about its support. The stems are occasionally hollow, having grown round



Fig. 4. *Primnoa costata*. $\frac{2}{3}$ l. Limhamn (Sweden).



Fig. 6. *Gorgonella torta*. $\frac{2}{3}$ l. Bryosoa-chalk, Faxe.

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objects which have since dissolved, leaving cavities in their place.

Younger Danian: Faxe, Rejstrup, Aggersborggaard.

7. *Gorgonella radificera* Br. Nielsen.

Fig. 7.

G. radificera 1913. BR. NIELSEN: *Moltkia Isis*, p. 10, Tab. III, Fig. 32—33.

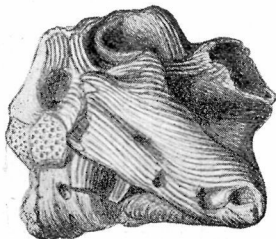


Fig. 7. *Gorgonella radificera*. Root outgrowth. $\frac{2}{1}$. Faxe.
(The figure taken from *Mindeskrikt for JAP. STEENSTRUP*. Tab. III, fig. 32).

Of this species only a single root outgrowth is known, the axis having probably been horny.

It has been attached to a small block of coral rock, growing about the same with its striped root outgrowth. The shape is therefore, like that of the underlayer, irregularly angular. On the one side there is the commencement of a calcareous stem, which has contained a thick horny axis, and is therefore hollow.

Younger Danian: Faxe.

8. *Isis Steenstrupi* Br. Nielsen.

Fig. 8.

I. Steenstrupi 1913. BR. NIELSEN: *Moltkia Isis*, p. 10, Tab. III, Fig. 34—43.

Calcareous segments are known, practically always found as separate fragments. The calcareous segments are thin, formed by concentric chalky layers, about 2—3 cm. long. Ends often slightly swollen, terminal surfaces con-

centrically striped. On these calcareous segments there are at times signs of ramification, in the form of fairly long calcareous excrescences or buds with surface concentrically striped, answering to a horny joint. The manner of ramification in this species corresponds to that known in the recent *I. hippuris*.

Older Danian: Stevns, Kagstrup.

Younger Danian: Faxe, Rejstrup.

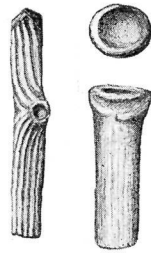


Fig. 8.
Isis Steenstrupi.
2/3. Kagstrup.

9. *Isis vertebralis* Hennig.

Fig. 9.

I. vertebralis 1899. HENNIG: Faunan i Skånes yngre krita, III, p. 5, Tab. I.

I. vertebralis 1913. BR. NIELSEN: Moltkia Isis, p. 11, Tab. II, Fig. 17—21 and Tab. IV, Fig. 1—12.

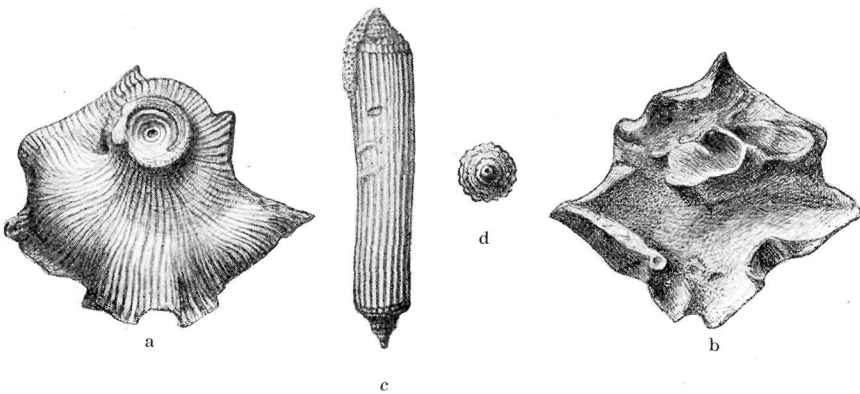


Fig. 9. *Isis vertebralis*.

a—b root outgrowth. a from the top, b from the underside. 2/3. Bryozoa-chalk, Herfølge. c—d Calcareous segment, c lateral view, d from the top. 2/3. Bryozoa-chalk, Faxe. (The figures c—d taken from »Minderkrift for JAP. STEENSTRUP», Tab. IV, fig. 5 and 6).

Calcareous segments of a single root outgrowth are known. The segments are roller-shaped, often very thick, with distinct longitudinal stripes, which run parallel with the axis of the segment, are not branched, and are not

granulous. The ends of the segments are not swollen, but conically prolonged, the inner calcareous layer being the longer, and the outer one shorter. The horny joints must thus have been shaped like an hour-glass.

The root outgrowth found is flat, and has the sculpture of the calcareous segment on its upper surface, the lower being irregularly pitted with the marks from the object on which the coral had been attached.

Younger Danian: Saltholmen, Faxø, Herfølge, Aggersborggaard.

Crania-chalk: Herfølge.

10. *Moltkia Isis* Steenstrup.

Fig. 10-13.

Moltkia 1846. JAP. STEENSTRUP: Amtlicher Bericht ueber die 24. Versammlung Deutscher Naturforscher und Aertzte, p. 179.

Moltkia Isis 1844-50. GEINITZ: Das Quadersandsteingebirge in Deutschland, p. 254-55.

Moltkia Isis 1890. STEIMANN u. DÖDERLEIN: Palæontologie, p. 86, Fig. 80.

Moltkia Isis 1899. HENNIG: Faunan i Skånes yngre krita, III, p. 7, Pl. I, Fig. 4-5.

Moltkia Isis 1913. BR. NIELSEN: *Moltkia Isis*, p. 12, Tab. I, Fig. 1-4, Tab. II, Fig. 1-16, Tab. IV, Fig. 13-20.

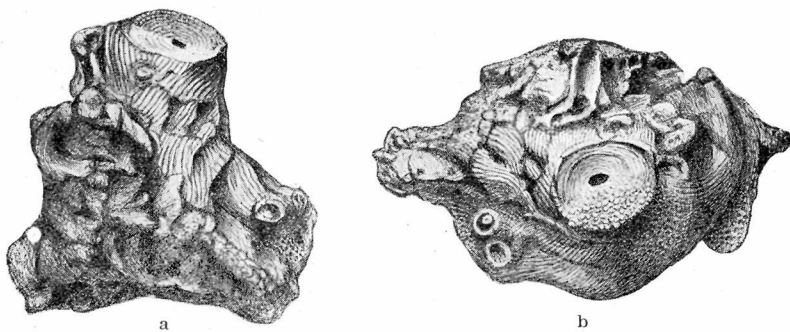


Fig. 10. *Moltkia Isis*. Root outgrowth of a small colony; a lateral view, b from the top.
^{2/1}. Coral-chalk, Faxø.

Calcareous segments of various ages are known, also root outgrowths. The smallest branches are compressed,

with impressions of the basal parts of the separate individuals on the two broad sides. At times the impressions fuse together, forming an elongated furrow along both sides of the segment without distinct separation between the single calyx impressions. The intervals are filled up by raised granulous lines either running parallel with the longitudinal axis of the branch or forming irregular figures resembling the impression of a finger. Round each impression of the single individuals there is a garland of grains extending at times right into the smooth depression itself, but having nothing to do with the mesenterial partitions of the animal. Fig. 12.



Fig. 12. *Mollkia Isis*. Terminal segment with impressions of the separate individuals. $\frac{3}{4}$.

The ramification is so arranged that practically each horny joint has two facets on its distal terminal surface. This method of ramification is distinctly evident from older pieces, where the horny joints are surrounded by calcareous layers, and the calcareous segments thus fixed in their original position. Fig. 11. This tendency to calcareous deposition is characteristic of the species. Not only are the horny joints as a rule surrounded by calcareous layers, but when two calcareous segments happen to meet in process of growth, they are enveloped at the point of contact with new calcareous layers, and thereby fused together. Foreign bodies also, when encountered by the colony, are likewise surrounded with calcareous layers; in specimens from the coral-chalk at Faxø, for instance, we often find branches of *Dendrophyllia* enveloped in a growth of *Mollkia* layers.



Fig. 11. *Mollkia Isis*, showing the ramification and the horny joint covered with calcareous layers. $\frac{2}{3}$.



Fig. 13. *Mollkia Isis*. Middle-sized branch with impressions of separate individuals $\frac{3}{4}$.

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When then the *Dendrophyllia* branch becomes dissolved, a cavity is left, bearing distinct traces of its origin.

The stems have been attached to fixed objects on the sea bottom, by means of root outgrowth, the lower side of which is also found to be filled with a number of blister-like hollows, the upper side showing the usual type of slightly knobby surface. Fig. 10.

The colony had branches extended fanwise.

Older Danian: Eerslev, Stevns, Kagstrup.

Younger Danian: Saltholmen, Faxø, Rejstrup, Aggersborggaard, Limhamn (Sweden).

11. *Moltkia Lyelli* Br. Nielsen.

Fig. 14—15.

M. Lyelli 1913. BR. NIELSEN: *Moltkia Isis*, p. 18, Tab. IV, Fig. 31—45.

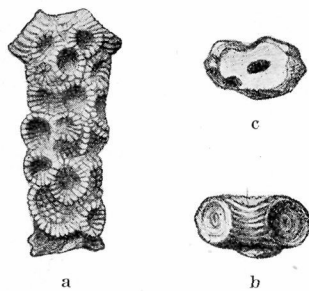


Fig. 14. *Moltkia Lyelli*. A young segment, a in lateral view, b distal terminal face, c surface of fracture. $\frac{2}{3}$ l. Limhamn (Sweden). (The figure taken from »Minderkrift for JAP. STEENSTUP«. Tab. IV, figs. 34—36).

Calcareous segments, but no root outgrowths, are known of this species, which is evidently the one originally described by LYELL in his work »On the cretaceous and tertiary strata of the Danish Islands of Sealand and Møen« p. 248¹⁾, and with regard to which he states, *inter alia*, that it is distinguished by having the younger branches hollow.

The smaller calcareous segments are roller-shaped, and marked on all sides with the impressions of the basal parts

¹⁾ Geol. Soc. of London. Geol. Transact. vol. V, second series. 1835.

of the separate individuals. These impressions are very closely set, and fuse together at times, lacking the partition between. The intervals are closely patterned with the granulous finger-mark lines known from *M. Isis*; the lines can project in the form of ridges, and these may, in a special variety, be almost smooth.

The calcareous segments are hollow, having probably enclosed a horny axis.

The typical form of ramification differs greatly from that of *M. Isis*, a bifurcation taking place in the calcareous segment itself, so that almost every joint has a con-

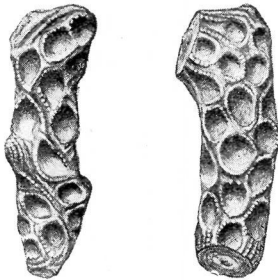


Fig. 15. *Moltkia Lyelli* var. *faxensis*. Lateral views of young calcareous segments. $\frac{2}{1}$. Bryozoa-chalk, Faxe. (The figures taken from »Mindeskrift for JAP. STEENSTRUP», Tab. IV, figs. 46—47).

centrically striped surface proximally, and two such distally. At times a calcareous branch may also be formed irregularly at one or another point on the surface of the segment.

Deposition of calcareous matter about the horny joints would seem to have taken place only to a slight extent, and the tendency to form calcareous deposit does not appear to have been prominent.

This form attains its strongest development in the Limhamn chalk (Sweden), and the present form from Skaane has therefore been taken as type of the species.

Younger Danian: Faxe.

In addition to the above, there is also found a modification of the same, which calls for a special name: *Moltkia Lyelli* var. *faxensis* Br. Nielsen. Fig. 15.

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The calcareous segments, which are of the same shape and type of ramification as in the main form, have almost smooth intervals between the separate individuals, and only slightly granulous, or quite smooth, margin about the basal impressions. The form thus somewhat resembles in appearance a species not yet described, viz. *Moltkia minuta* nov. sp., which I have found at Ivö (Southern Sweden) in the upper cretaceous gravel («Skalgruskalk») composed of shell-fragments and belonging to the zone of *Actinocamax mamillatus*; this species I regard as the original ancestral form for the two abovenamed species *Moltkia Isis* and *M. Lyelli*.
Younger Danian: Faxø.

12. *Heliopora incrustans* n. sp.

Fig. 16–17.

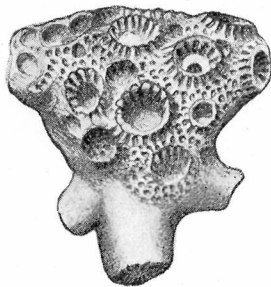


Fig. 16. *Heliopora incrustans*. The colony incrustated upon a branch of *Dendrophyllia*.
⁴/₁. Coral-chalk, Faxø.

The family of *Helioporidæ* has not hitherto been found in the Danish chalk, though the genus *Polytremacis* is known from foreign chalk deposits. The genus is distinguished by a marked development of the pseudo-septa in the calices.

The structural peculiarities of the calcareous skeleton in the family have been described by MOSELEY as follows¹⁾:

»A compact corallum present, composed of a fibrocry-stalline calcareous tissue as in *Madreporaria*. Corallum con-

¹⁾ H. N. MOSELEY, 1880: Report on certain Hydroid, Alcyonarian and Madreporarian Corals procured during the voyage of H. M. S. Challenger. Challenger Report Vol. II, p. 123.

sisting of an abundant tubular coenenchyme, and with calicles having an irregular number of lateral ridges resembling septa. Calicles and coenenchymal tubes closed below by a succession of transverse partitions. «

Small colonies of a *Heliopora* exactly answering to MOSELEY'S description are found in the coral-chalk at Faxø, incrusting upon corals and hydrocorals.

The colonies are small, tuberous, comprising from 3 to about 30 single individuals. The latter are very closely set, the tubularly developed tissue between the calicles only narrow. The margin of the calicles often projects somewhat beyond the surface of the colony. The pseudo-septa referred to are but slightly developed, and do not extend very far down the inner side of the calicles. They vary in number according to the size of the calicles, and quite irregularly; about 20—30.

At the base of the calicles we find, either — if the animal was somewhat old — a smooth transverse bottom (tabula) or, — in the case of a younger individual, — a closed porous surface, answering to the intercalicular tissue of an earlier stage.

Danian: Faxø coral-chalk.



Fig. 17. *Heliopora incrustans*. A young colony on a branch of *Dendrophyllia*.