SVERIGES GEOLOGISKA UNDERSÖKNING

SER. C AVHANDLINGAR OCH UPPSATSER N:O 571

ÅRSBOK 54 (1960) N:o 2

ON TYLOCIDARIS SPECIES (ECHINOIDEA) AND THE STRATIGRAPHY OF THE DANIAN OF SWEDEN

WITH A BIBLIOGRAPHY OF THE DANIAN AND THE PALEOCENE

BY

FRITZ BROTZEN

WITH THREE PLATES

Pris 7 kronor

STOCKHOLM 1959

Sveriges Geologiska Undersöknings senast utkomna publikationer:

Geological survey of Sweden. Recent publications

Ser. Aa. Geologiska kartblad i skalan 1:50 000 med beskrivningar

Geological maps, scale 1:50000 with explanation

Priset för karta i Ser. Aa med beskrivning är 10:— kr, för karta enbart 8:— kr.
(Price: map sheet + descriptive text Sw. cr. 10:—, map sheet Sw. cr. 8:—)

N:o 197 *Laholm* av W. Larsson och C. Caldenius { Beskr. under utarbetande. / Expl. in preparation.
» 198 *Halmstad* av W. Larsson och C. Caldenius » » »
» 199 *Uppsala* av P. H. Lundegårdh och G. Lundqvist. With English summaries. 1956

Ser. Ad. Agrogeologiska kartblad i skalan 1:20 000 med beskrivningar

Agrogeological maps, scale 1:20000 with explanation

Priset för karta i Ser. Ad med beskrivning är 8:— kr, för karta enbart 6:— kr.
(Price: map sheet + descriptive text Sw. cr. 8:—, map sheet Sw. cr. 6:—)

N:o 1 *Hardeberga* av G. Ekström. 1947, karta med beskrivning
» 2 *Lund* » » 1953, » » »
» 3 *Revinge* » » » t. v. utan beskrivning
» 4 *Löberöd* » » » t. v. » »
» 5 *Örtofta* » » » t. v. » »
» 6 *Kävlinge* » » 1955 t. v. » »
» 7 *Teckomatorp* » » 1955 t. v. » »
» 8 *Trollenäs* » » 1955 t. v. » »
» 9 *Bosjökloster* » » 1956 t. v. » »

} Explanation in preparation

Ser. C. *Årsbok 51 (1957)*

N:o 550 Lundqvist, J., Övre Klarälvsdalens kvartärgeologi. Summary: Quaternary geology of the Upper Klarälven valley, Värmland. Med 3 planscher. 1957 5,00
» 551 Lundqvist, J., Geokronologiska undersökningar i Värmland. Summary: Geochronological researches in Värmland, Western Sweden. Med en plansch. 1957 2,50
» 552 Sund, R. B., Nyare undersökningar inom nordöstra Upplands berggrund. Engl. abstract: New investigations in the Archaean of North- Eastern Uppland. Med en plansch. 1957 3,00
» 553 Lundegårdh, P. H., Göteborgstraktens berggrund. Med en plansch. Summary: Petrology of the Göteborg (Gothenburg) — Kungälv region, Western Sweden. 1958 7,50
» 554 Lundqvist, J., C 14-dateringar av rekurrensytor i Värmland. Summary: C14-determinations of recurrence surfaces in Vermland, Western Sweden. 1957 2,00
» 555 Åhman, E., Degerberget, Baggen och Kluntarna. Några drag ur Piteområdets berggrundsgeologi. With English abstract. [Some features of the petrology of Pite region] 1957. 2,50
» 556 Assarsson, G., Kristallisationserscheinungen und Paragenese in den Systemen der Alkalichloride — Erdalkalichloride — Wasser. With Engl. abstract. 1957 2,00
» 557 Lundqvist, G., C 14-analyser i svensk kvartärgeologi 1955 — 57. With English summary. [C14-analyses in Swedish Quaternary geology.] 1957 . 2,00

Forts. å omslagets 3:de sida

SVERIGES GEOLOGISKA UNDERSÖKNING

SER. C AVHANDLINGAR OCH UPPSATSER N:o 571

ÅRSBOK 54 (1960) N:o 2

ON TYLOCIDARIS SPECIES (ECHINOIDEA) AND THE STRATIGRAPHY OF THE DANIAN OF SWEDEN

WITH A BIBLIOGRAPHY OF THE DANIAN AND THE PALEOCENE

BY

FRITZ BROTZEN

WITH THREE PLATES

STOCKHOLM 1959

CONTENTS

Introduction

The Danian was distinguished by Desor in 1846 and ranged as the youngest stage of the Cretaceous. In 1897 Grossouvre discussed the boundary between Cretaceous and Tertiary. He concluded that the Danian must belong to the Tertiary, and this problem of the Danian stratigraphical range is still as important today. But hitherto it seems difficult to draw far-reaching conclusions or make mondial correlations on the basis of present paleontological and stratigraphical knowledge. It now seems more necessary than it formerly appeared to collect detailed material, both paleontological and stratigraphical in the "type region". (According to Troelsen 1956 the "type region" is the province or region, from which the stratigraphical unit was originally described. Often the type locality is not clearly defined, but in the "type region" the unit should be well exposed and the rocks have characters resembling the original definition.)

According to the original introduction of the stage "Danian" by Desor, both Faxe and Stevns Klint in Denmark are "type localities". The type region will include all Danian occurrences around Stevns Klint and Faxe in such extension as the facies has the same characters. Thus, the Swedish side of the Öresund, which is the boundary between Denmark and Sweden, can also be considered to belong to the "type region" (see discussion on the range of the Danian at the XXth Geological Congress 1956 in Mexico and the figure 1).

An enlargement for the quarry of Limhamn near Malmö, southern Sweden

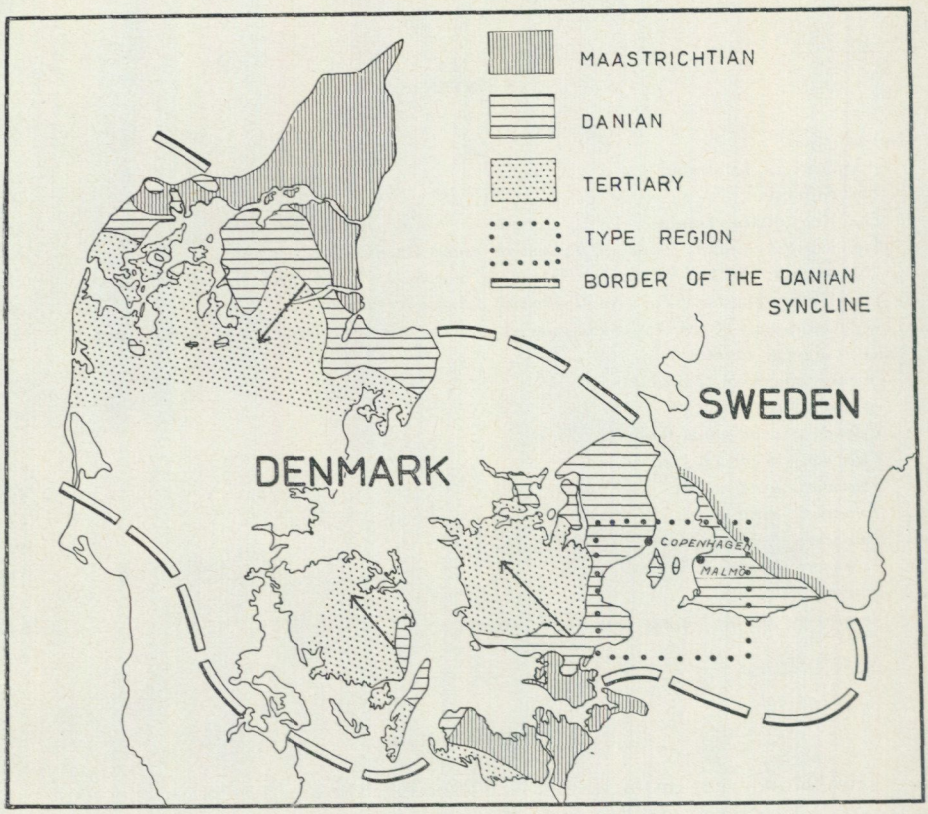


Fig. 1. Distribution of the Danian in Denmark and Sweden.

(see fig. 2), has allowed very detailed stratigraphical and paleontological studies. This research was made possible by the kind permission of Skånska Cement AB, who supported the author in many ways during the work in their quarry. Therefore I wish to express here my sincere thanks to disponent G. Laurell, ing. R. Troell and ing. T. Andersson, all of the Skånska Cement AB Limhamn.

Mrs. P. Brotzen has kindly assisted the author with the compilation of bibliography for which I wish to express my sincere thanks. Miss M. Kendall, Oxford has corrected the English of the manuscript and for her intensive and careful work I thank her most heartily.

Ödum in 1926 erected a fundamental stratigraphy for the Danish Danian, based on different zone fossils, mainly on different varieties of the echinid Tylocidaris vexillifera Schlüter. Spines of this *Tylocidaris* occur fairly abundantly in the majority of localities of the Danian and in 1909 Brünnich-Nielsen had already noted the possibility of using their variations for stratigraphical purposes. But Ödum was the first to describe the different shapes of the spines and to name them as varieties, as follows:

Fig. 2. The situation of the quarries at Limhamn and Klagshamn. (Godkänd för spridning den 21/9 1959 av Rikets allmänna kartverk).

Seelandian

Younger Danian: *Tylocidaris vexillifera* forma β

Older Danian: *Tylocidaris* forma α and γ

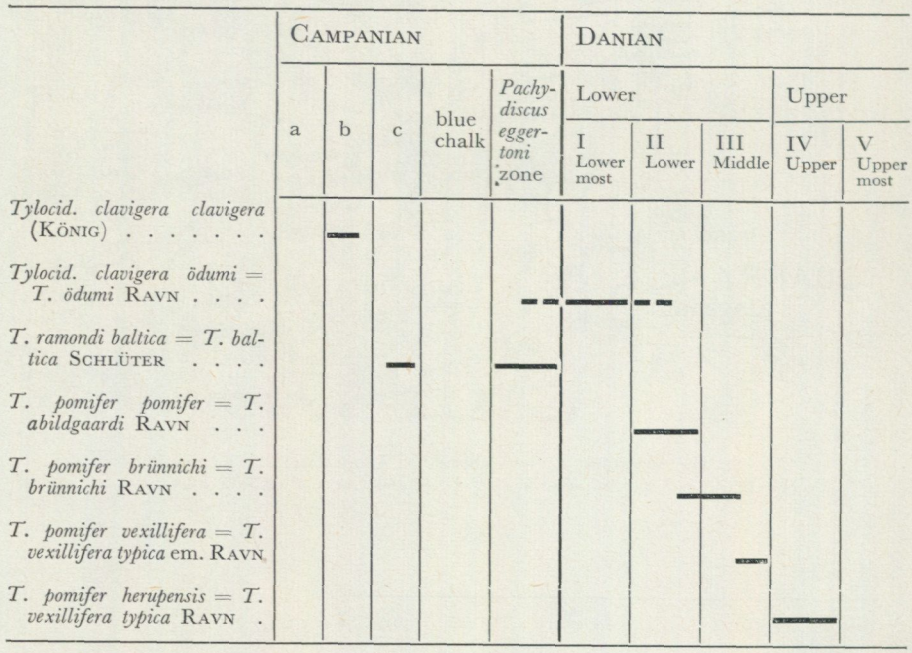
Senonian

Ravn (1937) completed the description of these varieties of *Tylocidaris vexillifera* and distinguished *Tylocidaris vexillifera* Schlüter forma typica; var. *brünnichi;* and var. *abildgaardi*. According to Ravn *Tylocidaris vexillifera* forma *typica* and var. *brünnichi* belong to the forma β Ödum; var. *abildgaardi*

= forma α and γ Ödum. Brünnich-Nielsen gave a stratigraphy of the Danian at a meeting of the Danish Geological Society in November 1936, but it was first printed in January 1938. The Brünnich-Nielsen zonation was also based on variations of *Tylocidaris vexillifera,* but he considered the former varieties as new species. He gave following succession of zones:

Upper Danian	4)	*Tylocidaris vexillifera* Schlüter, rev. Ravn
	3)	» *brünnichi* Ravn
Lower Danian	2)	» *abildgaardi* Ravn
	1)	» *ödumi* Brünnich-Nielsen = forma γ Ödum

This stratigraphical distribution of the *Tylocidaris* species was also used by Rosenkrantz (1937). Wind in 1954 attempted a paleontological and stratigraphical revision of the *Tylocidaris* spines of the Senonian and Danian, introducing a new nomenclature and a new zonation. His results can be summarized as follows:



The entire section of the Danian could not be observed at any locality. The different authors built up the succession of zones on several outcrops. However, for several years (since 1956) the Danian has been exposed in the quarry at Limhamn, from its base upon the uppermost Stevnsian to the lower part of the Upper Danian. Thus it has been possible to collect the different "species" of *Tylocidaris* spines at a single outcrop and to control there the succession of zones and their facies.

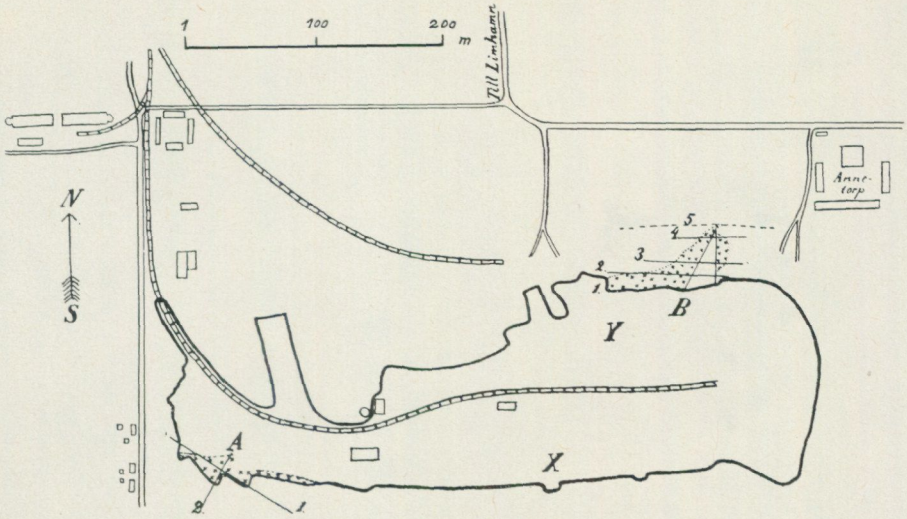


Fig. 3. The Limhamn quarry according to HENNIG 1899.

The Quarry at Limhamn

The occurrence of limestone south of Malmö was noted by Linné in 1750 and later dated by Hisinger (1828), Lundgren (1865), Johnstrup (1866), Fischer-Benzon (1867), Hébert (1869), Dames (1881), Hébert (1882), Lundgren (1888), Jönsson (1884), Moberg (1884, 1885, 1888). In 1899 Hennig published a monography of the Danian at Limhamn[1] with a map of the quarry and 9 profiles. His map shows that this old quarry was situated more or less in the middle of the present quarry. The depth was about five meters. This quarry was called Annetorp Quarry in contrast to the small outcrops and pits to the north and west, which were collectively called the Limhamn Limestones.

All noted old outcrops near Malmö are at present covered by buildings or are filled up. Only the quarry at Annetorp has been developed so that it now extends over an area of about a half km^2 (500 000 m^2) with one axis of about 1 km in an east-west direction, the other of more than 600 m in a north-south direction. The name Annetorp[2] Quarry is no longer used, instead it is called "Skånska Cement's Kalkbrott" or "Kalkbrottet vid Limhamn" (The Limestone Quarry at Limhamn). It is situated to the west, on the highway from Limhamn to Klagshamn, 2 km south of the port of Limhamn, or about 6 km south of the central station of Malmö. During the years 1910—1927 there existed another quarry about 500 m north of the present one, and this also was called Limhamn Quarry. It was filled in with earth and is now used as playing field at Limhamn. Fossils may be found which were labelled and

[1] Limhamn was formerly a village. Now it is incorporated as a suburb of Malmö.
[2] Annetorp is an old name of a former estate; some estate houses north of the present quarry have preserved the name.

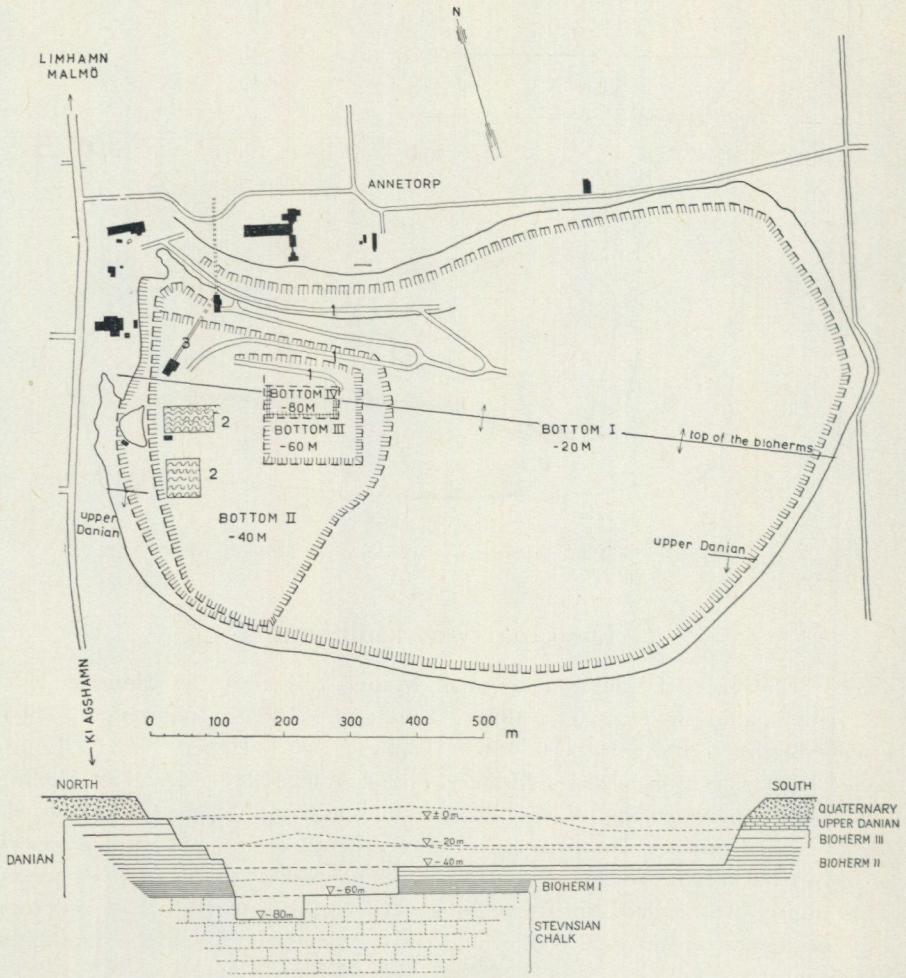


Fig. 4. Map and section of the Limhamn Quarry 1958.

described "from Limhamn" before 1930, and which came from some of the small, old outcrops west or north of the recent quarry; consequently, all fossils from the region of the recent quarry were before 1930 labelled "Annetorp". A detailed section of the quarry, and its correlation with other Danian occurrences had already been given in the author's publication: Flintrännans och Trindelrännans geologi, with summary in German, in 1940.

In 1954 the quarry was deepened, so that its present floor lies about 80 meters below the soil surface. The old floor at —20 m is scheduled to be dug in three deeper steps of —40 m, —60 m and —80 m. The main working wall should go more or less from north to south, and the quarrying will be carried out from west to east until the entire old quarry floor is broken up. The quantity of limestone which will be usable according to this schedule will

be about 30 million m³. At present, work is being carried out on the floor at —40 m across the entire breadth of the quarry, the next, at —60 m is in course of development, with an east wall and a south wall, while the fourth, at —80 m is like the foregoing, but much smaller (see fig. 4, 5 and pl. 3).

In 1956 the floor at —60 m was reached, and there the base of the Danian was visible. Since 1956 the underlying stage has been exposed. At present, the following section can be studied in the quarry:

Quaternary	1—15 m
Upper Danian	12—20 m
Middle Danian	40—50 m
Lower Danian	8—12 m
Stevnsian	20 m

The Stevnsian

The term Stevnsian was introduced by the author in 1945 for the upper part of the Maastrichtian in the Danish-Swedish syncline. Its lower part was called Moenian.[3]

The Maastrichtian at Maastricht in Holland is formed as local facies but the guide fossils of the type-locality characterize this stage clearly. The guide ammonites is *Scaphites (Hoploscaphites) constrictus Sow. s. str.*, which also occurs both in the Moenian and Stevnsian of the Danish and Swedish syncline. It may even be that other fossils restricted to the type Maastrichtian occur in the Baltic region. Thus, there seems to be no doubt that the Moenian and Stevnsian can be correlated with the Maastrichtian of Maastricht but only in sensu lato. The great difference in thickness of the sediment and especially the differences in the facies of Maastricht and Scandinavia hinder a detailed correlation of both sections. (Note that at Höllviken the Maastrichtian with its typical fossils reaches a thickness of 530 m. Brotzen 1945.) The terms Upper, Middle and Lower Maastrichtian are used in different regions as local ones with very different stratigraphical value. In the type region it is not

[3] In 1945 the author derived he terms from the Danish localities Stevns- and Moens Klint, where the characteristic formations are exposed, and named the two substages Moenian (Möenien) and Stevnsian (Stevnsien). Ödum in 1953 criticized in an exhaustive note these terms from the linguistic point of view. He wanted a latinization of Mön (not Möen) and Stevns as Meonium or Meonian and Stefnium or Stefnian. Using this "modern" Latin nobody, including Danish geologists and paleontologists will recognize the very well-known Danish type-localities. The method of deriving stratigraphical names from the original national names of the localities is very common. In this particular case it seems unhappy to introduce the name Stefnian, which resembles "Stephanian" from the upper part of the Upper Carboniferous too closely.

The Danish name of the island of Mön until the year 1920 was spelled Möen, according to maps of Denmark; at least in 1917 in Priors Lomme Atlas över Danmark 10de Udgave, København 1917 — therefore Möenian and not Mönian. A correct decision concerning the spelling of Stevnsian or Stevnian is very problematical. Stevns can be genitive and would be derived from Stevn. In the type-region, only the genitive occurs as "the Peninsula of Stevns Klint" and "Stevns fyr". A locality Stevn is situated in the northern part of Denmark, where no Stevnsian occurs. Therefore the substage should be named Stevnsian and not Stevnian or Stefnian.

Fig. 5. View of Limhamn Quarry seen from West to East (see also pl. 1).
A = — 20 m floor. B = — 40 m floor. C = — 60 m floor. The arrow = the road to the — 80 m floor.

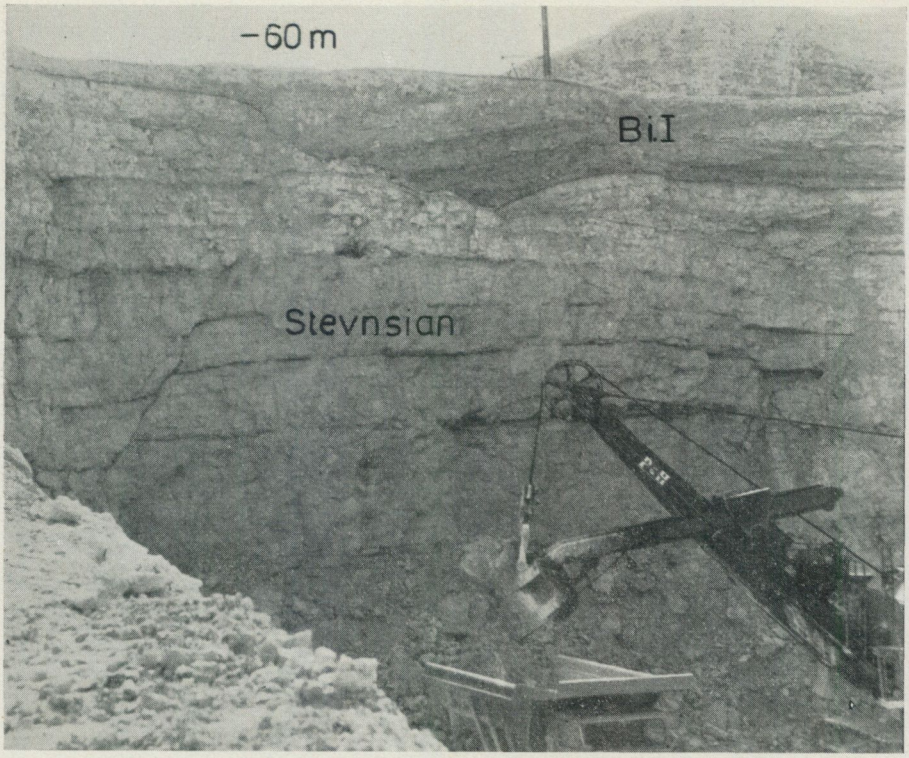


Fig. 6. Stevnsian and the base of the Danian (Bi I). Limhamn Quarry, wall on the east-side below the floor -60 m.

The boundary Stevnsian Danian is here irregular with preformed corrosion holes. At the left side of the figure a fault is shown in the Stevnsian not continuing into the Danian.

possible to distinguish between an Upper, Middle or Lower Maastrichtian. Discussion of a zonation of the Maastrichtian based on belemnite species seems hitherto to have resulted in correlations between regions with Stevnsian and Moenian facies, but not definitely in correlations with the type region (see Jeletzky, Birkelund, Naidin). The differences between the stratigraphical ranges of the chalk at Moen and Stevns had already been noted by Richter in 1935. In 1937 Troelsen gave a zonation of the Danish chalk with *Scaphites constrictus,* in which the layers of Moen lie at the base and the chalk of Stevns at the top of his section. The Moenian and Stevnsian substages in the Baltic region are well distinguished from each other by their fossils. To the Moenian are restricted the foraminifera: *Reussella pseudospinulosa* Troels., *Gavelinella costata* Brotzen, *Pseudovalvulineria gracilis* (Marsson), *Pulvinulinella alata* (Marsson), *Bolivinoides miliaris* Hiltermann, *Bolivinoides laevigata* Marie, *Bolivinoides delicatula* Cushman. Restricted to the Stevnsian are: *Bolivinoides peterssoni* Brotzen *s. str., Bolivinoides doreeni* Fin., *Dorothia bulletta (Cars.) Pseudouvigerina cimbrica* (Troels.), *Pseudouvigerina rugosa* Brotz., *Eponides frankei* Brotz.

According to Birkelund 1957 *Belemnella lanceolata* s. str. and its variations and *Belemnella occidentalis* and its variations are restricted to the Moenian, *Belemnella casimirovensis* and mainly *Belemnitella junior* are characteristical for the Stevnsian. The problem of the limitation of the two substages is not solved. The type localities Moens Klint and Stevns Klint show only parts of the entire section. But the outcrops are in facies and fauna characteristic of the stages. In the complete section of the well at Höllviken the Stevnsian will reach from — 48 m to — 300 m, so long as *Bolivinita peterssoni* is observed, the Moenian occurs from —300 m to —595 m.

The chalk exposed in the quarry at Limhamn contains the typical foraminiferal fauna of the Stevnsian, and in all layers including the uppermost, *Scaphites constrictus* occurs. Except for microfossils, other fossils are fairly rare. The author found: *Baculites* sp. very badly preserved, *Tylocidaris baltica* (on the top the Stevnsian), *Echinocorys ovata* rare, *Pecten* sp. — The chalk is fairly hard, its layer 0,75—2,00 m thick, and intercalated by grey clayish layers of 0,10—0,30 m thickness. Flint nodules are here and there of the characteristic black colour, which are known in Sweden as "the Upper Senonian flints". But many of them are grey, or generally grey with an irregularly black centre. The petrographical character of the chalk differs from that at the type locality, Stevns Klint in Denmark, where bedding is indistinct. The chalk occurrences east of Malmö, near Tullstorp and Husie belonging to a deeper part of the Stevnsian, likewise do not show this characteristic bedding. Otherwise the same bedding was observed in cores from deep drillings south of Malmö between Skanör and Östratorp (see Brotzen 1945 and 1950).

It may be that the bedding disappeared when the chalk was exposed for a long time, (during the entire Quaternary) as at Stevns Klint or east of Malmö. In such regions as at Limhamn or on the coast of South Western Scania (between Skanör, Trelleborg, Östratorp) the Stevnsian chalk is covered at least by 20 metres of limestones of the Danian and there its primary structure is best preserved. There are even certain local differences in facies in the uppermost Stevnsian. Near Trelleborg it contains fewer flint nodules and the chalk is whiter than at Skanör or Limhamn. *Pseudotextularia elegans* Rz. characterizes the upper 12 m and demonstrates that at Limhamn too this subzone is the uppermost in the Stevnsian as Troelsen (1937) and Brotzen (1938 and 1945) noted in other places in Denmark and Sweden. The deepest exposed beds contain numerous specimens of *Pseudouvigerina rugosa* Brotzen. Therefore the entire section belongs to the zone of *Pseudouvigerina rugosa*. A short list of foraminifer species of the chalk is given in the table p. 13. The number of species is very large, but during recent years foraminifer species from the uppermost Cretaceous have often been incorrectly determined, and it would be useless to give here a long list of foraminifera which would merely add to the existing confusion. The list therefore contains only names according to their original determination.

Table 1. Foraminifera from the junction between the Stevnsian and Danian in the quarry at Limhamn

	Stevnsian					Danian			
	5	4	3	2	1	4	3	2	1
Ammodiscus cf. *cretaceus* (REUSS)							×		
Orbignyna ovata (HAG)	×	×	×	×					
Spiroplectammina semicomplanata (CARS)	×	×	×	×	×				
» *cretosa* CUSHM.	×	×			×				
» *flexuosa* (REUSS)	×	×	×						
» sp. (aff. *mexiaensis* LAL)							×	×	
Verneuilina limbata CUSH.	×							×	×
» sp. 1	×								
Eggerella procera n. sp.[1]	×								
» *tribullata* (v. HG)	×	×	×						
Messina trochoides (REUSS)[1]	×			×					
Gaudryina aff. *rugosa* (D'ORB)	×	×	×	×					
» *danica* n. sp.							×	×	
Heterostomella stephensoni CUSH.		×							
Tritaxia sp.	×								
Dorothia bulletta (CARS.)	×		×	×					
» *irregularis* (MARSSON)		×	×	×					
Marssonella turris (D'ORB)	×	×	×	×	×				×
Plectina solida n. sp.[1]	×	×	×	×	×				
» *clava* MARSSON	×	×		×					
» *ruthenica* (REUSS)	×	×							
Arenobulmina obliqua (D'ORB)	×	×	×	×					
» *conica* MARIE	×			×					
» *sphaerica* MARIE	×	×		×					
» *obesa* (REUSS)	×	×	×						
Ataxogyroidina variabilis (D'ORB)	×	×	×						
» *globosa* (v. HG)	×	×	×	×	×				
Lagena simplex (REUSS)	×						×		×
» *apiculata* (REUSS)	×				×				×
» *amphora—cylindrica* MARIE	×		×	×					×
» *gradata* n. sp.[1]	×	×	×		×		×		
» *sulcatiformis* POZ + URB.	×							×	
» *isabella* (D'ORB)	×			×	×				×
» *hispida* REUSS		×							
Dentalina gracilis D'ORB	×	×	×	×					
» *catenula* (REUSS)	×	×			×				
» *sulcata* NILSSON			×				×	×	×
» sp. sp.									
Nodosaria velascoensis CUSH.	×								
» *affinis* REUSS	×								
Svenia megalopolitana (REUSS)	×								
Planularia sp. 1	×								
Saracenaria navicula (D'ORB)	×								
Astacolus sp.	×								
Lenticulina rotulata LAMARCK	×	×	×	×	×	?			
» *comptoni* SOW	×	×	×	×	×				
Robulus discus BROTZ.						×	×	×	×
» *midwayensis* PLUM.						?	×	×	×
» sp.									×
Neoflabellina reticulata (REUSS)	×	×							
Palmula robusta BROTZ.							×		
Frondicularia linearis FRANKE	×								
» *biformis* MARSSON	×		×	×	×		?	×	×
» *affinis* MARSSON			×						
Globulina lacrima REUSS	×		×			×	×	×	
» cf. *gibba* D'ORB				×	×	×	×	×	
Guttulina trigonuloides n. sp.[1]	×	×		×	×		×		×

	Stevnsian					Danian			
	5	4	3	2	1	4	3	2	1
Guttulina sp. 1	×	×							
» sp. 2	×								
» aff. *problema* D'ORB	×	×	×	×	×				
» aff. *spicaeformis* ROEM.							×	×	
» aff. *hantkeni* CUSH. + OZ.							×		
» sp. 3									×
Sigmoidella cretacea n. sp.[1]	×		×						
» sp. 1		×							
Pyrulina cylindroides (REUSS)	×		×	×					×
Ramulina sp. sp.	×	×						×	
» sp. 1							×		
Polymorphina sp.							×		
Buliminella laevis (BEISSEL)	×	×	×	×	×				
Bulimina pseudoacuta MARIE	×								
» *cacumenata* CUSH. + PARKER			×						×
Bolivinoides reissi n. nom.[1] (= *B. draco—dorreeni* REISS 1954)	×								
Bolivinoides wicheri n. nom. = *B. draco* f. *gigantea* WICH. 1949	×	×							
Bolivinoides peterssoni BROTZ.	×	×	×	×	×		×	×	×
» *paleocenica* BROTZ.									×
Bolivina tegulata (REUSS)	×	×							
» » *incrassata* REUSS	×	×	×	×					
Reussella minuta (MARSSON)	×								
» *curvisuturata* BROTZ.						×	×		
Virgulina n. sp.	×								
Pseudouvigerina rugosa BROTZ.		×	×						
» *cristata* (MARSSON)	×		×	×	×		×		
Gümbelina sp. sp.	×	×	×	×	×				
Pseudotextularia acervulinoides (EGGER)	×	×			×				
Gümbelitria sp.	×								
Nodosarella sp. 1	×	×							
» sp. 2								×	
Ellipsonodosaria plummerae CUSH.	×	×	×	×		×	×		×
» *alexanderi* CUSH. + TODD									×
Cornuspira (?) *serpuloides* (SCHACKO)	×								
» *subornata* (BROTZ.)	×		×	×				×	×
» *recta* (BROTZ.)									×
Spirillina vivipara (EHRENBERG)							×		×
Nonionella cretacea CUSH.				×					
» *robusta* PLUM.	×								
Rosalina sp. 1			×					×	
Conorbina conula BROTZ.								×	×
Discopulvinulina bimkhorsti (REUSS)									×
Pullenia cretacea CUSH.	×	×	×	×	×				
» *reussi* CUSH. + TODD	×	×							
» *marssoni* » »	×					×	×		
» *angusta* » »						×	×		×
» cf. *jarvisi* CUSH.							×	×	×
Valvulineria n. sp. 1	×		×	×	×				
» *laevis* BROTZ.									×
Gyroidinoides pontoni BROTZ.								×	×
» sp. 1	×	×	×	×	×				
» sp. 2 (*G. girardana* CUSH. non REUSS)	×	×	×	×	×			×	×
Anomalinoides preacuta n. sp. 1)		×	×	×	×		×	×	×
» *neutrica* n. sp. 1)	×		×	×					
Gavelinella pertusa (MARSSON)	×	×	×	×	×			×	?
» sp.	×								

	Stevnsian					Danian			
	5	4	3	2	1	4	3	2	1
Stensioina pommerata BROTZ.	×	×	×	×					
Eponides sp. 1	×	×	×	×	×				
» sp. 2	×	×	×		×		×	×	
» sp. 3							×	×	×
» sp. 4							×	×	
» sp. 5								×	
Cibicides beaumontiana (D'ORB)	×	×	×	×	×			×	×
» *bosqueti* (MARSSON)		×	×	×					
» aff. *bosqueti* (MARSSON)								×	×
» *voltziana* (D'ORB)	×	×	×	×	×	×	×	×	×
» *constricta* (v. HAG)	×	×	×	×	×				×
Phanerostomum sp.	×	×	×	×					
» *asperum* EHRB.	×	×	×	×					
Biglobigerinella sp.	×								
Rugoglobigerina cf. *cretacea* (D'ORB)	×	?	?	×					
Globigerina sp.								×	
Globigerina cf. *pseudobulloides* PLUM.								?	×
Globotruncana lapparanti BROTZ.	×								
» cf. *stuarti* (DE LAPP)	×								
» cf. *caliciformis* (DE LAPP)	×								
Lamarckina n. sp.					×				
Alabamina dorsoplana BROTZ.	×	×	×	×	×		×	×	×
Osangularia lens BROTZ.	×	×	×	×	×				×
Pulsiphonina eklundi (BROTZ.)			×				×	×	×
Quadrimorphina sp. 1	×								
» sp. 2	×								

[1] The new and characteristic species and genera will be described and figured in the near future.

The base of the Danian

The junction between the Stevnsian and Danian is distinct with regard to both fauna and facies. This border is well known at Stevns Klint in Denmark where the two stages, the chalk and the Danian were already distinguished by Desor 1848. In 1764 Abildgaard described the Stevns Klint section and in modern times Rosenkrantz in 1937 and 1938 (here also the main references) published the stratigraphy of this classical locality. In Sweden the junction Stevnsian and Danian was not exposed before 1956, but well known from many drill holes (Brotzen 1938, 1940, 1942). At Limhamn it was for the first time possible to study the geology of the base of the Danian exposed in Sweden (see fig. 6). The junction follows more or less the —60 m floor in the quarry and lies more or less in a plane, with a slight dip to the south except for some narrow depressions up to 3 m deep, resembling small valleys. Such a valley reaches into the surface of the chalk (see fig. 5). An undisturbed section between the Stevnsian and the Danian is observed as follows:

	Numbers of samples		Metres
Danian	L. L. 1—DA 1	grey, soft bryozoan limestone with many flint nodules, irregularly embedded. Fossils common: *Brissopneustes danicus* SCHL. *Echinocorys sulcatus* GOLDF. *Tylocidaris ödumi* RAVN » *abildgaardi* RAVN » *windi* n. sp.	0,55
	DA 2	dark grey, soft limestone, finely bedded .	± 0,15
	DA 3	grey clayish chalk with flint nodules . .	0,30
	DA 4	greyish-yellow-white limestone very hard with flint nodules	0,35
Stevnsian	MA 1	chalk moderately hard	0,30
	MA 2	chalk, less hard with flint nodules . . .	0,60
	MA 3	chalk moderately hard with large flint nodules. Large worm-borings	0,30
	MA 4	chalk, soft, with large flint nodules . . .	0,50
	MA 5	chalk, moderately hard, with grey and black flints. *Hoploscaphites constrictus* . .	1,10

The fauna, especially the foraminiferal fauna changes suddenly between the layers DA 4 and MA 1. Even the petrographical character is different. All the chalk, even the hardened layer at the top (MA 1) is microscopically extremely fine grained, with bryozoans not rare, but petrographically they are unimportant. In the layers above MA 1 the bryozoan fragments are dominant. Thin sections show under the microscope that even if the bryozoan fragments are not distinguishable macroscopically, as in the hard bottom layer DA 4 they are dominating. Small depressions and very indistinct boreholes in layer MA 1 are filled with material from the Danian bryozoan limestones. It seems that the hardness of MA 1 is the result of a secondary process connected with interruption in sedimentation, and that even the corrosion of the surface must be caused of this process. It seems that corrosion and corrosion processes continued during the first part of the Danian, and the hard limestone of DA 4 shows the same characters as the layer MA 1. This is quite well illustrated by the 2—3 metre sinkings in the surface of the Stevnsian, where also the bed DA 4 is destroyed and younger sediments belonging to DA 1 fill the depressions (see fig. 5).

The change of foraminiferal fauna is given in table 1. The arenaceous species are dominant in the Stevnsian but rare in the Danian and occur only at its base. The same species of Lagenidae are present throughout the few metres at and below the junction. Buliminidae, Bolivinidae, Gümbelinidae and

related genera are restricted to the Stevnsian. Guttulinae are common both in the uppermost Stevnsian and in the lowermost Danian, but some species are newcomers in the Danian. *Stensiöina pommerana* and *Globotruncana* species are restricted to the layers below the junction.[4] Some new *Discorbis* species occur only in the Danian. *Globigerina* and related species are extremely rare and small in this part of the section. They belong to triloculine types as *G. daubjergensis* Bronnimann and *G. trivialis* Subb., which already begin to occur in the upper part of the Stevnsian.

At 10 m below the junction, and again, at about 3 m above it in the Danian, *Globigerina* species are not so rare as in the region of the junction itself. The average diameter of *Globigerina* in the deeper part of the Stevnsian and the upper part of the Lower Danian is about 0,3 mm. In the Stevnsian *Biglobigerinella* species occur, and in the uppermost part extremely small specimens of triloculine *Globigerinae,* with diameters less than 0,09 mm. In the Danian begin the groups[5] *Globigerina daubjergensis, Globigerina pseudobulloides* and *Globigerina compressa.*

The Lower Danian: Zone of Tylocidaris ödumi Brünnich-Nielsen

In 1938 the author introduced the term Lower Danian for deeper parts of drill-hole sections in Sweden and correlated it with the lower and partly the middle unit of the Danish Danian according to Rosenkrantz 1937. In 1957 Sorgenfrei (Lexique de stratigraphie internat. vol. I, part 2 d.) called the same units number 1, and 2. Wind, 1954 (see p. 6.) named five zones of the Danian. It seems that his zone I and II can be correlated with the author's Lower Danian. According to Rosenkrantz and Sorgenfrei the unit 1 begins with a few centimetres of clay — the "Fish Clay Formation" — and a hard limestone of 0—1 m, the "Cerithium Limestone Formation". Above the "Cerithium Limestone Formation" in unit 2 follow, according to Rosenkrantz the three *Tylocidaris zones: Ty. ödumi, Ty. abildgaardi, Ty. brünnichi;* Sorgenfrei (1957) does not mention these zones. The author's "Lower Danian" was known only from drillholes. It was characterized by its bryozoan limestones and its poor foraminiferal fauna. At Limhamn the lower part of the Danian is limited both petrographically and paleontologically. It begins with the bed

[4] WICHER (1953) and other German stratigraphers could not find *Stensiöina pommerana* in the upper part of the Maastrichtian. They distinguished a zone without *Stensiöina.* Quite apart from the impossibility of using the lack of occurrence of a fossil as a character of a stratigraphical unit, *Stensiöina* occurs throughout the 500 m of the Maastrichtian in Sweden, both in the Moenian and the Stevnsian, including the uppermost beds below the Danian.

HOFKER in 1957 (Foraminif. d. Oberkr.) found that in his Lower and Upper Maastrichtian *Stensiöina altissima* HOFKER occurs, and that *Stensiöina pommerana* disappear already in the Lower Maastrichtian. He noted that *Stensiöina* does not occur in the deep between — 50 to 260 m in the well at Höllviken in Sweden. This is an important mistake, because *St. pommerana* is found rarely in all layers of this depth. On the other hand this species occurs often in this part sparsely. *Stensiöina esnehensis* NAKADY in contrast to HOFKER's opinion 1956 and 1957 was never found in the Maastrichtian in Sweden or Denmark.

[5] It seems that the *Paleocene globigerina* species represent only certain especially local types, which are possibly restricted to stratigraphical units. This is demonstrated by the very variable shape in the figures given by LOEBLICH and collaborators in 1957. Before a revision of these variations is completed, it is practical to name them in a broad sense as "sensu lato" or as groups.

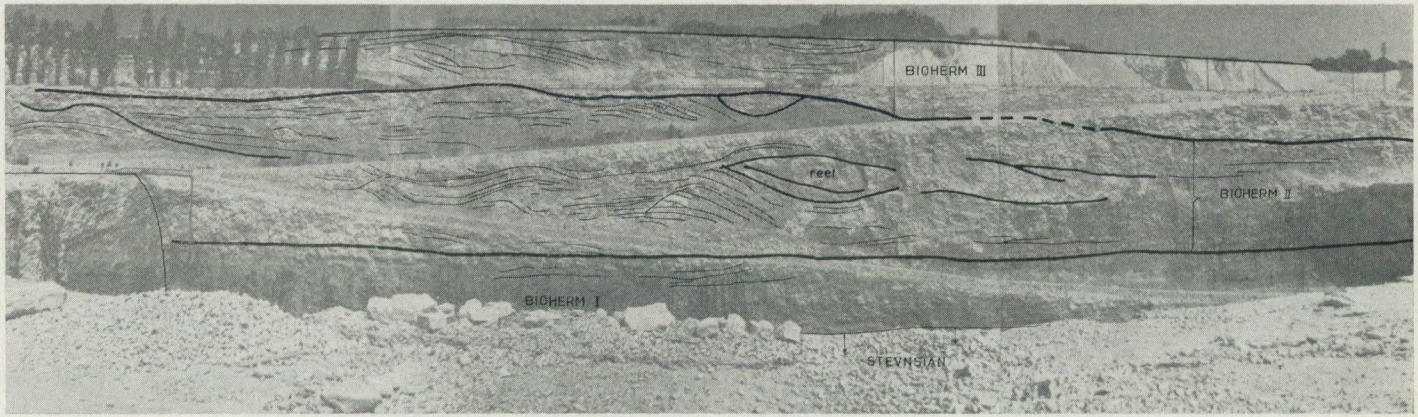


Fig. 7. Limhamn Quarry, wall on the north side of the quarry. Stratigraphical interpretation of plate 3.

DA 4, which may be correlated with the Cerithium Limestone in Denmark. Above this bed follow several limestone layers of which loose bryozoan-fragment limestone beds dominate over the hard layers. Flint nodules occur in all beds. *Tylocidaris ödumi* Brünnich-Nielsen, *Tyl. abildgaardi* Ravn and *Tylocidaris windi* n. sp. are found in these layers — rarely in the hard base, but fairly commonly in the other layers. It is of stratigraphical value that all these three species occur together and are often found only a few centimetres apart.

Hitherto, no secondary fossils from the Stevnsian, including foraminifera and coccoliths, have been found in the lowermost Danian. Other fossils of the Lower Danian have already been named in the foregoing chapter. Apart from the *Tylocidaris* species, *Echinopneustes sulcatus* seems to be restricted to the Lower Danian of Denmark and Sweden as Ravn noted already in 1928. Terebratules, crinoids, asteroids and echinids are not rare.

The characteristic sediments of the Lower and Middle Danian at Limhamn are built in general of bryozoan fragments (see fig. 7 and pl. 3). Abildgaard, in his description of the geology of Stevns Klint, had already figured the undulations of the limestone beds of the Lower Danian, which Rosenkrantz in 1937 interpreted as reef bedding (Rosenkrantz 1937, Brotzen 1938 and 1956; see also Hadding 1941). The expression "reef" for the structures of the Danian is not fully correct, because these elevations of the sea bottom never reached to the surface of the sea. The term bioherm for the reefy mounds in the seas used by Cumings and Shrock (1928) will be more useful than reef. It is planned to give a detailed description of the bioherm structures at Limhamn in another paper. Here only their main characters will be noted. In the Lower Danian at Limhamn, small ridges of limestone begin to develop above the basal bed, lying more or less north-west to south-east. Individual layers increase in thickness towards their centres, and new beds occur on top of such ridges. Cores of ridges may be irregularly bedded, or all bedding may have disappeared, but at the margins of the core bedding is perfectly preserved. The spaces between the ridges are irregularly filled with material removed from the tops of the ridges. Coral limestones are developed on the margins of the bryozoan bioherms (figs. 5, 6, 7, 8 and pl. 3). New ridges begin on the sides of the older generation of ridges. It should be noticed that coral limestones occur only on the flanks of the ridges, thus being comparable with fringing reefs on recent atolls. It seems that each group of bioherms finished with more or less massive limestone beds on their top. These limestones form a final surface on which a new cycle of bioherms begins.

The bioherms of the Lower Danian = zone of *Tylocidaris ödumi* are slightly undulated, and the angles at their margins are of a few degrees (up to 10°). The ridges are flat. Coral limestones (or possibly more correctly, corralline limestones) have not been observed in the Lower Danian.[6]

[6] SORGENFREI (1957) in Lexique Stratigraphique introduced the new term "Corallian limestone" as a "Rock Term" applied as a formation-name, for the lower part of his zone 2. "Corallian" has long been reserved for a stage of the Upper Jurassic containing other rocks besides limestone. Hence, it is confusing to use the term "Corallian Limestone Formation" for a formation in the Danian.

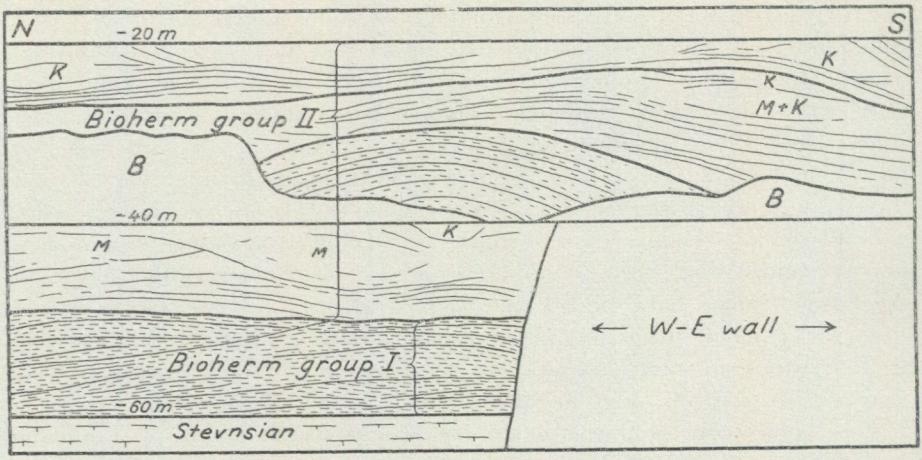


Fig. 8. Limhamn Quarry: East wall between — 20 m and — 70 m. Coral limestones or muddy limestones on the flanks of the bioherms, B = broken material for production, K = coral limestones, M = muddy or compact limestone. Compare fig. 5, p 10.

The compact limestone beds on top of the first series of bioherms cannot be followed over all the exposed part of the quarry, but the new series of bioherms has a character distinctly different from the lower ones. The boundary between the Lower and Middle Danian at Limhamn is therefore very well marked. The thickness of the Lower Danian varies from 8—15 m, and on the average will be about 10 m. At present the Lower Danian is exposed all over the —60 m floor.

Correlations between the section at Limhamn and the profile at Stevns Klint in Denmark are not difficult. Rosenkrantz in 1937 figured and described the details of the sections on this cliff. It seems that the uppermost bed of the Stevnsian has been destroyed by some means and a so-called "grey chalk" (Graakrid) completes the preserved sediments of the chalk. In depressions in its irregular surface lies a greyish chalk with derived fossils from the Stevnsian; this is the so-called "Fish Clay" (fiskler), so named on account of the many teeth and bone-fragments of fishes. According to Rosenkrantz 1932 and 1939 the surface below the "Fish Clay" is often hardened, and "Fish Clay" beds do not occur regularly between the "Grey Chalk" and the following beds. According to Rosenkrantz (1937 and 1939) and Sorgenfrei (1957) the "Fish Clays" are the beginning of the Danian and the hardened beds are the preserved top of the Stevnsian. On top of the "Fish Clay" or sometimes directly on the Stevnsian follows a hard limestone bed called the Cerithium Limestone. This hard limestone contains a fauna of typical Danian character (Rosenkrantz 1939). Its thickness varies from a few centimetres to one metre. About 10—15 m higher up bryozoan limestones have been deposited, described schematically by Rosenkrantz. At its base, Rosenkrantz observed locally an indistinct conglomerate. Thus a correlation between the Danish and Swedish sections should be made as follows:

DENMARK	SWEDEN
deepest beds of bryozoan limestones	deepest beds of bryozoan limestones
local basal conglomerate	not observed
"Cerithium Limestones"	hard basal limestone
„Fish Clay" only locally present	not observed hitherto
Stevnsian	hardened beds of the uppermost chalk

The Middle Danian: Zones of Tylocidaris rosenkrantzi n. sp. and Tylocidaris brünnchi Ravn

On the top of the compact limestones representing the youngest beds of the Lower Danian new groups of bioherms begin. Over this second a third group of bioherms is developed and both together are united as the Middle Danian. The author named Middle Danian different bryozoan and coralline limestones well distinguished by facies and fauna from the Upper Danian limestones (Brotzen 1938 etc.). It was known in Sweden from drill-hole sections as well as from the quarry at Limhamn. Its thickness could locally reach more than 100 m. The new exposure at Limhamn demonstrated that the two groups of bioherms are distinguished by different *Tylocidaris* species. In the lower one occurs *Tylocidaris rosenkrantzi* n. sp. The higher group contains only varieties of spines of *Tylocidaris brünnichi* Ravn.

Both zones are of more or less the same pertrographical character. Rosenkrantz (1937, 1939), Sorgenfrei (1957) take both groups as one unit, "nr 2". It seems that Wind (1954) does not differentiate between these zones (zone III = Middle Danian).

The lower group has a thickness up to 30—35 m and the upper one can reach the same thickness, but is generally less. In both groups the bioherms form a system of high and long ridges, generally extending from the north-west corner of the quarry to its south-east corner. All the ridges are built up of a very variable system of small growth-centres of bryozoan fragment limestone. In some soft limestones beds of flint nodules occur. All the types of bedding described before occur in both zones. Lenses of a hard and dense limestone have grown on the flanks of the ridges, often characterized by corals. But the corals are not the dominant element of these rocks, although they give the rock a specific aspect distinguishing it from the bryozoan limestones. Often the corals are weathered and are therefore preserved only as casts. These coral limestone lenses are not very large. Their diameter may range from 1—20 m and their height from a half to 10 m. Fossils, apart from bryozoans and foraminifera, are not abundant. *Echinocorys sulcatus*, some terebratula species and crinoids are not rare. Also *Gryphea*, group *Gr. vesicularis* can be found in all beds. Gastropods are generally preserved in the coral limestone. By systematic collection of fossils it is possible to get a large number of species from the Middle Danian, especially from the coral limestone. But

in general the picture of the entire fauna of the Middle Danian is uniform, and the state of preservation of the dominant bryozoans is poor. It may be noted that *Crania brattenburgicus* (Schlotheim) already occurs[7] in the lower part of the Middle Danian.

The lower zone is well exposed in the Limhamn quarry in the upper part of the walls over the —60 m floor, and partly over the —40 m floor. The north-south walls show transverse sections through the main ridge and its deposition. Sections in other directions are difficult to understand. In their central cores the limestones are harder than at the margins, and often crudely bedded. Coral limestones occur rarely in the central part but are more common on the sides of the ridges. Towards their margins the ridges become gradually fine-bedded, with intercalated soft and hard limestones and even flint nodules becoming more common at the edges than at the centre.

On the north as well as on the south flanks of the main structure the bedding becomes more regular and horizontal. But on the core margins the dip of the beds may reach an angle of 30°.

The upper group of bioherms is characterized by *Tylocidaris brünnichi* and can be studied over and under the —20 m floor. The boundary between the *T. rosenkrantzi* and *T. brünnichi* zone is not always distinct. There occur often one or several compact limestone beds, similar to those which divide the Lower and Middle Danian bioherms. It seems that at several places these top beds were destroyed before the sedimentation of new bioherms began. The last group of bioherms achieve their greatest thickness over the crest of the lower ridge and reach there a maximum height of about 30 m, easily observed in the north-west corner of the quarry. Transverse sections are exposed on the west and east walls of the quarry over the —20 m floor. Coralline limestone lenses are more common in this group than in the older one. On the margin of the main ridge they occur commonly and are preserved on the northern flank. Quarrying has removed them from the southern side of the main ridge, where they were clearly visible during the time before 1940. At present the southern wall of the quarry is too far from the flank region with coral limestones and therefore they occur rarely in this section. Sections figured by Hennig show their situation on both sides of the main ridge. The fauna seems to be richer in the *Tylocidaris brünnichi* zone than in the older ones. *Terebratula, Gryphea, Dromiopsis* and *Echinoides* occur abundantly. *Galathea* can be found occasionally. *Crania brattenburgicus* occurs throughout the entire zone. *Echinocorys sulcatus* is common, but *Echinocorys obliquus* rare. Crinoids and asteroid plates and parts are not rare. Hägg in 1940 noted from Annetorp and Limhamn:

Pleurotomaria niloticiformis Schlotheim, *Emarginula coralliorum* Lundgren, *Trochus* sp., *Patella* sp., *Eocypraea bullaria* Schlotheim, *Palaeocypraea suecica* Schilder, *Palaeocypraea spirata* Schlotheim, *Polynices* (*Lunatia*) sp., *Crepidula* sp., *Metacerithium selandicum* Lundgren, *Tenagodus ornatus* Lundgren, *Scala* (*Acrilla*) *elegans* Ravn, *Tritonium* (*Sassia*) *faxense*

[7] *Crania brattenburgicus* (Schlot.) generally known as *Crania tuberculatus* Nilsson revised by G. Carlsson 1958.

Ravn, *Tritonium* (*Lampusia?*) *subglabrum* Ravn, *Tudicla* sp., *Siphonalia ravni* n. sp., Hägg, *Scaphella faxensis* Ravn, *Volutomitra quinqueplicata* Ravn, *Admete? biplicata* Ravn, *Clavatula* (*Surcula*) *faxensis* Ravn, *Arca* (*Acar*) *forchhammeri* Lundgren, *Arca* (*Acar*) *tenuidentata* Hennig, *Arca* (*Cucullaea*) *crenulata* Lundgren, *Arca* (*Isoarca*) *obliquedentata* Lundgren, *Glycymeris sublenticularis* Ravn, *Limopsis obesa* Ravn, *Brachyodontes* (*Septifer*) *lineatus* Sow., *Lima* (*Ctenoides*) *holzapfeli* Hennig, *Lima* (*Mantellum*) *densestriata* Hennig, *Pecten* (*Chlamys*) *tesselatus* Hennig, *Pecten* (*Camptonectes*) *monotiformis* Hennig, *Pecten* (*Syncyclonema*) *nilssonia* Goldfuss, *Amussium inversum* Nilsson, *Spondylus danicus* Ravn, *Spondylus dutempleanus* D'Orb., *Spondylus faxensis* Lundgren, *Ostrea canaliculata* Sow., *Ostrea hippopodium* Nilsson, *Ostrea reflexa* Ravn, *Ostrea vesicularis* Lam., *Isocardia faxensis* Lundgren, *Cardium schlotheimi* Lundgren, *Cardium* (*Protocardia*) *vogeli* Hennig, *Pholadomya clausa* Hennig, *Cuspidaria* sp. *Nautilus bellerophon* Lundgren, *Nautilus* (*Hercoglossa*) *danicus* Schlotheim, *Nautilus* (*Hercoglossa*) *fricator* Beck. *Crania brattenburgicus* (Schl.), *Crania brattenburgicus* var. *transversa* Lundgren, *Crania* (*Isocrania*) *ignabergensis* Retzius var. *costata* Sow., *Rhynchonella incurva* Schlotheim f. *typica*, *Rhynchonella incurva* Schlotheim var. *faxensis* Posselt, *Carneithyris carnea* Sowerby, f. *typica*, *Carneithyris carnea* Sowerby var. *incisa* v. Buch, *Chatwinothyris lens* (Nilsson), *Gibbithyris subrotunda* (Sowerby) f. *typica*, *Neoliothyrina fallax* Lundgren f. *typica*, "*Terebratula*" *mobergi* Lundgren, *Terebratulina striata* Wahlenb. var. *chrysallis* Schlotheim, *Terebratulina striata* var. *striatula* Mantell, *Megathiris koeneni* Brünnich-Nielsen.

Nearly all these species are found in the Middle Danian. It seems that *Hercoglossa danica* (Schl.) is restricted to the Middle Danian and especially to its upper part.

The foraminiferal fauna is much richer in species than the lower zone in the Middle Danian. Munthe published several foraminifera from the Danian at Limhamn (1896), but according to the usage at that time the species were determined in a very broad sense and their exact stratigraphical position is not given. The foraminifera species hitherto published by the author (1940, 42, 45, 48) from the Middle Danian are as follow:

Ataxophragmoides frankei Brotz.
Marssonella oxycona (Rss)
Arenobulimina sp. sp.
Eggerella sp.
Siphonodosaria sp.
Bolivina selmensis Cush.
Bulimina plena Brotz.
Spirillina vivipara Ehr.
» *recta* Brotz.
» *subornata* Brotz.
Conorbina conula Brotz.
Pullenia aff. *americana* Cush.
Rosalina aff. *ystadiensis* Brotz.
Discorbis binkhorsti (Rss)
Valvulineria laevis Brotz.
Gyroidina nitida (Rss)
Gavelinella bullata Brotz.
Eponides aff. *lunata* Brotz.
» *frankei* Brotz.
Cibicidoides constricta (v. Hag).
Cibicides voltziana (D'Orb.)
» *beaumontiana* (D'Orb.)
» aff. *lobatulus* (W & I)
» *hemisphaera* (Rss)
Anomalinoides danica (Brotz.)
Anomalinoides aff. *acuta* (Pl.)
= *C. taylorensis* Brotz.
Karreria fallax Brotz.
Alabamina dorsoplana (Brotz.)
Osangularia lens Brotz.
Pulsiphonina eklundi (Brotz.)
Coleites reticulosus Pl.
Globigerina triloculinoides Pl.
Globigerina daubjergensis Bronn.
Globigerina pseudobulloides Pl.
Globigerina compressa Pl.
Hastigerina n. sp. = *Globigerinella aspera* (Ehr).

The foraminiferal fauna of the Middle Danian is much richer than noted here, especially in the occurrence of several arenaceous species and many

Lagenidae, and in particular, the Polymorphinidae begin in the Middle Danian with many new genera and species.

A detailed correlation of the Swedish Middle Danian with the Danish sequence is difficult. It seems that in the famous quarry of Faxe, one of the type-localities of the Danian of Desor, there occurs a fauna similar to that of the *Tylocidaris brünnichi* zone at Limhamn. It is possible that there the upper part of the *Tylocidaris rosenkrantzi* zone may also be preserved. Ödum (1926) ranged this occurrence in the upper Middle Danian. Sorgenfrei (1957) placed the corallian limestone interbedded in the bryozoan limestone at Faxe at the base of his division "2" of the Danian, which should be correlated with the upper part of our Lower Danian, or the lower part of our Middle Danian. These differences in the Middle Danian on both sides of the Öresund may possibly have a tectonical background.

In the sections drilled south of the Malmö region, near Skanör and Trelleborg the presence of the *Tylocidaris ödumi* zone could always be observed, but it seems that there the *Tylocidaris rosenkrantzi* zone has disappeared and that the *T. brünnichi* zone follows directly above the Lower Danian. Thus the possibility also exists that in certain regions of Denmark, especially on Seeland and near Faxe the lower part of the Middle Danian was not deposited, or that it was destroyed after deposition. The conglomerate at the base of the Middle Danian, noted by Rosenkrantz (1938) confirms the impression that in Denmark there is a break in sedimentation between the Lower and Middle Danian. North of Malmö the Middle Danian increases to more than 100 m in thickness (Brotzen 1942). A change of facies and an increase in its thickness is also observed towards the south-east, where the bryozoan limestone changes to fine grained limestones. Typical examples of changing of sediment and facies are the little quarries and outcrops near Smygehuk (= Östratorp). There occur well-bedded grained limestones intercalated with many flintlayers with *Tylocidaris brünnichi* and *Tyloc. herupensis*. The layers belong to the zones of the highest Middle and lowest Upper Danian, in a facies, lacking at Limhamn.

The Upper Danian: Zone of Tylocidaris herupensis Wind

The Upper Danian in Sweden was described by the author in 1938 and correlated with the zone of *Tylocidaris vexillifera* var. *typica* Ravn in Denmark according to Brünnich-Nielsen (1938) and Rosenkrantz (1938). It was divided into a lower and an upper part: the sections published in 1940 showed that the first is exposed at Limhamn, the second at Klagshamn south of Limhamn. At the top of the upper part there the Paleocene is exposed (Holst and Grönvall 1907 and Brotzen 1948).

Generally the Middle and Upper Danian in Sweden are well distinguished by their sediments and fauna (see Brotzen 1948). In the Upper Danian, from the base to its top continuously bedded hard and soft limestone beds are intercalated with flint-beds, or strata with irregular flint-nodules. The number

of flint-beds increases from the base to the top. The characteristic bioherm building of the Lower and Middle Danian does not occur in any part of the Upper Danian either at Limhamn or other Swedish localities. The flint-beds or strata with flint-nodules may increase in numbers as well as in thickness. A few kilometres south of Limhamn at Klagshamn the flint-beds predominated over the limestone and were a hindrance to the modernisation of the quarry, which was filled with water in 1940. Certain flint-beds there reach a thickness of 2 m. On the south coast of Scania at Smygehuk (formerly Östra-Torp), Upper Danian also occurs and there the flint-beds are more numerous than the limestone layers.

Bryozoans occur in all layers of the Upper Danian, but in the rocks they are never a predominant element as in the Middle and Lower Danian. Rördam (1897) in his fundamental sedimentological analysis of the rocks of the Danian has introduced the term "coccolith limestone". According to him certain soft limestones of the Danian contain a large number of coccolith elements, which could be isolated by washing. Such fossils occur also in other Cretaceous sediments and it was possible to isolate coccoliths from Stevnsian chalk and from all horizons of the Danian. After Rördam's publication very different limestones of the Danian were called coccolith-limestones.[8]

The limestones of the Upper Danian in Sweden are fine grained, partly harder beds, partly loose rocks. Such fine grained limestones, especially the loose ones were studied by Rördam and called coccolith-limestone. This term was later used for many dense limestones of the Danian, generally without microscopical control. Thus "coccolith limestone" were named from different parts of the sections, and the hard limestone at the base of the Danish Danian the "cerithium limestone" was also called coccolith limestone; possibly therefore that coccoliths do not occur there or are extremely rare! Many of the loose limestones of the Upper Danian are easy to wash, when they have been exposed for some years. In their finest residues below 0,01 mm a great number of coccolith elements occur, like those described by Rördam. The majority belong to a new species *Cribrosphaerella danica* n. sp.[9]

[8] Publications in the languages of small nations are easily neglected outside their home countries, and the name Rördam is relatively unknown because he writes in Danish generally with summaries in French. But all his important sedimentary petrographical work, with its exhaustive descriptions of rare and heavy minerals in the sediments is nearly forgotten in Scandinavia and his homeland. Not one of these papers is named in the reference list of the section on Denmark in the 1957 volume of the stratigraphical lexicon, but his petrographical terms "bryozoan limestone" and "coccolith limestone" were long time used as stratigraphical units of the Danish and Swedish Danian.

[9] A description of the coccoliths of the Swedish Danian is in preparation. The main element in the Upper Danian is

Cribrosphaerella danica n. sp.
Textfig. 7.

Oval, the margins with variable numbers of knots, between 18—24, generally 24. Central plate irregularly perforated, between margin and central plate a dividing zone, long axis 10—18 μ and short axis 8—11 μ. Margins breadth 2—2,5 μ.

This new species is related to *Cribrosphaerella ehrenbergi* (Arch), which was figured originally 1912 in different figures (pl. VI figs. 19—20). The first one is regularly perforated in the central part. Such types are also noted by Gorka 1957, who measured a long axis of 6 μ and

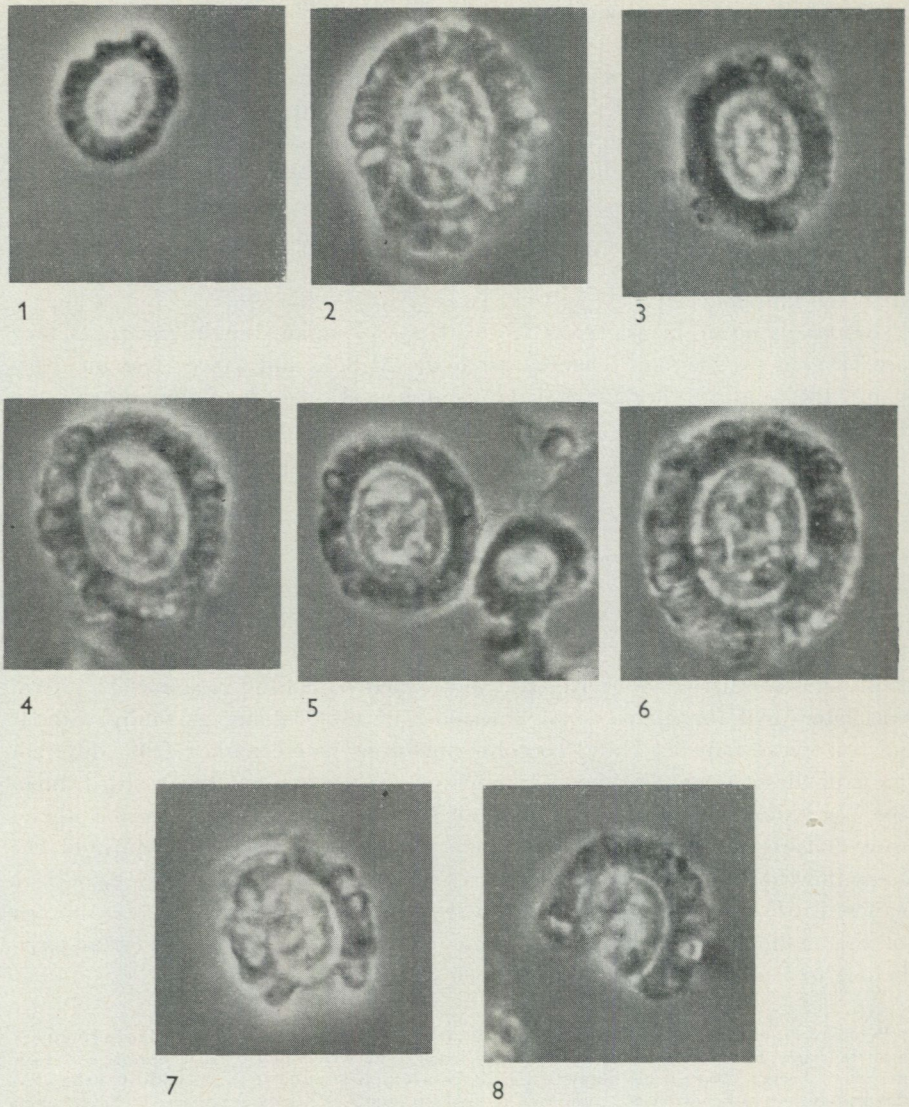


Fig. 9. Cribrosphaerella danica n. sp. Limhamn Quarry; lower part of the Upper Danian. Phas-microscope 2 000 ×.

the numbers of perforations as 29 in the central part. From this type the new species is well distinguished by the irregularity of the pores on the central part, their lower numbers and the size of the margins divisions. The second type figured by ARCHANGELSKY is much larger and its long axis is possibly 12 μ. Its margin is more or less of the same shape as that of the new species. A dividing zone occurs in the Russian and the Swedish specimens. In the Swedish ones this zone is smaller than in the Russian species. The perforations of the central part are regular and smaller in the Russian species, than in the new one. Small plates with a diameter of only 7 μ occur besides the large specimens and these are of the same shape as the large ones.

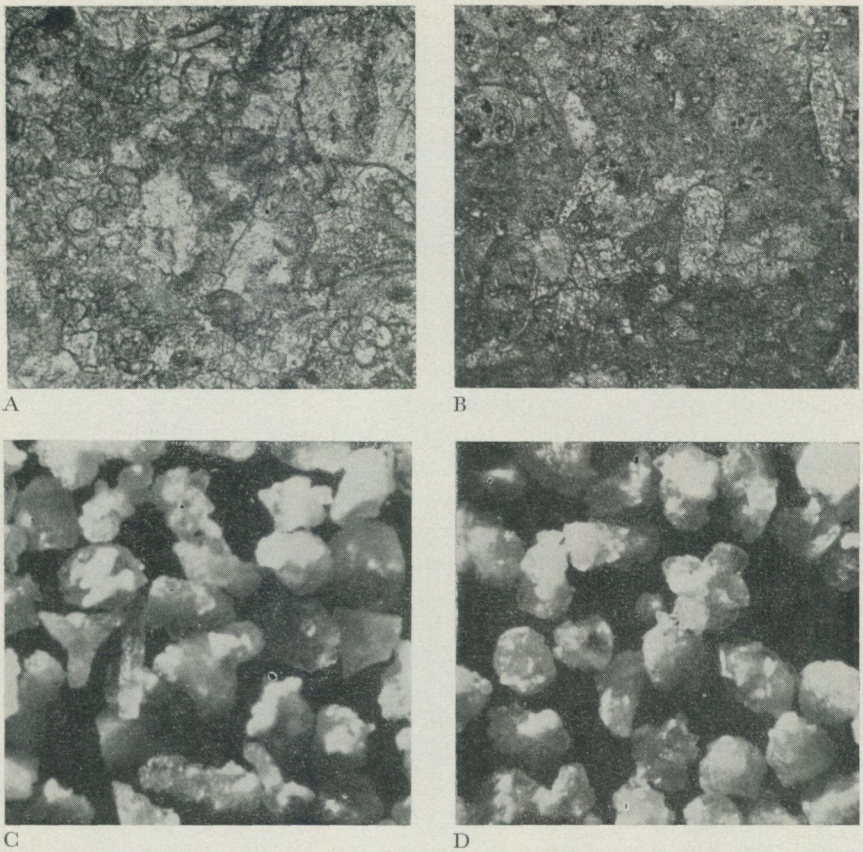


Fig. 10. Upper Danian grained limestone, Klagshamn Quarry. A — generally large crystallized background, few parts of muddy limestone containing coccoliths. Foraminifera occurring both in crystallized as well in muddy masses. 100 ×. B. = Muddy limestone with coccoliths and few isolated larger calcite crystals, large foraminifera occurring in the muddy masses. 100 ×. C & D. = Residue of washed sample containing calcite crystals, spongia needles and foraminifera 50 x.

It seems that inorganic elements are more characteristic than coccoliths for the Upper Danian limestones. The loose limestones contain mainly small needles of calcite. In the softer limestones which intercalate the hard beds, these loose crystals give the impression that the limestone is a fine sand in which calcite grains occur instead of quartz grains. Therefore Rosenkrantz in 1938 and Brotzen in the same year used the term "limestone sand", which is not quite correct, but the term sand can also be used as foraminiferal sand or mollusc sand. It is difficult to find a correct term for this rock. A great number of foraminifera and small shell fragments are embedded between the calcite crystals and the fine grained ooze of small crystals and coccoliths among the larger crystals. It seems that the calcite crystals are congenetic with the sediment and therefore the terms crystalline limestone or crystal-grained lime-

stone can also not be used. A term for these limestones used to be Saltholm Limestone, after the type locality, the island of Saltholm east of Copenhagen. Saltholm Limestone was used partly as a petrographical term und synonymous with coccolith limestone, partly as a stratigraphical unit. Therefore the use of this term is questionable if errors are to be avoided. Grained limestone from the Upper Danian or loose grained limestone seems to be a correct determination of this characteristic rock of the Swedish Upper Danian. In 1957 Troelsen used the term Calcarenite. This name was suggested by A. W. Grabau for a "Limestone or dolomite composed of coral or shell sand or sand derived from the erosion of older limestones". The term by itself is derived from the latin for lime and sand. It is terminologically identical with our "Limestone sand". But according to the suggestion of Grabau it means another type of rock, different from the Upper Danian one.

The fauna changes suddenly between the Upper and Middle Danian. A superficial study shows immediately the rarity of bryozoans in the Upper Danian. *Echinocorys sulcatus* disappears in the upper part of the Upper Danian and *Echinocorys obliquus* occurs frequently. The species of crinoids and asteroids are different (Wienberg-Rasmussen 1952). The foraminiferal fauna is characterized by the dominance of *Globigerina*. Many foraminiferal species occurring here do not occur in the Middle Danian or are rare there. Such species continue into the Paleocene. Species noted in the list on p. 23 from the Middle Danian which occur rarely or are lacking in the Upper Danian are:

Bulimina plena Br.
Spirillina subornata Br.

Species rare in the Middle Danian and common in the Upper Danian are:

Karreria fallax Rh.
Coleites reticulosus Pl.

New in the Upper Danian are:

Ataxophragmoides frankei Br.	Br. 1948	p. 36
Pseudoclavulina anglica Cush.	»	» 37
Gaudryina cf *faujasi* (Rss.)	»	» 38
Robulus discus Br.	»	» 42
Astacolus paleocenicus Br.	»	» 43
Citharina plummoides Br.	»	» 45
Palmula aff. *elliptica* Nilss.	Br. 1937	
Sigmomorphina soluta Br.	1948	» 53
Bulimina paleocenica Br.	»	» 61
Pyramidina curvisuturata (Br.)	1940	» 29
	1948	» 62
Angulogerina europaea Cush. & Edw.	»	» 69
Elphidiella prima (Ten Dam)	»	» 70
Cibicides sahlströmi Br.	»	» 85
Coleites danicus Br.	»	» 113

The foraminiferal fauna of the Upper Danian contains many more species, especially Polymorphinidae, Lagenidae and Buliminidae. In general the fora-

miniferal fauna of the Upper Danian is more closely related to the Paleocene than to the Middle Danian association of genera and species.

At Limhamn the Upper Danian shows best in the southern wall. There the regular bedding of the Upper Danian can be seen and it reaches a thickness of 10—15 meters. The greatest thickness of this unit has been observed in the southwestern corner of the quarry. All layers dip slightly to the south or southwest. One or two layers of dark greenish clayish limestone in the south wall of the quarry (see Brotzen 1940) contain fossils from the Middle Danian, which have been redeposited there. These layers can be considered as a bottom conglomerate of the Upper Danian. The fact that Middle Danian fossils occur in different parts of the Upper Danian demonstrates a successive transgression. In the western wall, and even better, in the eastern wall it is possible to follow the transgression of the Upper Danian over different beds of the Middle Danian. The main ridge of the Middle Danian bioherm was at that time a real reef, or barrier, reaching above sea level. These reefs or barriers were successively submerged during the first period of the Upper Danian, from both the southern and the northern directions. Besides Middle Danian fossils there are also foraminifera and other small fossils from the Stevnsian and Moenian redeposited in the Upper Danian. Already earlier the occurrence of these fossils had been regarded as evidence of tectonic movements at the end of the Middle Danian and the beginning of the Upper Danian. During this time the Maastrichtian in the region of the Romeleåsen west of Malmö was raised, and it was already being destroyed during this movement, since it came above sea level (Brotzen 1945).

The steep walls and the mechanical method of quarrying hinder the collecting of fossils from the Upper Danian at Limhamn. It has hitherto been impossible to find *Tylocidaris* spines there. Therefore the author was very surprised to discover some characteristic spines of this species in the collection of D'Orbigny in the paleozoological department of the Muséum d'Historie Naturelle at Paris, labelled Scania, Sweden. The possibility exists that the labelling is a mistake and that these fossils came from Denmark. But the localities from which these large spines are known were few and not exposed during D'Orbigny's time. The only locality open in Denmark was Saltholm and there the spines are generally of smaller size. But during D'Orbigny's time, the Upper Danian was exposed in many small quarries around Malmö, and it is not impossible that the fossils came from such a quarry. This seems to demonstrate that the guide fossil of the Upper Danian in its typical form occurs also in Sweden. On Saltholm these spines occur fairly commonly in the same facies of grained limestone as known from Limhamn. At Herfölge, south of Copenhagen this fossil may be found in a bryozoan facies. This helped to form the opinion that in the marginal part of the transgressions of the Upper Danian sea the facies changes from the bryozoan limestone to the grained limestones. It is possible that in the central part of the Danian sea as in the basin in Denmark the bryozoan limestone facies continued into the uppermost beds.

The development of the Tylocidaris species and the stratigraphical range of the Danian

The genus *Tylocidaris* is known from the entire Cretaceous, possibly also occurring in the Jurassic. The species from the Danian seems to be closely related to *Tylocidaris clavigera* (Kön.) from the Campanian and Maastrichtian. The relation between *T. clavigera* (Kön.) and *T. ödumi* Br.-Nielsen was noted by Ravn and Wind. It was considered by Wind that the other species of the Lower Danian, *T. abildgaardi,* belongs to a same group as *T. pomifer* (Boll). But the stratigraphical range of *T. pomifer* (Boll) is uncertain; it may be that it occurs in the Maastrichtian and that it may be an ancestor of *Tylocidaris abildgaardi,* which is abundant in the Lower Danian and occurs rarely in the lower part of the Middle Danian at Limhamn. In Denmark both of these *Tylocidaris* species may be found together (according to Wind 1954), but generally *T. ödumi* begins earlier than *T. abildgaardi,* which is a good indicator of a younger zone of the Lower Danian in Denmark.

In the second group of bioherms *Tylocidaris rosenkrantzi* is the successor of *Tylocidaris ödumi* and it is the last species of the group of *Tylocidaris* which are related to *Tylocidaris clavigera.*

Already in the deeper beds of the Lower Danian there occurs *Tyl. windi* n. sp. which is the first species with "crowned" spines. With this species begin the most characteristic *Tylocidaris* forms of the Danian. From the upper part of the Middle Danian this group occurs alone. All the "crowned" spined species are related to *Tylocidaris vexillifera* Schlüter. The figures given by Schlüter show the characteristic spines with wings, but their origin is doubtful. According to Schlüter they are known only from the Baltic-chalk with *Belemnitella mucronata* and from the Stevns klint. In his summary Schlüter listed *Tylocidaris vexillifera* from the Upper Senonian, but not from the Danian! The specimens fig. 4 Schlüter resemble *Tylocidaris ödumi* but imperfect and differ in many details. The figure 3 shown belongs to a type hitherto unknown from the type Danian. Thus it is uncertain in which way *Tylocidaris vexillifera* is related to our Danian species. The crowned spines belonging to *Tyl. windi* occur in the Lower Danian rarely, they are small and their crowns indistinct. In the second bioherm at Limhamn such spines were found occasionally abundantly. Their adult-size is larger than before, their crowns distinct, but the wings remain small. This species is *Tylocidaris ravni* n. sp. a direct successor of *Tylocidaris windi.* As noted before from the next higher zone, in the third group of bioherms, only spines with distinct crowns and wings are known. They belong to *Tyl. brünnichi* Ravn and differ from the foregoing in the larger size of their spines, the larger crowns with their broad and distinct wings. In certain beds the spines of *Tylocidaris brünnichi* are very common, generally they can be found as well in bryozoan as in coralline limestones. In the basal clays of the Upper Danian at Lim-

hamn, *Tylocidaris brünnichi* is replaced and the spines are broken, rolled and eroded.

The last species of *Tylocidaris* in the Danian is *Tyl. herupensis* Wind. In lower beds of the Upper Danian the spines are similar to *Tyl. brünnichi*. They are of the same size and their wings are only slightly larger than on *T. brünnichi* spines. Such forms occur commonly at Saltholm in layers some metres above the Middle Danian limestones. Large spines with long plates on their ends will be found at Herfölge in Denmark and are the last development of this group. As in the case of the first *Tylocidaris* spines in the Danian some of the large spines of *Tyl. herupensis* occur without crown or wings. In the Swedish Upper Danian *Tylocidaris herupensis* is extremely rare and there are only a few specimens to demonstrate that in the Swedish Upper Danian also only this species of the *Tylocidaris* group occurs.

Fig. 11 shows the distribution and development of the spines of *Tylocidaris* in the Swedish Danian, without reference to their distribution in the Danish Danian. It seems that in Denmark the development is more or less the same as in Sweden. *T. abildgaardi* is in Denmark confined to a special zone and the zone with *T. rosenkrantzi* has not been distinctly distinguished there in the lower part of Middle Danian. In the quarry of Faxe and from Klostergaard Wind observed a group of *Tylocidaris* spines, in many ways similar to Schlüter's species which Wind described as *Tyl. pomifer vexillifera* Schlüter and figured a wide variety of them. According to Wind they occur on the highest part of the Middle Danian, directly below the zone of *Tyl. herupensis*. Specimens of such types are found at Klagshamn and are included by the author in *Tylocidaris herupensis* Wind (see the paleontological description).

The table 2, p. 33 gives the stratigraphy of the Danian at Limhamn and Klagshamn.

At least a few words of discussion are necessary on the correlation problems of the Danian. A correlation table of the Upper Danian and the Paleocene was published by the author in 1948 and has not changed much through papers published during recent years. At the XXth Intern. Geol. Congress at Mexico City Troelsen and the author gave lectures on the world wide correlation problems of the Danian. Both reached independently of each other the same conclusion that the Danian is a well characterized stage between the uppermost Cretaceous and the Paleocene. Based on observations in Scandinavia we included the Danian in the Cretaceous as in the original definition of Desor: "Desor pense dès lors qu'il faut envisager le calcaire de Faxoe, la craie corallienne et le lambeau pisolitique de Laversine et de Vigny, comme un étage particulier de la Craie, le plus récent de tous." In the discussion at the Mexico congress both Troelsen and the present author could give evidence for this opinion.

In 1953 Subbotina published a monography on *Globigerina* and *Globorotalia* fauna of the Russian Danian and Paleocene, the stratigraphical results of which in general fit well with the distribution of these genera in Sweden.

In 1957 Troelsen published a paper, "On some planktonic foraminifera of

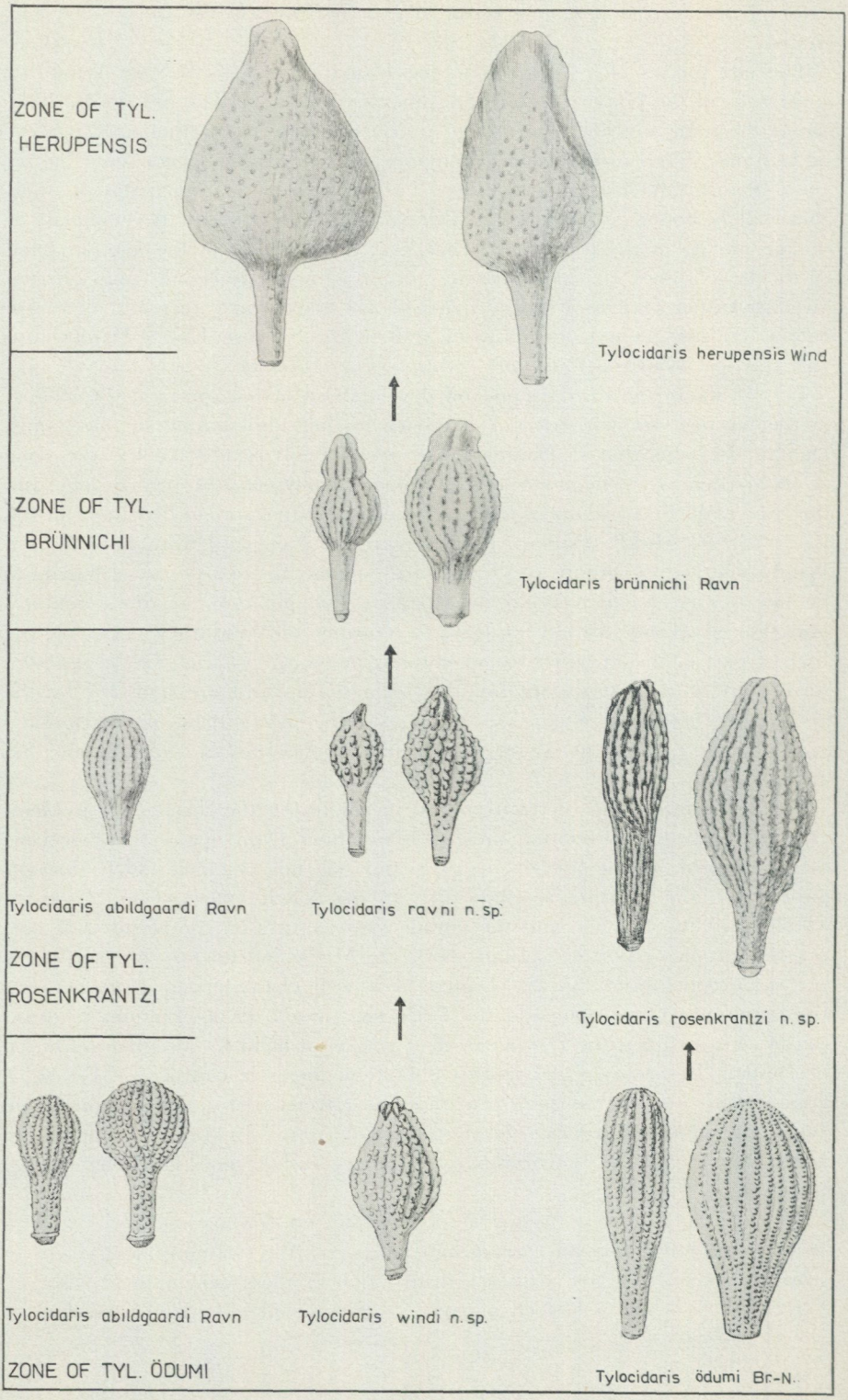


Fig. 11. Development of *Tylocidaris* spines during the Danian.

Table 2. The Danian section in the Malmö region

PALEOCENE			clays, greensand and conglomerate
			unconformity
UPPER DANIAN		The Klagshamn Limestones	greyish grained limestones and flint beds with abundant occurrence of *Echinocorys obliquus*. about 20 m
	Tyl. herupensis zone	The Limhamn Limestones	yellow grained limestones and flint beds. *Echinocorys sulcatus* common and *Echinocorys obliquus rare*. about 20 m
			conglomeratic basal clay beds
			unconformity
MIDDLE DANIAN	*Tyl. brünnichi* zone	Bioherm Group III	central ridge hard and middle hard bryozoan limestones; marginal sediment well bedded bryozoan limestones. "Fore reefs" of coralline limestones. 15—20 m
			unconformity
			top beds of dense limestone
	Tyl. rosenkrantzi zone	Bioherm Group II	central ridge with dense and badly bedded bryozoan limestones; lenses of coralline limestones on the flanks of the central part; well bedded bryozoan limestones marginally 30—35 m
			unconformity
LOWER DANIAN	*Tyl. ödumi* zone	Bioherm Group I	top beds of dense limestone
			fairly loose bryozoan limestone 8—12 m
			basal hard limestone bed
			unconformity
STEVNSIAN			chalk

the type Danian and their stratigraphic importance." There he has a new idea of the stratigraphical range of the type Danian. This new point of view

Troelsen built up on 6 samples from different localities of the Danian in Denmark and Sweden and only studied 4 *Globigerina* species. The paper is full of mistakes of fundamental importance. Danian sediments were also laid down in Poland and therefore the Danian sea was connected with the sea of the Crimean Peninsula. This is in contradiction to his opinion that the Danian must be united with the Montian of West Europe. All common geological conclusions are reached without such knowledge of modern biology of the bottoms of oceans as the occurrence of benthonic organisms interpreted as a character of well aerated bottom water. A wonderful example of knowledge of the Paleocene of Denmark and Sweden is the statement that "true planktonic foraminifera have not been found, except for some specimens, which from their appearance must be assumed to have reworked from the Danian rocks." Besides the regular occurrence of a rich "planktonic fauna" meaning *Globigerina* and related genera (which cannot be planktonic ones) in many sediments of the Paleocene of Denmark as well in the Seelandian and in the Kertminde sediments a study of original samples of Maglehem could be of value for Mr. Troelsen. The author published in 1948 the Paleocene of Maglehem, where the *Globigerina* species occur in a frequency of 40—50 % of foraminiferal fauna, based on countings of more than 3 000 specimens. There occur many species, lacking in Swedish and Danish Danian, but well known from the Russian Paleocene according to Subbotina and also observed by the author in many samples of the Paleocene of Denmark. The author is at the time not able without finishing the researches on these species to give here some specific names. The problems of nomenclature are not solved definitely as for instance the large group of "*Globigerinella*" cannot be determined before a revision of the entire genus is finished. It should be of great value to know how Troelsen came to the conclusion that the occurrence of "Globigerinae in the Kerteminde marl of Denmark has not been confirmed," without studying the samples named in my paper 1948 p. 29, which are stored in the Geological Survey of Denmark at Charlottenlund, Copenhagen. It is a very common mistake on the part of paleontologists, to assume that fossils not found hitherto could exist and to use this not demonstrated fact for stratigraphical correlation. This mistaken assumption is used by Troelsen to solve the stratigraphical correlation between the type Danian and the Midway formation. "In as much as all these species (named by Brotzen 1948) have aragonite tests and therefore could not possibly have been preserved in limestone of the Danskekalk formation, although they may conceivably have lived in the area in the late Danian time." Apart from the main point of the argument, it seems to be funny that the foraminifera of the species named by Brotzen with aragonite tests are very well preserved in Maglehem limestones of Paleocene age and yet, could not possibly have been preserved in the Danian limestone (see list of foraminifera in Maglehem limestone in Brotzen 1948, where extremely thin tests of *Lamarckina naheolensis* are prefectly preserved).

In this connection it is very problematical whether the determinations of

the four *Globigerina* species studied are correct. But the author does not wish to make the same mistake of Troelsen, who added a question-mark on *Globigerina triloculinoides* Plummer, in Brotzen 1948 without studying the originals. I think it is of value in connection with the discussion of the stratigraphical range of the Danian, to note that the author already in 1940 published the frequency of Globigerina in the Swedish Danian and observed: "Hierunter (*Globigerina* sp. sp.) finden sich Arten, die denjenigen aus der Midway-Formation nahe stehen. Also *Globigerina pseudobulloides* Plummer 1926, *Globigerina triloculinoides* Plummer 1926, *Globigerina compressa* Plummer 1926." In the same publication is mentioned that the middle part of the Upper Danian is characterized by a maximum of *Globigerina* with a frequency up to 51 %.

For the discussion it may be of value that Troelsen noted the absence of *Globorotalia* in the Seelandian. This genus occurs both in the Seelandian and higher beds of the Paleocene of Denmark, not restricted to *Globorotalites lobata* Brotzen = *Globorotalia lobata* (Brotzen) only, but also species related with *"Acarinina" pseudotopilensis* Subbotina and others.

Even Loeblich and Tappan in 1957 (a and b) studied some samples of the Swedish and Danish Danian which resulted in world-wide correlation of the Danian. The important new results for correlating the Calcaire pisolithique and the Danish-Swedish Danian (noted already by Desor 1846 and before him by de Beaumont) are based on two foraminifera which should have a vertical distribution from the Lowermost Danian to the Eocene (according to the same authors in the same paper!). The correlation between the Danish-Swedish Danian with the type Montian is based also on two "planktonic" foraminifera in common in one sample of Mons and some sample from the Danian. With the same methods the correlations of the Paleocene were fullfilled, on a world-wide scale. Apart from the good descriptions and figures of "planktonic" foraminifera by Loeblich and Tappan, their stratigraphical correlation of the Danian lacks all background for a discussion.

I wish to conclude: 1) The Swedish and Danish Danian lies always on the highest layers of the Maastrichtian, the uppermost Stevnsian.

2) On the uppermost Danian, the Klagshamn limestones, follows the lowermost Paleocene, the Seelandian. The Seelandian is faunistically and petrographically well distinguished from the Danian.

3) Conglomerates, composed of hard parts of the Stevnsian flint, phosphorites, and fossils are not known on the base of the Danian; locally some fossils from the Stevnsian occur in claysih beds on the base of the type Danian. The break between Stevnsian and Danian is not of importance (in facies and fauna).

4) The Seelandian begins always with a well marked conglomerate, containing Danian flints, phosphorites, and replaced Danian fossils. The break between the

type Danian and Seelandian is larger and more distinct than the break between the Stevnsian and the Danian (in facies and fauna).

5) The Seelandian in Denmark and Sweden contains a foraminiferal and mollusc fauna different from the type Montian. The same foraminiferal fauna is known from Paleocene in Central Poland (Brotzen-Pozaryska 1957) and from the Paleocene of Russia (Subbotina 1953).

6) On the Seelandian in Denmark follows Paleocene containing a rich foraminiferal fauna, hitherto not studied in detail. This fauna seems to be similar to that of Middle and Upper Paleocene in England and West Europe.

7) The entire fauna of the Danian is characterized by the lack of some important groups of Cretaceous fossils, but many others of Cretaceous fossil groups continue into the Danian. Tertiary fossil groups begin sparsely in the Danian. A definitive decision on the range of the Danian into the Cretaceous or the Tertiary is impossible only on the fauna known hitherto.

8) The difference of fauna between the Maastrichtian and the Danian seems to be not larger than between the Campanian and the Maastrichtian. The number of ammonite genera and species diminishes successively from the Campanian to the Maastrichtian and they will have disappeared in the Danian.

9) Comparisons between Danian and Montian faunae show that the Danian seems to be older than the Seelandian and Montian.

10) A unification of Danian and Montian based on faunistical and geological characters is impossible.

11) To range the Danian with the Cretaceous or the Tertiary is only a question of convention

12) In my opinion no fundamental evidence has been adduced which will necessitate changing the classical range of the Danian as the youngest stage of the Cretaceous to the oldest stage of Tertiary.

Paleontological notes

On the spines of Tylocidaris

In 1892 Schlüter erected the new species *Tyl. vexillifera,* according to Schlüter "vexilifera", of which only the spines were known. The spines should be found in white chalk with *Belemnitella mucronata* and at Stevns Klint (Denmark). But the original locality is doubtful (see p. 30). Later on different spines from different occurrences of the Danian were noted under the same name. The stratigraphical distribution according to Ödum, Ravn, Brünnich-Nielsen, Rosenkrantz and Wind has already been discussed on p. 30. All the authors, who described these *Tylocidaris* spines, have not hesitated to base on them different species. Ödum, who distinguished the different shapes of spines in the different zones called them "formae" of *Tylocidaris vexillifera* Schlüter. Ödum's "formae" were replaced by Ravn as variations of *Tylocidaris vexillifera* Schlüter. This procedure seems not to be fully correct, because these variations include a wide variety of shapes, well distinguished from the type of Schlüter. In accordance with the convention that the shape of the spine is a character of different species Brünnich-Nielsen used the varietal names of Ravn as new species names. Wright in his monograph on British Fossil Echinodermata (1864—82) did not adapt this usage. His studies on *Cidaris clavigera* König, which seems to be closely related to the *Tylocidaris* species of the Danian, demonstrated that it would be difficult to determine a species on its spines alone. He demonstrated that the spines of *Tylocidaris clavigera* (König) in their original position vary strongly and according to him a researcher must be careful in founding species of *Cidaris* (or *Tylocidaris* and other related genera) on spines alone. Brünnich-Nielsen and others found a regularity in the occurrence of certain groups of spines in different zones of the Danian in Denmark and Sweden, and in the occurrence of the same variations of spines in the same stratigraphical position in different localities, which justified the use of different species names. The author accepts for the stratigraphical purposes the naming of the different varieties of spines as different species.

For several years, certain paleontologists have used a trinomenclature without giving an exact definition of this procedure. The zoological use of trinomenclature is restricted to geographical races or to subspecies representing geographical varieties. Usually it will be difficult to distinguish geographical races on fossils, which are generally more or less badly preserved parts of animals. It would seem that if it is possible to distinguish the characters of one fossil from another and to diagnose them by their characters, even when they are very closely related then it must be possible to give them species names, and a trinomenclature will be not necessary. In cases where it is difficult to distinguish the characters of fossils, a trinomenclature likewise will not help to show the relationship or the differences of fossils. Wind in his valuable paper 1954 used trinomina for the different species of *Tylocidaris* of the Danian in order to demonstrate the relationship of certain species. This procedure has

here not been accepted. The different groups of spines are here described as species even if all these species are some way related to Schlüter's *Tylocidaris vexillifera*. Neither of the spines figured by Schlüter is characteristic of the varieties of spines occurring in the Danian. Ravn tried to place them in his *Tylocidaris vexillifera* (Schlüter) forma typica Ravn, which Brünnich-Nielsen restricted to *Tylocidaris vexillifera* Schlüter from the highest zone of the Danian. But none of Ravn's 15 figured varieties from Herfölge, Upper Danian, can be compared with Schlüter's specimens from the Maastrichtian. In the same way, Wind's attribution of *Tylocidaris vexillifera* Schlüter to *T. pomifer vexillifera* (Schlüter) is impossible. Wind figured 22 specimens from the uppermost Danian at Klostergaard, Faxe and Herfölge, which differ from the original types. Therefore the author is forced to abolish *Tylocidaris vexillifera* Schlüter from the Danian fauna.

For the description of the spines the following terms are used:

b o d y = the general club shaped part of the spine
n e c k = the smaller stalk of the spine
c r o w n = large tubercles or wings on the apex of the spine
a r t i c u l a t i o n = proximal part of the spine, which communicated with the test.

The species occurring in the different zones of the quarry at Limhamn vary very widely. Small specimens of spines show few characters, and they cannot be attributed to a species as Wind already pointed out in 1954.

Tylocidaris ödumi Brünnich-Nielsen

Pl. 1, Figs. 15—19, 24—30, textfig. 12a—c.

1923.	*Tylocidaris vexilifera*, Schlüter?	Jessen og Ödum, DGU R.II, No. 39, p. 23, pl. II, fig. 23.
1926.	» » » forma γ	Ödum, DGU. R. II, No. 45, p. 160, pl. I, fig. 3a, 3b, 3c, 3d.
1928.	» » Schlüter var. *abildgaardi*	Ravn, K.D.V.S. Ad. 9, R. I, p. 35, pl. IV, fig. 27.
1938.	*Tylocidaris ödumi*	Brünnich-Nielsen, DGFM. Bd. 9, p. 126.
1954.	*Tylocidaris clavigera ödumi* (Brünnich-Nielsen)	Wind, DGFM. Bd. 12, p. 481, Pl. XIII, fig. 1—10. 59—63.

There are two types of spines, one slender and cylindrical, slightly tapering to its ends, the other club shaped with a rounded apex, body slightly tapering to the neck. The neck of neither type sharply distinguished from the body. Surface of the body and the neck with numerous longitudinal ridges, denticulated or build by coalescence of conical tubercles. Apex without crown or larger tubercles.

The slender type: (pl. 1 fig. 24) the body is elongate, more or less cylindrical, the largest diameter 1/3—1/4 of the total length; apex hemispherical or subacute. Body indistinctly distinguished from the neck, slightly tapering

to the neck. Extreme cylindrical types are given by Wind 1954, pl. XIII fig. 5, and 9. They are often broken and entire specimens occur rarely. Observed length at Limhamn 18 mm, at Nyvang Gaard, Denmark 21 mm. Intermediate type: Elongate, slender spines, with a short, indistinctly limited body, the diameter of which seldom exceeds that of the neck, neck long, slightly tapering to the articulation. This type occurs rarely at Limhamn, seems to dominate at Kagstrup, Denmark, typical specimens figured by Ödum pl. I fig. 3a, 3b, Wind 1954 pl. XIII figs. 2, 3, 4, 6, 7, 59, 60, 61, 63 and here pl. 3, figs. 26 and 27. Length 20 mm and more. Club shaped type: pl. 3 fig. 28, 29, 30, Ödum pl. I, fig. 3c, Ravn pl. IV, fig. 27, Wind pl. XIII, fig. 1, 10, 62. Body slightly tapering to the neck. The diameter of the body 2—3 times that of the neck, its length varies from 1/2—3/4 that of the spine, the apex hemispherical, subhemispherical or indistinctly acute. This type is the common one and the most characteristic for the species and for its stratigraphical zone.

On all types of spines the tubercle-ridges are narrow and their bases are in contact. The diameter on the bases is about 0,07 mm. The figures (textfig. 12) show that small isolated rounded cones from the apex downwards coalesce in ridges. Towards the neck the tubercles are isolated. Coalescence of the individual cones to form massive ridges without isolated peaks occurs rarely. Many specimens of this species are rolled and their sculpture eroded, thus they loose the original prickly surface. In such cases it seems that indistinct ridges run over the spines. Near the apex all ridges are tapering. On the neck the arrangement of cones in ridges is indistinct and they are distributed irregularly.

Relationship: Schlüter in 1892 noted, that spines figured by Abildgaard in 1759 are characterized by the lack of wings or crowns, which mark his *Tylocidaris vexillifera* spines. Indeed, the figures of Clavulae Echinorum pl. IIIa and b show types which must belong to the species here described. His figures c—f are well characterized as the second species — *Tylocidaris abildgaardi* — from the same stratigraphical zone.

Wind noted a close relationship between *Tylocidaris ödumi* and *Tylocidaris clavigera* (König), resulting in his trinomen *Tylocidaris clavigera ödumi.* Already the figures of König in Mantell's Geology of Sussex 1822, pl. XVII are of very different general shape. Wright in 1868, who gave a review of the different spines of *Tylocidaris clavigera* demonstrates other variation of spines in general as observed in *Tylocidaris ödumi.* In *Tylocidaris clavigera* except in the cylindrical and slender spines the bodies and necks are well distinguished from each other. Types with bodies constricted in their medial portion are common in *T. clavigera* and absent in *T. ödumi* (Textfig. 13). The most distinct difference between these two species is the fine tubercle ridges in the Danian species, and the larger and fewer denticulate ridges in *Tylocidaris clavigera.* The species occurring together in the same zone is *Tylocidaris abildgaardi* Brünnich-Nielsen, which is well distinguished by its smaller adult size, by its globular body, by the more prominent cones or tubercles.

Tylocidaris rosenkrantzi n. sp. described in the following pages, is closely related to *Tyl. ödumi,* but is distinguished by its larger spines, its main club-

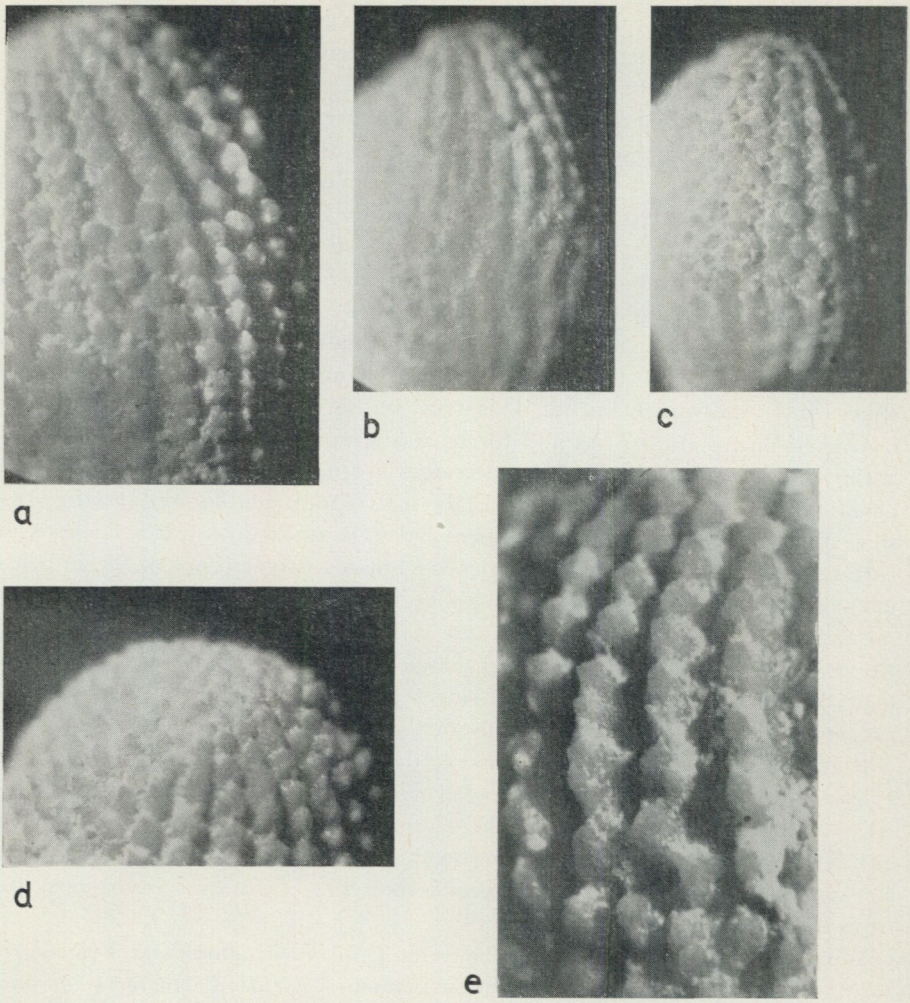


Fig. 12. Tylocidaris ödumi Br.-N. Limhamn Quarry Bioherm I.
Specimen a. = pl. 1, fig. 30, 7 ×
» b. = » » » 28, »
» c. = » » » 26, »
» d. = » » » 30, »
» e. = » » » 30, 12 ×

shaped type has fusiform bodies, tapering to the apex and to the neck, its longitudinal ridges are more solid, and their number always fewer than on *Tylocidaris ödumi* spines of the same size.

Occurrence. *Tylocidaris ödumi* Br.-Nielsen occurs already in the first layers of the Danian on the top of the Stevnsian at Limhamn. Generally spines occur in all the loose limestones, but they are never abundant. In the loose limestones all fossils are broken and also the spines are seldom entirely preserved; together with the spines isolated plates of *Cidaris* tests will be found. It is im-

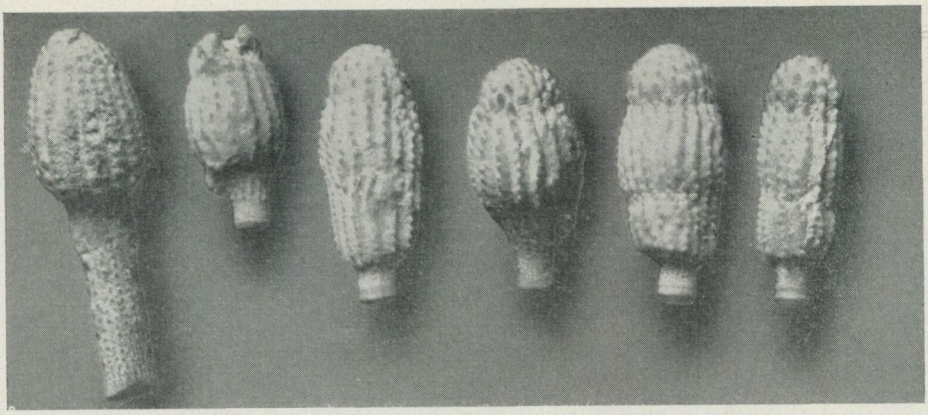


Fig. 13. Tylocidaris clavigera Koen. Vaux Eclusier (Somme), Criel (Seine), Senonian 2 ×. Specimens from the collection of the Museum National d'Histoire Naturelle Paris, France.

possible to decide to which species the isolated plates of the test belong. In the middle part of the Lower Danian the spines are more abundant. The number of loose limestone beds becomes fewer in the upper part of the Lower Danian, where hard layers are dominant. Therefore isolated fossils and also spines are very rare in these beds. In the second group of bioherms this species is not found, even though other echinid spines occur more commonly there than in the Lower Danian. Even below the Danian in the Stevnsian chalk of Limhamn not a single *Tylocidaris ödumi* spine has hitherto been observed.

According to Wind this species occurs abundantly in the Lower Danian of Denmark. Already Abildgaard in 1759 has observed it at the type locality of the Danian at Stevns Klint, but he remarked its occurrence also from the uppermost chalk at Stevns Klint. The same vertical distribution is also noted by Wind from Stevns Klint and from Nyvang Gaard in Jutland.

A holotype of this species was hitherto not designed. The author proposes that the specimens figured by Ödum pl. I fig. 3a—d should be the originals for the species and fig. 3b the holotype. Ödum named them *Tylocidaris* Schlüter forma γ. Locality of the types is Barmer I.

Tylocidaris abildgaardi Ravn

Pl. 1, figs. 1—14; pl. 2, fig. 1; textfig. 14a—f.

1926.	*Tylocidaris vexilifera*	Schlüter	forma α		Ödum DGU R. II, No. 45, p. 159, pl. 1, fig. 1a—1h.
1928.	»	»	»	var. *abildgaardi*	Ravn, K.D.V.S. Afd. 9, R. I, p. 35, pl. IV, fig. 26, 28—35.
1938.	»	*abildgaardi* Ravn			Brünnich-Nielsen DGFM. Bd. 9, p. 126.
1954.	»	*pomifer pomifer* (Boll)			Wind, DGFM. Vol. 12, p. 483, pl. XIII, fig. 11—24.

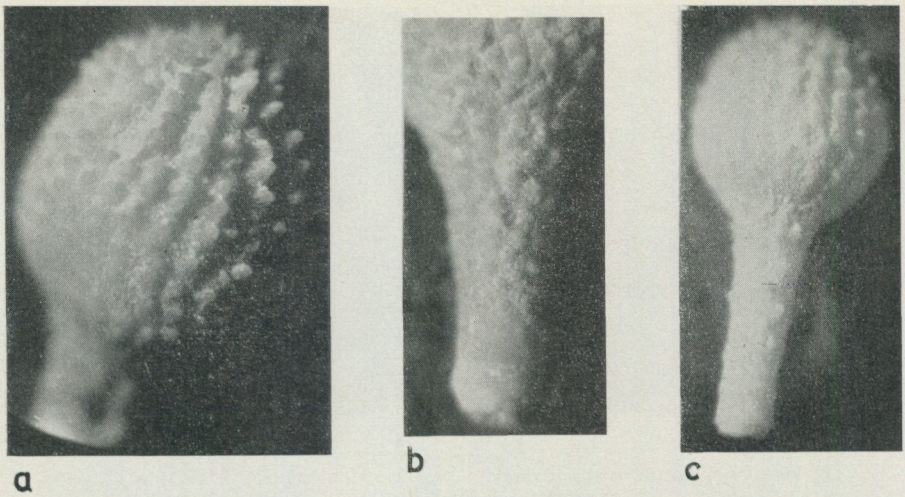
Spines small, length in general less than 15 mm. Body and neck well distinguished, body globular, seldom shaped with slightly tapering to its ends. Apex hemispherical or slightly acute, without crown or wings. Longitudinal ridges of single tubercles or cones, which may here and there coalesce to form massive ridges. The cones are acute, well preserved relatively tall. On the apex the size of tubercles does not diminish, but near the neck and on the neck the arrangement of tubercles is irregular and no distinct ridges are visible. The diameter of the body is 2—4 times that of the neck, between 4—6 mm.

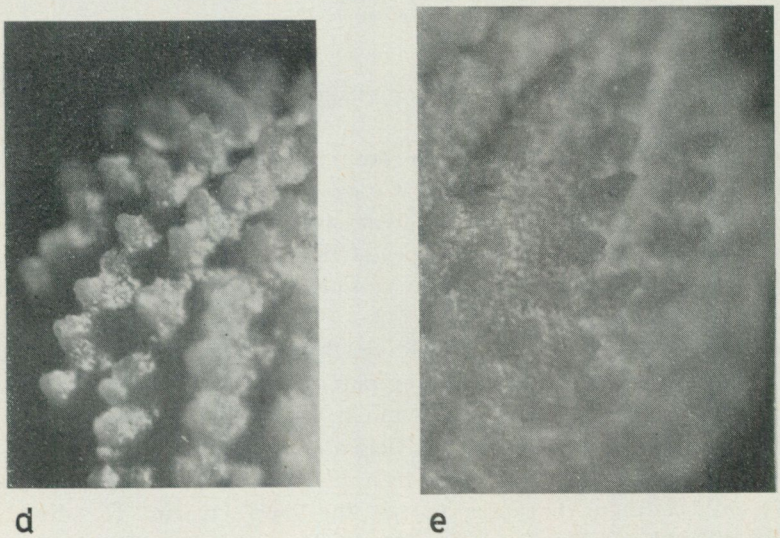
Remarks: This is the only species of *Tylocidaris* from the Danian of which a test is known together with spines in their original position, figured by Ravn on pl. IV, fig. 35. It shows that all preserved spines are more or less of the same shape. This slight variation of the spine types is also well demonstrated by the figures of Ödum and Ravn. The globular body is dominant, and spines with olive shaped bodies, or those in which the apex is acute as in figurs 1f, 1g, 1h, by Ödum; figs. 16, 18 and 20 by Wind and here on pl. 1, figs. 11, 13 and 14 occur rarely. Aberrant shapes with more cylindrical body as pl. 1 fig. 12, are extremely rare. Even the tubercles and the tuberculated ridges vary only slightly. On well preserved specimens the cones are more prominent and the lines more widely spaced than in *Tylocidaris ödumi.*

Relationship: Wind in 1954 believed, that the spines of this *Tylocidaris* had already been described and figured by E. Boll in 1846 (Geognosie der deutschen Ostseeländer, Neubrandenburg) as *Cidaris pomifer,* p. 145 pl. 2, fig. 3. It seems that this fossil may belong to Ravn's *Tyl. abildgaardi,* but this is very uncertain. Boll's fossils were found in chert boulders, possibly from the chalk of Maastrichtian age. Boll distinguished already between fossils in boulders of the chalk and the Faxö formation of the Danian. Schlüter in 1892 p. 55 considers it possible that the Boll's species could belong to his *Tylocidaris vexillifera,* which also occurs in the Baltic chalk but not in the Danian limestone. Boll's figure is very poor and does not allow certain conclusions. According to the figure the size of the spine and the body resemble those of *Tylocidaris abildgaardi,* but its thin neck differs very much from the Lower Danian species. According to Boll's other figures of fossils on the same plate it seems that the thin spine and globular body are real observations and not schematic drawings. All his other figures are perfect in proportions, in the molluscs, echinids, spongae as well as the foraminifera. Therefore the author gains the impression that *Cidaris pomifer* Boll is a well distinguished species and not synonymous with *Tylocidaris abildgaardi* Ravn. A trinomen for *T. abildgaardi* or *T. pomifer* is not necessary, both are well distinguished.

Abildgaard in 1759 gave on pl. III fig. 4 a typical picture of a *Tylocidaris abildgaardi* spine, with its characteristic shape and its longitudinal tuberculated ridges. It is more difficult to decide if the spine in fig. 4c—e also belongs to the same species.

The general shapes of this species, including both its tuberculate ridges and the tubercles of the neck, is similar to that of the spines of *Tylocidaris ödumi* Br.-N., which, even in the typical form of the apex, lacks crown or wings.





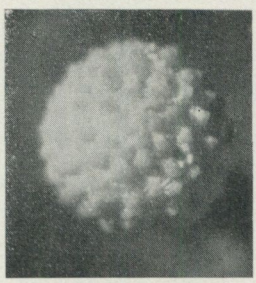


Fig. 14. Tylocidaris abildgaardi Ravn. Limhamn Quarry Bioherm I.

Specimen a. pr. 1001 7 ×
b. » » »
c. » 1004 »
d. » 1001 12 ×
e. » 1003 12 ×
f. » 1004 7 ×

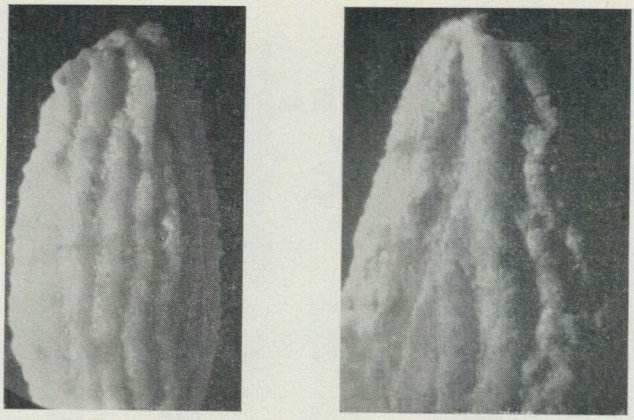


Fig. 15. Tylocidaris rosenkrantzi n. sp. Limhamn Quarry, Bioherm II.
Specimen a. Pl. 2 fig. 25 7 ×
b. » » » 22 »

The two species differ in the size and shape of the bodies, so that they are easy to distinguish.

According to Smisser (1935) there occur in the Maastrichtian at Geulern and in the Montian at Mesvin and Ciply, spines described as *Balanocidaris hardouini* Desor. It would be of great stratigraphical value to study these spines carefully. It seems that the types of these spines with granular surfaces may belong to *T. abildgaardi* or it is possible that *T. abildgaardi* is identical with Desor's species.

Occurrence: According to Ödum, Ravn, Brünnich-Nielsen, Rosenkrantz and Wind this species occurs in the lower part of the Danian. Ödum noted its occurrence in his two lower zones A and B, where *Tylocidaris ödumi* and *T. abildgaardi* occur together. Brünnich-Nielsen and Rosenkrantz assert, that both species occur in different zones, of which *T. ödumi* is restricted to the lowest and *T. abildgaardi* to the upper part of the lower Danian. The distribution table by Wind shows that *T. abildgaardi* is restricted to his middle part of the Lower Danian, where the occurrence of *T. ödumi* ended.

At Limhamn this species is very common in all layers of the Lower Danian (the first group of bioherms). It is always associated with a few spines of *T. ödumi*. In the lower part of the second group of bioherms there occur very rarely spines of the same size as *T. abildgaardi*, without crowns or wings, the body of which is olive-shaped and not globular. Their tuberculation also varies from that of the typical ones and they have not the longitudinal ridges of tubercles. It is possible to attribute these aberrant forms with some reservations to *T. abildgaardi* (pl. 2 fig. 1).

Holotype: A holotype has not hitherto been selected. The author proposes to choose the specimen figured in pl. I fig. 1a by Ödum 1926 as holotype.

Tylocidaris rosenkrantzi n. sp.

Pl. 2, figs. 17—36, textfig. 15a—b.

Spines large, length in adult between 15 to 20 mm. Shape varies from cylindrical, slender and long type to club-shaped forms. In all spines the diameter greatest near the middle of the bodies. Bodies slightly tapering to their ends. Apex rounded, hemispherical or complanate, longitudinal ridges tuberculated or denticulated, solid beginning at the apex often ending near the middle of the bodies, or running near to the neck. On other specimens on the lower part of the bodies and on the necks the ridges disappear and only tubercles occur. Bodies slightly tapering to the necks; diameter of necks about 1/3—1/2 those of the bodies. The longitudinal ridges have a breadth of 0,5—1 mm.

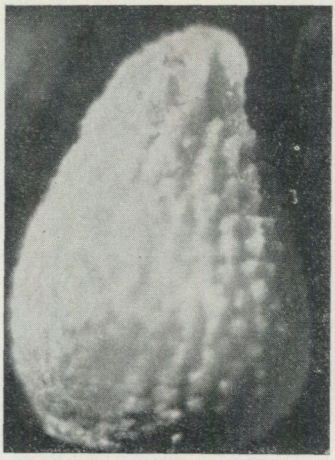
Remarks: These spines vary extremely. There are two extreme types, the elongate slender, with a tall body and the claviform one with large body. The elongate slender type is nearly fusiform, slightly tapering to its ends, on the apex complanate or nearly hemispherical. Such types (see pl. 2 fig. 25) resemble *Tylocidaris ödumi* spines as pl. 1, fig. 24, their swelling is more distinct. The medium types are club-shaped, their bodies short, olive-shaped, the length of the necks is the same as the bodies or generally longer than the bodies; their apex complanated and hemispherical. This type occurs most commonly (pl. 2, figs. 17, 18, 19, 20, 21, 31, 32, 33, 34, 35, 36). Many of them show a slight enlargement of individual longitudinal ridges near the apex. These may represent rudimentary wings, which are characteristic of the other groups of spines in the Danian, as *Tyl. windi, Tyl. ravni, Tyl. brünnichi* and *Tyl. herupensis*. Such rudimentary wings are visible in pl. 2 figs. 22, 30 and 36. The other extreme of this species is the most characteristic, relatively large, fusiform bodies tapering to both ends, length of bodies twice their diameter, maximum diameter near middle of body, length of neck approximately equal to length of bodies, its diameter about half the diameter of the bodies.

Relationship: This species is closely related to *T. ödumi* but is well distinguished by its fusiform bodies, distinctly tapering to its ends, and the strong longitudinal solid ridges, all characters lacking in *T. ödumi*. The size and the other characters are so different that confusion with the small spines of *T. abildgaardi* and their globular bodies will be impossible.

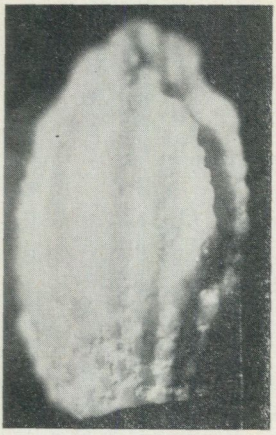
Occurrence: Spines of this species are restricted to the lower part of the Middle Danian and they occur at Limhamn in the second group of bioherms. In the middle part of the bioherm they occur more abundantly than in its lower and upper part.

Holotype: Pl. 2, fig. 22. Collection S. G. U.

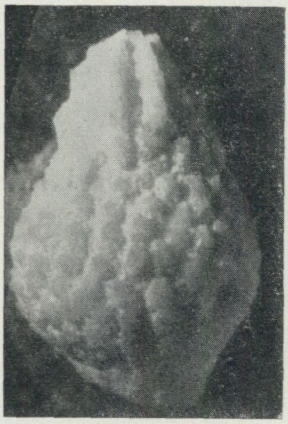
The species is named in honour of Prof. A. Rosenkrantz, Copenhagen, to whom we owe thanks for his valuable studies of the stratigraphy and paleontology of Danish and Greenlandian Danian.



a

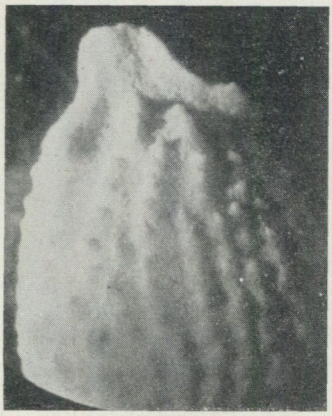


b



c

d



e

Fig. 16. Tylocidaris windi n. sp. Limhamn Quarry. Bioherm I
Specimen a = pl. 1 fig. 23
b = » 1 » 22
Tylocidaris ravni n. sp. Limhamn Quarry. Bioherm II
Specimen c = pl. 2 fig. 14.
d = » 2 » 12.
Tylocidaris brünnichi Ravn, Limhamn Quarry. Bioherm III
Specimen e = pl. 1 fig. 37
All figs 7 ×

Tylocidaris windi n. sp.

Pl. 1, figs. 20—23, textfig. 16a—b.

Spines of middle size, length about 10—20 mm, diameter 5—6 mm. The bodies are broadly rounded to the neck, and tapering to the apex. Largest diameter generally near the neck in the lower third of the length. Crown very small, only slightly winged, longitudinal ridges near the apex. The longitudinal ridges over the body denticulated, strongly elevated, running from the apex to the lower part, often lines of tubercles near the neck.

Remarks and relationship: These spines are the first with crown and wings occurring in the sections of the Swedish Danian. They reach a slightly larger size than *Tylocidaris abildgaardi* but never the size of *T. ödumi,* which both occur in the same zone. The bodies of the spines vary in their shapes, and the majority have the broadly rounded body on the neck-end and the slowly tapering form to the distal end. The tubercle ridges are less regular than in *T. ödumi,* but the tubercles are of the same size. One amongst all the specimens studied has strong ridges, denticulated and its shape is also different from the common ones (fig. 22). All spines of the species are characterized by the small crowns. Some (2—4) of the ridges on the apex become higher, more massive and form wings. The height and length of the wings is small, and between them other tubercle ridges continue to the apex without changing form or size. This species has the significant shape of the body of the spines, which will be a constant character of all the related species in the younger zones of the Danian. *Tyl. windi* is distinguished from the geologically younger species with wings and crowns by the small crown and the fine tuberculation.

Lambert in 1911 and Smisser in 1935 figured the spine of *Balanocidaris schlüteri* Lamb, which in all details resembles Schlüter's *Tyl. vexillifera.* The German and the Belgian species occur in chalk, and the Belgian one certainly in the Maastrichtian. The Belgian species in particular has spines which possess a rudiment of a crown and it seems to be related to the crowned species of the lower-most Danian.

Occurrence: *Tylocidaris windi* n. sp. occurs rarely in all beds of the Lower Danian at Limhamn.

Holotype and name: The holotype is the spine figured in pl. 1 fig. 23, in the collection of the Swedish Geological Survey. The species is named to honour of Mr. J. Wind, Aarhus, Denmark, who is one of the most enthusiastic explorers of the Danish Cretaceous.

Size of the holotype: height of the body 8,9 mm.
largest diameter 6,1 mm.

Tylocidaris ravni n. sp.

Pl. 2, figs. 2—16, textfig. 14c, d.

Diagnosis: Spines of medium size, length between 11—16 mm, diameter 6—7 mm. Body and neck well distinguished. Bodies partly olive- and often onion-

shaped. Crowns distinct on the apex, small; wings numerous 3—8, often crenulate and denticulate, rarely smooth.

Remarks: To this species belong two groups of spines, the first group is characterized by small bodies (pl. 2, fig. 2—9), the length of which varies from 5—7 mm, and with a diameter from 4 to 4,5 mm. The bodies of these spines are more or less olive-shaped, the crowns built up high by a few, narrow, longitudinal dentate ridges (pl. 2, figs 5—9). The second group possesses bodies with length and diameter of which are nearly equal, the largest diameter near the base, the apex acute, the crown low, the wings generally many (4—8). Except for the highest part, which has dentate ridges, the bodies are covered with lines of tubercles and not ridges. The length of the bodies varies from 15—20 mm and their largest diameter from 12—16 mm.

Relationship: It is possible that the group of spines, restricted to a certain geological zone, may belong to the species *T. brünnichi*. But it is difficult to decide exactly which of the figures of Ravn pl. IV fig. 16—25 is the holotype. The stratigraphical range of the Aggerbergsgaard locality is very uncertain, Ödum (1928) described this locality as belonging to the younger Danian, zone C. The size of the spines according to Ravn is larger than that of the specimens from the second bioherm at Limhamn and it seems according to the figures that the most characteristic types of the new species (fig. 11—16) do not occur in the second bioherm. In my opinion the species *Tyl. brünnichi* Ravn differs from *T. ravni* n. sp. in the occurrence of short broad bodies with short crowns and many wings in the new species. Wind takes the short bodies and the long neck as characters of his *Tylocidaris pomifer* Brünnichi (Ravn) = *Tylocid. vexillifera* var. *brünnichi* Ravn. A comparison of the new species and the figures given by Ravn and Wind is given in the following table:

T. brünnichi (according to Ravn)		*T. brünnichi* (according to Wind)		*T. ravni* n. sp. olive-shaped				*T. ravni* n. sp. onion-shaped			
length	breadth	length	breadth	length	breadth			length	breadth		
11	5,5 mm	10	6 mm	7,5	4	mm		9,5	7	mm	
10	7,5 »	10	5 »	7	4	»		8,5	6,5	»	
8,5	6,5 »	9	4 »	5,5	4	»		8	7	»	
8,5	6,5 »	8	5 »	5,5	4	»		7,5	6	»	
8	5,5 »	7	5 »	5,5	3,7	»		6,5	6,5	»	
8	4,5 »	3,5	3 »	5,5	3,5	»		6	6	»	
7	6 »			5	3	»					
6	4 »										
4,3	3 »										
2,7	2 »										

The measurements of *T. brünnichi* Ravn in the table show the general proportions which are common from bioherm III at Limhamn. In contrast, the specimens figured and described by Wind have proportions similar to *T. ravni* n. sp. and they have even the same olive-shaped bodies. According to Wind

his *Tylocidaris brünnichi* (not Ravn) partly occurs together with *T. clavigera ödumi* Wind. The author imagines that the spines which occur together with *T. pomifer brünnichi* Wind do not belong to *T. clavigera ödumi* Wind, but are related to *T. rosenkrantzi* n. sp. In this case also the geological distribution supports the opinion that *Tylocidaris pomifer brünnichi* Wind belongs to the *T. ravni* n. sp. The broad types of *T. ravni* n. sp. are closely related to the geologically older species *T. windi* n. sp. The elongate types introduce an evolution of older species to the dominant species in the next zone: *T. brünnichi* Ravn.

Occurrence: *T. ravni* occurs through the entire zone of *T. rosenkrantzi* and is at Limhamn restricted to the second group of bioherms. Holotype pl. 2, fig. 14, coll. S.G.U.

Tylocidaris brünnichi Ravn

Pl. 1, figs. 31—38; textfigs. 16e, 15a—d.

1928.	*Tylocidaris vexillifera* var. *brünnichi*	Ravn, K.D.V.S. Ad. 9, R. I, p. 35, pl. IV. fig. 18, 19, 22, 23.
1937.	» *brünnichi*, Ravn	Brünnich-Nielsen DGFM. Bd. 29, p. 126.

Bodies of the spines globular to olive-shaped, always with distinct crowns, length in adult between 13—15 mm, crowns often low, but generally one or two millimetres high, maximum 5 mm high. Strong longitudinal ridges run over the bodies, with and without tubercles, rarely the ridges disappear and only tubercles are present on the base of the bodies. The crown is built up of 3—5 wings.

The spines are more uniform than in other *Tylocidaris* from the Danian. The distinct crowns, the crude longitudinal ridges, the olive-shaped bodies distinguish the species well from the others.

Relationship: The limitation of this species is difficult and also the problem of the holotype. Ödum in 1926 figured spines from 6 localities as *Tylocidaris vexillifera* forma *β*. Certainly there are different species from different parts of the Upper Danian. An aberrant type is his figures 2h and 2i, which should be named separately and for which I propose the name *Tylocidaris* (?) *hilmari* n. sp. (to honour Dr. Hilmar Ödum).

It seems, that Ödum's fig. 2c—2h can be united with Ravn's *Tylocidaris vexillifera typica,* and therefore even with *Tylocidaris pomifer vexillifera* Wind.

Ravn figured spines from two localities — Aggerborggaard and Saltholm as *Tylocidaris vexillifera* var. *brünnichi,* which all possess olive-shaped bodies and tuberculated ridges. Some of his figures show the typical distinct crowns also, in which the wings are not very distinct. His figures 16, 21 and 25 are not crowned; they are small, and such small spines often occur without crown and wings. It is not easy to recognize the geological range of the occurrence of the types of this species (*Tyl. vexillifera* Schlüter, var. *brünnichi* Ravn = *Tylo-*

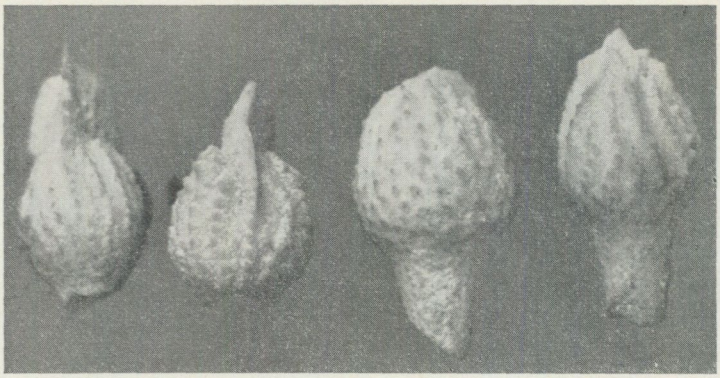


Fig. 17. Tylocidaris aff. brünnichi Ravn.
Saltholm island. Transition Middle-Upper Danian
a, b, brünnichi types with three winged crowns
c, d, transition types T. brünnichi—T. herupensis 3 ×.

cidaris brünnichi Ravn according to Brünnich-Nielsen). Figures 16—21 are speciments from Saltholm. On the island of Saltholm occur two different zones of the Danian section (Brotzen 1940). The upper one is easily correlated with the Limhamn Grained Limestones both by its petrographical character and the faunal elements. There occurs *Tylocidaris herupensis* Wind the guide fossil of the Upper Danian. This zone is exposed in quarries on the north side of the island. Many fossils in older collections and descriptions of Saltholm limestones have given evidence that in the southern part of the island occur bryozoan limestones with a fauna similar to the upper part of the Limhamn bryozoan limestones. But hitherto it was not possible to decide which parts of the Limhamn section are to be correlated with these bryozoan limestones. The figures given by Ravn must come from the bryozoan limestones at Saltholm and certainly not from the Upper Danian. They are all, including those from the second locality Aggersborggaard different from the new species *T. ravni*. Typically onion-shaped bodies are not figured. They are more intermediate types than the specimens found at Limhamn in the bioherm III, figured here on pl. 1 fig. 31—38. Ravn has not designed a holotype. The most characteristic specimen is given in his fig. 20, showing the olive-shaped body and a three-winged distinct crown. Therefore the author will propose that the original to pl. IV, fig. 20 in the collection of the Mineralogical and Geological Museum of the University at Copenhagen should be the holotype of *Tylocidaris brünnichi* Ravn emend. Brünnich-Nielsen.

The relationship of *Tylocidaris pomifer brünnichi* (Ravn) figured by Wind (1954) pl. XIII fig. 25—31 is not entirely clear. The possibility exists that the figured specimens belong to the new species *Tylocidaris ravni* n. sp. (see p. 48). That demonstrated the close relation between *T. ravni* and *T. brünnichi* and on the other hand the difficulty of determining isolated spines.

On the northern side of Saltholm island (Denmark) the author collected in

the Limhamn grained limestone zone specimens of an unusual shape of *Tylocidaris brünnichi*. They are in general similar to the main types, but are distinguished by extremely high crowns with three wings (see textfig. 17 a, b).

It seems that these types will be found the uppermost part of the bioherm III of the Middle Danian and occur also in the lower part of the Upper Danian in the Limhamn grained limestones. A spine of this type was found together with two specimens of *Tylocidaris* cf. *herupensis* Wind at Östratorp. This occurrence of these spines makes it possible to range the outcrops at Östratorp on the south coast of Scania in the uppermost *Tylocidaris brünnichi* zone or the lowermost part of the zone with *Tylocidaris herupensis*.

Occurrence: *Tylocidaris brünnichi* Ravn occurs in the third bioherm at Limhamn. Aberrant specimens are restricted to the uppermost part of this zone and are also found as rare ones in the lowermost beds of the Upper Danian. Typical specimens occur very abundantly and often they are redeposited from the upper beds of the bioherm III in the clayish layers at the base of the Upper Danian. Atypical spines are known from Östratorp on the southern coast of Scania.

Tylocidaris herupensis Wind

Textfig. 18, 19.

1926.	*Tylocidaris vexillifera* Schlüter forma β (partim)		Ödum DGU, R. II, nr. 45. p. 159, pl. I fig. 2c—g.
1928.	»	» Schlüter *typica*	Ravn KDVS. Afd. 9, R. I, p. 32, pl. IV, fig. 1—15.
1954.	»	*pomifer herupensis*	Wind DGFM. Bd. 12, p. 84, pl. XIII, fig. 55—58.

Wind in 1954 erected a new species, characterized by its large size with simple and large bilateral wings. The types he figured vary in the shape of the wing but are more uniform than other Danian *Tylocidaris* spines. These characteristic fossils were already known by Ödum in 1926, but certainly mixed up with similar spines. A very divergent type figured by Ödum was named *Tylocidaris hilmari* n. sp. (see p. 49). Besides the winged types Ödum figured two specimens from the same locality as the winged ones and one from another locality with large bodies, but without wings. These two different types were also figured by Ravn in 1928, which were altogether from one and the same locality (Herfölge). Really it seems not possible to distinguish between the types with and without the lateral wings and the collection contains all transitions between the different types. The types without wings possess onion-shaped bodies. The arrangements of the tubercles are clearly visible in the figures by Ravn and this species never has longitudinal ridges. The tubercles are isolated, they may be arranged in longitudinal lines, but no coalescence is observed. In extremely large specimens the number of tubercles diminishes and may disappear entirely from parts.

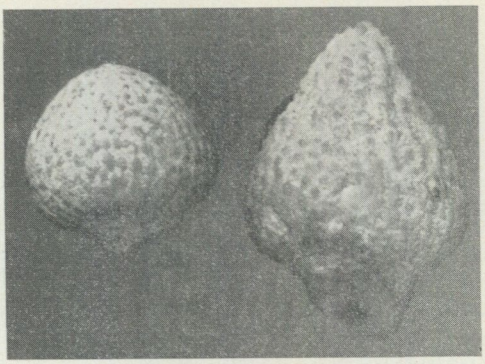


Fig. 18. Tylocidaris herupensis Wind Östratorp Quarry. Transition Middle-Upper Danian. 3 ×

It is an interesting fact that according to Wind these large unwinged spines occur at Klostergaard, accompanied by three-winged atypical specimens of *Tylocidaris brünnichi,* which occur abundantly at Faxe. Wind distinguished these types from *Tylocidaris herupensis* as *Tylocidaris pomifer vexillifera.* On account of all that is noted earlier in connection with *Tylocidaris vexillifera* Schlüter (see p. 30 and p. 37) it is impossible to use the species name "vexillifera" for any Danian type. But I think that Wind is right to separate the earlier types of *Tylocidaris herupensis,* in such layers where winged spines are not present. The spines from Sweden are too rare and the figures of Wind are too poor to erect a new species. Thus I determine the few Swedish findings as *Tylocidaris herupensis* Wind. The importance of Wind's observations, that a separate group of *Tylocidaris* occurs at Faxe, will be clear from the following stratigraphical conclusions. All stratigraphers of the Danian, Brünnich-Nielsen, Rosenkrantz, and Sorgenfrei seem to range the classical occurrence of Faxe in the Middle Danian. According to Rosenkrantz the coralline limestone at Faxe is characterized by *Tylocidaris abildgaardi* Ravn. Ravn, on the contrary, did not name a single specimen of *Tylocidaris abildgaardi* from Faxe, but only *T. herupensis* with aberrant shapes as described by Wind, and *T. brünnichi.* Wienberg-Rasmussen in 1950 ordered the occurrence of Faxe to the Middle Danian, but there occurs according to him *Ceramaster granulatus* and *Pycinaster danicus* both from Upper Danian. According to Ravn's and Wind's observations it seems that at Faxe Middle Danian with coralline limestones occurs as well as overlaying beds belonging to the lower part of the Upper Danian, characterized by aberrant types of *Tylocidaris brünnichi,* and early types of *Tylocidaris herupensis.*

At Limhamn none of the *T. herupensis* types has hitherto been observed. Two well preserved spines of the onion-shaped type without wings were found by the author at Östratorp, accompanied by *Tylocidaris brünnichi* aberrant types with three large wings (see textfig. 18). These three-winged types of spine range the outcrops of Östratorp to the uppermost Middle Danian, or lowermost Upper Danian.

The occurrence of two typical winged spines of *Tylocidaris herupensis* in the collection of D'Orbigny is described in detail on page 29 and the pos-

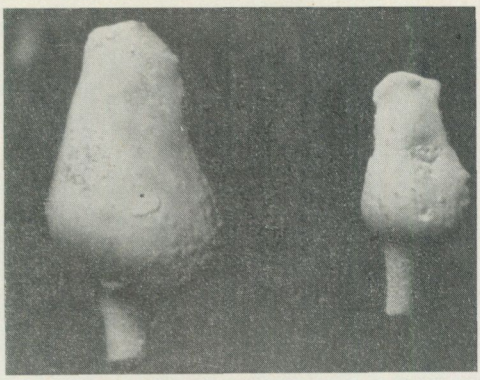


Fig. 19. Tylocidaris herupensis, Wind. "Scania" possible Malmö—Limhamn. Upper Danian. Coll. D'Orb. (Mus. Nat. Hist. Nat. Paris) about 2 ×.

sibility of their origin from Limhamn is there demonstrated. These two specimens (textfig. 19) do not differ from the winged types of Herfölge, Denmark, and are best compared with figures 6 and 15 pl. IV by Ravn. Their tuberculations are indistinct and large parts of the surface are smooth. It is uncertain if the surface is badly preserved or if it is in the original condition.

Occurrence: Typical specimens of *Tylocidaris herupensis* Wind seem to be restricted to the Upper Danian. The possibility exists that early types without wings already occur in the uppermost layers of the Middle Danian.

Holotype: Wind, who erected this species and distinguished it from related ones has not named a holotype. His own figures show the characters of the species, but are too poor to show details. The originals of Wind are not deposited in a public collection and it will often be difficult to study them. Therefore the author proposes as holotype the figured specimen in pl. IV fig. 15 from the limestone of Herfölge in Ravn (1928), deposited in the collection of the Mineralogical and Geological Museum of the University at Copenhagen, Denmark.

Summary

South of Malmö in Southern Sweden an important section of the Danian is visible in the quarry of Limhamn. Below the Danian occurs the uppermost part of the Stevnsian. The Stevnsian is a chalky formation in the Baltic region and ranged to the upper part of the Maastrichtian. The Danian is divided into four zones, characterized by different species of urchins, all belonging to the genus *Tylocidaris*. Different species of *Tylocidaris* are found in the same zone, but none of them occurs in two zones. The three lower zones are developed as bioherms and the dominating element of these are fragments of bryozoa. In the first group of bioherms occur *Tylocidaris ödumi* Br.-N., *Tylocidaris windi* n. sp., *Tylocidaris abildgaardi* Ravn. The last named species is possibly an exception from the rule, that a *Tylocidaris* species does not occur in two zones. Aberrant types of *Tylocidaris abildgaardi* are seldom observed in the zone II = the zone of *Tylocidaris rosenkrantzi* n. sp., the typical species of this zone. A new species *Tylocidaris ravni* n. sp. is found fairly common

together with *Tylocidaris rosenkrantzi* and is restricted to the zone II. The next zone, the highest of the bioherm groups, is characterized by *Tylocidaris brünnichi* Ravn and there only this species is observed. Above the bioherm III begins a stratum of well bedded limestones with layers of flint or flint nodules. From these layers no *Tylocidaris* specimens are known hitherto. But such limestones are well known from other localities, south of Limhamn at Klagshamn and at Östratorp. In the lower part of this series occurs a specialized species of *Tylocidaris brünnichi* and a new species the *Tylocidaris herupensis* Wind. The last occurs generally alone in the highest zone. A table of the section at Limhamn is given on page 33.

The author's point of view on the stratigraphical range of the Danian is given in 12 paragraphs on page 36: "In my opinion, no fundamental evidence has been adduced, which necessitates changing the classical range of the Danian as the youngest stage of the Cretaceous to the oldest stage of Tertiary."

The different species of *Tylocidaris* in the Danian are on page 37 ff revised and described. This list of foraminifera from the boundary Stevnsian-Danian shows that only few of the Stevnsian foraminifera continue to occur in the Danian and new species begin to be present immediately in the lowermost layer of the Danian.

Bibliography of the Danian and Paleocene

Hitherto a bibliography of the Cretaceous-Tertiary boundary has been lacking. Müller in 1939 published a bibliography on the Paleocene and Eocene of Northern and Central Europe, including the Danian. The actuality of the problem of the boundary of the two eras made it necessary to compile a new and mondial bibliography, especially from the point of view of getting a complete literature on the geology and paleontology of the type region, for discussions on the limitation of the Cretaceous and correlation of the Danian. Through the last fifty years the geological range of the Danian has often been discussed. It was never united with the Maastrichtian but often with the Paleocene. Therefore this bibliography has been extended to the Paleocene, but the rich literature of the Maastrichtian was not considered.

Danian and Paleocene are named and discussed in many papers, often hidden in description of maps or in notes of very local geological interest. Both formations were often determined as Upper Cretaceous or Eocene. All these facts hindered compilation of a complete list of publications on this matter. Therefore the author will be grateful for all aid in filling the gaps of the following list.

ABBREVIATIONS

CCF = Contributions from the Cushman Foundation for Foraminiferal Research.
CCL = Contribution Cushman Laboratory for Foraminiferal Research.
DGFM = Meddelelser fra Dansk Geologisk Forening.
DGU = Danmarks geologiske Undersøgelse.
GFF = Geologiska Föreningens i Stockholm Förhandlingar.
SGU = Sveriges geologiska undersökning.
KVA = Kungliga Svenska Vetenskapsakademien. (Swedish Acad. Sci.).

ABILDGAARD, S., 1759: Beskrivelse over Stevns Klint og dens naturlige Mærkværdigheter. København.
— 1764: Beschreibung von Stevns Klint und dessen natürlichen Merkwürdigkeiten. Kopenhagen und Leipzig.
ABRARD, R., 1925: Faune des sables de Chars, de Cresnes, de Marines et du Ruel. Soc. Geol. France Bull. 4.
— 1948: La lacune entre la craie et le calcaire pisolithique à Meudon. Soc. Geol. France, C. R.
— Furon, R., Marie, P., Soyer, R.; 1949: Le calcaire pisolithique de Vigny n'est pas un facies de la Craie. Acad. Sci. C. R. Vol. 228.
— Furon, R., Marie, P., Soyer, R., 1949, Sur l'âge du calcaire pisolithique de Vigny. Acad. Sci C. R. Vol. 228.
ALEXANDER, C. I., 1934: Ostracoda of the Midway of Texas. Jour. Pal. Vol. 8.
ALIMEN, H., LAPPARENT, A., DE LUCAS, G., 1948: Observations nouvelles en faveur de l'âge crétacé du calcaire pisolithique de Vigny. Acad. Sci. Paris, Vol. 227.
ALLEMANN, F., BLASER, R. UND NÄNNY, P., 1951: Neuere Untersuchungen in der Vorarlberger Flyschzone. Ecl. Geol. Helv. Vol. 44.
ANDERSEN, A. E., 1916: Danmarks Geologi i kortfattat Omrids. København.
ANDERSEN, S. A., 1933: Det Danske Landskabs Historie. Danmarks Geologie i almenfattelig Fremstellning. København.
— 1944: Det Danske Landskabs Historie. København.
ANDERSSON, H.-J., DITTNER, E. & GRIPP, K., 1959: Ergänzungen und Berichtigungen zum Lexique Stratigraphique international. Vol. I. Fasc. 5 h 1. Neues Jahrb. Geol. Pal.
ARKHANGUELSKIJ, A. D., 1904: Dépôts paléocènes de la région volgienne du gouvernement de Saratov et leur faune. — Materialien zur Geol. Russlands. Bd XXII, Lief. 1, St. Petersburg.
— 1912: Oberkreideablagerungen des östlichen europäischen Russlands (Russian). Materialien zur Geol. Russlands Bd XXV. St. Petersburg.
— 1935: Über das vermutliche Alter der unteren Horizonte tertiärer Ablagerungen des Nord-Kaukasus. Mosc. Obsc. Isp. Prir. Otd. Geol. Bull. T. 3.
D'ARCHIAC, A., 1850: Description des fossiles du groupe nummulitique recueillis par Pratt et J. Delbos aux environs de Bayonne et de Dax. Soc. Géol. France. Mem. Sér. 2, Vol. 3.
ARNOULD-SAGET, S., BOLZE, I. ET DE LAPPARANT, A. F., 1951: Preuves de l'âge crétacé (Maastrichtien-Danien) des marnes dites »suéssoniennes» dans les Monts de Téboursouk (Tunisie septentrionale). — Acad. Sci. Paris. CR 232.
ASTRE, G., 1949: Fossiles du Garumien d'Auzas remaniés dans le calcaire danien d'Arnaud-Guilhem. Soc. Géol. France. CR Nr 3—4.
AVNIMELECH, M., 1943: Lower Tertiary Aturia from Palestine. Journ. Pal. Vol. 17.
— 1958: A new Belemnoid genus from the Paleocene of Israel. Res. Counc. Israel. Bull. Vol. 7. Geol. 1.
— REISS, Z., 1953: On the Upper Cretaceous and Tertiary stratigraphy of a boring near Beit-Guvrin (Israel). Res. Counc. Israel. Bull. 3, 171.
BARKER, R. W., 1936: Micropaleontology in Mexico with special reference to the Tampico embayment. Am. Ass. Petr. Geol. Bull. Vol. 20. Nr 4.
BASSE, E., 1951: Observations récentes sur les couches à Cardita du Tinrhert (Sahara). Cah. Geol. Thoiry. Nr 9.
BASS, J. B., 1941: On Cretaceous and Paleogene deposits of the Molochna river basin. Acad. Sci. Ukr. SSSR Inst. Geol. Vol. 8.
DE BEAUMONT, É., 1847: Communication à la séance du 1er mars 1847. Soc. Geol. France. Bull. Sér. 2. Vol. 4.
BECK, H. H., 1835: Bemærkninger om Danmarks Geologi. Förelagt det Geologiske Selskab i London 1835 Edited by A. Clément. København 1917.
— 1835: Notes on the geology of Denmark. Geol. Soc. Proc. Vol. 2. London.
— 1836: Notes on the geology of Denmark. London and Edinburgh Phil. Mag. and Journ. of Science. Vol. 18. London.
— 1837: Notizen über die Geologie Dänemarks. Neues Jahrb. für Min. Geogn. Geol. und Petrefaktenkunde. Jahrg. 1837. Stuttgart.
VAN BELLEN, R. C., 1946: Foraminifera from the middle Eocene in the southern part of the Netherlands, Province of Limburg. (Dissertation.) Maastricht.
BELL, W. A., 1949: Uppger Cretaceous and Paleocene floras of Western Alberta. Geol. Surv. Canada, Bull. 13.
BENNET, R. R. & COLLINGS, G. G., 1952: Brighseat formation, a new name for sediments of Paleocene age in Maryland. Washington Acad. Sci. Journ. Vol. 42.
BETTENSTAEDT, F., 1944: Neues aus der angewandten Mikropaläontologie. Nordwestdeutsches Paläozän und Eocän, Methodisches. Oel und Kohle Nr 56.

Bettenstaedt, F., 1949: Paläogeopraphie des nordwestdeutschen Tertiärs mit besonderer Berüsichtigung der Mikropaläontologie. In A. Benz, Erdöl und Tektonik in Nordwestdeutschland. Amt für Bodenforschung.
— & Wicher, C. A., 1956: Stratigraphic correlation of Upper Cretaceous and Lower Cretaceous in the Tethys and Boreal by the aid of microfossils. With discussions of F. Dalbiez, F. Brotzen, T. F. Grimsdale, M. Glaessner. IV World Petroleum Congress, Proc. Sect. 1/D. Nr 5.
Beyrich, H., 1857: Protokoll der Märzsitzung. D. geol. Ges. Vol. 9.
Bezrukov, P. L., 1934: Oberkreide und Paläogen-Ablagerungen im Becken des Flusses Tobol. Mosk. Ob Is. Pri. Geol. Bull. Otd. 12 (2). (Russian with German summ.).
— 1936: Datskij jarus vostocnoeuropejskoj platformy. [Danien-etage der osteuropäischen Plattform] (Russ. with French summ.). Isv. An. SSSR Ser. Geol. Nr 5.
Bieda, F., 1948: Przyczynek do znajomosci otwornic fliszu karpackiego [Beitrag zur Kenntniss der Foram. im Karpatenflysch.] Roczn. Polsk Tow. Geol. 17. Krakow.
— 1955: Duze, otwornice we fliszu Karpackim. Przegl. geol. Nr 6. [Grosse Foraminiferen im Karpatenflysch.].
Birkelund, T., 1957: Upper Cretaceous Belemnites from Denmark. K. Dansk. Vid. Selsk. Bd 9, Nr 1. København.
de Blainville, H., 1839—1864: Ostéographie ou description iconographique des Mammifères. Paris.
Bold, v. d., W. A., 1957: Ostracoda from the Paleocene of Trinidad. Micropaleontology. Vol. 3.
Boll, E., 1846: Geognosie der deutschen Ostseeländer zwischen Eider und Oder. Neubrandenburg.
Bolli, H., 1950: The direction of coiling in the evolution of some Globorotaliidae. CCF Vol. 1, Parts 3 and 4.
— 1952: Note on the Cretaceous-Tertiary Boundary in Trinidad, BW 1. Journ. of Pal. Vol. 26. Nr 4.
— 1957: The genera Globigerina and Globorotalia in the Paleocene-Lower Eocene, Lizard Springs formation of Trinidad, BW 1. US Nat. Mus., Bull. 215.
— Loeblich, A. R. Jr, and Tappan, H., 1957: The planktonic foraminiferal families Hantkeninidae, Orbulinidae, Globorotaliidae, and Globotruncanidae. US Nat. Mus. Bull 215.
Bonnesen, E. P., Böggild, O. B. og Ravn, J. P. J., 1913: Carlsbergsfondets Dybdeboring i Gröndals Eng ved København 1894—1907 og dens videnskabelige Resultater. København.
Bonte, A., 1934: Observations sur les foraminifères du Tuffeau Landenien de Lille. Soc. Géol. du Nord. Ann. Vol. 59.
Bowles, E., 1939: Eocene and Paleocene Turritellidae of the Atlantic and Gulf Coastal Plain of North America. Journ. Pal. Vol. 13.
Bramlette, M. N., 1958: Significance of Coccolithophorids in Calcium-Carbonate deposition. Am. Geol. Soc. Bull. Vol. 69.
Briart, A., 1887/8: Notice déscriptive des terrains tertiaires et crétacés de l'Entre-Sambre-et-Meuse. Soc. géol. Belgique. Ann. T. 15.
— et Cornet, Fl., 1870/87: Déscription des fossiles du Calcaire grossier de Mons. Acad. roy. Belgique, Mém. cour. et sav. étrang. Part. 1. Vol. 36, 1870. Part 2. Vol. 37, 1873. Part 3. Vol. 43, 1878. Part 4. Vol. 47, 1887.
Brinkmann, R., 1934: Zur Schichtfolge und Lagerung der Gosau in den nördl. Ostalpen. Preuss. Ak. Wiss. Sitzb. phys-mat. Kl. 27. Berlin.
— 1935: Die Ammoniten der Gosau und des Flysch in den nördlichen Ostalpen. Geol. Staatsinst. Mitt. 15, Hamburg.
Briquet, A., 1906: Observations sur la composition des terrains éocènes inférieurs du Nord de la France. Soc. Géol. du Nord. Ann. T. 35.
Brotzen, F., 1935: Foraminiferen aus der schwedischen Kreide und ihre Beziehungen zum Sediment und zur Fazies. GFF Bd 57.
— 1936: Einige Bemerkungen zur Stratigraphie Schonens 1) Zur Mächtigkeit des Daniens. GFF Bd 58.
— 1937: Die Foraminiferen in Sven Nilssons Petrificata Suecana 1827. GFF Bd 59.
— 1938: Der postkimmerische Bau des südlichsten Schweden. GFF Bd 60.
— 1940: Flintrännans och Trindelrännans geologi (Öresund), SGU Ser. C. Nr 435.
— 1942: Grundvattnet i kritlagren vid Landskrona och dess utnyttjande genom djupborrning. Tekn. Tidskr. H. 32.
— 1943: Anstehendes Paläozän bei Ystad. GFF Bd. 65, H. 3.
— 1945: De geologiska resultaten från borrningarna vid Höllviken, SGU Ser. C, Nr 465.
— 1948: The Swedish Paleocene and its Foraminiferal fauna. SGU. Ser. C. Nr 493.
— 1949: Blottningar av äldre delar av danienformationen i Sverige. GFF. Bd 71.

Brotzen, F., 1956: Correlation problems of the Danian. Int. Geol. Congr. Mexico 1956, Lecture (in printing).
— 1958: Cretaceous, Danian, Paleocene. Lexique stratigraphique international. Vol. 1, Fascicule 2c. Suède. Sous la direct. de N. H. Magnusson.
— & Pozaryska, K., 1957: The Paleocene in Central Poland Acta Geologica Polonica, Vol. 7. Warszawa.
Brown, R. W. 1949: Map showing Paleocene deposits of the Rocky Mountains and Plains. U. S. Geol. Surv. Prelim. map. Scale 1 : 1 000 000.
Brönniman, P., 1952: Trinidad Paleocene and lower Eocene Globigerinidae. Amer. Paleont., Bull. Vol. 34. Nr 143.
— 1953: Note on planktonic foraminifera from Danian localities of Jutland, Denmark. Ecl. Geol. Helv. Vol. 45. Nr 2.
Bukija, S. G., 1954 [Über die Ablagerungen der dänischen Stufe in Megrelien, Südkaukasus.] (Russian). Akad. Nauk. SSSR, Dokl. 99.
Burrows, H. W. & Holland, R., 1897: The foraminifera of the Thanet Beds of Pegwell Bay. Geol. Assoc. Vol. 15.
Buschinsky, G. I., 1954: Litologija melowych otlozhenij Dneprowsko-Donezkoj wpadiny. [Die Lithologie der Kreide-Ablagerungen der Dnjepr-Donez Senke.] Inst. Geol. Nauk. Trudy. Lief. 156 Moscow. (Russian.)
Butterlin, I., 1956: Une microfaune nouvelle du Crétacé supérieure de la République d'Haiti. Soc. Geol. France. Bull.
Bykova, N. K., 1939: Foraminifery verchnemelovych i paleogenovych otlozenij Ferganskoj doliny. [Die Foraminiferen der Oberkreide- und Paleogenschichten des Fergana-Tales.] Neft. geol-razved. inst. Tr. Ser. A. 121. Leningrad.
Byramjee, R., Lemoine, M., Poimboef, F., 1953: Sur une coupe fossilifère precisant les rapports du crétacé supérieure et de l'éocène de la zone . . . Acad. Sci. Paris, C. R., T. 236. Nr 7.
Brunnschweiler, R. O., 1957: The geology of Dampier Peninsula, Western Australia. Bureau of Min. Resources, Geol. and Geophys. Dept Nat. Development-Commonwealth of Australia.
Cabrera, A., 1936/37: Estado actual de la cuestion del limite Cretaceo-Terciario en la Argentina. Obra del cincuecentenario del Museo de la Plata. 2.
Canu, F., & Bassler, R. S., 1933: The bryozoan fauna of the Vincentown limesand. U. S. Mus., Bull. 165.
Carez, L., 1904: La géologie des Pyrénées Francaises. Minist. Trav. Publ. Mém. Fasc. 2, Feuilles de Tarbes et de Luz.
Carlsson, I. G., 1952: The Cretaceous cirripedes of Sweden. Miner. Paleont.-Geol. Inst.-Skr. Nr 15. Lund.
— 1958: Le genre Crania du Terrain Crétacé de la Suède. Publ. Inst. Miner. Pal. and Quatern. Geol. Univ. Lund, Nr 45.
Casier, E., 1943: Observations sur la faune ichtyologique du Landénien. Mus. Roy. Hist. Nat. Belgique Bull. T. 19, Nr 36.
Cayeux, L., 1891: Étude micrographique du tuffeau à Cyprina planata du Nord de la France et de la Belgique. Du rôle des Diatomées dans la formation de ce tuffeau (note préliminaire). Soc. Geol. Nord. Ann. 19.
— 1891: De l'existence des diatomées dans le Landénien inférieur du Nord de la France et de la Belgique. Acad. Sci. Paris, C. R. T. 112.
— 1891: Composition minéralogique des sables glauconieux landéniens du Nord de la France. Soc. Geol. Nord., Ann. T. 19.
— 1891: Conditions dans lequelles, se fait le passage du Crétacé au Tertiaire en Grèce et dans l'île de Crète: Les derniers Rudistes et les premières Nummulites. Soc. Geol. France, C. R. Ser. 4. T. 13.
— 1925: Existence de Diatomées dans les meulières des environs de Paris. Origine organique de la silice de meulières. Acad. Sci. France, C. R. T. 180.
Chalilov, D. M., 1939 [Stratigraphie der Tertiär und Kreideablagerungen des Erdölvorkommens von Sowjetabad.] Asserb. Neft. Chos. Nr 4—5.
— 1948: Stratigrafia verchnemelovych i paleogenovych otlozenij M. Balchana po faune foraminifer. Aznefteizdat. [Stratigrafie der Oberkreide und Paleogen-Ablagerungen von Malyj Balchan nach Foraminiferenfauna.]
— 1956: Nowyje vidy Bolivina paleogenovych otlozenij Aserbejdzana. [Neue Bolivina-Arten von Aserbejdtans Paläogen Ablagerungen.] Inst. Geol. Ak. Nauk Aserbejdz. — SSR. Tr. 18 a.
— 1957: Novyje vidy fauny nonionil paleogenovych otlozenij Aserbejdzana. [Neue Arten der Nonioniden aus Paleogen-Ablagerungen Aserbejdzans.] Aserb. SSR Ak. Isv. An. Nr 2.
Chavan, A., 1936: Les Carditidés du calcaire de Mons. Mus. Roy. hist.-nat. Belgique, Bull. T. 12.

CHAVAN, A., 1946: L'évolution des faune marine de mollusques dans Nord-Ouest de l'Europe de la fin de Crétacé à celle de l'Eocène. Geol. France, 5 Ser. Bull. Vol. 16.
— 1947: Sur les Neridae du calcaire pisolithique. Soc. Geol. France, C. R. Nr 3.
— 1949: L'âge des principaux gîsements de calcaire pisolithique. (With discussion) Soc. Geol. France, Bull. Ser. 5. T. 18.
— 1949: Les caractères de la faune du calcaire de Vigny. Acad. Sci. Paris, C. R. Vol. 228.
— 1950: Fossile de Meulan (S. et O.), leur signification. Soc. Géol. France, Bull. Ser. 5. T. 19.
— 1950: Fossiles de Meulan (S. et O.), leur signification. Soc. Géol. France, C. R. Nr 5—6.
— 1950: Mise au point sur la question danien paléocène. Soc. Géol. France, C. R. Nr 7—8.
CITA, M. B., 1948: Ricerche stratigrafiche e micropaleontologiche sul Cretacico e sull' Ecocene di Tignale. Ital. Paleont. Stratigr. Riv. Vol. 54.
— (1948) 1949: Notizie sulla stratigrafia del cretaceo e del eoceno di Tignale (Lago di Garda). Soc. Geol. Ital., Boll. V. 67.
— 1949: L'affioramento neocretaceo di Sirmione e la sua microfauna. Ital. Paleont. Strat. Riv. Vol. 55, Nr 4.
— 1956: The Cretaceous-Eocene boundary in Italy. Fourth World Petrol. Congress, Proc. Sect. 1/D. Rome.
DE CIZANCOURT, M. ET COX, L. R., 1938: Contribution à l'étude des faunes tertiaires de l'Afganistan. Soc. Geol. France Mem. Nr 39.
COLLIGNON, M., ET SIGNAL, J., 1955: Première note sur quelques Foraminifères du Crétacé supérieur de Madagascar. Soc. Geol. France, C. R.
CONANT, L. C., 1939: Observations on the Midway group (Miss.) Miss. Acad. Sci. Journ. Vol. 1.
COOKE, C. W., GARDNER, J., WOODRING, W. P., 1943: Correlation of the Cenozoic formations of the Atlantic and Gulf Coastal Plain and the Caribean region. Am. Geol. Soc. Bull. Vol. 54.
COPE, 1870: Synopsis of the extinct Batrachia and Reptilia of North America. Amer. Phil. Soc. Trans. Vol. 14 NS Philadelphia.
— 1875: The Vertebrata of the Cretaceous formations of the West. US Geol. Surv. (of the Terr.). Rep. Vol. 2. Washington.
CORNET, FR. ET BRIART, A., 1865: Note sur la découverte dans le Hainaut. Acad. Roy. Belgique. Bull. Vol. 20.
— 1900: Documents sur l'extension souterraine du Maestrichtien et du Montien dans la vallée de la Haine. Soc. Belge Géol. Pal. Hydrol. Bull. 14.
— 1902: Note sur la présence du calcaire de Mons du tuffeau de Saint Symphorien et de la craie phosphatée de Ciply au sondage des Herbières (Commune de Tertre). Soc. Belge Géol. Pal. Hydrol. Bull. T. 16.
— 1903: Documents sur l'éxtension souterraine de Maestrichtien et du Montien dans la vallée de la Haine (deuxième note). Soc. Belge Géol., Hydrol. Bull. T. 17.
— 1906: Documents sur l'éxtension souterraine de Maestrichtien et du Montien dans la vallée de la Haine (troisième note). Soc. Belge Geol. Pal. Hydrol. Bull. T. 20.
CORROY, G., 1957: La limite entre le Crétacé et le Tertiaire en Provence occidentale. Soc. Geol. France, C. R.
COSSMANN, M., 1908: Pélécypodes du Montien de Belgique. Mus. roy. hist.-nat. Belgique. Mem. 19.
— 1913—1915—1924: Revision des Scaphopodes, Gastropodes et Céphalopodes du Montien de Belgique. Mus. roy. hist.-nat. Belgique Mem. T. 6 (Nr 24, 1915, Nr 34, 1924).
COTTER, G. DE P., 1926: The age of the so called Danian fauna from Tibet. India, Geol. Surv. Rec., Vol. 59.
CRESPIN, I. and RAGGATT, H. G., 1952: Geology of Tertiary rocks between Torquay and Eastern View, Victoria. Australian Journ. Sci. Rep. Vol. 14, Nr 5.
CUMINGS, E. R., 1932: Reefs or Bioherms. Geol. Soc. Am. Bull. Vol. 43 (exhaust. bibliography on reefs, not Danian or Paleocene).
CUSHMAN, J. A., 1926: The Foraminifera of the Velasco shale of the Tampico embayment area. Am. Ass. Petr. Geol., Bull. Vol. 10, Nr 6.
— 1940: Midway Foraminifera of Alabama. CCL. Vol. 16.
— 1944: A Paleocene foraminiferal fauna from the Bluff Marl Member of the Naheola formation of Alabama. CCL. Vol. 20.
— 1946: The genus Ceratobulimina and its species. CCL. Vol. 22.
— 1947: Foraminiferal evidence for the age of the Velasco Shale of Mexico and the Lizard Springs Marl of Trinidad. Jour. Paleont. Vol. 21, Nr 6.
— 1947: Some new Foraminifera from the Paleocene of the Southern United States. CCL. Vol. 23.

CUSHMAN, J. A., 1951: Paleocene Foraminifera of the Gulf Coast region of the United States and adjacent areas. U. S. Geol. Surv. Paper 232.
— AND BERMUDEZ, P. J., 1948: Some Paleocene Foraminifera from the Madruga Formation of Cuba. CCL. Vol. 24.
— — — 1948: Additional species of Paleocene Foraminifera from the Madruga Formation of Cuba. CCL. Vol. 24.
— AND DUSENBURY, A. N. JR., 1934: Eocene Foraminifera of the Poway Conglomerate of California. CCL. Vol. 10.
— AND JARVIS, P. W., 1932: Upper Cretaceous Foraminifera from Trinidad. U. S. Nat. Mus. Proc. Vol. 80.
— AND RENZ, H. H., 1942: Eocene, Midway, Foraminifera from Soldado Rock, Trinidad. CCL. Vol. 18.
— AND RENZ, H. H., 1946: The foraminiferal fauna of the Lizard Springs formation of Trinidad, British West Indies. CCL. Spec. Publ. 18.
— & RENZ, H. H., 1948: Eocene Foraminifera of the Navet and Hospital Hill formations of Trinidad, Br. W. I. CCL. Spec. Publ. Nr 24.
— & TODD, R., 1942: The Foraminifera of the type locality of the Naheola Formation. CCL. Vol. 18.
— AND TODD, R., 1946: A foraminiferal fauna from the Paleocene of Arkansas. CCL. Vol. 22.
CUVILLIER, J., 1934: Le Nummulitique d'Egypte. Les Esna-shales et leur veritable signification stratigraphique. Inst. Egypte. Ann. Vol. 16.
— 1945: Relations du Crétacé et de l'Eocène inférieur en Aquitaine méridionale. Soc. Geol. France, C. R.
— 1949: Présence du Paléocène en Haute-Egypt. Soc. Geol. France. Bull. T. 19.
— 1951: Correlations stratigraphiques par microfacies en Aquitaine occidentale. Leiden.
— DUPUY-CAMET, J., 1947: Phénomènes des remaniement dans la tertiaire marin de l'Aquitaine occidentale. Soc. Geol. France. C. R. Nr 11.
— DALBIEZ, F., GLINTZBOECKEL, C., LYS, M., MAGNE, J., PEREBASKINE, V. & REY, M., 1955: Etudes micropaleontologiques de la limite Crétacé-Tertiaire dans les mers mésogéennes. IV. World Petr. Congr. Proc. Sect. 1/D.
— et SZAKALL, V. 1948: Évolution du genre Globorotalia dans L'Éocène en Aquitaine occidentale. Soc. Geol. France. C. R.
DAGUIN, F., 1932: A propos de la signification stratigraphique de Nautilus danicus Schloth. Soc. Linnéenne Bordeaux Procès-verbaux. Vol. 74.
DALBIEZ, F. 1956: Étude sommaire des microfaunes de la legion du Kef Carte géologique de la Tunisie. Feuille Nr 44, Le Kef. Roy. de Tunisie. Minist. Trav. Publ. Serv. Mines, Industr. Energ.
— 1958: Discussion to: stratigraphic correlation of Upper Cretaceous and Lower Cretaceous in the Tethys and Boreal by the aid of microfossils. IV World Petrol. Congr. Proc. Sect. 1/D.
TEN, DAM, A., 1943: Overzicht over de foraminiferenfaunae van het tertiair in Nederland. Ned. Nat. Gen. Congr. Haarlem. Hand. 29.
— 1944: La stratigraphie et la microfaune du Tertiaire des Pays-Bas. Soc. Géol. France. C. R. 8.
— 1944: Bijdrage tot de kennis van het tertiair in oostelijk Nederland, Gedenkboek Dr. Ir. P. Tesch.
— 1944: Die stratigraphische Gliederung des niederländischen Paläozäns und Eozäns nach Foraminiferen. Geol. Sticht. Med. Ser. C. — V—Nr 3.
—1945: De structuur van de Palaeoceene en Eoceene Bekkens in Nederland. Geol.-Mijnb. 7 Jaarg. Nr 7—8.
— 1946: Sur l'âge de la faune de Bunde (Limburg, Pay-Bas). Soc. Geol. France, C. R.
— 1947: Le developpement des genres de foraminifères Ceratobulimina et Lamarckina. Soc. Geol. France. Bull. Ser. 5. T. 16.
— 1952: Relations du Crétacé et du Tertiaire dans le S. E. de la Turquie. 19th Intern. Geol. Congr. Alger 342.
— 1952: Relations du Crétacé et du Tertiaires dans la Tethys. 19th Intern. Geol. Congr. Alger. Abstr.
— 1953: The Cretaceous-Tertiary boundary in South Eastern Turkey. Geol. Soc. Turkey. Bull 4. Nr 1.
— UND REIHOLD, TH., 1941: Asterigerinen als Index-Foraminiferen für das Nordwest-Europaeische Tertiaer. Geol.-Mijnb. Jaarg. 3. Nr 7.
AND SIGAL, A., 1950: Some new species of Foraminifera from the Dano-Montian of Algeria. CCF. Vol. 1.
DAMES, W., 1881: Geologische Reisenotizen aus Schweden. D. Geol. Ges. Zsch. Vol. 33.
— 1890: Über Vogelreste aus dem Saltholmskalk von Limhamn bei Malmö. KVA Stockholm. Handl. Bih. 16. 4.

DAVIS, J. W., 1890: On the fossil fish of the Cretaceous formations of Scandinavia. Roy. Dublin Soc. Transact. Ser. 2. Vol. 4.
— 1891: The fish fauna of the Danian of Ciply. Geol. Mag.
DAVIES, L. M. 1927: The Ranikot beds at Thal. (North-West Frontier Provinces of India) Geol. Soc. London, Qu. Journ. Vol. 83.
— 1930: The fossil fauna of Samana Range and some neighbouring areas; Part 6. — The Palaeocene foraminifera. India, Geol. Surv. Mem. Pal. India. New Ser. Vol. 15.
— 1940: Geographical changes in northwest India during late Cretaceous and early Tertiary times. Geol. Soc. London. Q. J. Nr 382. Vol. 96.
— 1950: Foraminifera and the stratigraphy of the Indo-Afgan border. 18th Geol. Congr. Proc. 15. 73.
DEECKE, W., 1894: Über eine als Diluvialgeschiebe vorkommende Echinodermenbreccie. Natw. Ver. Neuvorpomm. u. Rügens. Mitt.
— 1899: Geologischer Führer durch Pommern. Samml. geol. Führer IV. Berlin.
— 1902: Neue Materialien zur Geologie von Pommern, I. Natw. Ver. Neuvorpomm. u. Rügens, Mitt. Bd. 32 u. 33, 1901 und 1902, Greifswald.
— 1905: Die südbaltischen Sedimente in ihrem genetischen Zusammenhange mit dem skandinavischen Schilde. Centralbl. f. Min. etc.
— 1907: Geologie von Pommern. Berlin.
DELGA, M. D. & MAGNÉ, J., 1957: Obsérvations sur le Crétacé superieur de Chennoua (Nord-Algerois). Soc. Geol. France, C. R.
DENISSOWA, O. W. & KRESTOWNIKOW, V. N., 1924: Structure géologique de la localité Bielgrod-Kouchetowka faisant de partie de la region de l'anomalie magnétique de Koursk. Osoboj Kommissii Kurskich Magn. Anomalij. Geol. Otd. Trudy 5. (Russ. with French summary.)
DEPAPE, G., 1925: La flore des grès landéniens du Nord de la France. Soc. géol. du Nord. Ann. T. 50.
DESIO, A. & MARTINIS, B., 1950: Notizie sulla constituzione geologica del Monte di Medea in Friali. Soc. Geol. Ital. Bull 69.
DESOR, E., 1846: Sur le terrain danien, nouvel étage de la craie. Soc. Geol. France. Bull. Ser. 2, Vol. 4.
DEWALQUE, G., 1868: Prodrome d'une description géologique de la Belgique. Bruxelles et Liège.
DEWEY, H., 1926: Studies in Danish geology. Geol. Assoc. Proc. 37.
DOBROVOLNY, E., 1940: Jurassic and Cretaceous strata of the Camp Davis area, Wyoming. Mich. Acad. Sci. Papers Vol. 26. Pt. 3.
DOLLO, L., 1922: Les vertébrés vivants et fossiles du Musée royal d'Histoire Naturelle de Belgique. Livret guide D 1. Congrès géol. int.
DOLLFUS, G., 1880: Essai sur l'extension des terrains tertiaires dans le bassin anglo-parisien. Soc. géol. Normandie, Bull. T. 6. Extrait.
DORF, E., 1942: Application of paleobotany to the Cretaceous-Tertiary boundary problem. Acad. Sci. N. Y. Trans. Ser. 2. Vol. 4, Nr 3.
DORR, J. A.,JR, 1952: Early Cenozoic stratigraphy and vertebrate paleontology of the Hoback Basin, Wyoming. Geol. Soc. of Am. Bull. Vol. 63.
DOUVILLÉ, H., 1902: Sur le terrain nummulitique de l'Aquitaine. Soc. Geol. France. Bull. (4) 2.
— 1903: Sur le terrain nummulitique à Biarritz et dans les Alpes. Soc. Geol. France. Bull. (4) 3.
— 1906: La limite du Crétacé et de l'Eocène dans l'Aquitaine. Soc. Geol. France. Bull. (4) 6.
— 1920: La limite entre le Crétacé et l'Eocène en Aquitaine, aux Indes et au Soudan. Acad. Sci. Paris, C. R. 170.
DROOGER, C. W., 1952: Foraminifera from Cretaceous-Tertiary-transitional strata of the Hodna Mountains, Algeria. CCF Vol. 3.
— ET VONTE, C., 1951: Sur la présence d'Inocérames dans un niveau post-maestrichtien près d'Ain-Fakroun (Algerie). Soc. Geol. France, Bull. 6.
DUMOM, P., 1950: Quelques observations sur le Landénien de la région de Mons. Soc. géol. Belgique. Bull.
— 1952: La surface de la base du Landénien marin sur la planchette topographique Mons au 1/40 000. Assoc. Ing. Faculté Polytechnique Mons, Publ. 3e Fasc.
DURAND-DELGA, M. ET SIGAL, I., 1952: Stratigraphie du complexe marneux »Crétace superieur» dans le Nord-Constantinois (Algerie). Acad. Sci. Paris, C. R. 234.
EDGELL, ST., 1953: Some guide foraminifera of the Upper Cretaceous and Lower Tertiary in Australia and California. Am. Assoc. Petrol. Geol. Bull. Vol. 37.
ELBERT, J. UND KLOSE, H., 1904: Kreide und Paläocen auf der Greifswalder Oie. Geogr. Ges. Greifswald, Jahresber 8.
ELLENBERGER, F., 1947: Le problème lithologique de la craie durcie de Meudon. Bancs-

limites et „Contacts par Racines" Lacune sous-marine ou émersion? Soc. Geol. France Bull. Vol. 17.
Ellenberger, F., 1928: »Excursions». Réun. Geol. Intern. à Copenhague. C. R.
Erdman, E., 1881: Beskrivning till kartbladet Helsingborg. SGU, Ser. Aa 74.
Fahrion, H., 1937: Die Foraminiferen der Kreide und Tertiärschichten im südlichen Deutsch-Ostafrika. Paleontographica. Stuttgart. Suppl. 7.
Farchad, H., 1936: Étude du Tanétien du Bassin de Paris. Soc. Geol. France, Mém. 30. T. 13, Fasc. 4.
Faris, M. J. 1947: The contact of the Cretaceous and Eocene rocks in the Taramsa-Tukh Area (Quena: Upper Egypt). Bull. Inst. Egypte, 28.
Finlay, H. J., 1939: New Zealand Foraminifera: Key species stratigraphy. Roy. Soc. New Zealand, Trans. Vol. 69.
— and Marwick, 1937: The Wangoloan and associated molluscan faunas of Kaitangata-Green Island subdivision. New Zealand. Geol. Surv. Pal. Bull. 15.
— — 1940: The divisions of the Upper Cretaceous and Tertiary. New Zealand. Roy. Soc. New Zealand. Trans. Vol. 70.
Fischer-Benzon, R. v. 1866: Über das relative Alter des Faxekalkes und über die in demselben vorkommenden Anomuren und Brachyuren. Kiel.
Fisk, H. N., 1941: Midway-Wilcox deltaic mass. Am. Ass. Petr. Geol. Bull. Vol. 25. Nr 5.
Forchhammer, G., 1825: »Om de geognostiske Forhold i en Deel af Sjælland og af Naboöerne» Dansk. Vid. Selsk. Phys. Skrivter, del 2.
— 1835: Danmarks geonostiske Forhold. Köbenhavn.
— 1847: »Om det nyere Kridt i Danmark» Forhandlinger Skand. Naturforskeres 5:te Möde.
— 1858: Bidrag til Skildringen af Danmarks geographiske Forhold i deres Afhængighed af Landets indre geognostiske Bygning. — Inbydelseskrift till Kjöbenhavns Universitets Fest i Anledning af H. M. Kongens Fødseldag. København.
— 1860: Om Lejringsforholdene og Sammensætningen af det nyere Kridt i Danmark. — Beretning om det 8. skandinaviske Naturforskermøde 1860. København.
— 1863: Danmarks geognostiske Forhold. — Naturforskerforsamlingen i Stockholm. — Stockholm.
— 1863: Oversigt over Danmarks geognostiske Sammensætning. Förh. Skand. Naturf. 9. möte i Stockholm.
Fourmarier, P., 1934: Vue d'ensemble sur la géologie de la Belgique. Soc. géol. Belgique, Ann. Mém.
Fox, S. K. jr and Ross, R. J. jr., 1942: Foraminiferal evidence for the Midway (Paleocene) age of the Cannonball Formation in North Dakota. Journ. Paleont. Vol. 16.
— and Olsson, R. K., 1955: Stratigraphy of late Cretaceous and early Tertiary formations in New Jersey. Journ. Paleontol. Vol. 29.
Franke, A., 1927: Die Foraminiferen und Ostracoden des Paleocäns von Rugaard in Jütland und Sundkrogen bei Kopenhagen. DGU II Ser., Nr 46.
Frizzell, D. L., and Middour, E. S., 1951: Paleocene Radiolaria from Southeastern Missouri. Univ. Missouri, Bull. Nr 77. Techn. Ser.
— and Exline, H., 1955: Monograph of fossil Holothurian Sclerites. Univ. Missouri, School of Mines and Metallurgy, Bull. Rolla, Missouri, Nr 89.
Furon, R., 1935: Le Crétacé et le Tertiaire du Sahara Soudanais. Mus. Hist. Nat. Paris Arch. Vol. 13, Nr 6.
— 1949: Sur le Paléocène africain. Soc. Geol. France., Bull. T. 19.
Gagel, C., 1906: Über die untereocänen Tuffschichten und die paleocäne Transgression in Norddeutschland und im Westbaltikum. Deutsch. Geol. Ges. Zeitschr. 58.
— 1906: Über eocäne und paleocäne Ablagerungen in Holstein. Kgl. Preuss. Geol. Landesanst. Jahrb.
— 1907: Über die untereocänen Tuffschichten und die paleocäne Transgression in Norddeutschland. Kgl. Preuss. Geol. Landesanst. Jahrb.
— 1911: Geologische Notizen von der Insel Fehmarn und aus Wagrien. III Teil. Kgl. Preuss. Geol. Landesanst. Jahrb.
— 1914: Neue Beobachtungen in den Kreidegruben von Finkenwalde bei Stettin über Untereocän, Paleocän (?) und Interglazial. Deutsch. Geol. Ges. Zeitschr. 66.
Gardner, J. 1926: On Scott's new correlation of the Texas Midway. Am. Journ. Sci. Ser. 5, Vol. 12.
Gardner, J. A., 1931: Relation of certain foreign faunas to Midway fauna of Texas. Am. Ass. Petr. Geol. Bull. Vol. 15.
— 1933: The Midway group of Texas. Univ. Texas Bull. 3301.
— 1945: Mollusca of the Tertiary formations of Northeastern Mexico. Geol. Soc. Am. Mem. 11.

GARDNER, J. S., 1881: American Cretaceous flora. Nature 1881.
— 1883: On the Lower London Tertiaries: Geol. Soc. London Quart. Journ. Vol. 39.
GANSS, O, UND KNIPSCHEER, H. C. G., 1954: Das Alter der Nierentaler und Zwieselalm-Schichten des Beckens von Gosau. N. Jahrb. Geol. Pal. Abh. 99.
— — 1956: Die Maastricht-Eozän-Folge des Helvetikums im Sprunggraben bei Oberteisendorf (Obb.) und ihre Gliederung mit Hilfe pelagischer Foraminiferen. Geol. Jahrb. Bd. 71.
GEINITZ, H. B., 1888: Die Kreidegeschiebe des Mecklenburgischen Diluviums. Deutsch. geol. Ges. Zeitschr.
— 1897: Beiträge zur Geologie Mecklenburgs, Neue Aufschlüsse der mecklenb. Kreideformation. Ver. d. Freunde d. Naturg. Mecklenb. Arch. Jahrg. 50. Güstrow.
GEINITZ, E., 1909: Paläozän im Untergrund von Rostock. Centralbl. f. Min. etc.
GELEV, Šč. AND GOČEV, P., 1938: Tertiär zwischen den Flüssen Isker und Ogosta. Bulg. Geol. Ges. Zeitschr. Jahrg. 10. Sofia.
GILKINET, A., 1924/25: Flore fossile du Landénien de Huppaye, Eocène inferieur. Soc. Geol. Belgique. Mém.
GILMORE, CH. W., 1942: Paleocene faunas of the Polecat Bench formation, Park County, Wyoming P. 2. Lizards. Am. Phil. Soc. Proc. Vol. 85.
GLAESSNER, M. F., 1930: Die geologischen Verhältnisse des Kreidevorkommens zwischen Bruderndorf und Ernstbrunn (Niederösterreich). In Kühn, O: Das Danien der äusseren Klippenzone bei Wien. Geol. und Pal. NF 17.
— 1934: Stratigraphie des unteren Paleogens des nördlichen und östlichen Kaukasus im Lichte des Studiums der Mikrofauna. Erdöl-Geol. Schürfinst. NCRI. Jb.
— 1936: Die Foraminiferengattung Pseudotextularia und Amphimorphina. Problems of Paleontology Vol. 1.
— 1936: Zur Mikropaläontologie der kaukasischen Erdölfelder. Petroleum, Jahrg. 32, Nr 27.
— 1937: Die Planktonforaminiferen aus der Kreide und dem Eocen und ihre stratigraphische Bedeutung. Etudy mikropal. Tom 1. Moscow. Univ.
— 1937: Studien über Foraminiferen aus der Kreide und dem Tertiär des Kaukasus I. Problems of Paleontology Vol. 2—3, Moscow Univ.
— 1937: On a new family of Foraminifera. Studies in Micropaleontology. Vol. 1 Fasc. 3 Moscow Univ.
— 1943: Problems of stratigraphic correlation in the Indo Pacific Region. Roy. Soc. Vict Proc. 55.
— 1958: Discussion: Stratigraphic correlation of Upper Cretaceous and Lower Cretaceous in the Tethys and Boreal by the aid of microfossils. See Bettenstaedt & Wicher, 1956.
GORKA, H., 1957: Les coccolithophorites du Maestrichtien supérieur de Pologne. Act. Paleont. Polonica Vol. 2.
GOTTSCHE, PH. C., 1883: Die Sedimentaer-Geschiebe der Provinz Schleswig-Holstein. Yokohama.
— 1915: Dito Neudruck mit Nachträgen und Berichtigungen. Kiel.
GRABAU, A. W., 1927: A summary of the Cenozoic and Psychozoic deposits with special reference to Asia. Geol. Soc. China. Bull. Vol. 6, Nr 2.
GREACEN, K. F., 1941: The stratigraphy, fauna and correlation of the Vincentown Formation. Dept. Cons. Developm. State of New Jersey. Geol. Series Trenton. Bull. 52.
GREGERSEN, A. OG SORGENFREI, T., 1951: Efterforskningsarbejdet i Danmarks dybere undergrund. DGFM. Vol. 12.
GREKOFF, N. AND LYS, M., 1951: Microfaunes du Crétacé supérieur et du Paléocène. leur utilisation en Afrique Aequatoriale Francaise. Third World. Petr. Congr. Proc. Nr 3, Sect. 1.
GRIMSDALE, T. F., 1947: Upper Cretaceous Foraminifera, a criticism. Journ. Pal. Vol. 21.
— 1951: Correlation, age determination, and the Tertiary pelagic Foraminifera. Third World Petr. Congr. Proc. Sect. 1, Leiden, Netherl.
— 1952: Cretaceous and Tertiary Foraminifera from the Middle East. Brit. Mus. Nat. Hist. B. Geol. Vol. 1. Nr 8.
— 1956: Discussion: Stratigraphic correlation of Upper Cretaceous and Lower Cretaceous in the Tethys and Boreal by the aid of microfossils. See Bettenstaedt & Wicher 1956.
GRIPP, K., 1913: Gliederungstabelle des Tertiärs in Nordwestdeutschland. Min. Geol. Inst. Hamburg. Mitteil.
DE GROSSOUVRE, A., 1897: Sur la limite du Crétacé et du Tertiaire. Soc. Geol. France. Bull. Ser. 3, T. 25.
— 1901: Recherches sur la Craie supérieure. Première partie. Stratigraphie générale. Serv. explic. Carte géol. Mém. Paris.

DE GROSSOUVRE, A., 1902: Sur des étages danien et montien. Soc. Geol. France. C. R.
GRUNAU, H. R., 1953: Geologie von Portugiesisch Ost-Timor. Eine kurze Übersicht. Nat.-forsch, Ges., Bern. Mitteil. N.-F., B. 13.
— 1956: Zur Geologie von Portugiesisch Ost-Timor. Ecl. Geol. Helv. Vol. 46.
GRY, H., 1935: Petrology of the Paleocene sedimentary rocks of Denmark. DGU., R. 2, Nr 61.
GRÖNWALL, K. A., 1896: Kritblock från sydöstra Skåne. GFF Bd. 18.
— 1897: Block av paleocän från Köpenhamn. DGFM Nr 4.
— 1898: Danmarks yngsta krit- och äldsta tertiäraflagringar. Förh. vid 15de Skandinaviska Naturforskarmötet i Stockholm 1898.
— 1899: Smånotiser om Jyllands krita. DGFM Nr 5.
— 1899: Några anmärkningar om lagerserien i Stevns Klint. GFF Bd. 21.
— 1900: Borrade ekinidtaggar från Danmarks krita. — DGFM Bd. 1 Nr 6.
— 1904: Om de løse Blokkes Betydning for Kendskabet til Danmarks Geologi. DGFM Bd. 2. Nr 10
— 1904: Geschiebestudien, ein Beitrag zur Kenntniss der ältesten baltischen Tertiärablagerungen. — Kgl. Preuss. Geol. Landesanst. Jahrb. Bd 24. Heft 3.
— 1904: Forsteningsførende Blokke fra Langeland, Sydfyn og Aerø samt Bemærkningar om de ældre Tertiærdannelser i det baltiske Omraade. DGU R. 2 Nr 15.
— 1905: Nogle Bemærkninger om Lagfolgen ved Vestre Gasvaerk i København. DGFM Bd. 2. Nr 11.
— 1907: Sedimentære Blocke fra Kortbladet Skamlingsbanke. DGU R. 1. Nr 12.
— 1908: En Boring paa Samsö og Danmarks ældre Tertiär. DGFM Nr 14.
— 1908: En Boring paa Samsö og nogle deraf følgende slutningar om Danmarks ældre Tertiær. DGFM 3.
— 1926: Discussion om Daniets geologiske Stilling. DGFM 7.
— 1936: Möjlig förekomst av tertiär i nordligaste Skåne. GFF Bd. 58.
— OG HARDER, P., 1907: Paleocæn ved Rugaard i Jylland og dets Fauna (Résumé en francais) DGU. Ser. 2. Nr 8.
— OG MILTHERS, V., 1908: Løse Blokke paa Kortomraadet Faxe og Stevnsklint. DGU R. 1. Nr 11.
GUBLER, Y., 1943: Remaniement d'une microfaune du Crétacé supérieur dans le Lutétien de Tréziers (Ande). Soc. Géol. France, C. R. Nr 9.
— 1946: Sur la stratigraphie du Flysch au Sud de Pau (Basses-Pyrénées). Soc. Geol. France. Bull. Ser. 5. T. 16.
— ET POMEYROL, R., 1946: Nouvelles observations stratigraphiques dans l'Eocène au sud de Pau (Basses-Pyrénées). Soc. Geol. France. Bull. Ser. 5. T. 16.
GULINCK, M., 1948: Sur des phénomènes de glissement sous-aquatique et quelques structures particulières dans les sables landéniens. Soc. Belge Géol. Pal. Hydrol. Bull. Vol. 57.
— 1949: Obervations sur le Landénien d'Epinois. Soc. Belge Géol. Pal. Hydrol. Bull. Vol. 58.
— ET HACQUAERT, A., 1954: L'Eocène. I. L'Eocène Inférieur — Le Landénien. Aperçu général. Prodrome d'une déscription géologique de la Belgique. Soc. Geol. Belg.
HADDING, A., 1919: Kritische Studien über die Terebratula Arten der schwedischen Kreideformation. Paleontographica, Vol. 63.
— 1923: Om uppfattningen av Terebratula lens Nilsson och några andra terebratulor i Danmarks danien. DGFM Bd. 6.
— 1927: Miljöförhållandenas inverkan på de sedimentära bergarternas faunistiska karaktär. Några reflexioner i Danienfrågan. DGFM Bd. 7.
— 1927: *The Pre-Quaternary sedimentary rocks of Sweden.* 1) A survey of the Pre-Quaternary rocks of Sweden. 2) The Paleozoic conglomerates of Sweden. Lunds Univ. Årsskr. NF Avd. 2. Bd. 23.
— 1929: 3) The Paleozoic and Mesozoic sandstones of Sweden. Lunds Univ. Årsskr. NF Avd. 2. Bd. 25.
— 1932: 4) Glauconite and glauconitic rocks. Lunds Univ. Årsskr. NF Avd. 2. Bd. 28.
— 1933: 5) On the organic remains of the limestones. Lunds Univ. Årsskr. NF Avd. 2. Bd. 29.
— 1941: 6) Reef limestones. Lunds Univ. Årsskr. NF Avd. 2. Bd. 37.
HAGN, H., 1950: Zur Paläogeographie und Mikropaläontologie des Oberbayrischen Paläocänflysches. Deutsch. Geol. Ges. Zeitschr. 101, (1949).
— 1952: Zur Kenntniss der obersten Kreide am Nordfuss des Untersberges (Salzburger Alpen). Neues Jahrb. Geol. und Pal.
— 1954: Paläontologische Untersuchungen am Bohrgut der Bohrungen Ortenburg CF 1001, 1002 und 1003 in Niederbayern, (Abs.) Palaeont. Zeitschr. Bd 28.
— 1955: Zur Altersfrage der Nierentaler Schichten im Becken von Gosau. Neues Jahrb. Geol. und Pal.

HAGN, H., 1957: Das Profil des Beckens von Gosau (österreichische Kalkalpen) in mikropaläontologischer Sicht. Österr. Ak. Wiss. Anz. math. natw. Kl. Nr. 4.
HAQUE-MOHSENUL, A. F. M., 1956: The foraminifera of the Ranikot and Laki of Nammal Gorge, Salt Range. Paleontol. Pakistanica. Vol. 1. Geol. Surv. Pakistan. Mem.
HALET, F., 1932: Les formations infraheersiennes du Limbourg belge. Soc. belge Geol., Pal. Hydrol. Bull. Vol. 42.
HAMILTON, E. L., 1953: Upper Crétaceous, Tertiary and Recent planktonic Foraminifera from Mid-Pacific flat-topped Seamounts. Journ. Paleonl. Vol. 27.
HANSEN, K., 1941: Tektoniske Retningslinier paa Sjælland. DGFM. Bd 10.
— 1941: Tektoniken i Danmarks Undergrund endnu en Gang. DGFM. Bd 10.
HANSEN, S., 1930: Om Forekomster af Glacialtlager af paleocæn Mergel paa Sjælland. DGFM Vol. 7.
HANZAWA, S., 1937: Notes on some interesting Cretaceous and Tertiary Foraminifera from the West-Indies. Journ. Paleont. Vol. 11.
HARDER, P., 1922: Om Grænsen mellem Saltholmskalk og Lellinge Grønsand og nogle Bemærkninger om Inddelingen af Danmarks ældre Tertiær. DGU Rk. 2. Nr 38.
HARRIS, G. D., 1896: The Midway stage. Am. Paleont. Bull. Vol. 1.
HARRIS, R. W., & JOBE, B. J., 1952: Three new names for basal Midway Foraminifera from Arkansas. CCF Vol. 3.
HAUG, E., 1911: Traité de Géologie. T. 2. — Paris.
HAYNES, I., 1954: Taxonomic position of some British Paleocene Buliminidae. CCF, Vol. 5.
— 1955: Pelagic Foraminifera in the Thanet beds and the use of Thanetian as a stage name. Micropaleontology. Vol. 1.
— 1956: Certain smaller British Paleocene Foraminifera. Part I: Nonionidae, Chilostomellidae, Discorbidae — — — CCF. Vol. 7.
— 1958: (1957), — — — Part II, see Wood, A. & Haynes) Part III, Polymorphinidae. CCF, Vol. 9.
— 1958: — — — Part IV. Arenacea, Lagenidea, Buliminidea, and Chilostomellidae. CCF, Vol. 9.
celui du bassin de Paris. Soc. Géol. France. Ann. Vol. 4.
HÉBERT, E., 1853: Note sur le synchronisme du Calcaire pisolithique des environs de Paris et de la crai supérieure de Maastricht. Roy. Acad. Sci. Belgique. Bull. Vol. 20.
— 1869: Recherches sur la craie du Nord de l'Europe. Acad. Sci. Paris. C. R. Vol. 69.
— 1873: Comparaison de l'Eocène inférieur de la Belgique et de l'Angleterre avec celui du bassin de Paris. Soc. géol. France. Ann. Vol. 4.
— 1881/2: (Remarques) Au sujet »Système Crétacé de la Suède» par Lundgren. Soc. Geol. France. Bull. Ser. 3. Vol. 10.
HENNIG, A., 1892: Studier öfver bryozoerna i Sveriges kritsystem. I. Cheilostomata. Lunds Univ. Årsskr. 28.
— 1893: Ueber Neuropora conuligera, eine neue Bryozoen-Art aus der schwedischen Kreide. KVA Handl. Bih. Bd. 19.
— 1894: Studier öfver bryozoerna i Sveriges kritsystem. 2. Cyclostomata. Lunds Univ. Årsskr. 30.
— 1898: Faunan i Skånes yngre krita. 1) Echiniderna. KVA Handl. Bih. Bd. 24.
— 1898: Med anledning af docent Mobergs anmärkning till min uppsats »Om skrifkritan i Skåne». GFF, Bd. 20.
— 1899: Faunan i Skånes yngre krita. 2) Lamellibranchiaterna. — KVA Handl. Bih. Bd. 24.
— 1899: Faunan i Skånes yngre krita. 3) Korallerna — KVA Handl. Bih. Bd. 24.
— 1899: Studier öfver den baltiska yngre kritans bildningshistoria. GFF Bd. 21.
— 1899: Svar till D:r Grönwall med anledning af hans anmärkningar mot mina »Studier öfver den baltiska yngre kritans bildningshistoria». GFF, Bd. 21.
— 1900: Geologischer Führer durch Schonen. Saml. Geol. Führer 7. — Berlin.
— 1910: Guide pour le terrain crétacé de la Suède. GFF, Bd. 32.
HENSON, F. R. S., 1938: Stratigraphical correlation by small Foraminifera in Palestine and adjoining countries. Geol. Mag. Vol. 75.
— 1949: Observations on Cretaceous and Tertiary reef formations and associated sediments in Middle East. (Abs.) Oil and Gas Journ. Vol. 47.
— 1950: Cretaceous and Tertiary reef formations and associated sediments in the Middle East. Amer. Ass. Petrol. Geol. Bull. Vol. 34.
— 1950: Middle Eastern Tertiary Peneroplidae (Foraminifera), with remarks on the phylogeny and taxonomy of the family. West Yorkshire Print. Co. Ltd.-Wakefield, Engl.
— 1951: Observations on the geology and petroleum occurences of the Middle East. Third World Petr. Congr. The Hague, Sect. I.

HENSON, F. R. S., ET BROWN, R. MC GINTY, J., 1949: A synopsis of the stratigraphy and geological history of Cyprus. Geol. Soc. London, Quart. Journ. Vol. 105.
HILTERMANN, H., 1941: Ein litorales Paläozän in Norddeutschland. Deutsch. Geol. Ges. Zeitschr. Vol. 93.
— 1956: Biostratigraphie der Oberkreide auf Grund von Mikrofossilien. Paläont. Zeitschr. Vol. 30.
— UND STAESCHE, K., 1940: Mikrofaunen aus dem Tertiär Nordwestdeutschlands. Reichanst. f. Bodenforsch. Abh. NF Heft. 201.
HINSCH, W., 1958: Lexique stratigraphique international. Vol. I Fasc. 5 — Allemagne — Tertiaire Allemagne du Nord. Congr. Geol. Intern.
HISINGER, W., 1828: Anteckningar i Physik och Geognosi. 4 H. Stockholm.
— 1837: Lethaea suecica seu Petrificata Sueciae, iconibus et characteribus illustrata. Holmiae.
— 1841: Förteckning öfver en geognostisk och petrifactologisk samling från Sverige och Norrige tillägnad Kongl. Vetenskapsacademien af en dess ledamot. — Stockholm.
HOFKER, J., 1955: The Foraminifera of the Vincentown formation. Mc Lean Foram. Lab. Rep., Nr 2.
— 1956: Het onder-paleoceen van Zuid-Limburg. Natuurhist. Maandbl. Jahrg. 45.
— 1957: Een nieuwe laag in het bovenste krijt van Zuid-Limburg. Natuurhist. Maandbl. Jahrg. 46.
— 1959: Foraminifera from the Cretaceous of South Limburg, Netherlands 39. Arguments for a Lower Paleocene age of the sediment above the upper Md in the quarry of Curfs, near Houthem. Natuurhist. Maandbl. Jahrg. 48.
— 1959: Foraminifera from the Cretaceous of South Limburg, Netherlands XXXX: The age of the Cr 4, Craie tuffoide. Natuurh. Maandbl. Irg. 48.
HOLST, N. O., 1902: Beskrifning till kartbladet Ystad. SGU, Ser. Aa Nr 117.
— & GRÖNVALL, K. A., 1907: Paleocen vid Klagshamn. SGU, Ser. C. Nr 208.
DE B. HORNIBOOK, N., 1953: Immigration of Foraminifera to New Zealand in the Upper Cretaceous and Tertiary. New Zealand J. Sci. Techn. sec. B. Vol. 34.
VAN HOUTEN, F. B., 1945: Review of the latest Paleocene and early Eocene mammalian faunas. Journ. Paleont. Vol. 19.
— 1948: Origin of red-banded early Cenozoic deposits in the Rocky Mountain Region. Am. Assoc. Petrol. Geol. Bull. Vol. 32.
HUME, W. F., 1911: The effects of secular oscillation in Egypt during the Cretaceous and Eocene periods. Geol. Soc. London, Quart. Journ. Vol. 67.
HÄGG, R., 1923: Referat: Brünnich-Nielsen, K.: Indelingen af Danienet i Danmark og Skaane. GFF Bd 45.
— 1924: Svenska kritbrachiopoder och kritmollusker i Hisingers samling. KVA Ark. Zool. Bd 16. Nr 8.
— 1930: Die Mollusken und Brachiopoden der schwedischen Kreide. I. Eriksdal. SGU, Ser. C. 363.
— 1935: Die Mollusken und Brachiopoden der schwedischen Kreide. II. Kullemölla, Lyckås, Kåseberga, und Gräsryd. SGU, Ser. C. 385.
— 1940: Mollusken und Brachiopoden des Danien in Schweden. GFF Bd 62.
— 1947: Die Mollusken und Brachiopoden der schwedischen Kreide. Das Kristianstadgebiet. SGU, Ser. C., Nr 485.
— 1954: Die Mollusken und Brachiopoden der schwedischen Kreide. Die Schreibkreide (Mucronatenkreide). GFF, Bd 76.
HÖGBOM, A. G., 1913: Fennoskandia. Handbuch der regionalen Geologie. Vol. 4, 5. Heidelberg.
v. IHERING, H., 1907: Les mollusques fossiles du Tertiaire et du Crétacé supérieur de l'Argentine. Mus. Nac. Buenos Aires, Ann. Vol. 5, Nr 19.
ISRAELSKY, M. C., 1951: Foraminifera of the Lodo-Formation, Central California. U. S. A., Geol. Surv. Prof. Paper 240 A.
JAEKEL, D., 1894: Ref. Davis, J. W., 1890. N. Jahrb. Mineral., Bd 2.
JANSCHIN, A. L., 1952: O nizhnej i werchnej granitze paleogena [Über die untere und obere Grenze des Paläogens] (Russian). Mosk. Ob. Isp. Prir. Otd. Geol. Bull. 27. Moscow.
JELETSKY, J. A., 1951: Die Stratigraphie und Belemnitenfauna des Obercampan und Maastricht Westfalens, Norddeutschlands und Dänemarks sowie einige allgemeine Gliederungsprobleme der jüngeren borealen Oberkreide Eurasiens. Geol. Jahrb. Beih. 1.
— 1958: Die jüngere Oberkreide (Oberconiac bis Maastricht) Südwestrusslands und ihr Vergleich mit der Nordwest- und Westeuropas. Geol. Jahrb. Beih. 33.
JENNINGS, P. H., 1936: A microfauna from the Monmouth and basal Rancocas groups of New Jersey. Amer. Pal., Bull. Vol. 23.

JEPSEN, G. L., 1930: Stratigraphy and paleontology of the Paleocene of northeastern Park County, Wyoming. Am. Philos. Soc. Pr. Vol. 69.
— 1940: Paleocene faunas of the Polecat Bench formation, Park County, Wyoming, Pt. I. Am. Philos. Soc. Pr. Vol. 83.
JESSEN, A., 1917. En Erosionsdal i Saltholmskalken NV for København. DGFM Bd 5.
JESSEN, A., & ÖDUM, H., 1923: Senon og Danien ved Voxlev. DGU, R 2. Nr 39.
JODOT, P. YOLEAUD, L., LEMOINE, P., TEILHARD DE CHARDIN, P., 1923: Observations sur le Calcaire pisolithique de Vertus et du Mont Aimé (Marne). Soc. Geol. France. Bull. Ser. 4. Vol. 22.
JOHNSTRUP, F., 1864: Faxekalkens Dannelse. — Köpenhamn.
— 1865: Faxekalkens Dannelse og senare undergaaende Forändringar. Kgl. Dansk Vidsk. Selsk. Forh. Ser. 5, Vol. 7.
— 1866: Om Faxekalken ved Annetorp i Skaane. Nat.hist. For. Medd.
— 1875: De geologiske Forhold i Jylland. Tidskr. f. Landök.
— 1876: Om Grønsandet i Sjælland. Nat.hist. For. Medd. — København.
— 1882: Oversigt over de geognostiske Forhold i Danmark. Danmarks statistik. Bd 1 — København.
JÖNSSON, J., 1884: Geol. Kartbl. Malmö. SGU, Ser. Aa Nr 91.
KALMA, G., 1928: Geologi von Denemarken. De Natuur.
KAPTARENKO-TSCHERNOUSSOWA, O. K., 1947: [Über Funde von Foraminiferen in den Paläogen Ablagerungen der Umgebung der Stadt Sumy.] Ak. Nauk, USSR Geol. Journ. T. 8. H. 4, Kiev (Ukrain).
— 1947: [Zur Stratigraphie des Paläogens des Manganerzgebietes von Nikopol.] Akad. Nauk. USSR Geol. Journ. Vol. 8. Kiev (Ukrain).
KELLER, B. M., 1936: [Stratigraphie der Oberkreideschichten des W-Kaukasus.] Ak. Nauk. SSSR. ISV. Ser. Geol. Nr 5. (Russian)
KISELMAN, E. N., 1957: Foraminifery ganjkinskoj swity (kampan? — maastricht-datskij? jarus). [Foraminiferen der Ganjkin-Folge (Kampan? — Maastricht-Danien? — Zone)]. (Russian) Tr. L. Gostoptechizdat.
DE KLASZ, I., 1953: Quadratobuliminella n. gen. eine neue Foraminiferengattung von der Wende Kreide-Tertiär. Neues. Jahrb. Geol. Pal. Min.
— 1956: Zur Kenntniss der ostalpinen Oberkreidestratigraphie. Neues Jahrb. Geol. Pal. Min.
— & KNIPSCHEER, H. C. G., 1954: Die Foraminiferenart Reussella szajnochae (Grzybowski) ihre systematische Stellung u. regionalstratigraphische Verbreitung. Geol. Jahrb. Bd 69.
KLINE, V. H., 1943: Clay County, Mississippi: Midway Foraminifera and Ostracoda. U. S. Geol. Surv. Bull. No 53.
KLINGHARDT, F., 1935: Die Kreide-Tertiärgrenze und verwandte Fragen. Deutsch. Geol. Ges. Vol. 87.
KÖLBEL, H. & KRUTZSCH, W. 1957: Stratigraphie, Erdölgeologie u. Paläontologie auf der 20. Tagung des Intern. Geol. Kongr. in Mexico 1956. Zeitschr. angew. Geol. Vol. 3.
V. KOENEN, A., 1885: Ueber eine paläocäne Fauna von Kopenhagen. Kgl. Ges. Wiss., Göttingen, Abh. Vol. 32.
— 1890: Über die Fauna der alt-tertiären Schichten im Bohrloche von Lichterfelde bei Berlin. Kgl. preuss. Geol. Landesanst. Jahrb.
KOKEN, E., 1888: Neue Untersuchungen an tertiären Fisch-Otolithen. D. Geol. Ges. Zschr. Bd 40.
KONGIEL, R. 1935: Contribution à l'étude du Siwak dans les environs de Pulawy (Plateau du Lublin). Dissertation, Wilno. (Polish with French summary.)
— 1936: Sur la position stratigraphique du Siwak de Wolka Rzadowa et Wolka Dorgunska près Sopockinie, Nord-Ouest de Grodno. Inst. Geol. Univ. de Wilno Travaux. Nouv. Ser.
— 1949: O przedstawicielach rodzaju Echinocorys z danu Danii, Szwecji i Polski. [Sur l'Echinocorys du Danien danois, suedois et polonais.] Panstw. Inst. Geol. Prace. Vol. 5 — Warszawa. (Polish with French summary.)
— 1949: O zmiennosci jezowcow rodzaju Echinocorys pochodzacych z danu Danii, Szwecji i Polski. [On the variability of Echinoderms from the Danian of Denmark, Sweden and Poland.] Wiad. Muz. Ziemi (Polish Geol. Mag.). Vol. 4.
— & MATWIEJEWÓWNA, L., 1937: Materialy do znajomosci fauny gornokredowej z okolic Pulaw [Material zur Kenntnis der Fauna der Oberkreide aus der Umgebung von Pulawy.] Tow. Przyj. Nauk. Wilno. Vol. 11. (Polish with German summary.)
KOROBKOV, I. A., 1947: [Über das Alter des Elburgansk-Horizonts der Paleogen-Ablagerungen, N-Naukasus] (Russian.). Dokl. Ak. Nauk. SSSR Vol. 58.
KÖSTER, E., 1950: Formveränderungen von Echinocorys sulcatus. GFF Bd 72.
KRUTZSCH, W., 1957: Sporen- und Pollengruppen aus der Oberkreide und dem Tertiär

Mitteleuropas und ihre stratigraphische Verteilung. Zeitschr. f. angew. Geol., H. 11/12.
KRUTZSCH, W., u. LOTSCH, D., 1957: Zur stratigraphischen Stellung der Latdorfstufe im Paläogen. Geologie, Jahrg. 6, H. 5 — Akademie Verlag. Berlin.
KRUYTZER, E. M. AND MEIJER, M., 1958: On the occurrence of Crania brattenburgica (W. Schlotheim 1820) in the region of Maastricht (Netherlands). Nat.-Hist. Maandblad, Jrg. 47. Nr 11—12.
KUGLER, H. G., 1938: The Eocene of the Soldado Rock near Trinidad. Geol. y Mineria Bol. T. II, Caracas.
— 1956: Trinidad. Geol. Soc. Am. Bull. Mem. 65.
— 1957: Contribution to the geology of the Islands Margarita and Cubagua, Venezuela. Geol. Soc. Am. Bull. Vol. 68.
KULCZYCKIJ, J. O. & CHLOPNIN, K. L., 1957: O vozrastie jamnienskich pescanikov (Vostocnyje Karpaty). [Über das Alter des Jamna Sandsteines, (Ost-Karpaten)]. Geol. Nefty. Nr 9.
KÜHN, O. 1930: Das Danien der äusseren Klippenzone bei Wien. Geol.-Pal. Abh. NF, Bd 17.
— 1947: Zur Stratigraphie und Tektonik der Gosauschichten. Österr. Ak. Wiss. Sitzungsber. mat.-nat.wiss.Kl. Abt. I.
KÜPPER, K., 1956: Stratigraphische Verbreitung der Foraminiferen in einem Profil aus dem Becken von Gosau, (Grenzbereich Salzburg-Oberösterreich). Geol. Bundesanst. Wien. Jahrb. Bd 1 c.
LAFFITTE, R., 1935: Le Danien et le Nummulitique dans l'Aurès occidental. Acad. Sci. Paris. C. R. 201.
LAMBERT, J., 1903: Description des Échinides Crétacés de la Belgique. I. Étude monographique sur le genre Echinocorys. Mus. Roy. Hist.-Nat. Belgique. Mem. 2.
— 1910: Description des Échinides crétacés de la Belgique. II. Échinides de l'étage Sénonien. Mus. Roy Hist.-Nat. Belgique. Mem. 4.
— 1923: Referat: A. Jessen & H. Ödum: Senon og Danien ved Voxlev. Rev. Géol. et sci. conn. Liéges.
LAMBERT, M., 1897: Note sur les Échinides de la craie de Ciply. Soc. Belge Géol. Pal. Hydrol. Bull. T. 11.
— 1912, Note sur les Échinides du calcaire pisolithique du Bassin de Paris. Ass. France, Avanc. Sci. (Congrès de Reims.)
— 1922: Sur un Échinide nouveau du Montien des environs de Paris. Soc. Géol. France. Bull. 4 Sér. T. 20.
DE LAPPARENT, A. F., 1939: Apropos de l'âge tertiaire du »calcaire pisolithique» de Vigny (S-et-O). Soc. Géol. France. Bull. 5 Sér. Vol. 9.
— & ELLENBERGER, F., 1946: Contacts du calcaire de Meudon et de la craie à belemnitelle. Soc. Géol. France. C. R. Nr 6.
LAURENT, I., 1907: Études scientifiques sur le pays rémois. Ass. France Avanc. Sci. — Congrès de Reims.
LEDOUX, A., 1910—11: Études sur les roches cohérentes du tertiaire belge. Soc. Géol. Belgique, Ann. T. 38.
LEMOINE, P., 1937: L'âge et les conditions de dépôt du calcaire pisolithique. Soc. Géol. France. Bull. Sér. 5. T. 7.
— 1937: Les algues calcaires du calcaire pisolithique, leurs enseignements stratigraphiques. Soc. Géol. France Bull. Ser. 5, T. 7.
LERICHE, M., 1901: Sur quelques éléments nouveaux pour la faune ichthyologique du Montien inférieur du Bassin de Paris. Soc. Géol. du Nord. Ann. T. 30.
— 1902: Compte rendu sommaire des excursions de la session extraordinaire de la Société belge de Géologie, aux environs de Mons, Tournai et Bruxelles, du 24 au 27 août 1902. Soc. Belge Geol. Pal. Hydrol. Bull T. 16.
— 1902: Les poissons tertiaires de la Belgique. Mus Roy. Hist.-Nat. Belgique. Mem. T. 2.
— 1903: Les poissons du Paléocène belge. Soc. Belge Géol. Pal. Hydrol. Bull. T. 17.
— 1903: Sur les horizons paléontologiques du Landénien marin du Nord de la France. Soc. Géol. du Nord. Ann. T. 32.
— 1905: Observations sur la classification des assises paléocènes du Bassin de Paris. Soc. Géol. du Nord. Ann. T. 34.
— 1905: Sur la signification des termes »Landénien» et »Thanétien». Soc. Géol. du Nord. Ann. T. 34.
— 1906: Contribution à l'étude des poissons fossiles du Nord de la France et des régions voisines. (Thèse de doctorat). Soc. Géol. du Nord. Mem. T. 5.
— 1906: Grès landénien à végétaux dans l'Artois. Soc. Géol. du Nord. Ann. T. 35.
— 1908: Note sur des poissons paléocènes et écocènes des environs de Reims (Marne). Soc. Géol. du Nord. Ann. T. 37.

LERICHE, M., 1910: Sur la faune malacologique des Grès landéniens, à végétaux, du Nord de la France. Soc. Géol. du Nord. Ann. T. 39.
— 1913: Les Poissons paléocènes de Landana (Congo). Les gisements de Poissons paléocènes et éocènes de la côte occidentale d'Afrique. Mus. Congo belge, Géol. Pal. Miner. Ann. Ser. 3. T. 1.
— 1913: Les »Campanile» du „Tuffeau de Ciply" et du »Calcaire de Cuesmes». Soc. Roy. zool. malacol. Belgique. Ann. T. 47.
— 1919: Observations sur le Landénien dans le Sud du Cambrésis. Soc. Belge Géol. Pal. Hydrol. Bull. T. 29.
— 1920: Notes sur la Paléontologie du Congo: I. Deuxième note sur les Poissons des couches du Lualaba. II. Sur les premiers fossiles recontrés dans les couches du Lubilash. III. Note préliminaire sur des Poissons nouveaux du Paléocène et de l'Écocènes de la région côtière du Congo. Revue Zool. Africaine. Vol. 8.
— 1921: Une nouvelle coupe dans le Landénien à Maret, près Orp-le-Grand (Hesbaye). Soc. Belge Géol. Pal. Hydrol. Bull. T. 31.
— 1922: Les Poissons paléocènes et éocènes du Bassin de Paris (Note additionelle). Soc. Géol. France. Bull. 4 Ser. T. 22.
— 1927: Note préliminaire sur deux Scylliidés nouveaux du Paléocène de Landana (enclave portugaise de Cabinda), Congo. Revue Zool. Africaine. Vol. 15.
— 1929: Quelques observations géologiques nouvelles dans la vallée de la Senne, aux environs de Lembecq (Brabant): I, II, III. Soc. Belge Geol. Pal. Hydrol. Bull. T. 37.
— 1929: Sur la répartition des facies lagunaires et fluviatiles du Landénien dans les Bassins belge et parisien. Soc. Belge Géol. Pal. Hydrol. Bull. T. 38.
— 1930: Rectifications de nomenclature au sujét du grand Cérithe du Tuffeau de Ciply (Montien) et de l'Hybodus de la Glauconie de Lonzée (Santonien). Soc. Belge Géol. Pal. Hydrol. Bull. T. 39.
— 1933: Revision de la Feuille du Cambrai au 80 000e (Campagne de 1932). I. Le Landénien du massif tertiaire du Clary — Selvigny — La Terrière. II. Observations sur le Landénien au Nord du massif tertiaire de l'Arrouaise. Serv. Carte géol. France et Topogr. souterr. Bull. T. 38. Nr 190.
— 1940: Le synchronisme des formations tertiaires des deux côtés de l'Atlantique, d'après leur faune ichtyologique. Acad. Sci. C. R. T. 210.
— 1940: Revision de la Feuille de Gambrai au 1/80 000. Campagne de 1931. I. Le Landénien marin à l'Est de la Selle. II. Le Landénien des environs de Vertain (N.). III. Le tuf calcaire de Solesme. IV. Les failles de la région de Solesme. Serv. Carte géol. France et Topogr. souterr. Bull. T. 42. Nr 203.
LE ROY, L. W., 1949: Stratigraphic and micropaleontologic analysis of the Maqfi section, Farafra oasis, Western Desert of Egypt. (Abs.). Geol. Soc. Am. Bull. V. 60. Nr 12.
— 1953: Biostratigraphy of the Maqfi section, Egypt. Geol. Soc. Am. Mem. 54.
LEUPOLD, W., 1933: Neue mikropaläontologische Daten zur Altersfrage der alpinen Flyschbildungen. Ecl. Geol. Helv. Vol. 6. Nr 2.
LEYMERIE, A., 1881: Description géologique et paléontologique de Pyrénees de la Haute Garonne. Toulouse.
LINDSTRÖM, G., 1857: Geologiens grunder. — Stockholm.
LINNAEUS, C., 1751: Skånska resa. — Stockholm.
v. LINSTOW, O., 1922: Die Verbreitung der tertiären und diluvialen Meere in Deutschland. Preuss. Geol. Landesanstalt. Abh. NF 87.
LIPPARINI, T., 1940: Tettonica e geomorfologia della Tripolitania. Soc. Geol. It. Bull. Vol. 59.
DE LIZAÚR Y ROLDAN, J. AND GALVEZ-CAUERO, A., 1935: Estudios paleontologicos de los terrenos de la zona Atlantica. Inst. Geol. y Miner. Notas y Com. Vol. 6. Nr 6.
LOEBLICH, A. R. AND COLLABORATORS, 1957: Studies in Foraminifera. U. S. Nat. Mus. Bull. 215, Smithsonian Inst. — Washington DC.
LOEBLICH, A. R. AND TAPPAN, H., 1957: Correlation of the Gulf and Atlantic Coastal Plain Paleocene and Lower Eocene formations by means of planktonic foraminifera. Journ. Paleont. Vol. 31. Nr 6.
LORY, P., 1947: Sur le Crétacé supérieur des Gas de Châtillon (Diois NE) et ces rapports avec celui Bochaine. Soc. Géol. France. Bull. T. 17.
LOWENSTAM, H. A. AND EPSTEIN, S., 1954: Paleotemperatures of the post-Aptian Cretaceous as determined by the oxygen isotope method. Journ. Geol. Vol. 62. Nr 3.
LUNDBLAD, B., 1946: De sista 15 årens bidrag till kännedomen om Sveriges mesozoikum. GFF. Bd. 68.
LUNDGREN, B., 1865: Bidrag till kännedomen om Saltholmskalkens geologiska förhållande. Dissert. — Malmö.

LUNDGREN, B., 1866: Paleontologiska iakttagelser öfver Faxekalken på Limhamn. Lunds Univ. Årsskr. T. 3.
— 1881: Om lagerföljden inom kritformationen vid Malmö. GFF, Vol. 5.
— 1878: Über Angelins geologische Übersichts-Karte von Schonen. N. Jahrb. Min. etc. Jahrg.
— 1882: Referat: »Morgan, J. de, Mémoire sur les Terrains Crétacés de la Scandinavie». GFF. Vol. 6.
— 1882: Note sur le systéme crétacé de la Suède. Soc. Géol. France. Bull. Ser. 3. Vol. 10.
— 1882—83: Note sur le système crétacé de la Suède. Rf. GFF. Bd 6.
— 1885: Anmärkningar om Spondylusarterna i Sveriges kritsystem. SGU, Ser. C. Nr 69.
— 1885: Undersökningar öfver Brachiopoderna i Sveriges kritsystem. Lunds Univ. Årsskr. Bd 20. Afd. 4. Nr 3.
— 1886: Några anmärkningar om Ananchytes sulcata Goldf. GFF Bd 8.
— 1888: Öfversikt af Sveriges mesozoiska bildningar. Lunds Univ. Årsskr. Bd 24. Afd. 2. Nr 5.
— 1888: List of the fossil faunas of Sweden. 3. Mesozoic. — Stockholm.
— 1888: Om Sveriges kritfauna. Några anteckningar. KVA Öfvers. Nr 4.
— 1890: Ein Gavial aus dem Senon von Annetorp bei Malmö. Neues Jahrb. Mineral. Bd 2.
— 1891: Studier öfver fossilförande lösa block. GFF Bd 13.
LYELL, CH., 1835: On the Cretaceous and Tertiary Strata of the Danish Islands of Seeland and Møen. Geol. Soc. London. Transact. II. Ser. Vol. 5.
— 1836: Lyells omtale (i formandsberetningen) af Beck. 1836, foruden Lyells egne iakttagelser over emnet. Geol. Soc. of London. Proc.
— 1836: On the Cretaceous and Tertiary Strata of the Danish Islands of Seeland and Møen. London and Edinburgh, Phil. Mag and Journ. of Science. Vol. 7.
— 1837: Über die Kreide und Tertiärschichten der dänischen Inseln Seeland und Møen. Neues Jahrb. für Miner. Geogn. Geol. Petrefact.
— 1838: Sur les terrains crétacés et tertiaires du Danemark. Soc. géol. France. Bull.
— 1917: Omtale af Dr. Becks Bemærkninger. Translated to Danish and edited by A. Clément. København.
LYS, M., 1951: Robulus incisus n. sp., phylum caractéristique en Afrique à la limite Crétacé-Éocène. Inst. France, Petr. Rev. Vol. 6.
LYS, M. & GREKOFF, N., 1951: Microfaunes du crétacé supérieure et du paléocène; leur utilisation en Afrique èquatoriale francaise. (With discussion) Third World Petr. Congr. The Hague, Sect. I.
MADSEN, V., 1902: Beskrivelse til Kortbladet Nyborg. DGU, 1 R. Nr 9.
— 1928: Übersicht über die Geologie von Dänemark. DGU, 5 R. Nr 4.
— AND OTHERS, 1928: Summary of the Geology of Denmark. DGU, 5 R. Nr 4. (Danish, English, French and German Editions).
— ØDUM, H., GRY, H., 1935: Boringerne ved Langbrogaard ved Sønderborg. DGU, 2 R., Nr 55.
MAJZON, L., 1943: Beitrag zur Kenntniss einiger Flyschschichten des Karpathenvorlandes mit Rücksicht auf die Globotruncanen. Kgl. Ung. Geol. Anst. Jhrb. Mitt.
MALZAHN, E., 1934: Über ein neues paläozänes Transgressionssediment. Zeitschr. Geschiebef. Vol. 10.
MANGIN, J. PH., 1957: Remarques sur le terme Paléocène et sur la limite Crétacé — Tertiaire. Soc. Géol. France. C. R.
— 1957: La limite Crétacé — Tertiaire sur le versant sud des Pyrénées occidentales. Acad. Sci. France. C. R. T. 244.
MARIE, P., 1937: Sur la faune de foraminifères du calcaire pisolithique du bassin de Paris. Soc. Géol. France Bull. Ser. 5, Vol. 7.
— 1949: Microfaunes pelagiques des couches à Cardita beaumonti. Soc. Géol. France. C. R.
— 1947: Sur l'âge montien du Calcaire de Bunde (Limbourg hollandais). Soc. Géol. France. Bull. T. 17.
— 1949: Microfaunes pélagiques des couches à Cardita beaumonti. Soc. Géol. France. C. R.
— 1950: Sur l'evolution de la faune de foraminifères des couches de passage du Crétacé au Tertiaire. (Abs.) Int. Geol. Congr. 18-th. Gr-Br. Rept.
MARLIÈRE, R., 1928—29: Note préliminaire à la description de la faune héersienne du bassin de la Haine. Soc. Géol. Belgique. Ann. T. 52.
— 1949: Le site géologique du captage d'Hainin-Hautrage (Hainaut). Soc. Géol. Belgique. Ann. T. 73.
— 1954: Le Paléocène. In Furmarier, P.: Prodrome d'une description géologique de la Belgique. Soc. Géol. Belgique.

MARLIÈRE, R., 1955: Définition actuelle et gisement du Montien dans le bassin de Mons. Soc. Géol. Belgique. Ann. T. 78.
— 1957: Sur le »Montien» de Mons et de Ciply. Soc. Belg. Géol. Pal. et Hydr. Bull. T. 66.
— 1958: Ostracodes du Montien de Mons et résultats de leur étude. Soc. Belg. Géol. Pal. et Hydr. Mem. Sci. in 8°.
MARTIN, G. P. R., 1942: Die Grenzschichten Oberkreide-Alttertiär in der südwestlichen Krim. Zentralbl. Miner. Geol. Paleont.
MARTY, A., 1907: Études sur les végétaux fossiles du Trieu de Leval. Mus. Roy Hist. Nat. Belgique. Mem. T. 5.
MATTHEW, W. D., 1924: Correlation of the Tertiary formations of the Great Plains. Geol. Soc. Am. Bull. Vol. 35.
— AND GRANGER, W. 1921: New genera of Paleocene mammals. Am. Mus. Nat. Hist. Novitates. Nr 13.
MAURY, C. J., 1929: The Soldado Rock type section of Eocene. Journ. Geol. 37.
MAZUREK, A., 1930: Danien w okolicach Kazimierza Dolnego. [Danien in der Umgebung von Kazimierz Dolne.] Pánstw. Inst. Geol. Posiedz. Nauk. 27. Warszawa.
— 1932: Paleocen lubelski. [Paleocen von Lublin.] Pánstw. Inst. Geol. Posiedz. Nauk. 33. Warszawa.
MC GLAMERY, W., 1937: Holothurian remains from the Midway of Alabama. (Abstr.). Alab. Acad. Sci. Journ. 9 (2): 32
MCLEAN, J. D., 1951: Paleocene foraminifera from the Atlantic coastal plain. CCF, Vol. 2.
— 1952: New and interesting species of Foraminifera from the Vincentown Formation. Part 1. New Species. Notulae Naturae. Nr 242.
— 1953: New and interesting species of Foraminifera from the Vincentown Formation. Part II. Forms previously described. Notulae Naturae. Nr 247.
— 1953: A summary of the guide fossil Foraminifera of the Atlantic Coastal Plain between New Jersey and Georgia. A revision. McLean Foram., Lab., Rep. Nr 1.
— 1953: Four new species of foraminifera from the lower Tertiary of New Jersey. CCF Vol. 4.
— 1955: 1. Some notes on the Vincentown formation. 2. Two new species of Foraminifera from Maryland. McLean Foram. Lab. Rep. Nr 2.
— 1958: Stratigraphic study of well at Crisfield, Somerset County, Maryland. Am. Ass. Petr. Geol. Bull. Vol. 34.
MELLEVILLE, M., 1843: Mémoire sur les sables tertiaires inférieurs du Bassin de Paris. Soc. Géol. France. Ann. T. 2.
MERCIER, J., 1953: Le passage du Crétacé au Tertiaire en Haute Mésopotamie occidentale. Acad. Sci. Paris. CR T. 237.
MICHAELIS, G. A. & SCHERK, H. F., 1847: Gebirgsarten und Versteinerungen vom Museum der Kopenhagener Universität. Die 24. Vers. Deutsch. Nat. & Ärzte in Kiel, Amtlicher Bericht.
MILLER, A. K., 1935: The »Paleocene» nautiloid cephalopods of Landana, Port. West Africa. Journ. Pal. Vol. 9.
— 1947: Tertiary Nautiloids of the Americas. Geol. Soc. Am. Mem. 23.
— AND THOMPSON, L. M., 1937: Some Tertiary Nautiloids from Venezuela and Trinidad. Ecl. Geol. Helv. Vol. 30.
— AND THOMPSON, M. L., 1933: The nautiloid cephalopods of the Midway group. Journ. Paleont. Vol. 7.
MILLER, H. W., JR., 1956: Correlation of Paleocene and Eocene Formations and Cretaceous-Paleocene boundary in New Jersey. Amer. Ass. Petr. Geol. Bull. Vol. 40.
MILTHERS, V., 1907: Det ældere Tertiærs Udbredelse i det nordvestlige Sjælland. DGFM Bd 3.
— 1907: En ny Lokalitet for Faxekalk paa Sjælland. DGFM Bd 3.
— 1908: Kortbladene Faxe og Stevns Klint. DGU I. Rk. Nr 11.
— 1922: Nordøstsjællands Geologi, DGU 5 R. No 3.
MIATLUK, E. V., 1950: Stratigrafja fliševych osadkov severnych Karpat v svete dannych fauny foraminifer. [Stratigrafie der Flyschsedimente der Nordkarpaten im Lichte der Foreminiferen-Fauna.] Mikrofauna SSSR, Sbornik IV, Kaukas + Ukraina, Tr. VNIGRI, vyp. 51.
MOBERG, I. C., 1880: Berättelse afgifven till Kongl. Vetsk. Akad. om en med understöd af allmänna medel företagen resa till en del svenska kritlokaler. KVA, Översikt Nr 10.
— 1885: Cephalopoderna i Sveriges kritsystem. I och II. SGU, Ser. C, Nr 73.
— 1888: Om fördelningen af Sveriges viktigare kritförekomster på två skilda bäcken. GFF, Bd 10.

MOBERG, I. C., 1898: Med anledning af docent Hennigs uppsats »Om skrifkritan i Skåne». GFF Bd 20.
DE MORGAN, J., 1882: Mémoire sur les terrains Crétacés de la Scandinavie. Soc. Geol. France. Mem. Sér. 3. Vol. 2.
MORNOD, L., 1949: Les globorotalidés du Crétacé superieur du Montsalvens (Préalps frib.). Ecl. Helv. geol. Vol. 42.
MOROZOVA, V. G., 1939: K stratigrafii verchnevo mela i paleogena Embejskoj oblasti po faunides foraminifer. [Stratigraphie der Oberkreide und des Paleogen im Embagebiet nach Foraminiferen-Fauna.] Mosk. Obsc . . . Bull. T. 17.
— 1939: On the Stratigraphy of the Upper Cretaceous and Lower Tertiary deposits in the Emba Oil Bearing District of the fauna of foraminifera. Soc. Nat. Moskva. Bull N., Ser. 47.
— 1946: Über das Alter unterer Foraminiferschichten Nord-Kaukasiens. Ak. Nauk. SSSR Dokl. T. 54.
— 1946: The boundary between Cretaceous and Tertiary deposits in the light of the study of foraminiferes. Acad. Sci. SSSR Dokl. 54.
MUNIER-CHALMAS, E., 1897: Note préliminaire sur les assises montiennes du Bassin de Paris. Soc. géol. France. Bull. T. 25.
MUNSEY, G. C., jr., 1953: A Paleocene Ostracoda fauna from the Coul Bluff marl member of the Naheola formation of Alabama. Jour. Pal. Vol. 27.
MUNTHE, H., 1896: Till kännedomen om foraminiferfaunan i Skånes kritsystem. GFF, Bd 18.
MURRAY, G. E., 1955: Midway stage, Sabine stage, and Wilcox group. Amer. Assoc. Petr. Geol. Bull. Vol. 39.
MURRAY, G. E. JR AND THOMAS, E. P., 1945: Midway-Wilcox surface stratigraphy of Sabine uplift, Luisiana and Texas. Am. Assoc. Petr. Geol. Bull. Vol. 29.
MUIR, J. M., 1936: Geology of the Tampico region, Mexico. Am. Assoc. Petr. Geol. Bull. Vol. 20.
MULLER, S. W. AND SCHENCK, H. G., 1943: Standard of Cretaceous System. Am. Assoc. Petr. Geol. Bull. Vol. 27.
MÜLLER, TH., 1937: Das marine Paläozän und Eozän in Norddeutschland und Südskandinavien. Berlin.
MÜLLER-DELLE, G., 1948: Neue Ergebnisse aus der Grenzregion zwischen der Flyschzone u. den nördl. Kalkalpen. Geol. Rdsch. Bd 36.
MÖRCK, C., 1874: Forsteninger i Tertiärlagene i Danmark, bestemdte af Dr. O. Mörck. Skand. Naturforsk. møde i København. Meddel.
NAGAPPA, Y., 1959: Foraminiferal biostratigraphy of the Cretaceous — Eocene succession in the India — Pakistan. Burma region. Micropaleontology. Vol. 5.
NAIDIN, D. P., 1956: Nekotorye voprosy stratigrafii verchnemelovych etlojenij russkoj platformy. [Einige Probleme der Stratigrafie der Oberkreideschichten der russ. Plattform.] VNGR et VNIGN, Leningrad.
NAIDIN, D. P., TEISS, R. W., TSCHUPACHIN, M. L., 1957: Determination of paleotemperatures according to the isotopic composition of oxygen in the calcite of shells of some cretaceous fossils from the Crimea. (Russian with Engl. summary.) Ak. Nauk SSR — Geochimia Nr 4.
NAKKADY, S. E., 1949: The foraminiferal fauna of the Esna-shales of Egypt. Pt. I. Inst. Egypte. Bull. Vol. 31.
— 1950: A new foraminiferal fauna from the Esna-shales and Upper Cretaceous Chalk of Egypt. Journ. Paleont. Vol. 24.
— 1951: Zoning the Mesozoic-Cenozoic transition of Egypt by the Globorotaliidae. Alexandria Univ. Fac. Sci. Bull. Nr 1.
— 1952: The foraminiferal fauna of the Esna-shales of Egypt. Pt. II. Inst. Egypte. Bull. Vol. 33.
— 1955: The stratigraphical implication of the accelerated tempo of evolution in the Mesozoic-Cenozoic transition of Egypt. Journ. Pal. Vol. 29.
— 1957: Biostratigraphy and interregional correlation of the upper Senonian and lower Paleocene of Egypt. Journ. Pal. Vol. 31.
DI NAPOLI-ALLIATA, E., 1952: Foraminiferi pelagici e facies in Italia. Conv. Naz.Met. Petr. »Atti» 7.
NATHAN, H., 1949: Geologische Ergebnisse der Erdölbohrungen im Bayerischen Innviertel. Bayr. Geol. Landesanst. Geol. Bavar.
NIELSEN-BRÜNNICH, K., 1909: Brachiopoderne i Danmarks Kridtaflejringer. Kgl. Dansk Vid. Selsk. Skr. 7. R. Nat. math. afd. 6, 4.
— 1910: Om det i Københavns Havn ved Knippelsbro fundne yngste Danien. DGFM Bd 3.
— 1911: Brachiopoderne i Faxe. DGFM Bd 3.
— 1912: Cirripedierne i Danmarks Danien-Aflejringer. DGFM Bd 4.

NIELSEN-BRÜNNICH, K., 1913: Crinoiderna i Danmarks Kridtaflejringer. DGU II. Rk. Nr 26.
— 1913: Moltkia Isis Steenstrup og andre Octocorallia fra Danmarks Kridtidsaflejringer. Mindeskr. for J. Steenstrup.
— 1915: Rhizocrinus maximus n. sp. og nogle Bemærkninger om Bourgueticrinus DGFM Bd 4.
— 1917: Cerithiumkalken i Stevns Klint. DGU IV Rk. Bd 1, Nr 7. — DGFM Bd 5, Nr 7.
— 1917: Heliopora incrustans nov. sp. With a survey of the Octocorallia in the deposits of the Danian in Denmark. DGFM Bd 5. Nr 8.
— 1918: Slægten »Moltkia» og andre Octocoraller i Sveriges Kridttidsaflejringer. GFF Bd 40. — Lunds Geol.-Min. Inst. Medd. Nr 25.
— 1919: En Hydrocoralfauna fra Faxe og Bemærkninger om Danien'ets geologiske Stilling. DGU IV Rk. Bd 1, Nr 10. — DGFM Bd 5, Nr 16.
— 1920, Inddelingen af Danien'et i Danmark og Skaane, DGFM Bd 5, Nr 17.
— 1921: Nogle Bemærkninger om de store Terebratler i Danmarks Kridt- og Danienaflejringer. DGFM Bd 6, Nr 3.
— 1922: Zoantharia from Senone and Paleocene deposits in Denmark and Skaane. Kgl. Dansk. Vid. Selsk. Nat.-math. Afd., 8 Rk., Vol. 3.
— 1925: Nogle nye Octocoraller fra Danienet. DGFM Vol. 6.
— 1925: Nogle Echiniderester fra Danmarks Senon og Danien. DGFM. Bd 6.
— 1926: Kalken paa Saltholm. DGU IV Bd 1, Nr 20.
— 1926: Discussion om Daniets geologiske Stilling. DGFM Bd 7.
— 1926/30: Kalksvampe i Danmarks Senonium og Danium. DGFM Bd 7.
— 1928: Argiope-Arterne i Danmarks senone, daniske og paleocæne Aflejringer. DGFM Bd 7.
— 1931: Serpulidae from the Senonian and Danian deposits of Denmark DGFM Bd 8.
— 1938: Faunaen i ældre Danium ved Korporalskroen. DGFM Bd 9.
— 1941: En ny Ophiur fra Danium. DGFM Bd. 10.
— 1943: The asteroids of the Senonian and Danian deposits of Denmark. Kgl. Dansk Vid Selsk. Biol. Skr. Bd 2. Nr 5.
NILSSON, S., 1823: »Utkast till en geologisk beskrifning öfver Skåne.» Physiogr. Sällsk. Årsber.
— 1827: Petrificata suecana formationis cretaceae, descripta et iconibus illustrata. Londini Gothorum.
— 1840: Reseanteckningar under sommaren 1840. KVA 1841 — Stockholm 1842.
NOETLING, F., 1905: Vorläufige Mitteilung über die Entwicklung und die Gliederung der Tertiärformation im westlichen Sind (Indien). Centralbl. Min. etc.
NOREM, W. L., 1956: Tertiary spores and pollen related to paleoclimates and stratigraphy of California. Micropaleontology. Vol. 2.
NØRREGAARD, E. M., 1904: Dolomitforkomsten ved Faxe. DGFM Vol. 2.
NUTALL, W. L. F., 1931: The stratigraphy of the Upper Ranikot Series (Lower Eocene) of Sind (India). Geol. Surv. India. Rec. Vol. 65.
D'OMALIUS D'HALLOY 1865: Rapport présenté à l'Academie sur la note de MM. Cornet et Briart. Acad. Roy. Belgique, Bull. 2. Série. T. 20. Nr 11.
D'ORBIGNY, A., 1836: Note sur le terrain nouvellement découvert à Meudon. Soc. géol. France. Bull. Vol. 7.
— 1850: Note sur les fossiles de l'étage Danien. Soc. géol. France. Bull. 2. Sér. Vol. 7.
— 1851: Über die fossilen Reste des Terrain Danien oder T. pisolithique. Neues Jahrb.
ØDUM, H., 1926: Diskussion om Daniets geologiske Stilling. DGFM Bd 7.
— 1926: Studier over Daniet i Jylland og paa Fyn. DGU 2 R. Nr 45.
— 1927: Bemerkungen zum Aufsatz von E. Voigt »Gehört das Danium zum Tertiär?» Ztschr. Geschiebeforsch. Bd 3.
— 1928: Vort sydligste Danium. DGFM Bd 7.
— 1928: Kridt. Pp. 42—63 i: Oversigt over Danmarks Geologi (Red: V. Nordmann, Udg: V. Madsen). DGU, V, Nr 4.
— 1929: Mindre Meddelser fra Danmarks geologiske Undersøgelses Borearkiv. DGFM Vol. 7.
— 1932: Mindre Meddelser fra DGU:s Borearkiv Nr 8. Maarum Skovridergaard. DGFM Bd 8.
— 1933: Mindre Meddelser fra DGU:s Borearkiv Nr 11. Den prækvartære Undergrund ved Sønderborg. DGFM Bd 8.
— 1935: Træk af den prækvartære Undergrunds Geologi paa Sjælland. DGFM. Bd 8.
— 1937: To Boringe paa Herlufsholm. Herlufsholm Skoles Aarsskrift. Næstved.
— 1942: Prækvarter-Profilet Nyborg-Sprogö-Korsör. DGFM Bd 10.
— 1953: De geologiska resultaten från borrningarna vid Höllviken. Del. 5, The macrofossils of the Upper Cretaceous. SGU, Ser. C. Nr 527.

OSMAN, A., 1954: Upper Cretaceous foraminifera of Western Sinai. Cairo Univ. Facult. Engin. Bull.
PAVLOW, M., 1897: Voyage géologique par la Volga. Livret guide du Congrès géol. intern. de Saint Petersbourg 1897.
PASTIELS, A., 1948: Contribution à l'étude des microfossiles de l'Éocène belge. Mus. roy. Hist.-Nat. Mem. Nr 109.
PERGENS ED. & MEUNIER, A., 1886: La faune des Bryozoaires garumniens de Faxe. Soc. Roy Malac. Belgique. Ann. T. 21.
PFEFFER, G., 1925: Die Frage der Grenzbestimmung zwischen Kreide und Tertiär in zoogeographischer Betrachtung. Jena.
PICARD, L., 1943: Structure and evolution of Palestine. Hebr. Univ. Geol. Dep. Jerusalem.
— AND AVNIMELECH, M., 1937: On the geology of the central coastal plain. Geol. Dept. Hebr. Univ. Jerusalem. Ser. 1. Bull 4.
PLUMMER, H. J., 1926: Foraminifera of the Midway formation in Texas. Univ. Texas Bull. Nr 2644.
— 1932: Foraminiferal evidence of the Midway-Wilcox contact in Texas. Texas Univ. Bull. 3201.
— 1934: Epistominoides and Coleites. New Genera of Foraminifera. Am. Midland Naturalist. Vol. 15.
— 1936: Structure of Ceratobulimina. Am. Midland Naturalist. Vol. 17.
POSSELT, H., 1894: Brachipoderne i den danske Kridtformation. DGU II Rk. Nr 4.
POTONIÉ, R., 1925: Über die Fauna norddeutscher Obersenongeschiebe, insbesondere des Certithiumkalks. Preuss. geol. Landesanst. Jahrb. 1924, Bd 45.
POULSEN, CHR., 1948: Forstenede hvirvellöse Dyr. Textbind og Atlas. — København.
POZARYSKA, K., 1952: The sedimentological problems of Upper Maastrichtian and Danian of the Pulawy environment. (Middle Vistula.) Bull. Geol. Pol. 81 — Warszawa.
— 1956: The Upper Cretaceous index foraminifers from Central Poland. Act. Geol. Pol. Vol. 4 — Warszawa.
— 1957: Lagenidae du Crétacé Supérieur de Pologne. Pal. Pol. Nr 8 — Warszawa.
POZARYSKI, W., 1938: Senonstratigraphie im Durchbruch der Weichsel zwischen Rachow und Pulawy in Mittelpolen. Serv. geol. Pologne — Inst. Geol. Pologne 6.
— 1948: Jura i Kreda miedzy Radomiem, Zawichostem i Krasnikiem [Jurassic and Cretaceous between Radom, Zawichost and Krasnik]. Bull. Geol. Pol. Bd 46. Warszawa.
— 1957: The southwestern margin of Fenno-Sarmatia. Kwartalnik Geologiczny, Vol. 1 — Warszawa.
PRESTWICH, J., 1852: On the structure of the strata between the London Clay and the Chalk in London and Hampshire Tertiary systems: Part III, Thanet Sands. Geol. Soc. London. Quart. Jour. Vol. 8.
PRIEM, F., 1897: Sur les dents d'elasmobranches de divers gisements senoniens. (Villedieu, Meudon, Foix-les-Caves.) Soc. Géol. France. Bull. Ser. 3, T. 25.
PUGGAARD, C., 1851: Møens Geologie. — København.
— 1862: Die Geologie der Insel Möen — Leipzig.
PUTZER, H., 1942: Die oberste Kreide bei Bochotnica a.d. mitteren Weichsel. Zentrbl. Min. Geol. Pal. Abt. B. Nr 12.
QUAAS, A., 1902: Die Fauna der Overwegischichten und der Blättertone in der libyschen Wüste. Palaeontographica 30, II.
VAN RAADSHOOVEN, B., 1951: On some Paleocene and Eocene larger foraminifera of Western Venezuela. Third World Petr. Congr. Proc. Sect. I, Repr. Nr 3.
RAMA RAO, L., 1950: The problem of the Cretaceous-Eocene boundary. Current Science. Vol. 19 — India.
— 1953: The Problem of the »Danian». A Review. Current Science. Vol. 22 — India.
RAVN, J. P. J., 1897: Nogle Bemærkninger om danske Tertiæraflejringers Alder. DGFM Vol. 1.
— 1899: Et Par Bemærkninger i Anledning af A. Hennig: Studier öfver den baltiska yngre kritans bildningshistoria. GFF Bd 21.
— 1900: Løse Blokke af Cerithiumkalk, fundne i Nordtyskland. DGFM Bd 1.
— 1902: Molluskerne i Danmarks Kridtaflejringer. I. Lamellibranchiater. Kgl. Danske Vid. Selsk. Skr. 6, R. T. 11. Nr 2.
— 1902: Molluskerne i Danmarks Kridtaflejringer. II. Scaphopoder, Gastropoder og Cephalopoder. Kgl. Danske Vid. Selsk. Skr. 6, R. T. 11, Nr 4.
— 1903: Molluskerne i Danmarks Kridtaflejringer, III. Stratigrafiske Undersøgelser. Kgl. Danske Vid. Selsk. Skr. 6 R. T. 11, Nr 6.
— 1907: Molluskfaunaen i Jyllands Tertiæraflejringer. En palæontologisk-stratigrafisk Undersøgelse. Acad. Roy Denmark. Mem. 7 Ser. T. 3, Nr 2.
— 1908: Fortegnelse over Kridtforsteningerne fra Stevns Klint, Faxe, Herfølge, Aashøj

og Solhøjsgaard (Svansbjerg). — V. Milthers: Kortbladene Faxe og Stevns Klint, DGU 1. Rk. Nr 11.
Ravn, J. P. J., 1922: Carte géologique du Danemark. Les formations préquaternaires. DGU 3 R. Nr 22.
— 1925: Sur le placement géologique du Danien. DGU 2 R, Nr 43.
— (and others), 1926: Diskussion om Daniets geologiske Stilling (English summary). DGFM Vol. 7.
— 1928: De regulære Echinider i Danmarks Kridtaflejringer. Kgl. Danske Vid. Selsk. Skr. Afd. 9, R. 1. 1.
— 1933: Études sur les Pélecypodes et Gastropodes daniens du calcaire de Faxe. Kgl. Danske Vid. Selsk. Skr. R. 9, T. 5, Nr 2.
— 1939: Études sur les Mollusques du Paléocène de Copenhague. Kgl. Danske Vid. Selsk. Biol. Skr. Bd 1, Nr 1.
Reichel, M., 1953: Remarques sur les Globigerines du Danien de Faxe (Danemark) et sur celle des couches de passage du Crétacé au Tertiaire dans la Scaglia de l'Appenin. Ecl. Geol. Helv., Vol. 45.
Reiss, Z., 1952: On the upper Cretaceous and lower Tertiary microfaunas of Israel. Res. Council of Israel. Bull. Vol. 2.
— 1954: Upper Cretaceous and Lower Tertiary Bolivinoides from Israel. CCF Vol. 4.
— 1955: Remarks on the age of some late Cretaceous and early Tertiary stratigraphic units of Israel. Res. Counc. Isr. Bull. Vol. 5. Sect. B (Biol. Geol.).
— 1955: Micropaleontology and the Cretaceous-Tertiary boundary in Israel. Res. Counc. Isr. Bull. Vol. 5. Sec. B, Biol. Geol.
— 1957: Notes on foraminifera from Israel. 2. Loxostomoides, a new late Cretaceous and early Tertiary genus of Foraminifera. Res. Counc. Isr. Bull. Vol. 6. B.
— 1957: Notes on foraminifera from Israel. 6. Stratigraphical distribution of some Mesozoic and Cainozoic Foraminifera from Israel. Geol. Surv. Jerusalem.
Rengarten, W. P., 1951: Stratigrafie der Kreide- und der Tertiärablagerungen des östlichen Uralgebietes. Inst. Geol. Nauk. USSR Trudy 133, Geol. Sect. Nr 54.
Renz, C. und Reichel, M. 1949: Neue Fossilfunde in Griechenland und Vorderasien. Ecl. geol. Helv. Vol. 42.
Renz, H. H., 1940: Stratigraphy of Northern South-America, Trinidad and Barbados. Eighth Am. Sci. Congr. Geol. Sci. Proc. General Geology, Vol. 4.
— 1951: Remarks on the age of the Lizard Springs formation of Trinidad, Br. W. I. CCF Vol. 2.
— 1951: Globorotalia lacerti Cushm. and Renz from the Lizard Springs formation of Trinidad, BrWI (A correction). CCF Vol. 2.
— 1955: Some Upper Cretaceous and Lower Tertiary foraminifera from Aragua and Guarico, Venezuela. Micropaleontology, Vol. 1.
Renz, O., 1936: Stratigraphische und mikropaleontologische Untersuchung der Scaglia (Oberkreide — Tertiär) im Zentral-Apennin. Ecl. Geol. Helv. Vol. 29.
Reuss, A. E., 1854: Beiträge zur Charakteristik der Kreideschichten in den Ostalpen, besonders im Gosauthale u. am Wolfgangsee. K. Akad. Wiss. Wien, Denkschr. 7, Math.-Nat.-Kl.
Reyment, R., 1956: On the stratigraphy and palaeontology of Nigeria and the Cameroons, British West Africa. GFF Bd 78.
— 1959: The Foraminiferal genera Afrobolivina gen. nov. and Bolivina in the Upper Cretaceous and Lower Tertiary of West Africa. Stockholm Contributions in Geology Vol. 3.
— 1959: Zur Fassung der Foraminiferengattung Aragonia. Paläont. Zschr. Bd 33.
— & Reyment, E., 1959: Bairdia ilaroensis sp. nov. aus dem Paleocän Nigeriens und die Gültigkeit der Gattung Bairdoppilata (Ostr. Crust.). Stockholm Contributions in Geology Vol. 3.
Reyre, D., 1946: Crétacé supérieur et Tertiaire des Hautes-Pyrénées. Soc. Geol. France. Ser. 5. T. 15.
Richards, H. G., 1945: Deep oil test at Salisbury, Wicomico County, Maryland. Am. Ass. Petr. Geol. Bull. Vol. 29.
Richter, K., 1928: Fossile Fischotolithen aus Pommern. Pomm. Nat.-forsch. Gesellsch. Abh. u. Ber. Bd 9.
— 1939: Nordostdeutschland (Schleswig-Holstein, Mecklenburg, Brandenburg, Pommern, Ostpreussen). Geol. Jahresberichte Bd 1. B.
Rivoirard, R., 1954: (avec collaboration de Sigal, I.) Observations géologiques dans l'Atlas Tellien près de Tablat (Dept. d'Alger). Soc. Hist.-Nat. Afrique du Nord. Bull. T. 45.
Roedel, H., 1913: Sedimentärgeschiebe. Helios Bd 27, Frankfurt a O.
— 1930: Fischotolithen aus Paläozängeschieben. Zschr. Geschiebeforsch. Bd 6.
— 1935: Die Muschelfauna der norddeutschen Paleozängeschiebe. Zschr. Geschiebeforsch. Bd 11.

ROEDEL, H., 1936: Die Fauna der norddeutschen Paleozängeschiebe: Schnecken, Scaphopoden, Brachiopoden und Korallen. Zschr. Geschiebeforsch. Bd 13.
ROSENKRANTZ, A., 1920: En ny københavnsk Lokalitet for forsteningsførende Paleocæn. DGFM Bd 5.
— 1920: Craniakalk fra Københavns Sydhavn. DGU 2. R. Nr 36.
— 1923: En Redogörelse i Anledning af Dr. P. Harders Afhandling: Om Grænsen mellem Saltholmskalk og Lellinge Grønsand. DGFM Bd 6.
— 1923: En Trionyx fra Craniakalk-Blokke i København. DGFM Bd 6.
— 1924: De københavnske Grönsandslag og deres Placering i den danske Lagrække. DGFM Bd 6.
— 1924: Nye Iagttagelser over Cerithiumkalken i Stevns Klint. DGFM Bd 6.
— 1925: Undergrundens tektoniske Forhold i København og nærmeste Omegn. DGFM Bd 6.
— 1930: Den paleocæne Lagserie ved Vestre Gasværk. DGFM Bd 7.
— 1931: Jordskorpebevægelser i Yngre Danientid indenfor Øresundsområdet. DGFM Bd 8.
— 1934: Notits vedrørende en Brudlinie i det sydøstlige Københavns Undergrund. DGFM. Bd 8.
— 1937: Bemærkninger om det østsjællandske Daniens Stratigrafi og Tektonik. DGFM Bd 9.
— 1939: Faunaen i Cerithiumkalken og det hærdnede Skrivekridt i Stevns Klint. DGFM Bd 9.
— 1942: Om de strukturelle Forhold i den prækvartære Undergrund i Østsjælland. DGFM. Bd 10.
— 1943: Exkursion til Stevns Klint. DGFM Bd 10.
— 1944: Smaabidrag til Danmarks geologi 1—8. DGFM Bd 10.
— 1951: Oversigt over Kridt- og Tertiærformationens stratigrafiske Forhold i Vestgrønland. DGFM Bd 12.
— 1951: Bemærkninger om deformerede Echinocorysskaller. DGFM Bd 12.
ROUAULT, A., 1850: Description des fossiles des environs de Pau. Soc. Geol. France, Mem. Ser. 2. T. 3.
RÓZKOWSKA, M., 1955: Some corals from the Crania tuberculata-zone in vicinity of Sochaczew near Warsaw. Act. Geol. Pol. Vol. 5, 2.
RUDKEVIC, M. J., RUBINA, N. V. & PERMJAKOV, A. I., 1957: Materjaly k'stratigrafii paleogena niznevo Pryobja. [Materialien zur Stratigrafie des Paleogen im Unteren Ob-Tal.] Mosk. Obsc. Ispyt. Pri. Otd. Geol. Bull. 32.
RUSSELL, L. S., 1932: The Cretaceous-Tertiary transition of Alberta. Roy. Soc. Canada, Transact. 3 Ser. Vol. 26. Sect. 4.
RUTHERFORD, R. L., 1947: The Cretaceous-Tertiary boundary in the foothill of Central Alberta. Roy. Soc. Canada Transact. Ser. 3. Vol. 41. Sect. 4.
RUTOT, A., 1881: Sur la position stratigraphique des restes de mammifères terrestres recueillis dans les couches de l'Éocène de Belgique. Ac. Roy. Belgique. Bull. 3 ser. T. 1.
— 1886: La tranchée de Hainin. Soc. géol. Belgique. Ann. T. 13.
— 1894: Montien et Maestrichtien. Soc. belge Géol. Pal. Hydrol. Bull. T. 8.
— 1902: Sur la découverte d'une flore fossile dans le Montien du Hainaut. Soc. belge Géol. Pal. Hydrol. Bull. T. 15.
— 1903: Compte rendu des excursions de la Session extraordinaire de la Société belge de géologie dans le Hainaut et les environs de Bruxelles. Soc. géol. Belgique. Bull. T. 17.
— 1908: Chapitre »Stratigraphie», in Cossmann: Pélécypodes du Montien de Belgique. Mus. roy. Hist. Nat. Belgique. Mem. Nr 19. T. 5.
— 1920: Texte explicatif du levé géologique de la planchette de Tirlemont. Serv. géol. Belgique.
— ET VAN DEN BROECK, E., 1884: Explication des feuilles de St. Troud, de Landen, de Heers. Mus. roy. Hist.-Nat. Belg.
— 1885: Sur l'âge tertiaire du Tuffeau de Ciply. Soc. roy. malac. Belgique. Bull. T. 20.
— 1885: Note préliminaire sur l'âge des diverses couches confondues sous le nom de Tuffeau de Ciply. Soc. roy. malac. Belgique, Ann. T. 20.
— — 1886: La géologie des territoires de Spiennes, Saint-Symphorien et Havré. Soc. géol. Belgique. Ann. T. 13.
— 1886: Sur le relations stratigraphiques du Tuffeau de Ciply avec le Calcaire de Cuesmes à grands Cérithes. Soc. géol. Belgique. Ann. T. 13.
— 1885: Sur l'âge tertiaire de la masse principale du Tuffeau de Ciply. Soc. Géol. Belgique. Mem. T. 13.
— 1887: Documents nouveaux sur la base du terrain tertiaire en Belgique et sur l'âge du Tuffeau de Ciply. Soc. géol. France. Bull. 3 sér. T. 15.

— 1885: Résumé de nouvelles recherches dans le Crétacé supérieur des environs de Mons. Soc. géol. Belgique. Ann. T. 12.
— 1885: Note sur la division du Tuffeau de Ciply en deux termes stratigraphiques distincts. Soc. géol. Belgique. Ann. T. 12.
— 1885: Nouveaux documents relatifs à la détermination de la masse principale du Tuffeau de Ciply. Soc. roy. malac. Belgique. Ann. T. 20.
— 1886: La géologie de Mesvin-Ciply. Soc. géol. Belgique. Ann. T. 13.
— ET VINGENT, G., 1878—79: Coup d'oeil sur l'état actuel d'avancement des connaissances géologiques relatives aux terrains tertiaires de la Belgique. Soc. géol. Belgique. Ann. T. 6.

RUTSCH, R., 1936: 1. Die stratigraphische Bedeutung der Venericardia planicosta und ihrer Verwandten. 2. Ist Venericardia baumonti auf die Oberkreide beschränkt? Ecl. Geol. Helv. Vol. 29.
— 1939: Terebratulina kugleri n. sp. from the Eocene of Soldado Rock. Journ. Pal. Vol. 13.
— 1939: Die Abtrennung des Paleocens vom Eocen. Ecl. geol. Helv. 32.
— 1943: Die Paleocen-Mollusken der Inseln Trinidad und Soldado Rock. (Br. Westind.) Ecl. geol. Helv. Vol. 36.

RZEHAK, A., 1891: Die Foraminiferenfauna der alttertiären Ablagerungen von Bruderndorf in Niederösterreich mit Berücksichtigung des angeblichen Vorkommens von Kreide bei Leitzersdorf. K-k. Nat.-Hist. Hofmus. Ann. Bd 6.

RØRDAM, K., 1893: De geologiske Forhold i det nordøstlige Sjælland. DGU R. 1. Nr 1.
— 1897: Kridtformationen i Sjælland i Terränet mellem København og Kjøge, og paa Saltholm. (Résumé d'une recherche géologique sur les terrains crétacés de le Seeland.) DGU R. 2, Nr 6.
— 1899: Kortbladen København og Roskilde. DGU R. 1, Nr 6.
— 1908: Nogle Bemærkninger om det sorte Ler i Grønsandformationen ved Lellinge. DGFM. Bd. 3.
— 1909: Geologi og Jordbundslære. Bd II: Danmarks Geologi. Bd 2. — København.
— OG MILTHERS, V. 1900: Kortbladene Sejrø, Nykøbing, Kalundborg og Holbæk. DGU R. 1, Nr 8.

SAID, R. AND KENAWY, A., 1956: Upper Cretaceous and Lower Tertiary Foraminifera from northern Sinai, Egypt. Micropaleontology. Vol. 2.

SANDEGREN, R., 1914: Block av paleocen från Maglehem i östra Skåne. SGU, Ser. C, Nr 255.

DE SAPORTA, G. ET MARION, A. F., 1873: Essai sur l'état de la végétation à l'époque des marnes heersiennes de Gelinden. Acad. roy. Belgique. Mem. cour. sav. étrang.
— 1878: Révision de la flore heersienne de Gelinden d'après une collection appartenant au comte G. de Looz. Acad. Roy. Mem. cour. T. 41, Bruxelles.

SCHAD, A., 1947: Neue stratigraphische Ergebnisse im nordwestdeutschen Tertiär. Nat.-hist. Ges. Jahresber. 94—98 — Hannover.

SCHAUB, H., 1951: Stratigraphie und Paläontologie des Schlierenflüsches, mit besonderer Berücksichtigung der paleocaenen und untereocaenen Nummuliten und Assilinen. Schweiz. Paläont. Abh. 68.

SCHILDER, F. A., 1928: Die Cypræacea des Daniums von Dänemark und Schonen. DGU IV R. Bd 2.

SCHIMPER, W. PH., 1874: Traité de Paléontologie végétale, 3. Paris.

SCHLÜTER, CL., 1870: Bericht über eine geognostisch paläontologische Reise im südlichen Schweden. N. Jahrb. Min. etc. Jahrg. 1870.

SCHOELLER, H., 1947: Sur la présence du Crétacé supérieur dans la zone des conglomérats de Tarantaise, au N de l'Isère. Soc. Geol. France. Bull. T. 17.

SCHÖNFELDER, E., 1933: Die Kreideanhäufungen im Geschiebemergel des nördlichen Schleswig-Holstein, ihre Fossilführung und geologische Bedeutung. Niedersächs. geol. Ver. Jahresber. — Hannover.

SCHUH, F. 1932: Die Ergebnisse einiger Tiefbohrungen, insbesondere auf die Verbreitung und Stratigraphie von Kreide und Alttertiär sowie in Bezug auf die magnetische Vermessung Mecklenburgs. Deutsche Geol. Ges. Zeitschr. 84.

SCHUSTER, J., 1911: Paläozäne Rebe von der Greifswalder Oie. Deutsch. Botan. Ges. Ber. 29.

SCHWAGER, C., 1883: Die Foraminiferen aus den Eocaenablagerungen der Libyschen Wüste und Aegyptens. Palaeontographica, Bd 30.

SCHWEIGHAUSER, J., 1953: Mikropaläontologische und stratigraphische Untersuchungen im Paleocän und Eocän des Vicentin (Norditalien). Schweiz. Pal. Abh., Vol. 70.

SCOTT, G., 1926: Études stratigraphiques et paléontologiques sur les terrains Crétacés du Texas. Univ. Grenoble, Thèse.

Scott, G., 1926: On a new correlation of the Texas Cretaceous. Amer. Journ. Sci. 5 Ser. Vol. 12.
— 1933: The Cretaceous of Texas. 16-th Int. Geol. Congr. U. S. Guidebook 6.
— 1934: Age of the Midway group. Geol. Soc. Amer. Bull. Vol. 45.
— 1940: Research Problems of the Cretaceous of Texas. Texas Acad. Sci. Proc., Vol. 23.
— 1940: Cretaceous-Tertiary relationships in the Coastal Plains Area of Texas. Geol. Soc. Am. Bull. Vol. 51.
Segerberg, K. O., 1900: De anomura och brachyura dekapoderna inom Skandinaviens yngre krita. GFF Bd 22.
Seumes, I., 1888: Note sur le Crétacé supérieur des Pyrénées occidentales. Soc. Geol. France. Bull. Ser. 3. T. 16.
— 1890: Recherches géologiques sur les terrains secondaires et l'Éocéne supérieur de la région sous-pyrénéenne du SO de la France (B.-P. et Landes). Thèse.
Shimer, H. W., 1934: Correlation chart of geologic formations of North America. Geol. Soc. Am. Bull. Vol. 45.
Shrock, R. R., 1939: Wisconsin Silurian bioherms (Organic reefs). Geol. Soc. Am. Bull. Vol. 50.
Shukri, N. M., 1954: Remarks on the geological structure of Egypt. Soc. Geol. Egypt Bull. T. 27.
Sieverts-Doreck, H., 1951: Ein Isocrinus aus der obersten Kreide Bulgariens. Paläont. Zeitschr. Bd 24.
— 1951: Über Isocrinidae (Meta-Crinus-Verwandte) aus der Dänischen Kreide. DGFM. Bd 19.
Sigal, I., 1949: Dano-Montien ou Paléocène? ou le passage du Crétacé au Tertiaire en Algérie. Soc. Geol. France. Bull. T. 19.
— 1958: Réflexions à propos des termes Paléocène et Danien. Soc. Geol. France, C.R.
Simpson, G. G., 1934: The Tiffany fauna, Paleocene. III Primates, Carnivora, Condylarthra and Amblypoda. Am. Mus. Nat.-Hist. Novitates, Nr 817.
— 1937: Notes on the Clark Fork, Upper Paleocene fauna. Am. Mus. Nat.-Hist. Novitates, Nr 954.
— 1937: The Fort Union of the Crazy Mountain Field. Montana and its mammalian faunas. U.S. Nat. Mus. Bull. 169.
— 1947: A continental Tertiary time chart. Journ. Pal. Vol. 21.
Slansky, M., 1957: Précisions sur la faune des formations marines du bassin Sédimentaire Côtier du Dahomey du Togo. Soc. Geol. France. C.R.
Smout, A. H., 1955: Reclassification of the Rotaliidea (Foraminifera) and two new Cretaceous forms resembling Elphidium. Wash. Acad. Sci. Journ. Vol. 45.
Sobolewskaja, V. I., 1951: Paläogeographie und Struktur der russischen Tafel während der Oberkreide Epoche. Akad. Nauk SSSR (Sbornik pamjati akademika AD Archangelskogo.) Wopr. litol. i stratigr. Moscow.
Sohn, I. G., 1954: Paleocene Ostracoda from Outcrops in Maryland. Science. Vol. 119.
Sorgenfrei, Th., 1937: Et geologisk Kort over Danmarks prækvartære Undergrund. DGFM Bd 9.
— 1949: Nyere undersøgelser over Fyns Undergrund. DGFM Bd 11.
— 1951: Oversigt over prækvartærets topografi, stratigrafi og tektonik i omraadet Fyn, Sydsjælland, Lolland-Falster-Moen. DGFM Bd 12.
— 1956: Formations of Denmark, Lexique stratigraphique international. Vol. I. Europe, Fasc. 2 d. — Danemark.
Sornay, I. 1947: Remarques sur le Crétacé supérieur dans le S de l'Ardèche. Soc. Geol. France. Bull. Vol. 17.
— 1947: Sur le Crétacé supérieur de la région de Châtillon-en-Diois et de la forêt de Saou: remarques sur la phase tectonique antésénonienne. Soc. Geol. France. Bull. Vol. 17.
Soyer, R. 1937: Nouveaux gisements de Calcaire pisolithique à l'ouest et au sud de Paris. Soc. Geol. France. Bull. Ser. 5, Vol. 7.
— 1947: Sur la craie tubuleuse et les depôts montiens. Soc. Geol. France. Bull. Vol. 17.
Ssawtschinskaja, O. V., 1940: [Beiträge zur Kenntnis der Fauna der Oberkreide des Beckens der Flüsse Psiol und Desna.] Zap. Nautschno. Issled. Inst. Geol. Charkow. Univ. 8 (Russian).
Staesche, K., 1938: Die Gliederung des nordwestdeutschen Tertiärs auf Grund von Mikrofossilien. Preuss. Geol. Landesanst. Jahrb. 58.
Staesche, K. & Hiltermann, H., 1940: Mikrofaunen aus dem Tertiär NW-Deutschlands. Reichsst. Bodenforschg. Abh. NF 201.
Stainier, X., 1924: Résumé de nos connaissances sur la géologie de la Campine. Ann. des Mines de Belgique. T. 25.

STAINIER, X., 1931: Le Montien et le Heersien du Hainaut de la Campine et de la Hollande. Soc. belge Géol. Pal. Hydrol. Bull. T. 41.
STAMP, D., 1921: On cycles of sedimentation in the Eocene strata of the Anglo-Franco-Belgian basin. Geol. Mag. Vol. 58.
STEENSTRUP, J. 1847: Moltkia og Cyathidium. Die 24. Versammlung Deutscher Naturforscher und Aerzte in Kiel 1846. Amtlicher Bericht.
STENZEL, H. B., 1940: Tertiary nautiloids from the Gulf Coastal Plain. Texas Univ. Publ. 3945.
— 1942: Illustrated card catalogue of North American early Tertiary fossils of Atlantic Gulf Coastal Plain. (Cephalopoda, Cards 1—28) Texas Univ. Bur. Econ. Geol.
STEVENS, CH., 1913—14: Étude du Landénien supérieur dans le Hainaut. Soc. géol. Belgique. Ann. T. 41.
STOLLEY, E., 1897: Gliederung des norddeutschen und baltischen Senons. Archiv. Anthrop. Geol. Schlesw.-Holst. 2, 2.
SUBBOTINA, N. N., 1936: Stratigrafia niznievo paleogena i verchnevo miela Sever. Kavkasa po faunie foraminifer. NGRI ser. A, 96. [Stratigr. d. unt. Paleogens und ob. Kreide des Nordkaukasus nach der Foram-fauna.]
— 1938: [Verbreitung der Mikrofauna in den Maikop- und Chadum-Schichten am nördlichen Kaukasus.] Abh. Erdölgeol. Inst., Ser. A 104. — Moskva.
— 1947: Foraminifery datskich i paleogenowych otlozenij Severn. Kavkaza. Sbornik, »Mikrofauna Kavkaza, Emby i sredniej Asji». Lengostoptechisdat. [Foraminiferen der Danien- und Paleogenschichten Nord-Kaukasiens.]
— 1949: [Mikrofauna der Kreideablagerungen des südlichen Kaukasabhanges.] Mikrofauna der SSSR, Sbornik II. Trudy VNIGRI, nov. ser. vyp. 34.
— 1950: Mikrofauna i stratigrafia elburganskovo gorisonta i gorisonta Gorjacevo Kluca. [Mikrofauna u. Stratigrafie der Elburgansk- u. Gorjačyj Kluč-horizonte.] Trudy VNIGRI, Nov. Ser. vyp. 51.
— 1953: [Fossile Foraminiferen der USSR. Globigerinidae, Hantkeninidae und Globorotaliidae.] (Russian) Erdölforschg. Geol-Forsch-Inst. Trudy N. Ser. H. 76.
TATUM, J. L., 1928: Cretaceous and Tertiary of southern Texas and northern Mexico. Univ. Texas Bull. 2748; Am. Ass. Petr. Geol. Bull. Vol. 12.
THALMANN, H. E., 1935: Age of the Velasco formation in Eastern Mexico. Geol. Soc. Am. Proc.
— 1938: Bemerkungen zur Frage des Vorkommens kretazischer Nummuliten. Ecl. geol. Helv. Vol. 31.
— 1946: Mitteilungen über Foraminiferen, V. 20. Vorkommen von Rotalia skourensis Pfender in der Ober-Kretazischen Guayaquil-Formation von Ecuador. Schweiz. Naturf. Ges. Verh. 126.
— 1946: Micropaleontology of Upper Cretaceous and Paleocene in Western Ecuador. Am. Ass. Petr. Geol. Vol. 30.
THIADENS, A. A., 1937: Cretaceous and Tertiary Foraminifera from Southern Santa Clara Province, Cuba. J. Paleont. Vol. 11.
TEILHARD DE CHARDIN, P., 1927: Les mammiféres de l'Éocène inférieur de la Belgique. Mus. roy. Hist.-Nat. Mém. T. 36.
TESSIER, F., 1949: Le Paléocène au Sénégal. Soc. Géol. France. Bull. T. 19.
TOUCAS, M., 1882: Synchronisme des étages turonien, sénonien et danien dans le nord et dans le midi de l'Europe. Soc. Géol. France. Ser. 3. Vol. 10.
TOULMIN, L. D., JR., 1944: The Midway-Wilcox contact in Alabama. Alab. Acad. Sci. Journ. Vol. 16.
TROEDSSON, G. T., 1923: Om krokodilfynden i Skånes yngsta krita. GFF, Bd 45.
— 1932: Några tektoniska och stratigrafiska problem i Skåne. GFF, 54.
TROELSEN, J. C., 1937: Om den stratigrafiske Inddeling af Skrivekridtet i Danmark. DGFM Bd 9.
— 1955: Globotruncana contusa in the White Chalk of Denmark. Micropaleontology. Vol. 1.
— 1955: On the value of aragonite tests in the classification of the Rotaliidea. CCF Vol. 6.
— 1956: Lexique stratigraphique international. Vol. 1. Europe. Fasc. 1a — Greenland.
— 1957: Some planktonic Foraminifera of the type Danian and their stratigraphic importance. U.S. Nat. Mus. Bull. 215.
TROMP, S. W., 1942: The microfaunae of the basal-Eocene and Upper Cretaceous section of Ramandig Well No. 2 (S. E. Turkey). Madente ve Arama Enstitüsü Yayinlarindan.
— 1943: Microfauna of the Upper Cretaceous and Tertiary sections (Arabian Facies) in the Urfa and Gaziantep regions (Southern Turkey). Mining Research Institute Turkey. Bull. Serie 8.

TROMP, S. W., 1943: The value of drilling speed data for well correlations and stratigraphic classifications. Mining Research Institute Turkey. Bull. Serie 8.
— 1949: The value of Globigerinidae ratios in stratigraphy. Journ. Pal. Vol. 23.
— 1949: The determination of the Cretaceous-Eocene boundary by means of quantitative generic, microfaunal determinations and the conception »Danian» in the Near East. Journ. Pal. Vol. 23.
— 1951: Preliminary compilation of the macrostratigraphy of Egypt. Soc. Géogr. Egypte. Bull. 24.
— 1952: Tentative compilation of the micropaleontology of Egypt. Journ. Paleontolog. Vol. 26.
TRUEMAN, A. E., 1952: Some fundamental aspects of correlation. Summary, with discussion. 18-th. Int. Geol. Congr. Great Britain. Rept. Pt. 10.
TSCHACHTLI, B. S., 1941: Über Flysch und Couches rouges in den Decken der östlichen Préalps romandes. (Simmental-Saanen.) Geol. Inst. Univ. Bern. Publ.
TSCHERNETSKY, I. P., 1940: New data on the Upper Cretaceous and Paleogene deposits of the Sumy district (Northeastern part of the North Ukrainian basin). Journ. Geolog. Kiew, 7 (Ukrain, with Engl. summary).
TURNOVSKY, K., 1958: Kann der Faunenwandel vom Mesozoikum zum Känozoikum durch eine Katastrophe erklärt werden. Geol. Soc. Turkey. Bull. Vol. 6.
TZANKOV, V., 1939: Études stratigraphiques et paléozoologiques du Danien de la Bulgarie du Nord. Bulg. Geol. Ges. Zschr. 11.
TÖRNEBOHM, A. E., 1910: Übersicht über die präquartäre Geologie Schwedens. Int. Geol. Congr. Guide des éxcursions en Suède. — Stockholm.
USSING, N. V., 1899: Danmarks Geologi i allmenfatteligt Omrids. DGU III R. Nr 2.
— 1910: Dänemark. Handbuch der regionalen Geologie. Heidelberg.
WAHLENBERG, G., 1824: Geologisk afhandling om svenska jordens bildning. Uppsala. Svea, H. 1 (2:a uppl.).
WANNER, J. 1902: Die Fauna der obersten weissen Kreide der libyschen Wüste. Paleontographica, Bd 30.
WASSILENKO, V. P., 1950: Foraminifery paleocena centralnoj časti dnejprovsko-doneckoj wpadiny. [Paleocen Foraminiferen im centralen Teil des Dnjepr-Donetz-Beckens.] Mikrofauna SSSR, Sbornik IV, Kaukas Ukraina. Trudy VNIGRI, Nov. Ser. Vyp. 51
— 1950: [Neue Angaben über die Stratigraphie des Paläogens des Zentralteils de Dnjepr.-Donez-Senke.] (Russ.) Ak. Nauk. SSSR Dokl. — Nov. Ser. 73. Nr 3.
VASSOEVIC, N. B., 1933: [Materialien zur Stratigrafie und Petrografie von Kreide- und Paleogen-Ablagerungen Süd-Ost-Kaukasiens.] Geol. Inst. Ak. Nauk. Trudy. T. 3.
VATAN, A., 1949: La sédimentation détritique dans la zone subalpine et le Jura méridional, au Crétacé et au Tertiaire. Soc. Géol. France. Bull. T. 19.
— 1950: Rythmes de sédimentation en Aquitaine au Crétacé et au Tertiaire. 18-th Int. Geol. Congr. Great Britain. Rept. pt. 4.
VAUGHAN, T. W., 1934: Criteria and status of correlation and classification of Tertiary deposits. Geol. Soc. Am. Bull. Vol. 35.
— 1945: American Paleocene and Eocene larger Foraminifera. Geol. Soc. Am. Mem. Nr 9.
— ET COLE, W. S., 1941: Preliminary report on the Cretaceous and Tertiary larger Foraminifera of Trinidad, Brit. West-Indies. Geol. Soc. Am. Sp. Pap. Nr 30.
WEIGELT, J., 1939: Die Aufdeckung der bisher ältesten tertiären Säugetierfauna Deutschlands. Nova Acta Leopoldina, NF 7.
WEIGEL, C., 1937: Stratigraphie u. Tektonik des Beckens von Gosau. Geol. Bundesanst. Jahrb. 87. — Wien.
WEISS, L., 1955: Planktonic index foraminifera of Northwestern Peru. Micropaleontology. Vol. 1.
VENZO, S., 1954: Stratigrafia e tettonica del Flysch (Cretaceo-Eocene) del Bergamasco e della Brianza Orientale. Mem. Descr. Carta Geol. d'Italia, 31.
WETZEL, W., 1927: Beiträge zur Erforschung des kretazischen und tertiären Untergrundes des Baltikums. Nat. Ver. Schlesw.-Holst. 18.
— 1929: Geologischer Führer durch Schleswig-Holstein. — Berlin.
— 1952: Beitrag zur Kenntnis des dan-zeitlichen Meeresplanktons. Geol. Landesanst. Geol. Jahrb., Bd 66.
WEYL, R., 1932: Studien zur vergleichenden Sedimentpetrographie der norddeutschen Tertiärmeere. Zentralbl. Min. Abt. 13.
WHITE, M. P., 1928: Some Index Foraminifera of the Tampico Embayment Area of Mexico. Journ. Pal. Vol. 2.
WICHER, C. A., 1943: Neues aus der angewandten Mikropaläontologie (IX). Oel und Kohle, 39.
— 1949: On the age of the Higher Upper Cretaceous of the Tampico Embayment Area in Mexico, as an example of the worldwide existence of microfossils and the

practical consequences arising from this. Mus. d'Hist. Nat. Pays Serbe. Beograd. Bull. Ser. A—2.

WICHER, C. A., 1953: Mikropaläontologische Beobachtungen in der höheren borealen Oberkreide, besonders im Maastricht. Geol. Jahrb. 68.

— 1956: Die Gosauschichten im Becken von Gams (Österreich) und die Foraminiferengliederung der höheren Oberkreide in der Tethys (mit einem Beitrag von F. Bettenstaedt). Paläont. Zeitschr. 30, Sonderh. 87.

— UND BETTENSTAEDT, F., 1957: Zur Oberkreide-Gliederung der bayerischen Innviertel-Bohrungen. Geol. Bavarica. Nr 30.

WICK, W., 1943: Mikrofaunistische Untersuchung des tieferen Tertiärs über einem Salzstock in der Nähe von Hamburg. Senckenberg naturf. Ges. Abh. 468.

WIENBERG-RASMUSSEN, H., 1944: Observations on the Asteroid fauna of the Danian. DGFM Vol. 10.

— 1950: Cretaceous Asteroidea and Ophiuroidea, DGU II R. Nr 77.

— 1951: Cretaceous Ophiuroidea from Germany, Sweden, Spain and New Jersey. DGFM Bd 12.

— 1953: Cretaceous crinoidea. Preliminary report on the species found in Denmark. DGFM Bd 12.

VILLATTE, I., 1956: Sur l'extension du Montien marin entre les vallées du Volp et de l'Arize (Ariège). Soc. Géol. France. Bull. CR.

VINCENT, E., 1913: Contribution à la paléontologie des falaises de Landana (Bas Congo). Mollusques. Mus. Congo Belge. Ann. Sér. 3, T. 1.

— 1927: Observations sur l'âge des dépôts ligniteux de la base du Tertiaire recontrés en Campine. Acad. roy. Belgique. Bull. Sér. 5. T. 13.

— 1928: Observations sur les couches montiennes traversées au puits no 2 du charbonnage d'Eysden, près de Maaseyck (Limbourg). Acad. Roy. Belge Bull. Classe des Sciences, 5 Ser., T. 14.

— 1930: Études sur les mollusques montiens du poudingue et du tuffeau de Ciply. Mus. roy. Hist.-Nat. Belgique. Mém. 46.

— 1930: Mollusques des Couches à Cyrénes (Paléocène du Limbourg). Mus. roy. Hist.-nat. Belgique. Mem. 43 (Mém. posth.)

— DOLLO, L., ET LERICHE, M., 1913: La faune paléocène de Landana. Matériaux pour la paléontologie du Bas et du Moyen-Congo. Mus. Congo Belge. Ann.

VINCENT, G., 1876: Description de la faune de l'étage landénien inférieur de la Belgique. Soc. Malacol. Belgique. Ann. T. 11.

WIND, J., 1953: Kridtaflejringer i Jylland. Flora og fauna 59. Aarhus.

— 1954: Tylocidaris piggene som ledeforsteninger. DGFM Bd 12.

— 1955: Anmeldelse af I. A. Jeletsky: Die Stratigraphie und Belemnitenfauna etc. DGFM, Bd 12.

— 1959: Echinocorys formerne og deres stratigrafiske udbredelse DGFM. Bd 14.

WIRTZ, D., 1939: Das Alttertiär in Schleswig-Holstein. N. Jahrb. Miner. etc. Beil. Bd 81.

VAN DER VLERK, I. M., 1955: Correlation of the Tertiary of the Far East and Europe. Micropal. Vol. 1.

VOIGT, E., 1925: Über das Vorkommen von Bryozoen in Diluvialgeschieben und die Grundzüge ihrer Systematik. Ztschr. Geschiebeforsch. 1.

— 1925: Gehört das Danien zum Tertiär? Ztschr. Geschiebeforsch. B. 1.

— 1927: Entgegnung an Herrn H. Ødum. Ztschr. Geschiebeforsch. 3.

— 1929: Die Lithogenese der Flach- und Tiefwassersedimente des jüngeren Oberkreidemeeres. Hall. Ver. Erf. Mittd. Bodenschätze. Jahrb. NF Vol. 8.

— 1951: Das Maastricht-Vorkommen von Ilten bei Hannover und seine Fauna mit besonderer Berücksichtigung der Gross-Foraminiferen und Bryozoen. Geol. Staatsinst. Hamburg. Mitt. H. 20.

— 1956: Untersuchungen über Coscinopleura Marss. (Bryoz.foss.) und verwandte Gattungen. Geol. Staatsinst. Hamburg. Mitt. H. 25.

— 1956: Der Nachweis des Phytals durch Epizoen als Kriterium der Tiefe vorzeitlicher Meere. Geol. Rundschau Bd 45.

— 1956: Zur Frage der Abgrenzung der Maastricht-Stufe. Paläont. Ztschr. 30.

— 1958: Untersuchungen an Oktokorallen aus der oberen Kreide. Geol. Staatsinst. Hamburg. Mitt. H. 27.

— UND HÄNTZSCHEL, W., 1956: Die grauen Bänder in der Schreibkreide Nordwest-Deutschlands und ihre Deutung als Lebensspuren. Geol. Staatsinst. Hamburg. Mitt. H. 25.

WOLFF, W., 1928: Die internationale Geologentagung in Kopenhagen 1928 und die damit verbundene Hauptexkursion durch Seeland, Fünen, Langeland und Jütland. Ztschr. Berg-, Hütten- u. Salinenwesen 76.

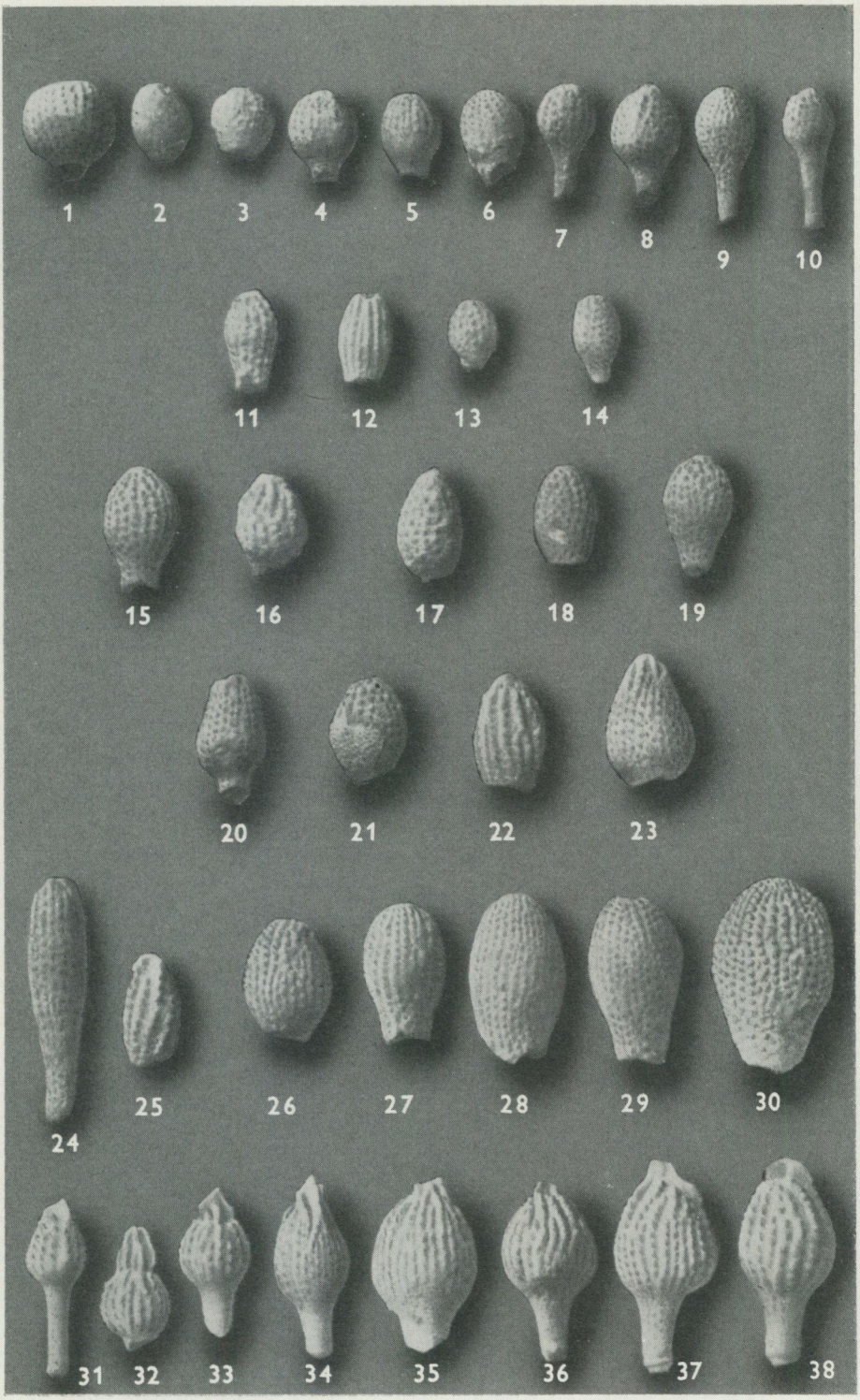
Wood, A. and Haynes, I., 1957: Certain smaller British Paleocene Foraminifera, P. II. CCF Vol. 8.
Wood, A. & Haque-Mohsenul, A. F. M., 1957: The genus Cycloloculina (Foraminifera) with a description of a new species from Pakistan. Geol. Surv. Pakistan. Rec. Vol. 8.
Wood, H. E. (and others), 1941: Nomenclature and Correlation of the North American continental Tertiary. Geol. Soc. Am. Bull. Vol. 52.
Woodward, H., 1901: Crustacea from the Upper Cretaceous of Faxe, Denmark. Geol. Mag. NS, Vol. 8.
Woodward, A., Smith, 1891: Referat: »James W. Davis: On the fossil Fish of the Cretaceous formations of Scandinavia» etc. Geol. Mag. Vol. 28.
Wright, T., 1864—1882: Monograph on the British fossil Echinodermata from the Cretaceous formations. Vol. 1. The Echinoidea. London.
Young Smith, B., 1957: Lower Tertiary Foraminifera from Contra-Costa County, California. Univ. California Public. Geol. Sci. Vol. 32.
Zittel, K., 1883: Beiträge zur Geologie und Paleontologie der Libyschen Wüste und der angrenzenden Gebiete von Aegypten. Palaeontographica, Bd 30.
Zonow, N. T., 1939: A geological review of the phosphorite-bearing deposits of the Khoper horizon in the basin of the Seim River. (Russ. with Engl. summary.) Sci. Inst. Fertilizers and Insectofungicides. Trans. 146.
— 1941: [Geologische Beobachtungen über die phosphoritführenden Ablagerungen der Fluszbecken von Desna, Psiol, Worskla und Norddonez.] Agronomicheskije Rudy SSSR 6.

6—591255. *SGU. ser C 571. Brotzen*

Pl. 1

Figs. 1—14. Tylocidaris abildgaardi, Ravn. Limhamn Quarry. Bioherm group I.
Figs. 15—19. Tylocidaris ödumi Br. Nielsen. Limhamn Quarry. Bioherm group I.
Figs. 20—23. Tylocidaris windi n. sp. Limhamn Quarry. Bioherm group I.
Figs. 24—30. Tylocidaris ödumi Br. Nielsen. Limhamn Quarry. Bioherm group I.
Figs. 31—38. Tylocidaris brünnichi Ravn. Limhamn Quarry. Bioherm group III.

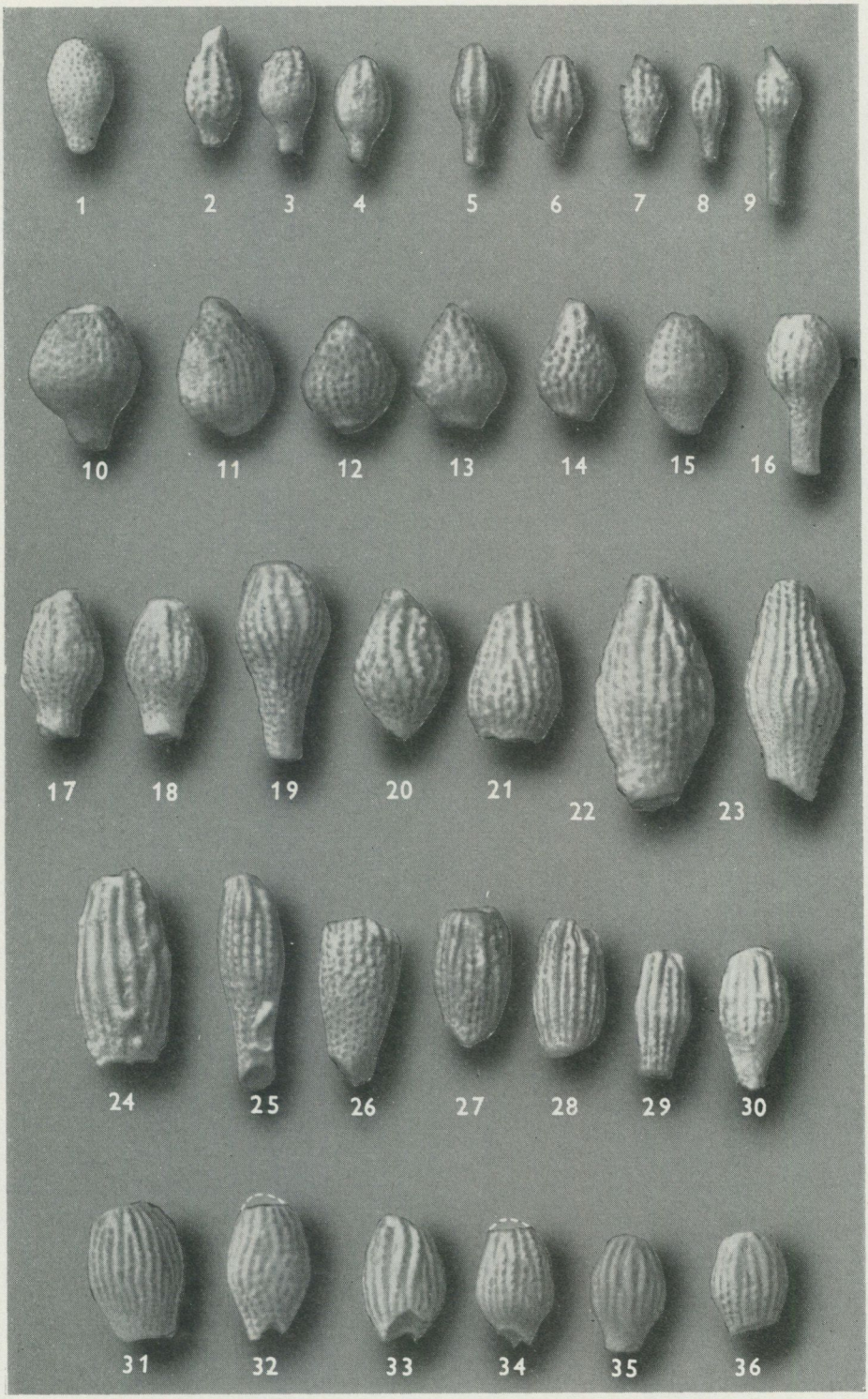
All figures enlarged about 2× (1,94:1,00.)
The originals are deposited at the Geologial Survey of Sweden.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38

Pl. 2

Fig. 1. Tylocidaris of abildgaardi Ravn. Limhamn Quarry. Bioherm group II.
Figs. 2—16. Tylocidaris ravni n. sp. Limhamn Quarry. Bioherm group II
Figs. 17—36. Tylocidaris rosenkrantzi n. sp, Limhamn Quarry. Bioherm group II.

All figures enlarged about 2 × (1,94:1,00).


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

Limhamn Quarry. Northern wall with the lower and middle Danian. Stratigraphical interpretation and bioherm features see textfig. 7.

Årsbok 52 (1958)

N:o 558 STÅLHÖS, G., Rackebymassivet; ett västsvenskt norit-gabbromassiv. Summary: The Rackeby norite-gabbro massif; W. Sweden. - 1958 4,00

» 559 LUNDQVIST, J., Studies of the Quaternary history and deposits of Värmland, Sweden. Experiences made while preparing a survey map. 1958 6,00

» 560 HAST, N., The measurement of rock pressure in mines. 1958 15,00

» 561 LUNDQVIST, G., Kvartärgeologisk forskning i Sverige under ett sekel. [A century of investigation in the Quaternary geology in Sweden.] 1958. . . 4,00

» 562 SAHLSTRÖM, K. E. och BÅTH, M., Jordskalv i Sverige 1951 — 1957. Zusammenfassung: Erdbeben in Schweden 1951 — 1957. 1958 1,50

Årsbok 53 (1959)

N:o 563 SANDEGREN, R., Register över Sveriges geologiska undersöknings publikationer 1858—1958. [Index of publications of the Geological survey of Sweden 1858—1958.] 1959 10,00

» 564 OFFERBERG, J., Rocks and stratigraphy of the Ledfat area, Västerbotten county, Northern Sweden. 1959. With two plates 10,00

» 565 LUNDQVIST, G., C 14-daterade tallstubbar i fjällen. Summary: C 14-dated pine stumps from the High Mountains of Western Sweden. 1959 3,00

» 566 MÖLLER, H., Från nordostis till lågbaltisk is. En glacialgeologisk studie i sydvästra Skåne. Zusammenfassung: Vom Nordosteis zum Niederbaltischen Eis. Eine glazialgeologische Studie in SW-Schonen. 1959 9,00

» 567 NILSSON, K., Isströmmar och isavsmältning i sydvästra Skånes backlandskap. Zusammenfassung: Eisströme und Eisabschmelzung im Hügelland des südwestlichen Schonens. Mit zwei Tafeln. 1959 6,50

» 569 HJELMQVIST, S., Förekomsten av tungmineral i kaolinen på Ivö. Abstract: Occurence of heavy minerals in the kaolin of Ivö. 1959. 2,00

Årsbok 54 (1960)

» 571 BROTZEN, F., On Tylocidaris species (Echinoidea) and the stratigraphy of the Danian of Sweden. — With a bibliography of the Danian and the Paleocene. With three plates. 1959 7,00

Ser. Ba. Översiktskartor (Survey maps)

N:o 14 Jordartskarta över södra och mellersta Sverige. Efter de geologiska kartbladen sammandragen vid S. G. U. av K. E. SAHLSTRÖM. Skala 1 :400 000 [Quaternary deposits of Southern and Central Sweden]
Mellersta bladet, tryckt 1947 15,00
Södra bladet, tryckt 1948 15,00
Norra bladet, tryckt 1949 15,00

» 15 Jordartskarta över Uppsalatrakten. 1 :20 000. Av N. G. HÖRNER † och B. JÄRNEFORS. Berggrunden sammanställd av P. H. LUNDEGÅRDH. [Quaternary deposits of the Uppsala region.] 1956 8,00
Beskrivning till Jordartskarta över Uppsalatrakten. Av B. JÄRNEFORS. Summary: Quaternary deposits in the Uppsala region. 1958 5,00

» 16 Karta över Sveriges berggrund. (Pre-Quaternary rocks of Sweden). Skala 1:1 milj. Sammanställd av N. H. MAGNUSSON m. fl. 1958. Karta i tre blad. (Map in three sheets; each 15 Sw. kr.) Pris per blad. 15,00
Description to this map in Sw. and Engl. editions in preparation

Forts. å omslagets 4:de sida

N:o 17 Karta över Sveriges jordarter. (Quaternary deposits of Sweden.) Skala 1:1 milj. Sammanställd av G. LUNDQVIST 1958. Karta i tre blad. (Map in three sheets; each 15 Sw. kr.) Pris per blad. 15,00
Beskrivning till Jordartskarta över Sverige. Av G. LUNDQVIST. 1958. . . . 5,00
Description to accompany the Map of the Quaternary deposits of Sweden. English edition by G. LUNDQVIST. 1959 5,00

Ser. Ca.

N:o 37 GAVELIN, S. och KULLING, O., Beskrivning till berggrundskarta över Västerbottens län. [Description to Map of the Pre-Quaternary rocks of the Västerbotten County, N. Sweden.] Karta i skala 1:400000. With English summaries, 1955. Beskrivning med karta 45,00
Endast karta (Map single) 18,00
» 38 LUNDQVIST, J., Beskrivning till jordartskarta över Värmlands län. (Quaternary deposits of the county of Värmland.) Karta i skala 1:200000. 1958. Beskrivning med karta (Text with map) 65,00
Karta i två blad (Map in two sheets) 30,00
» 41 ÖDMAN, O. H., Beskrivning till berggrundskarta över urberget i Norrbottens län. English summary: Description to map of the Pre-Cambrian rocks of the Norrbotten County, N. Sweden, excl. the Caledonian mountain range. Karta i skala 1:400000. 1957. Beskrivning med karta. Text with map 45,00
Karta i två blad (Map in two sheets) 20,00

Meddelanden i stencil

N:o 4 STÅLHÖS, G., Bidrag till kännedomen om den radioaktiva strålningens fördelning inom den svenska berggrunden. Summary: Contribution to the knowledge of the distribution of the radioactivity in the bedrock of Sweden. 3,00

Distribueras genom

Generalstabens Litografiska Anstalts Förlag, Vasagatan 16, Stockholm 16

STOCKHOLM 1959. KUNGL. BOKTRYCKERIET P. A. NORSTEDT & SÖNER PRINTED IN SWEDEN