ZOANTHARIA

FROM SENONE AND PALEOCENE DEPOSITS IN DENMARK AND SKAANE

BY

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WITH 4 PLATES

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PREFACE

If, in this paper, I have succeeded in presenting many new species of corals to the public, the credit is largely due to the fact that a foundation for my work has been laid by others. Both of our own museums have possessed for a long time a large material, classified and determined. I owe warm thanks to Professor A. JENSEN and Inspector, Dr. phil. MORTENSEN of the Zoological Museum, and no less to Professor BØGGILD and Docent RAVN of the Mineralogical Museum for their permission to make use of this. My thanks are also due to Professor, Dr. phil. GRÖNWALL of the University of Lund for the great interest he has shown in my work and for the direct help he has given me. Without his valuable assistance it would have been impossible for me to account for several of our single corals.

I. Introduction.

Although *Zoantharia* belong to those fossils which were among the first to attract the attention of collectors in Denmark, both on account of the frequency of their occurrence in our chalk and tertiary deposits, and because of their striking appearance, yet not until very recently has any attempt been made to classify and describe these animal remains.

FORCHHAMMER[1])—[2]) mentions in nearly all his fossil series the appearance of one or two species of *Turbinolia* from Katholm, Møen, Faxe and the Cerithium chalk from Stevns Cliff, but he makes no attempt to determine these fossils more exactly.

That it seemed desirable to classify them is proved by the fact that the Zoological Museum contains remains of corals, for the most part the stone kernel of single corals, partly classified and named as follows:

Turbinolia faxoensis,
— *brevis*,
— *ponderosa*,
— *biseriata*,
— *pusilla*,
— *crassa*,
— *ambigua*.

No small amount of work had been done with the corals as may be seen from a table, preserved in the archives of the Museum, in which is printed a list of Danish fossil corals. This was prepared as table III of a contemplated large work on *Gaea danica*. The two first tables, (tables I and II) dealt with octocorals, and were published in my paper: Moltkia Isis, Stp. og andre Octocorallia (Vid. Selskabs Skrifter. Mindeskrift for Japetus Steenstrup XVIII).

As it proved possible to find the originals of all the cuts shown in table III, this table is now being published in its original form as table III of this paper.

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[1]) FORCHHAMMER: Om de geognostiske Forhold i en Del af Sjælland og Naboøerne. Vid. Selskabs Skr. II. Del (Naturv. Skr.) 1825.

[2]) FORCHHAMMER: Danmarks geognostiske Forhold. Indbydelsesskrift til Reformationsfesten. København 1835.

No text to the tables was found, but I have endeavored to retain the old specific names, used, in so far as is possible, in their original meaning, and by publishing the work to give a visible proof of the interest in paleontology shown by an earlier generation.

Some of the specific names were commonly known to the earlier paleontologists. FISCHER BENZON[1]), for instance, cites the following series from Faxe:

Turbinolia sp. (*faxeensis*), also found at Stevns Cliff.
Monomyces pusillus, Steenst. and Forch.
— *brevis*, — —
Astraea.
Caryophyllia faxeensis Bech.
(*Calamophyllia fax.* d'Orb. L. and Br. Jahrb. 1851, p. 102.)
Cladocora.

PUGGAARD[2]) mentions as the only coral from Møen

Turbinolia excavata V. Hag.

LUNDGREN[3]) gives the following list of corals in his fauna.

Monomyces faxeensis M. U. H.
— *pusillus* M. U. H.
Oculina sp.
Caryophyllia faxeensis M. U. H.

A. v. KOENEN[4]) describes two species of corals found at Vestre Gasværk, Copenhagen:

Trochocyathus calcitrapa,
Sphenotrochus latus.

and finally there is a far more detailed description of corals given by HENNIG[5]). Of *Zoantharia* he mentions:

Dendrophyllia candelabrum Hng.
Lobopsammia faxensis Bech.

Both these species were known earlier, the first as *Cladocora* sp., the second as *Caryophyllia faxensis* Beck. Among the single corals he mentions:

Parasmilia Lindstrømi Hng.

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[1]) v. FISCHER BENZON: Ueber das relative Alter des Faxekalkes. Kiel, 1866, p. 19.
[2]) PUGGAARD: Møens Geologi, Copenhagen, 1851, p. 66.
[3]) LUNDGREN: List of fossil Fauna of Sweden. III. Mesosoic. Stockholm. 1888.
[4]) A. v. KOENEN: Ueber eine paleocene Fauna von Kopenhagen. Göttingen, 1885.
[5]) Faunan i Skaanes yngre Krita. III. Korallerne: Bihang til K. Svenska Vet. Akad. Handl. Bd. 24. Afd. IV, No. 8. 1894.

This he says is likewise found at Faxe.

Parasmilia scanica Hng.
Ceratotrochus supracretacea Hng.

Of the species we find again quoted in RAVN's[1]) list of fauna:

Dendrophyllia candelabrum,
Lobopsammia faxensis,
Parasmilia Lindstrømi,
— *excavata.*

If we make a tabular comparison of these facts about Danish Zoantharia, we find that until the present time only ten forms were known; of these only the six following have been described:

Parasmilia excavata, v. Hag.
Sphenotrochus latus v. Koenen,
Trochocyathus calcitrapa v. Koenen,
Parasmilia Lindstrømi Hng.,
Lobopsammia faxensis Beck.,
Dendrophyllia candelabrum Hng.

(See list, p. 7.)

As may be seen, our knowledge of these Zoantharia is not very great. Only the species which are underscored have been described and pictured,while the others are merely known as names in a museum, and in a single case even this is doubtful. There is, for instance, nothing in the collection to support FISCHER BENZON's *Astraea* sp., for there is no coral from Faxe of asteroid form. However, as HENNIG too, claims to have observed "two imprints of an asteroid form", we are forced to believe that there is some ground for the assumption. It seems reasonable to suppose that specimens of *Heliopora incrustans* were meant, for when the colony is well-covered with calcite this species readily resembles an asteroid coral. All the other forms given in the list have been found to tally with the species in question.

II. Anatomical Conditions.

Great are the difficulties encountered in determining fossil corals from Danish deposits. As a rule the coral is filled with mud or coated with calcite crystals both of which efface and hide the details by which it is possible to determine the family, genus and species. It often becomes necessary to cut through the coral, and only in more fortunate instances in which the mud may be removed do all the characteristics become visible.

[1]) MILTHERS: Kortbladet Faxe og Stevns. D. G. U. I Række, Kbhvn., 1908.

Puggaard 1851	Gæa danica Tb. III. 1863	Fischer Benzon 1866	von Koenen 1885	Lundgren 1888	Hennig 1899	Ravn 1908	1920
Turbinolia excavata	Monomyces excavata	....	....	.. .	....	Parasmilia excavata	Coelosmilia excavata
	Monomyces ponderosa	....	....	....	....	....	Coelosmilia ponderosa
	Monomyces faxensis	Turbinolia faxensis	....	Monomyces faxensis	....	....	Smilotrochus faxensis
	Monomyces pusilla	Monomyces pusilla	....	Monomyces pusilla	....	....	Epitrochus pusillus
	Monomyces brevis	Monomyces brevis	....	....	....	....	Coelosmilia brevis
	Monomyces biseriata	....	....	....	....	....	Parasmilia biseriata
	Monomyces crassa	....	....	....	....	....	Rhizotrochus crassus
	Monomyces ambigua	....	....	....	....	....	Ceratotrochus ambiguus
		Astraea	....	....	....	....	(Heliopora incrustans?)
		Caryophyllia faxensis	....	....	*Lobopsammia faxensis*	Lobopsammia faxensis	Haplophyllia faxensis
		Cladocora	....	....	*Dendrophyllia candelabrum*	Dendrophyllia candelabrum	Dendrophyllia candelabrum
			Trochocyathus calcitrapa	....	....	....	Flabellum calcitrapa
			Sphenotrochus latus	....	....	....	Sphenotrochus latus
				Oculina sp.	....	....	Amphihelia Beckii
					Parasmilia Lindstrømi	Parasmilia Lindstrømi	Parasmilia Lindstrømi
					Parasmilia scanica	....	Parasmilia scanica
					Ceratotrochus supracretacea	....	Epitrochus supracretacea

In the main I follow ZITTEL[1]) and VAUGHAN[2]) for the skeleton and anatomy of the corals. Only at a very few points does the material at hand differ from the customary. The determination of *Columella*, however, is worthy of note. This formation is classified by various scientists as Columella proper and pseudo-Columella. Columella proper is supposed to originate from a formation deposited in the kernel of the coral at the earliest stages of the latter's development, and to have developed parallel with this in the direction of the calyx. Columella proper may be divided according to its appearance into: 1) Styliform C. formed by a massive column of lime; 2) lamella-like C. formed from a lamella-like lime plate on which the costae find support, and 3) fasciculata C. formed by a group of twisted or foliaceous columns of lime.

Pseudo-columella is the name given to those formed by the inner edges of the septa, which in some way or other unite in the center of the coral. This junction of the septal edges might lead to the formation of spongiose or tortile columella.

VAUGHAN makes a distinction between lamella-like columella and columella proper. demonstrating that the first is formed by a single septum which sends a leaf-like extension towards the center on which the other septal edges find their support.

The Danish material which shows such a septum, (*Sphenotrochus granulatus*, tab. 1, figs. 24—25) wholly supports this view. Cutting shows that columella is a continuation of a septal edge, and as the lowest portion of the coral has no columella, it cannot be an independent formation branching out of the base of the coral.

Styliform C. is found nowhere in the Danish material.

Fasciculate C. is supposed to be found in certain of the species described: *Caryophyllia danica*, *Brachycyathus parvus* and others, but the material is so small that it was impossible to sacrifice any of it to cutting.

In all the other species among which columella is found, and where, according to the theories of the earlier authors, there should be a fasciculate C., i. e. an independent formation projecting from the base of the coral, a pseudo-columella only seems to exist. This is not located at the base of the coral, but is formed during the growth of the animal by the inner edges of the septa curving from side to side in many folds. The curves of the adjacent septa overlap and grow together forming a spongy mass with very regular folds and channels of communication. This columella increases in thickness towards the top. It can attain very considerable dimensions and projects from the bottom of the calyx.

Forms like *Coelosmilia* and *Smilotrochus*, which authorities claim are entirely devoid of columella, have a growth on their lower portions, though not the very lowest, resembling a columella formation, indistinguishable from the calyx and only visible when the coral is cut. It appears then, that all the forms of *Parasmilia*, *Ceratotrochus*, and *Epitrochus* possess a spongy pseudo-columella, and not, as was determined earlier, a true fasciculate columella.

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[1]) ZITTEL: Grundzüge der Paleontologie I. Abtl. München u. Berlin. 1915.

[2]) VAUGHAN: Eocene and lower oligocene Coral Faunas of the U. S. Washington. D. C. 1900.

III. Stone Kernels.

The determination of those remains of corals in which the skeleton proper is disintegrated, leaving only hardened deposits from the inter-septal compartments and occasionally the impression of the outer surface of the coral, presents many difficulties. These remains, too, are the very ones which are found most frequently in our deposits from Danien and senone. They are very common in coral chalk from Faxe and by no means unusual in chalk from Saltholm and Aggersborggaard. Numbers of them have been found in Cerithium chalk from Stevns Cliff.

These stone kernels from the white chalk are only preserved when they are deposited in flint which prevents their destruction.

The few species of ramifying corals to be found at Faxe produce stone kernels that are easily recognized by their mode of ramification. It is only necessary then to substantiate this characteristic in orders to determine them. They may, however, be determined even without this. Stone kernels of *Dendrophyllia* reveal the porous nature of that coral, for all the pores in the theca and its lacunous border are filled with mud in such a way that the upper surface of the stone kernel is covered with an entire layer of a closely lined web of chalk which anastomoses frequently and greatly resembles the tissue of hydro-corals.

Haplophyllia faxensis has elongated stone kernels with the fillings of the interseptal compartments sharply defined.

Amfihelia Becki, which like all *Oculinae* has a tendency to form compact endothecal fillings immediately under the calyces, yields thin, elongated, slightly crooked stone kernels, resembling single corals.

The stone kernels of single corals present many more difficulties. Stone kernels are formed when mud fills the interseptal compartments. The fillings of the calyces are, therefore, very intimately connected with the stony mass surrounding the coral, and it becomes almost impossible to analyse these conditions more exactly. Cutting the axis of the coral crosswise gives some information about the inner parts of the septum and the upper parts of the pali and columella; on the other hand cutting destroys part of the stone kernel, so it is advisable to have a large material on hand before resorting to this measure.

Cutting lengthwise gives information about the lateral surfaces of the septum, about the upper edge of the septum and about columella.

Among the endothecal formations the dissepiments are recognized by the fact that they hinder the further development of the stone kernel in the interseptal compartments in question, preventing, indeed, the mud from penetrating into the said compartments. If there are many dissepiments present, the stone kernel is short in comparison with the length of the coral, which may be measured by the impression of the theca. If, however, mud succeeds in penetrating beneath the dissepiments, the stone kernel is divided into several sections which lie one over the other.

Other endothecal formations are difficult to locate, for they disintegrate together with the skeleton proper, leaving no trace. A central formation in the very depth of the coral may occasionally be determined, as for instance incipient columella formation.

The same is true of the exothecal formations. These disappear and the impression left in the chalk is the only clue as to whether the epithecum was present or not. Costa, on the other hand, leave visible traces.

The matter may be summed up thus:

The impression determines the outer surface of the theca.
— — — costae.
— — — epithecum.
— form of the coral.

The stone-kernel determines the number and proportionate size of the septa.
— presence of dissepiments.
— central formation in the depth of the coral.

Cutting the stone kernel lengthwise determines the upper septal edge.
— lateral surface of the septa.
— columella.

Cutting the stone kernel crosswise determines the conditions of the calyx.
— the pali.
— columella.

IV. Taxonomy.

In this paper the arrangement adopted by Zittel: Grundzüge der Paleontologie, I. Abth. 4 Udg. 1915, is followed. It must be noted that the determination often rests on a very loose foundation due to the insufficiency of the material. In a few cases certain characteristics are supposed to be present even though the material at hand has been unable to furnish the proof.

Possibly future collections will modify the determinations made in regard to the position taken by the species here described.

The chemical condition of the lime skeleton seems to be one of the important points to be observed in systematizing the specimens. In some cases this seems to consist of calcareous spar, in others of arragonite, as Johnstrup has shown in his paper on the formation of Faxe chalk. One species which seems to have a calcareous spar skeleton is *Epitrochus pusillus*, found everywhere with its skeleton in a good state of preservation, whereas other corals from the same locality only appear as stone kernels. The skeleton of this species must therefore be formed of calcareous spar, while the species which have disappeared were of arragonite.

V. The species grouped according to localities.

From white chalk at
Stevns Cliff:

Coelosmilia excavata,
Parasmilia cylindrica.

Møen:

Coelosmilia excavata.

Aalborg:

Coelosmilia excavata,
— *ponderosa.*

From Cerithium chalk at
Stevns Cliff:

Trochocyathus hemisphaericus,
Parasmilia biseriata,
— *cincta,*
Coelosmilia excavata.

Besides these single corals there have also been found some remains of ramifying corals. However, these remains are few and small, and do not yet justify closer determination.

Of fossils of older Danien we know from
Stevns Cliff:

Epitrochus vermiformis,
Parasmilia parva.

Kagstrup:

Parasmilia parva.

Vixö:

Epitrochus vermiformis

Bulbjerg:

Epitrochus vermiformis.

Of fossils of younger Danien we know from
Rejstrup:

Parasmilia parva.

Frederiksholm:

Ceratotrochus Saltholmensis.

Saltholm:

Flabellum calcitrapa;
Ceratotrochus Saltholmensis,
Coelosmilia brevis.

Aggersborggaard[1]):

Epitrochus pusillus,
Smilotrochus faxöensis.

Bryozo chalk at Faxe:

Ceratotrochus Saltholmensis.
Epitrochus pusillus,
Parasmilia danica.

Coral chalk at Faxe:

Haplophyllia faxensis,
Dendrophyllia candelabrum,
Sphenotrochus granulatus.
Ceratotrochus ambiguus.
Epitrochus pusillus.
Brachycyathus parvus.
Caryophyllia danica.
Coelosmilia brevis,
Parasmilia Lindstrømi.
Smilotrochus faxoensis,
Rhizotrochus crassus,
Amfihelia Becki.

Coccolith chalk from Limhamn:

Parasmilia scanica.

[1]) Chalk from Aggersborggaard which contains a fauna with countless typical "Faxe" fossils is doubtless a coral chalk formed in the same way as the coral chalk at Faxe but at a different stage of development, for here not only the corals themselves but their stone kernels as well have desintegrated and vanished. The corals can then only be determined by their impressions made on the surfaces to which they were attached in the case of Ostreae, serpulae and others. In this manner *Dendrophyllia candelabrum* and some hydrocorals are found again.

Hydro-coral chalk from Limhamn:

Haplophyllia faxensis.
Dendrophyllia candelabrum;
Ceratotrochus ambiguus,
Ceratotrochus Milthersii.
Epitrochus pusillus,
Epitrochus supracretacea,
Coelosmilia brevis,
Parasmilia Lindstrømi,
Smilotrochus faxøensis,
Amfihelia Beckii.

Herfölge gravel chalk:

Ceratotrochus Saltholmensis.

Copenhagen harbour:

Ceratotrochus Saltholmensis,
Flabellum calcitrapa,
Sphenotrochus latus.

Ravnstrup[1]):

Ceratotrochus Saltholmensis.

"Vestre Gasværk", Copenhagen:

Flabellum calcitrapa,
Sphenotrochus latus.

As these lists show, a sharp distinction exists between the senone and the Danien species. The distinction between older and younger Danien is quite clear, only one species being common to both, *Parasmilia parva.* Most of the forms are common to the three divisions, the chalk formation, the tertiary formation and the present time; two, *Dendrophyllia* and *Amfihelia* are only known from the tertiary formation and the present time.

[1]) The chalk from Ravnstrup is a gravel chalk of the same species as the upper chalk at Herfölge. Its content of fossils resembles that of Herfölge at every point.

VI. Schematic list of the species and their localities.

	Senon				Danien																			
	Zone with scaph. constrictus				Older Danien				Younger Danien													Grønsand		
	Stevns	Møen	Aalborg	Cerithium chalk	Stevns	Kagstrup	Vixø	Bulbjerg	Rejstrup	Aggersborg	Koral. Faxe	Bry. Faxe	Frederiksholm	Saltholm	Ravnstrup	Herfølge	Kbh. Havn	Limhamn	Randers	Vestre Gasværk	Kbh. Havn
1. *Haplophyllia faxensis*, Bech.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.
2. *Dendrophyllia candelabrum*, Hennig	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.
3. *Sphenotrochus granulatus*, n. sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
4. *Sphenotrochus latus*, v. Koenen	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
5. *Ceratotrochus ambiguus*, Forchh. & Steenstr.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.
6. *Ceratotrochus saltholmensis*, n. sp.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	.	.	.	.
7. *Ceratotrochus Milthersii*, n. sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.	.
8. *Epitrochus vermiformis*, n. sp.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
9. *Epitrochus supracretacea*, Hennig	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
10. *Epitrochus pusillus*, Forchh. & Steenstr.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	+	.	.	.
11. *Trochocyathus hemisphaericus* n. sp.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12. *Brachycyathus parvus* n. sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
13. *Caryophyllia danica*, n. sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
14. *Coelosmilia excavata*, v. Hag.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15. *Coelosmilia ponderosa*, Forchh. & Steenstr.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
16. *Coelosmilia brevis*, Forchh. & Steenstr.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	+	.	.	.
17. *Parasmilia biseriata*, Forchh. & Steenstr.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18. *Parasmilia cincta*, n. sp.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
19. *Parasmilia parva*, n. sp.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
20. *Parasmilia cylindrica*, n. sp.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
21. *Parasmilia danica*, n. sp.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
22. *Parasmilia Lindstrømi*, Hennig	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
23. *Parasmilia scanica*, Hennig	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
24. *Flabellum calcitrapa* v. Koenen	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+
25. *Smilotrochus faxensis*, Forchh. & Steenstr.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.
26. *Rhizotrochus crassus*, Forchh. & Steenstr.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
27. *Amfihelia Becki*, n. sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.
	2	1	2	4	2	1	1	1	1	3	12	3	1	3	1	1	1	11	1	2	2

VII. Separate Species.

1. Haplophyllia faxensis, Beck.

Table I. Figs. 1—7.

Caryophyllia faxensis Beck 1835 in Lyell: Cretaceous and tertiary strata of the Danish Islands. Geol. Transact. Ser. 2. Vol. 5, p. 249. Fig. 4.

Calamophyllia Faxoensis Beck 1848. M. Alcide d'Orbigny: Prodrome de Paléontologie vol. II, p. 295.

Calamophyllia Faxoensis, 1851, d'Orbigny, Leonhardt. et Bronn: Neues Jarhb. f. Mineralogie Jahr. 1851, p. 100—102 (Synopsis of A. d'Orb. Ueber die fossile Reste des Terrain Danien oder T. pisolithique).

Rhabdophyllia faxensis 1854. Milne, Edw. et Jules Haime: Recherches sur la structure et la classification des polypiers récents et fossiles. Annales des sciences nat. 3 sér. Zool. V. IX—XVI.

Caryophyllia faxensis Beck 1866. (Calamoph. f. d'Orb.) Fischer Benzon: Ueber das relative Alter des Faxekalkes. p. 19.

Caryophyllia faxensis Beck. 1888. Lundgreen: List of fossil fauna of Sweden. III Mesosoic.

Lobopsammia faxensis Beck. 1899. Hennig: Faunan i Skaanes yngre Krita III. Korallerne. Bih. til K. svenska Vet. Akad. Handl. Bd. 24. Afd. IV. Nr. 8. Stockholm. S. 11.

As the list of synonymia shows, this species was known in early times. This is not surprising for it belongs to those corals which give the coral chalk at Faxe its characteristic appearance. Its determination, however, proved difficult, but as may be seen, d'Orbigny had already noted it as a *Calamophyllia*. However, as it does not possess the exothecal extensions, (Collerette), which distinguish genus *Calamophyllia* it must be classified with the closely related genus *Haplophyllia*.

Hennig determines it as a Lobopsammia for he presupposes it to belong to the porous coral group; however, this conclusion rests on an error doubtless due to the insufficiency of his material. Only stone kernels and impressions were at his disposal and so it was difficult for him to distinguish this form from Dendrophyllia candelabrum. His sketch of a cross-section of a Lobopsammia branch (Plate I, fig. 16) is, as a matter of fact, a cross-section of a Dendrophyllia branch identical with fig. 10 of the same plate.

Indeed the cross-section plainly shows the coral tube to be a non-porous coral entirely lacking the lacunous edge so characteristic of the Dendrophyllia.

The coral forms bushy colonies of considerable size, characterized by dichotomous self-dividing ramifications. Nowhere are the epithecal formations known as collerettes to be seen, but occasionally plate-like formations uniting some of the branches appear (table I, fig. 1). The branches in the same colony increase but slightly in circumference so that there is very little difference between the older and younger ones. A single individual is located at the extremity of each branch.

The calyx is rather deep, broad and cup-shaped, for the septa in the upper part of the calyx project only slightly from the thickened sharply truncated edge of the calyx. The theca is quite thick without epitheca, usually smooth, but sometimes, especially at the extremities of the branches, slightly protruding granular costae are seen.

In the upper part of the calyx the septa are only slightly distinguishable from the edge of the theca, further down they protrude from the walls of the calyx, while at the bottom of the deep calyx they intercept and coalesce with its inner edges.

The number of septa varies from 30—40, being as a rule about 36. It is usual to find

3 complete cycles (24 septa) and a fourth, incomplete. The single septa greatly resemble each other so that it is impossible to judge from their appearance to which species they belong. As a rule only two kinds of septa are found in a calyx, a comparatively large one alternating with a comparatively small one.

The lateral surfaces of the septa are almost smooth, though diagonal rows of slightly protruding granulations may be seen running inwards and downwards. The upper edge of the septum is uneven, finely dentate, further down the edge is wavy. Dissepiments often occur in the interseptal compartments, many appearing at the same height. The hollow beneath the calyces fills up quickly as a rule, but sometimes we find long pieces of the trunk with open interseptal compartments without dissepiments.

There is no columella. In the deeper sections of the trunks however, we observe that the septa coalesce by the help of their slightly billowing edges, turning towards the center, without though forming an ostensible pseudo-columella. A cross-section reveals septa from one side of the theca forming an easy transition with septa from the other side (table I, fig. 3).

New individuals are formed by splitting. The mother individual increases in breadth and number of septa; it then contracts in the middle and two equally large individuals are formed.

The colony may have a considerable extent but the trunks are apparently very little thicker in the lower parts than in the upper parts. The colonies seem to prefer to spread out like a fan, the branches dividing on the same plane. This characteristic is common to this form and to the majority of the Octo- and hydro-corals of Faxe.

Locality: Danien: coral chalk from Faxe (also known from Annetorp).

2. Dendrophyllia candelabrum, Hennig.

Table I. Figs. 8—22.

Cladocora. 1866. v. Fischer Benzon: Ueber das relative Alter des Faxekalkes. p. 19.
Cladocora. 1867. Johnstrup: Om Faxekalken ved Annetorp i Skaane. Overs. over det kgl. danske Vid. Selskabs Forh. f. 1866. No. 6. p. 9.
Dendrophyllia candelabrum. 1899. Hennig: Faunan i Skaanes yngre Krita. III. Korallerne. Bih. til K. Svenska Vet. Akad. Handl. Band. 24. Afd. IV. No. 8.
Dendrophyllia candelabrum. 1908. Ravn's Faunaliste i Milthers: Kortbladene Faxe og Stevns.

This species, which is the most common coral species to be found at Faxe and forms the largest part of the coral chalk there, was for many years determined as a Cladocora, because its outward appearance presents many points of resemblance with a Cladocora species from English tertiary formation. Much credit therefore is due to HENNIG, who with extremely insufficient material at his command, (only stone kernels and impressions), was able to see that its internal construction consigned it to the porous coral group, thus determining it as a *Dendrophyllia*. The same determination had, in the meantime, already been made by STEENSTRUP and FORCHHAMMER, as is proved by drawings of that species preserved in the

collection of the Mineralogical Museum in which the porous character of the skeleton is apparent, and on the wrapper of which is written: "Dendrophyllia." However, this fact in no way diminishes the credit due to HENNIG.

The coral forms woody, ramifying colonies. The older stems are slightly thicker than the younger branches, but the difference is not great. The branches are formed by gemmation from the outer side of the theca without any connection with a calyx. The new individual, the new branch, first grows a slight distance at right angles from the parent stem, then turns and continues its growth parallel to the parent stem. Branches may grow from every side of a stem (table I, figs. 19—20). If two branches collide during their growth, a frequent occurrence under intense furcation, they merge into one another, forming a complicated net-like growth (table I, fig. 12).

The theca is quite thick and, on account of the pores which are found throughout, forms a spongy (lacunous) tissue making a kind of connection between the interseptal compartments and the outside world. The exterior is at most smooth, as a rule, however, it is possible to distinguish slight costae which confine the porous parts of the tissue. Occasionally the costae are more plainly marked and divide the outer surface into facets (table I, fig. 10).

The calyx is quite deep and capacious, the free septal edges projecting only in the hollow of the calyx and to a very limited extent. Not until the bottom of the calyx are the septa able to reach the central formations. The free septal edge does not extend beyond the thecal edge; it is practically unbroken and is not dentate.

There are between 24 and 36 septa; 3 complete ordines and a fourth more or less incomplete. The septa of the first and second ordines reach the center and by a coalescence of their inner edges form a pseudo-columella of spongy consistency (table I; fig. 8). A cross-section reveals the way in which this is formed from connate septal edges and shows that it is not a true independent columella (table I, fig. 16).

A lengthwise cut through the stems shows how the interseptal compartments close to the calyx are closed by dissepiments.

No endothecal formations are seen. The stone kernels are readily distinguishable from the twisted fillings in the pores of the lacunous edges which are located within the interseptal fillings.

Locality: Danien. Coral chalk from Faxe and Aggersborggaard. (Also known from Annetorp).

3. Sphenotrochus granulatus, n. sp.

Table I. Figs. 23—25.

This species is a single coral of very small dimensions. It is about 10 mm long with a diameter at the edge of the calyx of about 2—3 mm. It is almost cylindrical in form, for its lateral development soon ceases and the breadth remains constant during the further growth of the coral. The axis is bent so that the coral is either curved once or in an S-form.

The coral spreads a little at the base, forming an adhesive disc.

The theca is quite thick; on the outer surfaces are slightly projecting costae. These are broad and dotted with several rows of small granulations. There is no epithecum.

There are 24 septa in 3 ordines and 3 cycles. Six in the first ordo are larger than the others, but as far down the calyx as may be seen they do not form columella.

Cutting crosswise reveals a lamella-like columella, formed by the elongation of a single septum. This proves the species to belong to the genus Sphenotrochus. The upper septal edge is smooth and projects slightly beyond the edge of the calyx. The lateral surfaces of the septum are practically smooth. Many dissepiments are seen in the interseptal compartments and the upper part of the coral is readily distinguished from the lower.

Locality: Danien: Coral chalk at Faxe.

4. **Sphenotrochus latus,** v. Koenen.

Sphenotrochus latus 1885 v. Koenen: Ueber eine paleocäne Fauna von Kopenhagen. Göttingen. S. 106. Tab. V. Fig. 12 a, b, c.

This species belongs in certain cases to those fossils which give the chalk its special character. Wherever it is found it occurs in great numbers. In small loose blocks from Ystad and Halsted I have seen it in enormous quantities.

I have nothing further to add to v. Koenen's description.

Locality: Younger Danien. Copenhagen harbor; Vestre Gasværk.

5. **Ceratotrochus ambiguus,** Forchhammer and Steenstrup.

Table III. Figs. 1 b, 5 and 6.

This species belongs to those commonly found in the coral chalk from Faxe. It appears as stone kernels, but there are a few remains of impressions which permit a description of its external appearance. The stone kernel is obovate-conical in form, gradually pointed toward the base of the coral. The axis is sometimes straight, but as a rule bent either once or in the form of an S.

The coral may attain a length of 35 mm with a diameter at the edge of the calyx varying between 12—18 mm.

The stone kernel shows traces of 50—60 septa in 6 ordines containing 1 incomplete and 7 complete cycles. The septa from the second and in part from the third ordo as well, are large and well-developed, whereas the interjacent septa are small. The interseptal compartments of the stone kernels, then, are grouped in 4's. The single groups are separated by deep furrows thus rendering the stone kernels easily recognizable. A calycinal cross-cut shows that the calyx is quite deep. A cut further down reveals loosely united inner septal edges. There was no true columella and there were no dissepiments, for the stone kernel extended without break to the base of the coral.

The lateral surfaces of the septum were covered with rows of such small granulations as to appear practically smooth.

The impressions and the few remains still existing show that the theca was thin, smooth without costae, and without epithecum.

As I was unable to find any special difference in the stone kernel shown in table III, fig. 1 b, 5 and 6, I have grouped them all under one of the names.

Locality: Danien. Coral chalk, Faxe, Limhamn.

6. Ceratotrochus Saltholmensis, n. sp.

Table I. Figs. 26—31.

This species is a very small one. It attains a length of only 12 mm, with a diameter at the calyx of 5 mm. It is regular in form, obovate-conical. There is no basic extension, no stem, but sometimes a small adhesive disc appears at the point; if this is not the case the point is smoothly rounded.

The theca is quite thin, without epithecum. The costae in the primary cycles are rather conspicuous, form no continuous ridge, but are scattered in rows of small prickles.

The calyx is shallow with a prominent, rather broad columella filling about one third of the diameter.

There are between 32 and 36 septa in 1 incomplete and 3 complete cycles on 4 ordines of which the 2 first are considerably developed and share in the formation of the columella. The later series are but weakly developed.

The septa do not protrude beyond the edge of the calyx, they soon bend their upper edge down into the depths of the calyx, where, their edges uniting in the center, they form a spongy pseudo-columella capable of considerable development (table I, fig. 29). The septal edges seem to be entire. The lateral surfaces of the septa are covered with granulations, often quite large, spinate, which greatly reduces the interseptal compartments.

No dissepiments are found, but the interseptal compartments are unencumbered down to the lowest parts of the coral. The inner edges and the columella are much thicker on the lowest parts of the coral and some solid endothecal chalk deposit is visible, making these lowest parts of the coral almost massive. It is not unusual to find specimens in which the larger portions of the theca and septa are worn away and only the lowest part of the coral with the thickened end of the columella preserved (table I, fig. 30).

Locality: Danien: The species is well known from younger Danien; not known from older Danien. Younger Danien: Frederiksholm, Saltholm, Bryozoa chalk from Faxe. Herfølge, Ravnstrup, Copenhagen harbour.

7. Ceratotrochus Milthersii, n. sp.

Fig. 1—4.

Among the most common fossils in the paleocene deposits near Randers is a coral which only appears as a stone kernel with no impressions. Various cuts showed the coral to have about 30 septa which are contiguous in the center of the coral and form small spongy columns. The interseptal compartments were free without dissepiments. At the lower end

of the coral the septa were much thicker and the interseptal compartments thus partially closed. The sides of the septa show the usual curved rows of granulations but without larger thorns. None of the specimens showed any traces of theca. The coral was obovate-conical with a slightly bent axis and there was no sign of root extension. In certain respects this

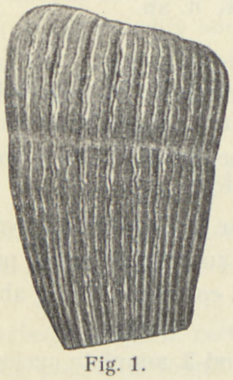

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4 a and b.

Fig. 1. Ceratotrochus Milthersi. Stone-kernel. Side view. $^3/_1$.
Fig. 2. do. do. do. Cross-cut. $^3/_1$.
Fig. 3. do. do. do. Tangential cut $^3/_1$.
Fig. 4 a and b do. do. do. Cross-cut and side view $^3/_1$ of the lowest end.

coral suggests Ceratotrochus Saltholmensis, but may readily be distinguished from that coral by its far greater size and by the appearance of the sides of the septa.

A few rare specimens of similar stone kernels may be found at Faxe and Limhamn.

In loose blocks of the same age from Halsted near Nakskov are found two corals with their shell preserved. They correspond at every point to the stone kernels referred to here, and I do not therefore hesitate to group them with these. They further strengthen the supposition that the coral was a Ceratotrochus. The under side shows traces of slightly protruding costae covered with countless granulations. These, however, are not arranged longitudinally as is the case with C. Saltholmensis. The two specimens show only the lower part of the coral, so it is impossible to describe the calyx.

Locality: Upper Danien: Faxe, Limhamn.
Green sand chalk near Randers.

8. Epitrochus vermiformis, n. sp.

Table II. Figs. 1—4.

This species is characterised by its epithecum, which not only entirely covers the outside of the coral, but also any objects with which the coral comes into contact during its growth, — for instance bryozoa colonies (table II, fig. 1).

The coral forms a root extension of considerable size in the inside of which are seen the remains of the bryozoa colonies or similar growths on which the young coral sought support.

The coral has the usual obovate-conical form, but in many places the growth is but slight so that the form becomes cylindrical. The axis is always bent, usually in several directions, giving the coral a worm-like appearance.

The theca is smooth, without corticles, but as the epithecum in its growth surrounds everything with which the coral comes in contact, the theca is sometimes rough with protuberances of various shapes. (table II, fig. 1).

The calyx is deep. There may be as many as 40 septa, 5 ordines in 4 cycles of which 12 reach the center while the others are but slightly developed. The septa do not extend beyond the edge of the calyx but soon disappear into the calyx. The septal edge is curved. The lateral surfaces of the septum are smooth. No rows of granulations are visible. The inner septal edges unite to form a pseudo-columella which attains considerable thickness towards the top; the upper part may be seen at the bottom of the calyx. There are no dissepiments or other endothecal formations.

Locality: Danien: Older Danien: Stevns, Kagstrup, Bulbjerg, Vixø.

9. **Epitrochus supracretacea**, Hennig.

Ceratotrochus supracretacea. 1899. Hennig: Faunan i Skånes yngre Krita. III. Korallerne. Bihang til K. Sv. Vet. Akad. Handlingar. Bd. 24. Afd. IV. No. 8. Stockholm. 1899. S. 21. Pl. 2. Figs. 27—40.

Although this species has not yet been found in the Danien of Denmark, it is included here because it is known from the closely adjacent Swedish Danien locality, Limhamn. I have examined three specimens from the collection in the University of Lund, but as all three showed thick epithecum and a large root extension they belong to the Epitrochus genus and not to the Ceratotrochus. They recall somewhat E. pusillus, for the shell is preserved, (calcareous spar, not arragonite) but are readily distinguished from that form by their greater size and rapid increase in breadth during growth.

Locality: Danien. Younger Danien. Coral chalk, Limhamn.

10. **Epitrochus pusillus**: Forchhammer and Steenstrup.

Table III. Figs. 7 a—g. Table II. Figs. 5—13.

Monomyces pusillus: Steenstrup and Forchammer. 1866. v. Fischer Benzon: Ueber das relative Alter des Faxekalkes. Kiel 1867, S. 17.

— M. U. H. 1867. Lundgren: List of fossil Fauna of Sweden. III. Mesozoic, Stockholm, 1888.

The species is the most common one found in the chalk pits at Faxe, appearing both among the varieties in the bryozo chalk and in the coral chalk (Ravn's Naese). It is well-known from earlier times. Numerous specimens are to be seen in the Mineralogical and Zoological Museums at Copenhagen.

The coral is small. The largest known specimens measure about 15 mm from base to edge of calyx and have a diameter of about 4 mm.

It is almost obovate-conical in form, increasing slightly in thickness towards the edge of the calyx. The coral was fastened to the bottom of the sea, or to solid bodies on the bottom by means of a stem and a flat, spreading, basic part, which on its under side shows the impression of the object to which it was attached. The upper side of the basic extension is either smooth or has faint longitudinal lines.

The usual form, then, is nearly obovate-conical, but seldom entirely regular as the extension often changes resulting in an irregularly bent form. Sometimes growth ceases suddenly and the interseptal compartments are closed with a tabular-like formation. A new individual then grows forth from some portion of the calyx, possibly at right angles to the original extension.

The theca is thick and solid, covered with a smooth epithecum which in rare instances permits the costae to shine through. Sometimes horizontal folds are observed. Septa are almost constantly present to the amount of 48, arranged in 5 ordines of 4 cycles. 6 of the first ordo are larger than the others and are easily recognizable in the calyx. Together with the 6 of the second ordo they form, by means of their inner edges, a pseudo-columella which reaches up to the bottom of the calyx and are readily observed here as slightly ruffled chalk leaves.

The edge of the septum does not protrude beyond the edge of the calyx; it is not entire but forms a few large patches in the calyx. Further down it billows from one side to another and unites with the neighboring septal edges. In this way the spongy pseudo-columella is formed.

The sides of the septa are covered with rows of granulations which are sometimes large and sharp enough to form thorns. These thorns do not unite with similar growths from adjacent septa, but form, especially on the lower sections of the coral, scattered dissepiments which close the interseptal compartments.

Locality: Danien: Younger Danien: Coral chalk from Faxe and Aggersborggaard; bryozoa chalk from Faxe.

11. Trochocyathus hemisphaericus, n. sp.

Table II. Figs. 14—15.

This species is found in cerithium chalk from Stevns Cliff. Both stone kernels and impressions are known.

The theca is almost hemispherical, it was once free. Smooth costae have protruded from the outer surface broken by very pronounced rings of growth.

The stone kernel is 15 mm in diameter, 10 mm long. It shows traces of 60 septa of which the 6 primary were the largest.

The septal edge has not extended beyond the thecal edge, but has penetrated almost immediately into the rather shallow calyx, where it joined the columella. The sides of the septa were covered with rows of prominent granulations.

There were no dissepiments.

No account can be given of the central parts of the coral. Judging by the appearance of the stone kernels there was a true fasciculate Columella at the base of the coral. Whether pali were found and, if so, of what kind, is unknown.

In spite of insufficient data about important parts of the coral, I do not hesitate to place it in the Trochocyathus genus on account of its external resemblance to certain French and American corals belonging to that group, — for instance *T. aptiensis*, Fromentel, and *T. Hyatti* Vaughan.

Locality: Upper senone. Cerithium chalk at Stevns Cliff.

12. Brachycyathus parvus, n. sp.

Table II. Figs. 16—18.

In the coral chalk at Faxe may be found some stone kernels of a single coral which has left no impressions so that it is impossible to describe its outward appearance. The stone kernels, however, are very characteristic and easily recognizable, so I have ventured to determine them.

Only small stone kernels are found, the largest specimen known measures 8 mm in height with a diameter of 8 mm at the edge of the calyx. It is regular, obovate-conical in form, somewhat truncated towards the bottom.

The stone kernel shows traces of 48 septa, 5 ordines of 4 complete cycles. A true columella has developed from the base causing characteristic grooves in the stone kernel.

A cross-cut downward from the edge of the calyx shows that the septa soon reached the center. The calyx was shallow. Septa of the first, second and in part of the third ordo were large, whereas the others only grew out a short distance from the edge of the calyx. Remains of 6 pali which penetrated far into the calyx were found, and a probable fasciculate columella (table II, fig. 18).

Based on these data it seemed right to determine the species as belonging to the Brachycyathus genus, in spite of the fact that information about the epithecum is lacking.

Locality: Younger Danien: Coral chalk at Faxe.

13. Caryophyllia danica, n. sp.

Table II. Figs. 19—20.

In the coral chalk at Faxe single specimens of a Caryophyllia are found.

This coral is about 14 mm long; at the edge of the calyx, which is oval, it is 10 mm at the greatest, and 8 mm at the smallest diameter.

The form is obovate-conical. The pointed end is broken off so that its mode of adhesion cannot be determined.

The theca is smooth with no protuberances and no epithecum. The costae are arranged in longitudinal, slightly granular rows. The calyx is rather shallow. There are about 48 septa, 4 cycles in 5 ordines. The first 2 ordines show equal development and are large, the

others are less developed. The septal edge is entire. The lateral surfaces of the septa are nearly smooth in so far as they may be seen in the calyx.

The columella is covered by a hardened deposit of chalk and cannot be described more closely.

Opposite the septa of the third ordo and toward the center are 12 well-developed pali of which the upper edge is entire and smooth and reaches into the calyx to about the same height as the septa.

Locality: Danien: Younger Danien: Coral chalk at Faxe.

14. **Coelosmilia excavata,** v. Hagenow sp.

Table III. Figs. 8, 8 a, 8 b. Table. II. Figs. 21—28.

Turbinolia excavata. 1839. v. Hagenow.
Monomyces — 1850. Forchhammer and Steenstrup.
Turbinolia — 1851. Puggaard: Möens Geologi p. 66. Fig. 9.
Coelosmilia excavata 1856. Milne, Ed. et Haime. Histoire naturelle des Coralliaires T. II. p. 179.
— 1858. Fromentel, E. de. Introduction à l'étude des polypes. p. 102.
Parasmilia excavata. 1908. Ravn: Faunalisten i Milthers: Kortbladet Stevns og Faxe. D. G. U. 1. Række. No. 11.

The species is well-known from olden times and belongs to the more common fossils from our white chalk where it is found in its natural condition with the parts of the skeleton preserved and as flint stone-kernels. It is rather common, too, in moraine deposits in gravel beds in secondary layer.

It is readily recognized on account of its size, enormous for a single coral.

Its determination has been rather difficult. Its inner construction is hard to recognize on account of deposits of solid masses of chalk very difficult to remove without injury to the septa and theca. The original determination of the species as Turbinolia was changed in 1856 to Coelosmilia because dissepiments and the lack of columella were observed. It is plain enough for the same reason that it cannot belong to the Parasmilia genus.

The coral is a single coral adhering at the base to other solid bodies at the bottom of the ocean. Its base widens, forming a disc showing on its under surface traces of the object to which the coral was fastened. On the upper surface of this basic disc are fine longitudinal stripes. A thin stem rises from the base, bearing the obovate-conical coral which rapidly increases in breadth; later on the growth in breadth is minimal, and long cylindrical parts are formed in the upper end of which is the calyx (table II, fig. 26).

The entire coral may measure about 100 mm from the base to the edge of the calyx, with a diameter of about 40 mm at that point.

The theca is rather thin and brittle; it is practically smooth. On the outer surface all the extremities of the septa are visible like slightly protruding costae. When examined through a magnifying glass they are found to be granulated. Countless cross lines, sometimes

very close together, indicate the pauses in the growth of the coral. There is no true epithecum, but at the point where stem, base and coral merge into each other, a granular epithecum is found which covers the costae and increases the thickness of the walls and its power of resistance.

The number of septa varies from 36—60 in well-developed specimens. These have 4 complete cycles and a fifth incomplete divided into 6 ordines. Of these the 3 first ordines, about 24 in number, penetrate to the center of the coral, while the later septa are weakly and protrude but slightly from the thecal edge. As far into the calyx as one can see after all mud has been removed, no trace of a central formation (Columella) is to be found. A cross-cut of the lowest portions of the coral shows that the septal edges increase somewhat in size towards the center, forming a wavy edge which merges into the neighboring septal edges and forms a fairly regular pseudo-columella, quite independent of the base of the coral, for it is totally lacking at the lowest section of the coral (table II, fig. 27).

A few dissepiments are scattered in the interseptal compartments but otherwise there are no endothecal formations.

The septa, at all events those of the first ordines, project from the thecal edge and, before the edge vanishes in the bottom of the calyx, form a curve whose edge is entire (table II, fig. 25). The lateral surfaces of the septa are practically smooth, the small granulated protuberances are, as usual, arranged in curves (table II, fig. 25).

Stone kernels of flint are rather common from both Stevns and Möens Cliff and in secondary strata in gravel deposits of the quaternary age. These are, as a rule, spheroidical in shape and consist of a flint kernel with septa preserved as lime septa.

No columella is seen in these stone kernels either (table II, fig. 28).

Locality: Senone: The zone with belemnitella mucronata: Möen, Stevns. Cerithium chalk. Stevns Cliff.

15. Coelosmilia ponderosa, (Forchhammer and Steenstrup).

Table IV. Figs. 1—2.

Under this determination we find in the Zoological Museum a few specimens of a Coelosmilia which is closely related to C. excavata. It differs from that form in the great thickness of its theca, its lack of adhesive surfaces and the fineness of the longitudinal stripes on the outer side of the theca.

The specimen is incomplete, only the lower part of the coral being present. The entire calyx is wanting.

Locality: Senone: The zone with belemnitella mucronata: Aalborg.

16. Coelosmilia brevis, Forchhammer and Steenstrup.

Table III. Figs. 2—3. Table IV. Figs. 3—4.

In the coral chalk at Faxe are found a few (5) stone kernels of a peculiar shape, like a low cylinder with rounded end surface. The cylindrical portion may be so abbreviated that

the entire stone kernel has about the form of a hemisphere. One shown in table III, fig. 3 is 18 mm in height and 22 mm in diameter at the edge of the calyx.

The stone kernel shows traces of about 60—64 septa (4 complete cycles and 1 incomplete). Only the septa of the 3 first ordines have reached any considerable development, the others were small and very little conspicuous. The lower part of the stone kernels shows indications of dissepiments, for sometimes the single stone kernels in the interseptal compartments are truncated at different heights so that the ending of the stone kernels is oblique. The ending of the stone kernels indicates lack of Columella but that the septal edges in the lowest parts of the coral were contiguous.

A cut through a single stone kernel reveals a deep calyx and contiguous edges of the septa only in the depth of the calyx. The cut which extends to within about 8 mm of the end of the stone kernel shows no traces of Columella.

Unfortunately no complete impression of the entire outer side of the coral exists, so it is impossible to state whether it was free or adhered. However, there are impressions of fragments of the coral which show that its costae were well-developed and dentate by means of crosswise furrows.

No material was attainable for making a longitudinal cut, so it is impossible to describe the septal edges and the lateral surfaces of the septum more closely.

A stone kernel similar in form but flatter was found at Saltholm and should in my opinion be classified as this species.

Locality: Danien: Younger Danien: Coral chalk. Faxe, Saltholm.

17. **Parasmilia biseriata**, M. U. H.

Table IV. Figs. 5—9.

This species is known from cerithium chalk at Stevns Cliff, but has never been found with its lime skeleton in a state of preservation. Only stone kernels and the impressions of the outer surface of the theca are found.

It attains a length of 23 mm and has a diameter at the edge of the calyx of about 8 mm. The impressions show that the form of the coral was obovate-conical with a bent axis. No adhesive extension or stem by which the coral had been fastened was observed. It was free.

The stone kernels are short and obovate-conical, often slightly bent; they do not fill out the impression in more than the two upper thirds. The filling of the interseptal compartments ends at various heights, thus giving the stone-kernel an irregular, obliquely truncate appearance. This is probably due to the fact that dissepiments at different heights have prevented the chalk precipitate from penetrating to the bottom of the interseptal compartments.

The theca was thin, either quite smooth on its outer surface or covered with longitudinal stripes of small granulations without any actual costae formation. The septa did not extend beyond the edge of the calyx; its edge was entire and it soon bent down into the rather deep calyx. The sides were granulated with the small protuberances arranged in oblique rows. The medial septal edges were zig-zag, bent, and joined to the pseudo-columella.

There were about 32 septa in 1 incomplete and 3 complete cycles. Only the septa of the 2 first ordines reached the center, the others protruded but slightly from the edges of the theca. This is known from the stone kernel by the fact that the interseptal fillings lie adjacent, 2 and 2, with deep furrows between the separate groups and slight furrows between the fillings in the same group. This gives the stone kernel a two-serried (bi-seriate) appearance.

Locality: Senone. The zone with Scaphites constrictus: Cerithium chalk at Stevns Cliff.

18. Parasmilia cincta, n. sp.

Table IV. Figs. 10—12.

From the cerithium chalk from Stevns Cliff we have a couple of stone kernels and the impression of a coral, so characteristic that they permit determination.

The impressions are very long; the longest is 28 mm with a diameter of about 8 mm. The impressions show that the coral was long, shaped like a worm with many bends. The theca was thin, covered on its outer surface with quite prominent costae, broken by numerous epithecal lines running in a transverse direction, thus dividing the outer surface of the coral into many small quadrilaterals. No actual smooth epithecal covering was seen.

The fragments found were not sufficient to determine whether the coral was attached or free.

The stone kernels show traces of dissepiments, for they are short, and, measured by the impressions, only a fraction of the entire length of the coral. There were about 30 septa, that is to say, 4 ordines in 1 incomplete and 3 complete cycles.

The lateral surfaces of the septum were covered with rows of sharp granulations.

Locality: Senone. The zone with Scaphites constrictus. Cerithium chalk at Stevns Cliff.

19. Parasmilia parva, n. sp.

Table IV. Figs. 13—16.

This little species is easily recognised by its external appearance. It seems to be common to all the Danien strata.

Its form is obovate-conical, seen best in young specimens. When older it shows an inclination to irregularly curved elongations. It adheres by means of a small root extension.

The largest specimen known measures 15 mm in length and has a diameter at the edge of the calyx of about 5 mm. The majority of the specimens are much smaller.

The theca is dotted on its outer surface with thin costae. These are sometimes broken off, forming a row of small ridges.

The calyx is deep.

The septa protrude but slightly beyond the edge of the calyx and, as a rule, close to the thecal tissue, they sink deep into the bottom of the calyx. Here their inner edges unite, forming a pseudo columella the upper portion of which is just visible. The septal edge is wavy. The lateral surfaces of the septum are covered with rows of quite conspicuous granulations.

There are 24 septa, that is 3 ordines or 3 cycles. Of these the two first form columella, while the latter are but slightly developed and only protrude a little from the edge of the theca. In the lowest parts of the coral many dissepiments are seen, but no other endothecal formations.

Locality: Danien. Older Danien: Stevns Cliff; Kagstrup.
Younger Danien: Faxe, Rejstrup.

20. Parasmilia cylindrica, n. sp.

Table II. Figs. 29—30.

I have a great rarity from the white chalk from Stevns Cliff, — the remains of a single specimen of a coral which permits determination in spite of very insufficient material.

The fragment of the coral which was obovate-conical in form, with very gradual increase in breadth, so that the fragment is almost cylindrical, is 12 mm in length with a slightly bent axis. The diameter varies between 3—4 mm.

The theca is thin, without epithecum. Costae are present as very low, sharp ridges with protruding granulations here and there. The interstices between the costae are smooth.

The material at hand shows no calyx. There are 24 septa; 3 ordines or 3 cycles of which the 12 in the first and second ordines reach the center where they participate in the formation of a spongy pseudo-columella of considerable size.

In the interseptal compartments, especially in the lower parts of the coral, scattered dissepiments are found which seal the interseptal compartments.

Locality: Senone. The zone with belemnitella mucronata. White chalk, Stevns Cliff.

21. Parasmilia danica, n. sp.

Table IV. Figs. 17—18.

Only a single defective specimen of this species exists. The coral is 22 mm in length with a diameter of 16 mm at the edge of the calyx. It is obovate-conical with a straight axis. It seems to have adhered directly without any actual basic disc.

The theca is thin, without epithecum. Costae are wanting. The calyx is shallow, shows at the edge 48 septa, that is 5 ordines in 4 cycles. Of these the 3 first ordines connect with the large central columella which seems to be fasciculate, while the septa of the 2 last ordines are but slightly developed. The upper edge of the septa protrudes beyond the edge of the calyx. The lateral surfaces of the septa are covered with many rows of well-developed granulations.

Locality: Danien: Younger Danien. Bryozoa chalk at Faxe.

22. Parasmilia Lindströmi, Hennig.

Parasmilia Lindströmi. 1899. Hennig. Faunan i Skånes yngre Krita. III. Korallerne. Bihang til K. Sv. Vet. Akad. Handlingar. Band 24. Afd. IV. Nr. 8. S. 15. pl. 2. Figs. 18—33.

This species is included because HENNIG states that it is also found at Faxe. However, I have not been able to identify it with any form known in the Danish Danien. As I have been unable to obtain specimens from Sweden for comparison I have nothing to add to HENNIG's description.

Locality: Danien. Younger Danien. Limhamn. Faxe.

23. **Parasmilia Scanica,** Hennig.

Parasmilia scanica. 1899. Hennig. Faunan i Skånes yngre Krita. III. Korallerne. Bihang till K. Sv. Vet. Akad. Handl. Bd. 24. Afd. IV. No. 8. S. 20. Pl. 2. Figs. 34—36.

I have been unable to find any specimens of this species in the Danish deposits, nor have I been able to see any of the Swedish specimens.

Locality: Danien. Younger Danien. Limhamn.

24. **Flabellum calcitrapa,** v. Koenen.

Trochocyathus calcitrapa. 1885. v. Koenen. Ueber eine paleocäne Fauna von Kopenhagen. Göttingen. S. 105. Table V. Figs. 9 a—i.

As the now very complete and well-preserved material at hand permits us to see that no pali exist and that the theca is covered by the epithecum which forms slightly curving elongations of the longitudinal axis of the coral, the coral being bent, no doubt exists but that the species in question is a Flabellum and not a Trochocyathus. Nothing further is to be added to v. Koenen's description.

Locality: Danien. Younger Danien. Saltholm. Greensand: Vestre Gasværk and Southern Harbor, Copenhagen.

25. **Smilotrochus faxöensis,** Forchhammer and Steenstrup.

Table III. Fig. 1, 1 a. Table IV. Figs. 19—22.

The species belongs to those more commonly found in the coral chalk at Faxe.

It attains quite a considerable size, up to 30 mm in length, with an average diameter at the edge of the calyx of about 15 mm.

It is obovate-conical in form, increasing quickly in breadth, with, as a rule, a strongly bent axis.

The theca is quite thin with no epithecum of importance. The costa are but slightly conspicuous, however, opposite the 12 first septa they are plainly visible. The outer surface is covered with numerous fine granulations irregularly scattered over the entire surface. No basic extension was found and no stem.

There are 36—48 septa, 3 complete cycles and 1 incomplete one in ordines 1—4. The septal edge protrudes slightly from the edge of the calyx, then, forming a curve, goes back into the calyx. The edge is entire. There is no columella, but deep down in the coral the free septal

edges grow thicker and unite without, however, forming a central growth deserving of the name columella.

As a rule the 6 primary septa are found to be the best developed, but the 6 of the secondary order are often just as large and can not be distinguished from those of the primary. The remaining septa are small and undeveloped, projecting but slightly from the edge of the calyx.

The lateral surfaces of the septa are covered with numerous granulations arranged in the usual curved rows. Toward the inner edge of each septum the granulations are larger and those from adjacent septa may touch each other without merging. No dissepiments or other endothecal formations are seen. The interseptal compartments are always open in their entirety.

The stone kernel is very often seen and, on account of the absence of columella, solid and lasting. It is easily recognized by the 48 septal impressions of which every second one penetrates deep into the stone kernel while the alternating one is but slight (table IV, fig. 24).

Locality: Danien: Younger Danien: Coral chalk at Faxe. Limhamn and Aggersborggaard.

26. **Rhizotrochus crassus,** Forchhammer and Steenstrup

Table III. Fig. 4. Table IV. Fig. 25.

In the Zoological Museum is a stone kernel with corresponding impressions from the coral chalk at Faxe, which is a great rarity; nothing similar to it is to be found in the collection.

As there is only the single specimen, further investigations by means of cutting and polishing were impossible.

The stone kernel is 30 mm in length with a diameter at the edge of the calyx of 18 mm.

It is obovate-conical in form and regular, though the lower part of the axis is slightly bent.

The stone kernel shows traces of about 60 septa, — 4 complete cycles and the fifth incomplete (6 ordines). The impressions left on the stone kernel by the interseptal compartments show the same grouping in 4's with deep furrows between as in the species Ceratotrochus ambiguus. There were 12—16 larger septa, the others being small. The lateral surfaces of the septa were strongly granular like the inner side of the theca. The interseptal fillings have therefore a strange prickly appearance characteristic of the species and plainly visible. Table III, fig. 4.

The impression of the coral in the chalk shows that it has possessed a thick, smooth epithecum, forming toward the bottom a large basic disc. The upper part of the epithecum was smooth, the lower part and the basic disc, granular. Table IV, fig. 25.

There were no dissepiments, and as judging from the lowest section of the stone-kernel there was no columella, it seems justifiable to me to classify the specimen as Rhizotrochus species.

Locality: Danien: Younger Danien. Coral chalk, Faxe.

27. Amfihelia, Becki, n. sp.

Table IV. Figs. 26—32.

Oculina 1867. Johnstrup: Om Faxekalken ved Annetorp i Skaane. Oversigt o. d. K. D. Vid. Selsk. Forhandl. f. 1866. S. 9.

Oculina sp. 1888. Lundgreen: List of the fossil faunas of Sweden. III. Mesozoic, p. 7.

In Hennig's[1]) revision of the corals in the Danien deposits in Skaane in which he likewise mentions the forms from Faxe, we read in his introduction: "By *Oculina* sp. was meant a *Lobopsammia* or *Dendrophyllia* species which a secondary deposit of lime has given small calyx-like protuberances scattered over the stem."

In this Hennig was mistaken. In the material from the Mineralogical Museum in Copenhagen examined by Hennig there is a very easily recognized and characteristic coral form, which for many years has borne the label, "Oculina." However, after an examination was made of the recently acquired and well-preserved material (Ravn's Naese) we find that it is rightly determined only in so far as it belongs to the species, Amfihelia, closely related to Oculina. In honor of the man who more than half a century ago studied these corals, and in many instances in spite of the insufficient material then at hand had the correct conception of them, I am giving this form his name and calling it *Amfihelia Becki*.

The coral forms ramifying colonies of considerable extension. The stems do not increase particularly in size, older and younger stems being of practically the same size. Ramification occurs by gemmation, a new individual growing out from the edge of the calyx of the terminal individual. This new individual grows a little in length and under the edge of its calyx another new individual in turn grows forth. Irregularities sometimes occur, 2 or 3 individuals growing out of one calyx edge. Where two branches are contiguous, they continue to grow close together, forming a kind of net-work.

The calyx is not deep. The theca is solid, thickly coated with a granulated epithecum. The costae protrude but slightly like rows of prickles.

The septa hardly extend beyond the edge of the calyx; in the upper parts of the calyx they protrude but slightly beyond the theca; at the bottom of the calyx they touch the rather conspicuous, fasciculate columella. In certain of the calyces there appear to be formations at the inner end of the septa which seem to indicate pali. The septal edge is whole.

The septa are almost constantly present to the number of 27 (3 cycles, 3 ordines), of which the 2 first ordines reach the center, while the septa of the third ordo have, as a rule, no connection with the columella. A lengthwise cut through the stems shows that close under the calyx very compact endothecal formations are found which make the stems massive like those in other Oculina forms.

Locality: Danien: Younger Danien. Coral chalk, Faxe, Limhamn.

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[1]) A. Hennig: Faunan i Skånes yngre Krita. III. Korallerne. Anhang till K. Sv. Vet. Akad. Handlingar. Bd. 24. Afd. IV. No. 8. 1899. S. 5.

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The originals belong to the Mineralogical Museum of the University of Copenhagen.

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The originals of Nos. 16—18, 21 and 26 belong to the Zoological Museum of the University of Copenhagen, the remainder to the Mineralogical Museum.

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Fig. 8 a. has been used by Puggaard as Fig. 9 in his Geology of Møen, p. 66.

Under the original tables is written: Monomyces Ehrb.

1. M. faxøensis n.
2—3. M. brevis. n.
4. M. crassus n.
5. M. elongatus Schloth.
6. M. ambiguus.
7. M. pusillus.
8. M. excavata v. Hagen.

All the originals belong to the Zoological Museum of the University of Copenhagen.

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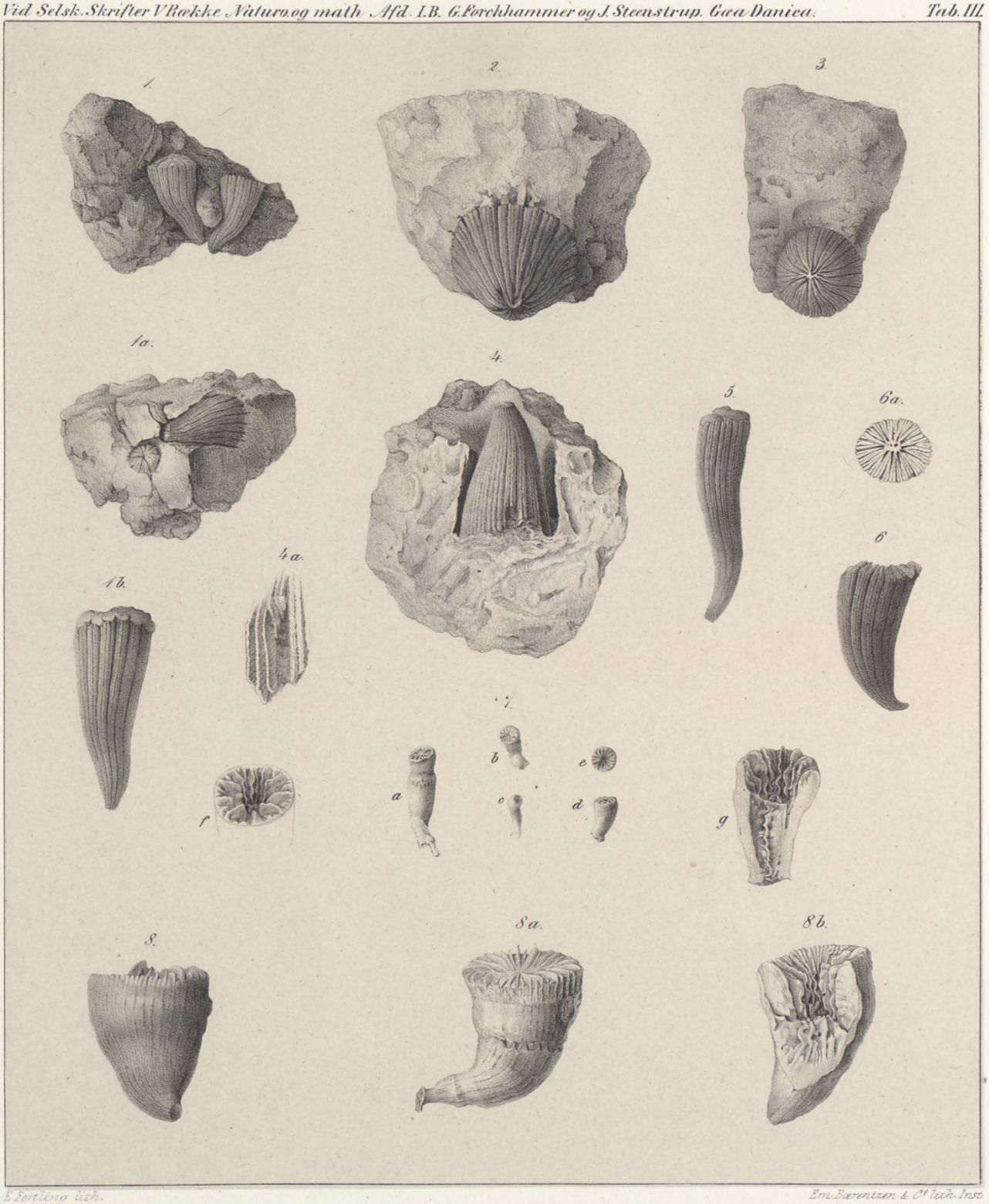
The originals of Nos. 1—2, 3, 4, 25 belong to the Zoological Museum of the University of Copenhagen, the others to the Mineralogical Museum.

St. Hentze del.

Fototypi. Pacht & Crones Eftf.

St. Hentze del.

Fototypi. Pacht & Crones Eftf.



E. Fortling lith. Em. Bærentzen & Co. Lith. Inst.

Monomyces Ehrb.?

1. M. faxöensis. n.
2-3. M. brevis. n.
4. M. crassus. n.
5. M. elongatus. Schloth.
6. M. ambiguus. n
7. M. pusillus. n.
8. M. excavatus. v. Hagen.

St. Hentze del.

Fototypi. Pacht & Crones Eftf.