41. CRETACEOUS FORAMINIFERAL SEDIMENTS AND LIMESTONES

41.1. LOWER CRETACEOUS FORAMINIFERAL FAUNA FROM GORRINGE BANK,
EASTERN NORTH ATLANTIC

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INTRODUCTION

An interesting and somewhat unusual sequence of Lower Cretaceous siliceous oozes and marls was recovered from the northern slope of Gorringe Bank at Site 120 (latitude: 36° 41.39'N; longitude: 11° 25.94'W) of the Deep Sea Drilling Project.

This site, the first occupied during Leg 13 of the project, is located in a water depth of 1711 meters approximately 200 km west-southwest from Cape San Vicente, Portugal (Figure 1). The drilling was targeted in a locale of unusually thin sediment cover where there appeared to be a likely chance of recovering pre-Cenozoic sediments overlying the oceanic bedrock (see Chapter 2 of this volume).

Earlier attempts at recovering deep-sea Mesozoic strata close to the European continent at Sites 118 and 119 in the Bay of Biscay, had been thwarted due to great sediment thickness and difficulty in penetrating basaltic sills. The site at Gorringe Bank was considered attractive principally because seismic reflection profiles of the Centre Océanologique de Bretagne and the Lamont-Doherty Geological Observatory had shown a region on the northern flank where the sediment cover above the acoustic basement is less than 0.3 second in thickness, and where strong subbottom reflectors (possibly indicative of chert or sills) are absent.

Consequently, it was anticipated that an exploratory hole at Gorringe Bank might have a chance of recovering hitherto unknown deposits of greater age than any yet cored from the eastern North Atlantic, and that the lowest sediments above the oceanic basement might offer interesting facies comparisons to the Mesozoic of Portugal and Spain.

RECOVERY

About 250 meters of sediment were penetrated before encountering an ophiolitic complex of spilitic basalt, serpentinite, and gabbro, which was considered by all the shipboard scientific party to be the oceanic basement. Eight cores were cut at intermittent levels in the column; 6.2 meters of an attempted 25.5 meters of the section were recovered.

Core 1, at 69.5 meters below the sea floor, contains 8 centimeters of siliceous Globigerinoides-Praeorbulina ooze with a Lower Miocene nanofauna. Material adhering to the drill bit and bottom-hole assembly upon pulling up the drill string confirmed that the above sediment lies beneath Pleistocene and Pliocene foraminiferal oozes which themselves contain traces of neritic debris (reworked bryozoans, etc.).

Core 2 (1.4 m recovery), taken eighty meters further down the section contains an Albian microfauna in a siliceous marl (carbonate content approximately 29 per cent). The absence of Oligocene, Eocene, Paleocene, and Upper Cretaceous materials as downhole contaminants or from cavities in the bottom-hole assembly of the drill string (that is, splines in the bumper-subs) suggests an unconformity (Miocene on Albian) somewhere between 69.5 and 149 meters below bottom (see Chapter 2 for a discussion of the location of this unconformity as inferred from the drilling logs).

Between Core 7, recovered from 229 to 232 meters below bottom, and the basement complex of serpentinized gabbro drilled in Core 8 (251.7 to 253.4 m), there exists an unknown section of 19.7 meters thickness from which no data are available.

The entire Lower Cretaceous sequence, from 144 (Core 2) to 232 meters (Core 7) below bottom, consists of olive-gray siliceous ooze which is usually indurated and laminated and which has the appearance of shale. Its total thickness may be estimated from the drill logs to be about 90 meters (neither the top nor base of the Lower Cretaceous was cored, though marked drilling breaks were noted at 55 and 246 meters).

BENTHONIC FORAMINIFERA

Except in Core 6, benthic foraminifera are present throughout the Cretaceous section, though nowhere can the associations be classified as rich. The examined samples contain a variety of species, but the different forms are generally represented by only a few specimens. A striking feature is the absence of planktonic foraminifera (a single specimen of Heilbergella cf. Infracretacea (Glaessner) was found in Core 2). This general sparseness has been noted by Douglas (1971) as a common characteristic of deep-sea sediments recovered in DSDP cores from the Atlantic and Pacific Oceans. Also lacking at Gorringe Bank are the stratigraphically important forms of the evolutionary lineages of Conocorallites bartensteinic-intercedensis-aptiensis (Bettenstael), Vaginitulina procura Albers, and the numerous species of Epistomina known from other sediments of Valanginian to Albian age. Another peculiarity of the recovered Lower Cretaceous foraminiferal fauna is the complete lack of the widely distributed forms characteristic of the neritic "Urgonian" shell facies, such as Orbitolina, Orbitolopis, Iriaia, Dictyoconus, and Coskintolina, as well as Choffatella and other larger Lituolidae. The Gorringe Bank Cretaceous is therefore regarded as representing laminated bathyal oozes which were deposited away from land. Though the depositional site may have been in a relatively deep basin, the presence of a varied calcareous benthos indicates that the site was above the contemporaneous carbonate-compensation depth (see distribution chart in Figure 2).
LOCATION OF SITE 120
ON GORRINGE BANK

Figure 1. Location of Site 120 on the northern slope of Goringe Bank and the distribution of outcrops of Cretaceous and pre-Mesozoic strata in Portugal. Physiographic diagram of the North Atlantic Ocean by Heezen and Tharp, 1968.

Among the 75 species determined from Cores 2 through 7, only very few, for example, Lingulogavelinella ciryi Malapris-Bizouard from the Albian (Cores 2 and 3), Lenticulina ouachensis multicella Bartenstein, Bettenstaedt, and Bolli from the Hauterivian-Barremian (Core 4), and Gavelinella, aff. barremiana Bettenstaedt from the Middle-Upper Barremian to basal Aptian (Core 7), are known to have a restricted stratigraphic range on which an age determination can be based. Haplophragmium aequale (Roemer), found in Core 7, is a Hauterivian-Barremian
| Figure 2. Range distribution of Lower Cretaceous foraminifera in Cores 2 through 7 of Site 120, Gorringe Bank, eastern North Atlantic. |
### Figure 2. (Continued)

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Plate</th>
<th>Figure</th>
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<tbody>
<tr>
<td>Dentalina legumen Reuss</td>
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<td>Lingulina biformis Bartenstein &amp; Brand</td>
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<td>Pseudonodosaria himilis (Roemer)</td>
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<td>Lenticulina ouachensis multicella Bart., Bett. &amp; Bolli</td>
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<td>Lenticulina turgidula (Reuss)</td>
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<td>Vaginulinopsis cf. dilecta (Reuss)</td>
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<td>Marginulina hamulus Chapman</td>
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<td>Citharina sp.</td>
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<td>Haplophragmoids cushmani Loeblich &amp; Tappan</td>
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<td>Ammobaculites subcretaceus Cushman &amp; Alexander</td>
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<tr>
<td>Astacolus sp.</td>
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<td>Vaginulinopsis maturina (d'Orbigny)</td>
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<td>Glomospira gordialis (Jones &amp; Parker)</td>
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<td>Bigenerina aff. antiquissima Bartenstein &amp; Brand</td>
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<td>13</td>
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<td>Frondicularia joidei n. sp.</td>
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<tr>
<td>Lingulina loryi gorringei n. subsp.</td>
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<td>23</td>
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<td>Pseudonodosaria tensa (Bornemann)</td>
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<tr>
<td>Gavelinella aff. barremiana Bettenstaeidt</td>
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</table>
species which does not extend into post-Barremian beds, though it is also known from the Jurassic. The other foraminiferal species either have poorly known stratigraphic value, or range throughout the Lower Cretaceous (many among them extending into the Upper Cretaceous). Four forms are considered to be new species or subspecies of which the stratigraphic range is not known: Gavelinella barremiana.bizouardiae n. sp. (Cores 2 and 3), Citharina giomarchielleriana n. sp. (Core 7), Frondicularia joitides n. sp. (Core 7), and Lingulina loryi goringei n. subs. (Core 7).

On account of the few marker species, an Albian age (Middle-Upper Albian?) is assigned to Cores 2 and 3, and a Barremian age to Core 7.

Spiropectinata annectens (Parker and Jones) of which a single test was found in Core 5, has so far not been recorded from pre-Albian beds, and the same applies to Spiropectinina nuda Lalicker. On the other hand, Bigenerina antiquissima Bartenstein and Brand and Lingulina biforis Bartenstein and Brand, to which some of the tests from Site 120 are attributed, have hitherto been only listed from Valanginian beds (Germany).

Cores 2, 3 and 4 also yielded very well-preserved Radiolaria with species hitherto known from Albian to Upper Cretaceous beds (see Chapter 34). In Core 7 the radiolarian tests are heavily pyritized, and sometimes completely replaced.

H. J. Oertli, SNPA-Pau, kindly gave the writer his opinion on the few Ostracoda found in Core 7. The recognized genera include Bairdina, Salpaenetra?, Cytherana?, Astartocythere, Pontocyprilla? and Macrocypris, but none of the represented, mostly juvenile forms is specifically known so far (Oertli, 1970, in litt.).

REMARKS ON THE LOWER CRETACEOUS FORAMINIFERAL FAUNA

It is not possible to compare the apparently bathyal facies of the Barremian-Albian section drilled on Gorringe Bank with any sediments known from continental Portugal. Both the Lusitanian and the Algarve-Guadagulquivir Basins (see Figure 1) lie in the vicinity of the Hercynian massif (Iberian Meseta) and show, accordingly, near-shore or shelf facies characterized by littoral or lagoonal deposits, transgressions, and sedimentary breaks (see Table 1, for stratigraphic correlations).

West of the Lusitanian Basin, in the present-day Atlantic Ocean, a swell or island zone has supposedly existed from which the detritus of the "Albo-Aptian" sandstones is largely derived (Rey, 1969b). A remnant of this high is seen in the Berlenga and Farilhões Islands, which lie about 15 km off the continent (Figure 1).

The rich fossil content of the Lower Cretaceous beds exposed in the Lusitanian Basin reflects a shallow, marine environment. Toward the northeast and east (North Torres Vedras area), these littoral beds grade into detrital and continental equivalents (Wealdian facies).

Lusitanian Basin

A sequence from the Upper Jurassic into the Cenomanian crops out in the area of Cape Espichel-Serra da Arrabida. Only the uppermost level (3 meters) of the Valanginian clastics, about 80 meters in thickness and wedging out towards the east, carries ammonites (Neocomites neoocomiensis (d'Orbigny)) and diagnostic echinoids (Pygurus rostratus Ag., Toxaster). The marl-limestone series of Hauterivian age, 70 meters thick, contains Lophophyllum rectangulare (Roemer), Exogyra coulonii (d'Orbigny), Brachiopoda, echinoids, and corals, as well as Ostracoda, for example, Cythereis gr. bernardi Grosdidier, Schuleridea aff. theoerensis (Triebel), and, in the upper part, the characteristic foraminifer Choffatella decipiens Schlumberger which is present throughout the Barremian beds (100 meters) and in the Lower Aptian marl-limestone (13.5 meters). Here it is associated with, i.e., Exogyra tuberculifera (K. and D.), Cythereis gr. bartestini Oertli, etc. Lagoonal influences (gypsum, lignite, dinosaurian bones) are seen in the uppermost and basal Barremian. The Upper Aptian (Lower Albian?) is represented by 18 meters of barren clastics.

In the region of Ericeira, the Purbeckian clastics with marine interlayers carrying Anchispirocyclina lusitanica (Egger)(Maync, 1959) are followed by the "Urgonian" limestones with Ostrididae, rudists, etc. (Valanginian-Lower Hauterivian). From the Upper Hauterivian onward to the base of the Upper Aptian, Choffatella decipiens Schlumberger is a characteristic microfaunal element. Trigonia beds (about 27 m) with Trigonia hornadana Lea, Trigonia caudata Ag., etc., compose the Lower Barremian, the Praia do Peixe Sandstone (14 m) and the Choffatella beds (54 m) the Upper Barremian. Orbitolina-bearing beds (30 m) with rudists, echinoids, Exogyra tuberculifera (K. and D.), Brachiopoda, Cythereis gr. bartestini Oertli, etc., represent the Lower Aptian, the Praia dos Banhos Sandstone (15 m) the Upper Aptian. This is followed by the Vraconian (=Upper Albian) level with Kremiceras ulhigi (Choffat) and the marine Cenomanian.

In the northern Torres Vedras area, the Valanginian to Aptian succession is represented by a barren clastic sequence, about 110 meters thick, of sandstones, conglomerates, and purple shales. The only marine level, 35 meters above the base of the Cretaceous section, has yielded some arenaceous smaller foraminifera (Ferreira, 1958) of no diagnostic value, which were held to be of Upper Valanginian age but probably reflect the Hauterivian ingressions (Rey, 1970).

In the region of Cascais, the Lower Valanginian (14 meters) with Natkeleviathan (P. c. T.) and Trocholina is succeeded by the Mexilhoeira beds (20 meters), the age of which is suggested as Upper Valanginian by ammonites such as Olocostephanus gr. asleri (d'Orbigny), Neocomites neoocomiensis (d'Orbigny), and Pygurus rostratus Agassiz in the lower part, and by the Exogyra-Toxaster marls and Lower Hauterivian ammonites in the upper half. The Upper Hauterivian-Lower Barremian is represented by the "Urgonian" limestone, the Upper Barremian-Aptian by the Almargem beds (about 70 m in thickness) with Exogyra boussingaultii (d'Orbigny), echinoids, Brachiopoda, Choffatella decipiens Schlumberger, Pseudocyclammina hedbergi Maync, Orbitolina (Petalobuitina) lentularis (Blumenbach), Orbitolinopsis, Cythereis bartestini Oertli, etc. A barren sandstone (25 m) occurs on top of the Almargem beds which is succeeded by the limestones and marls with
TABLE 1

Stratigraphic Summary of the Lower Cretaceous in the Lusitanian Basin of Western Portugal and Its Chronostratigraphic Correlation to the Sediment Section at Site 120, Gorringe Bank.

<table>
<thead>
<tr>
<th>Stage</th>
<th>N. Torres Vedras</th>
<th>Ericeira</th>
<th>Cascais</th>
<th>Cape Espichel - Serra da Arrabida</th>
<th>Site 120, Gorringe Bank</th>
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</thead>
<tbody>
<tr>
<td>Cenomanian</td>
<td>Ostreidae limestone</td>
<td>Beds with Ostreidae, rudistids, Praealevolina</td>
<td>Beds with Ostreidae, Rudistids, Praealevolina</td>
<td>Beds with Ostreidae, rudistids, Pholadomya, etc.</td>
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<tr>
<td>Albian</td>
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<td>Upper</td>
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<tr>
<td>Barremian</td>
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<td>Barremian</td>
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<td>Purbeckian</td>
<td>Varicolored shale and sandstone; Torres Vedras beds (Wealdian)</td>
<td>Clastics with limestone interbeds with Anchispirocyclina lusitana</td>
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</tr>
</tbody>
</table>

Knemiceras uhligi (Choffat) of the Upper Albian, and by the marine Cenomanian.

The Almargem beds were formerly assigned to the Albian but are now referred to the Upper Barremian-Aptian (Rey, 1971, in litt.). The Albian corresponds to a hiatus.

Algarve Basin

No modern data concerning this southern basin are available at this time. Some years ago, I had the opportunity to study some Orbiloolina-bearing marls and limestones from Luz and Sao Braz-Abilheira (Mayne, 1959). In a section measured nearby (Lagos), the Albian-Aptian beds carry a rare microfauna with Paracoskinoilina (fig. of Coskinoilina bullenensis Mayne), Sabaudia, and Pseudocyrtamina cf. hedbergi Mayne (P.Y. Berthou, 1971, in litt.).

To sum up, the Barremian-Albian section of continental Portugal is composed of marls, limestones, and clastics (platform-lithofacies) in thicknesses of about 100 to 150 meters. At Site 120, a sedimentary section, approximately 90 meters thick, of Barremian-Albian age was penetrated, but neither with regard to the lithology and facies nor to the microfauna does there exist any similarity between the sequence drilled at Site 120 on Gorringle Bank and the Portuguese Lower Cretaceous.

SYSTEMATIC DESCRIPTIONS

Rhizaminna Brady, 1879

Rhizaminna indivisa Brady (Plate 1, Figures 1, 2)

1935 Rhizaminna indivisa Brady, Elchenberg, Oel und Kohle, 11, Jahrg., No. 22, Pl. II, fig. 1; Pl. V, fig. 1.
1938 Bathysiphon D-2, Hecht, Senckenberg. Natl. Ges. Abhandl., 43, Pl. 2a, fig. 34-36; Pl. 5a, fig. 35-38; Pl. 5b, fig. 35; Pl. 6a, fig. 33-38.
1939 Bathysiphon D-7, Hecht, ibid., Pl. 22, fig. 7-11.
1967 Rhizaminna indivisa Brady, Michael, Palaeontogr., Suppl. bd. 12, p. 17, Pl. I, fig. 2-3; Pl. XVIII, fig. 20; Pl. XIX, fig. 23-24; Pl. XXIV, fig. 19; Pl. XXV, fig. 47; Pl. XXVI, fig. 47.

Test simple, tubular, straight or curved, usually compressed, finely agglutinated, irregular constrictions and knots may occur (no subdivision into chambers).

1 The beds cropping out at Porto do Cavalinho, 3.5 kilometers north of Ericeira, the type locality of Choffatella decipiens Schlumberger (see Mayne, 1950), were previously attributed to the Albian but are now likewise considered to be Barremian in age (Rey, 1967).

Rhizaminna? indivisa is found throughout the Cretaceous up to the Recent.

Rhizaminna? sp.

(Plate 1, Figure 3)

Some tests of Rhizaminna? show numerous constrictions and an irregular growth on which account an attribution to Rhizaminna? indivisa Brady is not justified.

The concerned specimens are comparable to Rhizaminna sp. as figured from the Barremian of Trinidad (Bartenstein, Bettenstaedt and Bolli, 1957, Pl. II, fig. 27-29).

Ammodiscus Reuss, 1862

Ammodiscus gautlinus Berthelin (Plate 1, Figures 4, 5)

1938 Ammodiscus D-2, Hecht, Senckenbg. Natl. Ges., Abhandl., 443, Pl. 2a, fig. 78-81; Pl. 2b, fig. 40-43; Pl. 3a, fig. 18-20; Pl. 3b, fig. 16-22; Pl. 4b, fig. 7-10; Pl. 5a, fig. 26-29; Pl. 6a, fig. 65-67; Pl. 9b, fig. 44-48; Pl. 10a, fig. 7-11; Pl. 10b, fig. 88-90; Pl. 11a, IV.
1938 Glomospira D-2 (pars), Hecht, ibid., Pl. 9a, fig. 38-39; Pl. 14a, fig. 19.
1943 Ammodiscus gautlinus Berth., Tappan, J. Paleontol., Vol. 17, No. 5, p. 481, Pl. 77, fig. 6.
1949b Ammodiscus rotulatorus n. sp., Loebisch and Tappan, J. Paleontol., Vol. 23, No. 3, p. 247, Pl. 46, fig. 1.
1962 Ammodiscus cretaceus (Reuss), Tappan, ibid., p. 130, Pl. 30, fig. 1-2.
1967 Rhizaminna indivisa Brady, Michael, Palaeontogr., Suppl. bd. 12, p. 17, Pl. I, fig. 2-3; Pl. XVIII, fig. 20; Pl. XIX, fig. 23-24; Pl. XXIV, fig. 19; Pl. XXV, fig. 47; Pl. XXVI, fig. 47.

Ammodiscus gautlinus differs from A. incertus (d'Orbigny) in its less regular coil. Ammodiscus cretaceus (Reuss) shows a calcareous, not arenaceous test and hence belongs to the genus Cyclolyptra Wood, 1842 (=Cornuaspira Schultze, 1854).

The tests of A. gautlinus are rather variable but the different species based on slight differences in the character of coiling, overlap of whorls, deformation through fossilization, etc. are
actually members of one taxon. Transitional forms lead to the streptospirally coiled tests included in the genus Glomospira Rzehak, 1885.

Glomospira Rzehak, 1885

Glomospira charoides (Jones & Parker)

(Plate 1, Figures 6-7)


1950 Glomospira charoides (Jones & Parker), Subbotina, VNIGRI, Trudy, Microfauna USSR, Vol. IV, n. ser. No. 51, p. 74, Pl. II, fig. 5.


1967 Glomospira charoides (Jones & Parker), Michael, Palaeontogr., Suppl. Bd. 12, p. 23, Pl. I, fig. 8; Pl. XXIV, fig. 40.

Glomospira charoides, a species known from Carboniferous to Recent sediments, is characterized by its horizontal planes of coiling.

Glomospira gordialis (Jones & Parker)

(Plate 1, Figure 8)


1938 Glomospira D-2 (pars), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 2a, fig. 82-86; Pl. 2b, fig. 44-46; Pl. 3a, fig. 14-17; Pl. 3b, fig. 23-29; Pl. 4b, fig. 11-12; Pl. 5a, fig. 21-25; Pl. 5b, fig. 25-29; Pl. 6a, fig. 56-64; Pl. 7b, fig. 437; Pl. 9a, fig. 38-39; Pl. 9b, fig. 39-41; Pl. 11a, fig. 17-23; Pl. 14a, fig. 17-19.

1938 Glomospira D-4 (pars), Hecht, ibid., Pl. 9b, fig. 10, 42-43; Pl. 10a, fig. 4-6.


Glomospira gordialis differs from Ammodiscus in its change of direction of coiling (latest coil wound around the early ones). G. gordialis shows streptosphirally early whorls, later inclined planes of coiling, not horizontal as in G. charoides (Jones & Parker).

Reophax Montfort, 1808

Reophax g. scorpianus-horridus

(Plate 1, Figure 9)


1941 Reophax eckernix n. sp., Vieaux, J. of Paleontol. Vol. 15, No. 6, p. 625, Pl. 10, fig. 1.

1943 Reophax deckeri Tappan, Tappan, J. of Paleontol. Vol. 17, No. 5, p. 479, Pl. 77, fig. 3.


Reophax minuta Tappan

(Plate 1, Figure 10)

1938 Haplostiche D-I, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 4a, fig. 4-8.


1943 Reophax minuta Tappan, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 480, Pl. 77, fig. 4.


This species is characterized by a small flattened test with a circular initial chamber, later ones arranged in a linear series, short, inflated, separated by horizontal depressed sutures. Periphery slightly lobulate.

Reophax minuta is known from Europe and the United States. It occurs in beds of Barremian to Lower Cenomanian age.

Reophax troyeri Tappan

(Plate 1, Figures 11, 12)

Among the known species closest to the present form from Goring Bank is Reophax troyeri Tappan (1960) described from the Albian Topagoruk Formation of Alaska.


Test stout, compressed, initial part broadly rounded, last-formed chamber triangular and slightly extended and tapering flask-like with a faint apertural neck similar to that in Reophax g. scorpianus-horridus (see Plate 1, Figure 9). Three to four chambers, sometimes twisted and irregular, separated by horizontal depressed sutures. Some tests are similar to Haplophragmoides or Ammobaculites but an immersion in clove oil discloses the absence of any early coiling. By the pointed adult chamber with its trace of a neck, our form differs from the otherwise similar, though coarsely arenaceous Upper Cretaceous species Reophax texanus Cushman & Waters which, moreover, displays spherical chambers. The large-sized Reophax subgoodlandensis Vanderpool from the Lower Albian of Oklahoma (which attains a length of 3.3 millimeters) lacks the broad globular first chamber and possesses a coarsely arenaceous test.

Haplophragmoides Cushman, 1910

Haplophragmoides concava (Chapman)

(Plate 1, Figures 13, 14)


1943 Haplophragmoides concava (Chapman), Tappan, J. of Paleontol., Vol. 17, No. 5, p. 481, Pl. 77, fig. 7.


1965a *Trockammina vocontiana* n. var., Moulaude, Revue de Micropal., Vol. 2, No. 4, p. 200, Pl. 1, fig. 1-3.


1967 *Haplophragmoides concavus* (Chapman), Michael, Palaeontogr., Suppl. bd. 12, p. 27, Pl. II, fig. 5-6; Pl. XXIII, fig. 4, 63-64, 77; Pl. XXIV, fig. 32; Pl. XXVI, fig. 63, 72, 78.


1969 *Haplophragmoides concavus* (Chapman), Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. 3, p. 127, Pl. 20, fig. 2-4; Pl. 21, fig. 7.

The test of this form is usually strongly compressed showing the collapsed chambers, the feature on which the specific name "concavus" is based. Planispirally coiled, involute, periphery lobate; 4-7 chambers in the last-formed whorl which partly overlap each other and which are separated by compressed radiate sutures; umbilicus depressed; aperture not visible in the available specimens.

Some of the greatly deformed and flattened tests seem to show a trochospiral coil and hence are close to *Trockammina depressa* Lozo from the Middle Albian of Texas (Lozo, 1944).

Tests referable to the widely distributed species *Haplophragmoides concavus* (Chapman) are found in all the cores taken in the Lower Cretaceous section of Hole 120, Gorringe Bank (except for the barren Core 6). Some of the greatly deformed and flattened tests seem to show a trochospiral coil and hence are close to *Trockammina depressa* Lozo from the Middle Albian of Texas (Lozo, 1944).

Tests referable to the widely distributed species *Haplophragmoides concavus* (Chapman) are found in all the cores taken in the Lower Cretaceous section of Hole 120, Gorringe Bank (except for the barren Core 6). Forms included in this variable species occur from the Middle Valanginian onwards up into the Albanian, in Europe, the Middle East as well as in the Western Hemisphere.

**Haplophragmoides cushmani** Loeblich & Tappan

(Plate 1, Figures 15, 16)

The few small tests with broadly rounded periphery, depressed umbilicus and depressed sutures, observed in Cores 5 and 7 of Hole 120, are compared with *Haplophragmium cushmani* Loebli. & Tappan (Albian of Texas).

1938 *Haplophragmium* D-5 (pars), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 10a, (II, pars); Pl. 10b, fig. 637; Pl. 11a (III, pars); Pl. 12b, fig. 61-68.

1946 *Haplophragmium* n. sp., Loeblich & Tappan, J. of Paleontol., Vol. 20, No. 3, p. 244, Pl. 35, fig. 4.

1951 *Haplophragmium* Loebli. & Tappan, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 268, Pl. 1, fig. 23; Pl. 14B, fig. 17; Pl. 14C fig. 12; Pl. 18, fig. 36?, 37-38.

1956 *Haplophragmium* Loebli. & Tappan, Bartenstein, Senckenberg, leh., Vol. 37, No. 5/6, p. 512, Pl. 3, fig. 62.


1967 *Haplophragmium latidorsatus* (non Bornemann), Michael, Palaeontogr., Suppl. bd. 12, p. 27, Pl. II, fig. 1; Pl. XXI, fig. 67, 72-73; Pl. XXIV, fig. 357, 52-53; Pl. XXVI, fig. 34.

The species *Haplophragmium cushmani* occurs in the stratigraphic interval Middle Valanginian-Upper Albanian.

**Ammobaculites** Cushman, 1910

*Ammobaculites euides* Loeblich & Tappan

(Plate 1, Figures 17, 18)


1969 *Haplophragmium aequale* (Roemer), pars, Kalantari, Nat. Iran. Oil Co., Geol. Lab., Publ. No. 3, p. 131, Pl. 17, fig. 4-5.


The few tests found in Core 7-1 show the characteristic features of *Haplophragmium aequale* (Roemer) which is generally taken as an index form of the Hauterivian-Barremian. However, the stout Jurassic specimens referred to the same form by F. Lutze (1960, fig. 8, Pl. 26, fig. 1-2, 5-6) are reported to show no differences with those from the Hauterivian of Germany.

The tests previously referred to as *Triplasia pseudorocerotriangulosa*-Brandt. & Brand, *Triplasia quadrata* Bart. & Brand, and *Pabelgialla smithi* Bart. & Brand are considered by some authors to be A-forms of *Haplophragmium aequale* (Parker, 1943; Diani & Massari, 1966, etc.).

*Textularia* Deffrance, 1824

*Textularia foeda* Reuss

(Plate 1, Figure 22)


1938 *Gaudryina* D-16, Hecht, Senckenbg. Natf. Ges. Abhandl. 443, Pl. 2a, fig. 1-3; Pl. 2b, fig. 1-10; Pl. 3a, fig. 30-31; Pl. 5b, fig. 14-15; Pl. 6a, fig. 23-28; Pl. 6b, fig. 23-28.


1962 *Textularia foeda* Reuss, Arbeitskreis Leitfoss. d. MikropaL, p. 270, Pl. 37, fig. 10; Pl. 39, fig. 19.


The few available tests do not reveal the true character of the initial portion so that the possibility of an assignment to the genus *Spiroplectammina* cannot be excluded.

*Textularia foeda* is listed from beds of Jurassic to Middle Albian age. The original type was described from the Turonian of Germany (Reuss, 1846).

*Spiroplectammina* Cushman, 1927

*Spiroplectammina cf. nuda* Lalicker

(Plate 1, Figure 23)


The only available specimen is very small with a length of about 0.2 millimeter.

Test flaring from the globular initial end, compressed; 3 pairs of rounded chambers divided by thick limbate sutures which are clearly oblique; latest chamber broadly rounded with curved periphery; aperture obscure.

The types of *Spiroplectammina nuda* show a gradually tapering, not flaring test, a less curved last-formed chamber, and more rectangular chambers.

*Spiroplectammina alexandri* Lalicker from the Middle Albian of Texas reveals horizontal limbate sutures, *Spiroplectammina goodlandiana* Lalicker from the same formation shows a flaring test but its limbate sutures are horizontal. *Spiroplectammina rectangularis* ten Dam from the Dutch Albian is larger and moreover displays numerous pentagonal chambers which are nearly twice as broad as high, and are separated by thin sutures.

*Spiroplectammina nuda* is known from the stratigraphic interval Middle Albian-Lower Cenomanian.

*Bigenerina* d'Orbigny, 1826

*Bigenerina aff. antiquissima* Bartenst. & Brand

(Plate 1, Figure 24)


Test with early portion indistinctly coiled, then composed of 6 to 8 pairs of biserial chambers which become much larger and irregular from the first quarter of the test onward, forming an indented periphery; last 2 chambers uniserial; aperture not discernible. Length 0.65 millimeter.

Our form differs from the original type from the Upper Valanginian of NW Germany in having a more regular and less coarse early biserial portion. Furthermore, the German form displays 4 rectilinear uniserial adult chambers.

*Bigenerina clarolata* Loebi. & Tappan

(Plate 1, Figures 25, 26)


1946 *Bigenerina clarolata* n.sp., Loebich & Tappan, J. of Paleontol., Vol. 20, No. 3, p. 245, Pl. 35, fig. 7-8.


Small elongate, very slender, mostly compressed and twisted tests with a considerable biserial part followed by 2 to 3 uniserial chambers, usually with a constriction between the biserial and uniserial portion; chambers rounded and inflated, generally collapsed; sutures distinct and depressed; aperture a terminal opening in the last, generally more inflated chamber. Average length: 0.5 - 0.6 millimeter.

The type specimen from the Upper Albian Weno Formation of Texas (Loebich & Tappan, 1946) which measure 0.28-0.86 millimeter in length, display only a short biserial portion, the uniserial part consisting of 3 to 7 chambers. The same applies to the figured tests from the Upper Valanginian of NW Germany (Bartenstein & Brand, 1951). This difference is, however, not held fundamental enough to justify the creation of a new species.

The coarsely textured specimens recorded as *Bigenerina* clarolata from the Maridale Formation (Upper Aptian to Middle Albian) of Trinidad (Barrentstein, Bettenstädte & Holli, 1966) are twice as large and show a straight Reophax-like test.

*Bigenerina clarolata* is recorded in a. from the Upper Valanginian-Hauterivian of NW Germany, from the Upper Valanginian-Lower Barremian of France (Colloque Crét. inf., 1965), and from the Lower Cretaceous of Poland (Sztein, 1958). The original type specimens are derived from the Upper Albian of Texas and Oklahoma, USA.

*Trochammina* Parker & Jones, 1859

*Trochammina globigeriniformis* (Parker & Jones)

(Plate 1, Figures 27, 28)


1938 *Haplophragmoides* D-7, Hecht, ibid., Pl. 12b, fig. 61-68.


1960 *Trochammina globigeriniformis* (Parker & Jones), Bielecka, Inst. Geol., Prace, Vol. XXXI, p. 120, Pl. 1, fig. 5.

1967 *Trochammina globigeriniformis* (Parker & Jones), Michael, Palaeontogr., Suppl. bd. 12, p. 31, Pl. II, fig. 2-4; Pl. XIV, fig. 11-13, 27; Pl. XXI, fig. 2-5, 14-16, 24, 35; Pl. XXII, fig. 56,
Versenullinoides Lobelich & Tappan, 1949

Verneuilinoides plexus neocomiensis (Mjatliuk)


1938 Verneuilinoides D-4, Hecht, Senckenberg. Nat. Ges. Abhandl. 443, Fig. 8a, text-fig. 2-3.

1939 Verneuilinoides subfiliformis, Bartenstein & Brand, Senckenberg. Nat. Ges. Abhandl. 485, p. 276, Fig. 4, p. 77-328; Fig. 16, Fig. 1-2; Fig. 18, Fig. 13-16, 28-30, 42, 44, 46; Fig. 19A, Fig. 3-5, 11; Fig. 19B, Fig. 10, 13-17.

1952b Verneuilinoides sibilliformis n.sp., Bartenstein, Senckenberg., Vol. 20, No. 6, p. 572, Fig. 8.

1951 Verneuilinoides neocomiensis n.sp. (Mjatliuk), Bartenstein & Brand, Senckenberg. Nat. Ges. Abhandl. 498, p. 276, Fig. 4, p. 77-328; Fig. 16, Fig. 1-2; Fig. 18, Fig. 13-16, 28-30, 42, 44, 46; Fig. 19A, Fig. 3-5, 11; Fig. 19B, Fig. 10, 13-17.

1958 Verneuilinoides neocomiensis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1957 Verneuilinoides neocomiensis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1946 Verneuilinoides chapmani n.sp., Ten Dam, J. of Paleontology, Vol. 20, No. 6, p. 572, Fig. 8.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1963 Dorothy grandis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1957 Verneuilinoides neocomiensis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1957 Verneuilinoides neocomiensis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1959 Verneuilinoides neocomiensis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1960 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Spiroplectinata annectens (Parker & Jones), Flandrin, Moullade & Porthault, Revue de Micropaleontologie, Vol. 4, No. 4, p. 216, Fig. 1, Fig. II, Fig. 39-40.

1965 Spiroplectinata annectens (Parker & Jones), Cushman, J. of Paleontology, Vol. 39, No. 1, p. 6, PL 2, Fig. 5.

1963 Dorothy grandis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1951 Verneuilinoides neocomiensis n.sp., Bartenstein & Brand, Senckenberg. Nat. Ges. Abhandl. 485, p. 276, Fig. 4, p. 77-328; Fig. 16, Fig. 1-2; Fig. 18, Fig. 13-16, 28-30, 42, 44, 46; Fig. 19A, Fig. 3-5, 11; Fig. 19B, Fig. 10, 13-17.

1962 Verneuilinoides sibilliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1963 Dorothy grandis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

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1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.

1962 Verneuilinoides subfiliformis n.sp., Bartenstein, Senckenberg., Vol. 50, No. 1, p. 19, Fig. II, Fig. 39-40.
Dorothia Plummer, 1931

Dorothia filiformis (Berthelin) (Plate 1, Figure 34).

The only non-ambiguous test referable to Dorothia filiformis was observed in Core 2-1 (Plate 1, Figure 34). The original figure (Berthelin, 1880, Pl. I, fig. 8) shows a slender elongate test, rounded in transverse section, with almost parallel sides and a poorly developed triserial initial protozoon. Marssonella oxycona (Reuss) 1935

1961 Marssonella hauteriviana. Dorothia praehauteriviana is also referred to in DSDP Holes 101A and 105 of Leg 11 in the northwestern Atlantic, in beds referred to as Valanginian. These tests which show a length/breadth ratio of 2.8:1 to 3.1:1 are identical with those from the Goring Bank determined as Marssonella hauteriviana. It may be pointed out that two very similar, though smaller tests than those assigned to M. praehauteriviana, are figured also from the Upper Valanginian of Sardinia as Dorothia kummi (Zedler). These specimens show a length/breadth ratio of 2 to 2.4:1 (Dieni & Massari, 1966, Pl. II, fig. 15-16).

In view of this overlap, the value of the length/breadth index for a clear-cut distinction of the species M. praehauteriviana, M. hauteriviana, and M. kummi is held to be questionable. Thus uncertainty is also revealed by the fact the Marssonella oxycona, illustrated from the Lower Hauterivian of the Bavarian Alps (Bettenbaudt & Wieher, 1955, Pl. IV, fig. 30), is placed in synonymy with M. kummi (Zedler, 1961, p. 31) but also with M. praehauteriviana (Dieni & Massari, 1966, p. 108).

Marssonella hauteriviana Moullade is known from the Hauterivian and Barremian of France and from the Barremian of Iran (M. praehauteriviana is so far only recorded from the Upper Valanginian). Since specimens referable to M. hauteriviana were found in Hole 120 on Goring Bank in Cores 3, 4, 5, and 7, the concerned species is proved to extend from the Hauterivian-Barremian up into the Aptian and Barremian Albian.

Marssonella Cushman, 1933

Marssonella hauteriviana Moullade (Plate 1, Figures 35-37).

The genus Marssonella is considered by some authors to be a junior synonym of Dorothia, but this concept is not dealt with here. 1961 Marssonella hauteriviana n.sp., Moullade, Revue de Micropaleontol., Vol. 3, No. 4, p. 213, Pl. I, fig. 9-12. 1962 Marssonella hauteriviana Moullade, Flandrin, Moullade & Porthault, Revue de Micropaleontol., Vol. 4, No. 4, p. 216, Pl. 2, fig. 4.

1969 Marssonella oxycona (Reuss), pars, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 23, fig. 1 (now Pl. 16, fig. 11-12).

The species Marssonella hauteriviana is characterized by an elongate-cylindrical, slender test showing a tapering conical early portion (3 chambers or more) and a large biserial stage. The apertural face forms a sharp angle with the sides of the test. Marssonella hauteriviana differs by its elongate test (length/breadth index of 2.5:1 to 3:1) from the stouter and conical, flaring species Marssonella oxycona (Reuss) and Marssonella kummi Zedler.

2Prof. Michel Moullade, University of Nîmes (France), very kindly sent the writer some topotype specimens of Marssonella hauteriviana Moullade for a comparison with the tests from Hole 120.

3Dr. H.-P. Lutcherbacher kindly placed his preliminary report as well as some specimens of Dorothia praehauteriviana at the writer's disposal which is gratefully acknowledged.
1951 *Marssonella oxycona* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 277, PI. 4, fig. 80; PI. 17B, fig. 19; PI. 18, fig. 45; PI. 19A, fig. 14-17; PI. 19B, fig. 48-51.


1962 *Marssonella aff. oxycona* (Reuss), Arbeitskreis, Leitfoss. d. Mikropal., PI. 35, fig. 11.


An indisputable differentiation between *M. oxycona*, recorded by a great number of authors from the Jurassic up into the Upper Cretaceous, and *M. kummi*, known from the Valanginian up to the Albian, is difficult on the basis of our present knowledge. The length/breadth ratio of the broadly flaring Upper Cretaceous forms of *M. oxycona* is 1.3:1 to 2:1, and in the tests referred to as *M. kummi* it varies between 0.8:1 and 2.4:1 (Dieni & Massari, 1966). This index is 1.8:1 in the holotype of *M. kummi* (Zedler, 1962, Pl. 1, fig. 1a).

As shown above in the synonymy, the species *M. kummi* includes *L. Textularia* D-14 of F. Hecht (1938, Pl. 18a, fig. 1-19, etc.), specimens which were subsequently placed in the new species *Dorothy hechti* (Dieni & Massari, 1966). In our opinion, the new name *D. hechti* should be deleted as it includes both the valid species *M. kummi* Zedler and the even broader, flaring cones of the *M. trochos* (D'Orbigny). *M. subtrochos* Bartenstein type with triangular forms in which the breadth of the last pair of chambers may exceed the total length of the test (Dieni & Massari, 1966). Moreover, both *M. kummi* and *M. hechti* occur in the same associations.

Specimens assigned to *M. kummi* Zedler have been found in Cores 2 and 4 of Hole 120 on Gorringe Bank, namely in deposits of Albian and Lower Aptian-Barmenian age.

**Lenticulina** Lamark, 1804

*Lenticulina oxycona* oxycona* (Sigal) ([Plate 2, Figure 1, 2])

The species *Lenticulina oxycona* was established in July, 1952, on material from the Algerian Hauterivian (Sigal, 1952). The almost identical species *L. wisselmanni* from the Barremian of NW Germany was erected in November of the same year (Bartenstein, 1952). *L. oxycona* was subsequently split into *L. oxycona* oxycona* (Sigal) and *L. oxycona* wisselmanni* (Bartenstein), the latter showing 2 or 3 encircled umbilical grooves (Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 26, PI. III, fig. 47; PI. IV, fig. 68-69).

This subspecies differs from *L. oxycona* oxycona* in its evolution growth and the great number of chambers (up to 16) in the last-formed whorl.

*Lenticulina oxycona* multiscilla is recorded from the Barremian of Trinidad, France, Czechoslovakia, etc. It is also listed from Site 105 (Core 18) of DSDP Leg 11 (preliminary report by H.-P. Luterbacher).

*Lenticulina oxycona* multiscilla is recorded from the Barremian-Hauterivian species is characterized by a broad peripheral keel. There are about 10 chambers in the last-formed whorl which are separated by translucent sutures. The umbilicus is largely filled with callous material.

The stratigraphically younger *Lenticulina gaultina* (Berthelin) shows more chambers and lacks a callus.

*L. praegaultina* was found in the Cores 5 and 7 of Hole 120 (Barremian).

*Lenticulina subangulata* (Reuss) ([Plate 2, Figures 5, 6])


1951 *Lenticulina (Lenticulina) subangulata* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 283, Pl. 5, fig. 15; Pl. 15C, fig. 16, 19.


1965 *Lenticulina (Lenticulina) subangulata* (Reuss), Neagu, Micropal., Vol. 11, No. 1, p. 10, Pl. 3, Fig. 21-22.

*Lenticulina subangulata* is characterized by its subpolygonal subacute periphery without a keel and by its thin obscure sutures which are flush with the smooth surface of the test. In the European realm, it occurs in beds of Valanginian to Albian age.
Lenticulina turgidula (Reuss)

(Plate 2, Figures 7, 8)


1858 \textit{Cristellaria circumcincta} n.sp., Berthelin, \textit{ibid.}, p. 52, Pl. 3, fig. 1.

1876 \textit{Cristellaria ingensa} n.sp., Berthelin, \textit{ibid.}, p. 52, Pl. 3, fig. 1.

1880 \textit{Cristellaria circumcincta} n.sp., Berthelin, \textit{ibid.}, p. 52, Pl. 3, fig. 1.

1839 from the Upper Cretaceous of the Paris basin, and other rather different forms such as \textit{Vaginulinopsis matsuliana} (d'Orbigny), \textit{Vaginulina pliospina} (Bartenstein, Bettenstaedt & Bolli, 1966). A. E. Michael (1967), who interprets \textit{Astacolus calliopsis} (d'Orbigny), described in 1839 from the Upper Cretaceous of the Paris basin, and other rather different forms such as \textit{Vaginulinopsis matsuliana} (d'Orbigny), \textit{Vaginulina pliospina} (Bartenstein, Bettenstaedt & Bolli, 1966).

\textit{Astacolus calliopsis} (Reuss), as interpreted according to the above synonymy, is a Lower Cretaceous species (Valanginian-Albian) which already appears in the late Jurassic.

In Hole 120, it occurs in Cores 2 and 7.

\textit{Astacolus eruciformis} (Wisniowski)

(Plate 2, Figure 12)

1839 \textit{Cristellaria eruciformis} Wisniowski, Mjatliuk, Transact. Geol. Oil Inst., Ser. A, fasc. 120, p. 58, Pl. IV, fig. 47.

1960 \textit{Astacolus eruciformis} (Wis.), Bielecka, Inst. Geol., Prace, Vol. XXIII, p. 127, Pl. IV, fig. 47.

The determination of the few tests from Core 3-CC as \textit{Astacolus eruciformis} is made with reservation because said species is, to the best of our knowledge, only recorded from the Upper Jurassic (Callovian-Oxfordian of Poland and the USSR). It is obvious that forms of this type may develop at different geological epochs.

The present specimens are similar in some way to the tests figured from the Maridale Formation (Upper Aptian to Middle Albian) of Trinidad as \textit{Vaginulina harpa} (Reuss), another Jurassic species (Bartenstein, Bettenstaedt & Bolli, 1966). A. E. Reuss's original specimens of \textit{Cristellaria harpa} from the late Senonian of Germany (Reuss, 1960, Pl. X, fig. 1-2) differ, however, from the Trinidanid forms by the strongly lobate acute back (keeled in the spiral part). The tests from Hole 120 show a longer uniserial portion with less inclined sutures than the forms depicted from Trinidad. Moreover, they display a thin marginal seam (subacute periphery of the spiral and dorsal parts), the last chamber is more inflated, and the spiral portion is less broad than in \textit{Vaginulina harpa} Bartenstein, Bettenstaedt & Bolli (non Reuss).

\textit{Astacolus grata} (Reuss)

(Plate 2, Figure 13)

As pointed out above with respect to the synonymy of \textit{Astacolus calliopsis}, many forms described so far in the literature as different species are likely to be different generations of one single species or interspecific forms so that the accommodation of a given species,
sometimes even to a subgenus of our artificial classification, is confronted with serious difficulties.

Because of the great variability and morphological intergradations, it might be preferable to include all the similar forms in a comprehensive supraspecific taxon or plexus.

The morphological group into which *Astacolus grata* belongs is characterized by gently curved tests which are relatively broad and oval in transverse section (ventral side broader), with an angled back, a more or less developed early spire, low chambers separated by oblique sutures and with the apertural face extending far downwards towards the spire. The plexus which embraces *Astacolus calliopsis*, on the other hand, includes narrow slender forms displaying a poorly developed spiral and depressed sutures. E. Michael (1967) has chosen *Astacolus calliopsis* (Phil.) as representative of the former group, a form based on Tertiary material, and includes in its synonymy different forms like *Astacolus grata*, *A. planiuscula*, *A. scitula*, *Planaulina strombecki*, *Marginulopsis lituola*, *Vaginulopsis dilecta*, etc. Without a thorough taxonomic revision of these variable groups, based on large populations rather than on scattered tests, any determination remains equivocal.


1938 *Cristellaria* D-97, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 18b, fig. 52-53; Pl. 19a, fig. 17-19; Pl. 19b, fig. 19; Pl. 20a, fig. 55; Pl. 20b, fig. 41-42.


1957 *Astacolus gratus* (Reuss), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 221, Pl. V, fig. 36.


1967 *Lenticulina (Astacolus)* grata (Philippi), pars, Michael, Palaeontogr., Suppl. bd. 12, p. 42, Pl. VIII, fig. 15, 716; Pl. XIX, fig. 61.

The test figured from the Barremian of Trinidad (Bartenstein, Senckenbg. Natf. Ges., Abhandl., 1957, PI. III, fig. 58), identified as *Lenticulina (Astacolus)* grata (Reuss) shows the features of *Saracenaria*.

The specimen illustrated as *Astacolus grata* (Reuss) by T. Neagu (1965, PI. 4, fig. 34-35) lacks the characteristic depressed sutures of the species and shows a rather broad apertural face.

The Turonian-Senonian forms figured from Pommern and Sarmenia (Reuss, 1863, p. 67, Pl. VII, fig. 3). Their back is faintly curved and edged; the ventral margin is broader (oval in transverse section). The tests reveal a smooth surface with flush sutures and an oval apertural face. Certain forms disclose a morphological transition into *Astacolus? scitula* which shows, however, a longer and broader, subtriangular apertural face.

*Astacolus? incurvata* is known from sediments of upper Valanginian to Albian age. The very rare tests, which are not as slender as those of the species, are here designated as *Astacolus? cf. incurvata* and are represented in Cores 5 and 7 of Hole 120.

**Astacolus? planiuscula** (Reuss) (Plate 2, Figure 15)

Test smooth, oval, with faintly convex flanks, composed of 3-4 chambers, the last one extending down to the spiral part; back convex and subacute; sutures faintly depressed or flush with the surface of the tests. Apertural face elongate, convex, sometimes subtriangular (*Saracenaria* morphotype).


*Astacolus? planiuscula* is a species recorded from the Albian and Aptian. In Hole 120, it was only found in Core 2 (Albian).

**Astacolus? scitula** (Berthelin) (Plate 2, Figures 16, 17)


1938 *Cristellaria D-63* (pars), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 2a, fig. 72-77; Pl. 2b, fig. 72-73; Pl. 3b, fig. 407 (non 39); Pl. 4b, fig. 26-317; Pl. 5a, fig. 60-617; Pl. 5b, fig. 377; Pl. 6a, fig. 76-80; Pl. 9a, fig. 127.


1940 *Vaginulopsis tripleura* (Reuss), pars, Tapan, J. of Paleontol., Vol. 14, No. 2, p. 113, Pl. 17, fig. 12 (non 11).


1954 *Lenticulina scitula* (Berthelin), Bartenstein, Senckenbg. lth. Geol., Vol. 35, No. 1/2, p. 46.
1962 Lenticulina (Astacolus) cf. schloenbachi (Reuss), pars, Bartenstein & Bettenstaedt, Arbeitskreis, Lettiss, d. Mikropal., p. 285, Pl. 37, fig. 9.

1966 Lenticulina (Astacolus) cicuta (Berthelin), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 149, Pl. II, fig. 147-150.


1967 Lenticulina (Astacolus) giudis (Philippi), pars, Michael, Palaeontogr., Suppl. bd. 12, p. 12, Pl. IV, fig. 12; Pl. VIII, fig. 167.


1953 Enantiomarginulina similis n. sp., Bullard, J. Paleontol., Vol. 27, No. 3, p. 340, fig. 4-5.

1953 Enantiomarginulina enigmata n. sp., Bullard, ibid., p. 341, Pl. 45, fig. 5-7, 14-15 = Citharina/Vaginulina tripleura (Reuss) fide Tappan, 1940, J. of Paleontol., Vol. 14, No. 2, p. 111, Pl. 17, fig. 11-12; fide Frizzell, 1954, Bureau of Econ. Geol., Univ. Texas, Rep. of Invest., No. 22, p. 96, 158, Pl. 11, fig. 33-34.


The forms present in Core 2, 3 and 4 of Hole 120 seem to be identical with those described and figured as Lenticulina (Astacolus) cicuta (Berthelin) from the Upper Aptian-Middle Albain Maridation Formation of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1966, Pl. II, fig. 147-150), placed in synonymy with Lenticulina (Astacolus) cf. schloenbachi (Reuss) as illustrated from the Upper Aptian of Germany (Bartenstein & Bettenstaedt, 1962, in Arbeitskreis, p. 285, Pl. 37, fig. 9).

The attribution to the subgenus Astacolus seems to be open to doubt as there is no spira (Lenticulina) developed but the early chambers appear to be added in a curved series. Cristellaria cicuta Berthelin is, however, usually placed in Astacolus. Astacolus cicuta is considered by Michael (1967) to be a junior synonym of Astacolus giudis (Philippi), A. cymboides (d’Orbigny), A. littuola (Reuss), A. grata (Reuss), A. planiscutata (Reuss), A. cymboides (d’Orbigny), A. girata (Reuss), Planispira strombeckii (Reuss), etc.

A very similar, only more compressed specimen was figured from the Lower Cenomanian Grayson Formation of Texas (Tappan, 1940, Pl. 17, fig. 12) as Vaginulina tripleura (Reuss). In the same specific name was included a quite different test (Pl. 17, fig. 11). Both these specimens were subsequently refigured as Citharina tripleura (Reuss) (Frizzell, 1954, p. 96, Pl. 11, fig. 33 (=Tappan, 1940, Pl. 17, fig. 11) and fig. 34 (=Tappan, 1940, Pl. 17, fig. 12). In his appendix, D. L. Frizzell erroneously placed both forms in Enantiomarginulina enigmata Bullard which is attached and shows less inflated chambers than the new species Enantiomarginulina similis Bullard. Both the latter species occur in the Lower Cenomanian of Texas (Bartenstein, 1953).

In a later publication, the name Vaginulina tripleura was applied to different forms from the Albain of Oklahoma and Texas (Tappan, 1943).

The name Vaginulina tripleura definitely cannot be applied to the species figured (Tappan, 1940, Pl. 17, fig. 12; Frizzell, 1954, Pl. 11, fig. 34) which is close to the tests from Hole 120. The designation Enantiomarginulina enigmata-similis Bullard cannot also be used for our tests which we refer herewith to Astacolus cicuta (Berthelin).

The tests of Astacolus cicuta encountered in Hole 120 are hyaline, smooth, with a protruding early portion without a visible coil. The back is curved with a blunt periphery; the chambers are strongly oblique, the last-formed one inflated and overlapping the ventral side almost down to the base of the test (Vaginulina type). The sutures are indistinct, oblique and rather straight, flush with the surface—with the exception of the youngest one which is slightly depressed. There is a radiate aperture at the peripheral angle of the large apertural face. Some tests show a rather broad subtriangular ventral side and hence a Saracenaria aspect.

The somewhat similar Vaginulina schraderensis Tappan from the Senonian of Alaska (Tappan, 1960, p. 295, Pl. 2, fig. 13-14) differs from our specimens in having depressed sutures and a smaller, less overlapping last chamber.

Tests similar to Astacolus cicuta are also known from the Jurassic, for example, Terquem’s Cristellaria anceps, hybrida, semi-involuta, Astacolus inconstans (Schwager), etc.

Astacolus cicuta (Berthelin) is reported from beds of Barreman to Albain age.

Astacolus vetusta (d’Orbigny)
(Plate 2, Figure 18)


1937 Cristellaria (Astacolus) vetusta (d’Orbigny), Bartenstein & Brand, Senckenb. Nat. Ges., Abhandl. 439, p. 172, Pl. 3, fig. 45; Pl. 6, fig. 31; Pl. 10, fig. 35; Pl. 11B, fig. 17; Pl. 12A, fig. 14; Pl. 13, fig. 32.

Astacolus vetusta shows a well-developed spira, an uniserial straight part with oblique flush sutures (limbate in early part).

A. vetusta is a Jurassic species but as the specimen from Gorringe Bank (Core 5-1) displays the same characteristics, their synonymy is tentatively assumed.

The two specimens of Astacolus, one of which is figured on Plate 2, Figure 19, were encountered in Core 7. They might be compared with the banal Astacolus varians (Bornemann), known from the Jurassic and Lower Cretaceous. On the other hand, they seem to be close to Astacolus pulchella (Reuss) figured from the Middle Albain of Holland (Fuchs & Stradner, 1967, Pl. 9, fig. 7).

Saracenaria Defrance, 1825
Saracenaria gr. brunni (Roumer)
(Plate 2, Figure 20)

The forms belonging to the spectrum Saracenaria brunni show a clearly developed spiral part, a curved back, and a rounded ventral side. There exists a considerable variability, however, as is evident from the different tests figured in the relevant literature, with forms transitional with Vaginulinosites as well as with Marginalinosites (e.g., M. cephalotes).

As there is only one poorly preserved and atypical test available from Hole 120 (Core 2) which seems to belong to Saracenaria gr. brunni. We refrain from giving the long list of synonymy.

Saracenaria cf. grandstandensis Tappan
(Plate 2, Figures 21, 22)

Some very rare tests present in Core 7-1 are somewhat like Astacolus grata (Reuss) but differ from it by a much broader, subtriangular apertural face. Because of this an affiliation with the genus Saracenaria is warranted.

The available specimens lack an early coil and the chambers, separated by straight oblique sutures, are added in a rather curved axis.

The species closest to the few tests from Gorringe Bank is Saracenaria grandstandensis Tappan, described and figured from the Middle-Upper Albain of Alaska (Tappan, 1960, 1962).


The tests from Hole 120 disclose a more inflated last chamber and hence a broader cross-section than those from Alaska.

The small tests from the Upper Aptian-Middle Albain of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1966, Pl. II, fide...
Available are only two juvenile stout tests which display a
strongly depressed sutures. By the end of the record and the final
inflated chamber which is also observed in several specimens figured
in the pertinent literature on Marginulina (Reuss). (Plate 2, Figures 23, 24)

1962 Lenticulina (Marginulina) gracilissima (Reuss), Arbeits-
kreis, Leitf., d. Mikropal., p. 256, Pl. 38, fig. 2.
Madagascar, fasc. XXII, p. 44, Pl. XVIII, fig. 17.
1966 Lenticulina (Astacolus) schoenbach mediterranea n. subsp.,
1970, Pl. IV, fig. 8-10.
1967 Lenticulina (Marginulina) gracilissima (Reuss), Michael,
Palaeontogr., Suppl. bd. 12, p. 44, Pl. IV, fig. 1-3; textfig. 7B (p.
45); Pl. XVIII, fig. 38, 40-42; Pl. XIX, fig. 38-39, 49, 57, 59, 69,
88; Pl. XX, fig. 10, 21, 23-25, 46, 62, 78, 100; Pl. XXI, fig. 38,
80-82; Pl. XXII, fig. 54, 56; Pl. XXIII, fig. 18, 25, 73, 85-86; Pl.
XXIV, fig. 79; Pl. XXV, fig. 41; Pl. XXVI, fig. 10, 40.
1969 Marginulina gracilissima (Reuss), Kalantari, Nat. Iran. Oil

Marginulina gracilissima is a cosmopolitan species of the
Lower Cretaceous (Valanginian-Lower Aptian). According to E.
Mjatliuk (1939, Pl. IV, fig. 50), M. gracilissima already occurs in the
Upper Jurassic Volgian of the Volga area, USSR, and A. Kalantari
has found it in the Alban of Iran (Kalantari, 1969).

Vaginulinopsis Silvestri, 1904

Vaginulinopsis cf. dilecta (Reuss)
(Plate 2, Figure 26)

Vaginulinopsis dillecta was originally described from Hauterivian
beds of Germany (Reuss, 1863). It is placed in synonymy with
Vaginulinopsis pachynota known from the Hauterivian and Barre-
minian of Holland, Germany and England.
The test reveals an early spiral; a curved back with an
angled margin. Characteristic are the sutures which show a thickening
in the median zone. In the original figure of V. dillecta, they are
strongly raised, this is not the case in the available specimens from
Hole 120 (Cores 4 and 7). By reason hereof, we refrain to declare a
specific synonymy.

1966 Lenticulina (Vaginulinopsis) pachynota (Reuss), Ten Dam, Tappan,
1965 Lenticulina (Vaginulinopsis) pachynota (Reuss), Neagu, Micro-
pal., Vol. 11, No. 1, p. 12, Pl. 4, fig. 12.
1966 Lenticulina (Marginulina) pachynota (Reuss), Bartenstein,
Bartenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 150,
Pl. II, fig. 179-180.
1967 Lenticulina (Marginulina) pachynota (Reuss), Michael,
Palaeontogr. Suppl. bd. 12, p. 46, Pl. XI, fig. 20.
1967 Lenticulina (Marginulina) pachynota (Reuss), Fuchs &
Stradner, Jahrb. Geol. Bundesanst., p. 296, Pl. 11, fig. 6.
Forms referable to Marginulina cephalotes (Reuss) are represented in many Lower Cretaceous foraminiferous associations
from the Hauterivian up to the Alban (Europe, Trinidad, Alaska,
Madagascar, etc.). Core 7-1 which has yielded the figured tests is
assigned to the Barremian Stage.

Marginulina gracilissima (Reuss)
(Plate 2, Figure 25)

1863 Cristellaria gracilissima, Reuss, Stitz. ber. k. Akad. Wiss. Wien,
Vol. 46, p. 64, Pl. VI, fig. 9-10.
1863 Cristellaria foeda Reuss, ibid., p. 64, Pl. VI, fig. 11-13.
Jahrg., No. 22, Pl. XI, fig. 8.
443, Pl. 7b, fig. 66; Pl. 8a, fig. 19; Pl. 9a, fig. 29; Pl. 10a, fig. 15;
Pl. 11b, fig. 1; Pl. 12a, fig. 24-29; Pl. 12b, fig. 85; Pl. 13a, fig.
42-44; Pl. 13b, fig. 6-8; Pl. 14a, fig. 15; Pl. 14b, fig. 18-30; Pl.
15a, fig. 51-55; Pl. 15b, fig. 50; Pl. 20b, fig. 55.
1938 Marginulina D-22, Hecht, ibid., Pl. 15a, fig. 55-59; Pl. 16b, fig.
56-72; Pl. 18b, fig. 70-80; Pl. 19a, fig. 3-13.
1938 Marginulina D-26 (pars), Hecht, ibid., Pl. 15a, fig. 51-54.
1937 Marginulina D-23 (pars), Hecht, ibid., Pl. 23, fig. 87-88.
1938 Cristellaria D-102 (pars), Hecht, ibid., Pl. 18a, fig. 62-63.
1939 Cristellaria gracilissima (Reuss), Mjatliuk, Trans. Geol. Oil
Inst., Ser. A, fasc. 120, p. 61, Pl. IV, fig. 50.
1948 Marginulina gracilissima (Reuss), Ten Dam, J. of Paleontol.,
Vol. 22, No. 2, p. 184, Pl. 32, fig. 7-8.
1951 Lenticulina (Marginulina) gracilissima (Reuss), Bartenstein
139; Pl. 14C, fig. 23-26.
1956 Lenticulina (Marginulina) gracilissima (Reuss), Bartenstein,
Senckenberg, leh, Vol. 37, p. 516, Pl. 2, fig. 59.
1956 Lenticulina (Marginulina) foeda (Reuss), Bartenstein, ibid.,
p. 516, Pl. 2, fig. 57-58.
1957 Lenticulina (Marginulina) cf. gracilissima (Reuss),
Bartenstein, Bartenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50,
No. 1, p. 31, Pl. VI, fig. 121.
1961 Lenticulina (Marginulina) gracilissima (Reuss), Zedler, Pal.
Zeitschr., Vol. 35, No. 1/2, p. 39, Pl. 8, fig. 8-10; textfig. 3
(p. 40).

411. LOWER CRETACEOUS FORAMINIFERAL FAUNA

Vaginulinopsis excentrica (Cornuel)
(Plate 2, Figures 27-29)

Vaginulinopsis excentrica shows a curved test with an acute to
subcarinate back, a well-developed lenticular spira, and a significant
uncoiled portion with broad, faintly recurved depressed sutures. It
was placed in synonymy with the common Jurassic form Vaginulin-
opsis prima (d'Orbigny) (Bartenstein, Bettenstaedt & Bolli, 1966).
1848 Cristellaria excentrica, Cornuel, Mem. Soc. Geol. France, 2e
1849 Cristellaria prima n. sp., d'Orbigny, Prodrome de Pal., Vol. 1,
p. 242, No. 266.
1936 Cristellaria prima d'Orbigny, MacFadyen, J. Roy. Microsc.
Soc., Vol. LXI, p. 151, Pl. I, fig. 266.
Lenticulina (Vaginulinopsis) prima (d'Orbigny), Bartenstein, Bettenstaedt & Boilli, Ecol. Geol. Helv., Vol. 50, No. 1, p. 31, Pl. III, fig. 59; Pl. IV, fig. 89-90.


non 1965 Lenticulina (Vaginulinopsis) cf. prima (d'Orbigny), Neagu, Micropal., Vol. 11, No. 1, p. 16, Pl. 4, fig. 13.

Vaginulinopsis centroidica is a widely distributed form known from the Miassic up into the Cretaceous.

Vaginulinopsis.matmulina (d'Orbigny) (Plate 2, Figure 30)


1957 Marginulina inaequalis, Chapman, Fuchs & Stradner, Jahrb., Geol. Bundesanst., Vol. 110, p. 305, Pl. 12, fig. 11.


The figured tests show quite a variability with respect to their shape (curvature of back, size and overlap of last-formed chamber). Typical for the species M. inaequalis is the lack of an early coil (initial chambers arranged in a curved axis forming a protruding blunt point), the low but broad chambers, and the oblique sutures.

The test shown by P. Marie from the Campanian of the Paris basin, France (Marie, 1941, PL XIII, fig. 153) lacks the characteristic shape of M. hamulatus with its pointed hook-like early part and the succeeding rectilinear series of oblique inflated chambers. On account of its oval form and the largely enveloping last chamber renders a clear-cut denomination of both species impossible.

Marginalina hamulatus occurs in the Albian (England, Holland) and well as in the German Hauterivian. A single specimen was found in Core 4 of Hole 120 on Goringe Bank (Lower Aptian-Barrerian).

Marginulina inaequalis Reuss (Plate 3, Figure 2)


The above-listed forms referred to *Marginulina inaequalis* disclose a rather variable shape from stout to more slender types. Typical are the inflated ovoid-shaped chambers, 15 of the oblique sutures, depressed on the ventral side. The initial portion is small, curved and protruding.

*Marginulina inaequalis* is listed from the Albian Stage of Germany, England, Holland, and Romania. Some rare specimens could be found in Hole 120, namely in Core 2 (Albian), Core 5 and Core 7 (Barremian-Lower Aptian).

*Marginulina linearis* (Plate 3, Figure 3)


1935 *Marginulina linearis* Reuss, Eichenberg, Oel u. Kohle, Jahrg. 11, No. 22, p. 395, Pl. VI, fig. 5.

1938 *Dentalina (Dentalina) soluta* (pars), Hecht, Senckenbg. Natf. Ges., Abhandl. 48, p. 308, Pl. 9, fig. 228-231; Pl. 14a, fig. 18; Pl. 16, fig. 347; Pl. 18, fig. 61-65.


1975 *Dentalina communis* d'Orbigny, Tappan, Profess. Paper 236-C, p. 175, Pl. 45, fig. 15-16.


1976 *Dentalina communis* d'Orbigny, Michael, Palaeontogr., Suppl. bd. 12, p. 61, Pl. V, fig. 1-2; Pl. XVII, fig. 32-39; Pl. XXIV, fig. 43; Pl. XX, fig. 70; Pl. XXII, fig. 29; Pl. XXIII, fig. 23, 93 (non 28); Pl. XXVI, fig. 15.


1976 *Dentalina communis* d'Orbigny, Kalantari, Nat. Iran. Oil Co., Publ. No. 3, p. 159, Pl. 15, fig. 16.

1965 *Dentalina communis* d'Orbigny, Neagu, Micropal., Vol. 110, p. 20, Pl. 5, fig. 3.

**Dentalina communis** was encountered in all the cores of Hole 120 which carry a microfauna.

*Dentalina cylindroides* Reuss (Plate 3, Figure 6)

*Dentalina cylindroides*, a Cretaceous species, shows a robust straight test composed of up to 4 chambers which are limited by faintly depressed sutures.


1938 *Dentalina D-9*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 55; Pl. 8a, fig. 26; Pl. 9a, fig. 24 & 26.

1938 *Dentalina D-12* (pars), Hecht, ibid., Pl. 11b, fig. 22-26.

1938 *Dentalina D-10*, Hecht, ibid., Pl. 2b, fig. 27.

1940 *Dentalina cylindroides* Reuss, Tappan, J. of Paleonto., Vol. 14, No. 2, p. 102, Pl. 16, fig. 2.


Dentalina distincta Reuss
(Plate 3, Figure 7)

Test stout with apiculate initial chamber succeeded by 4-5 elliptical chambers which are separated by faintly depressed and slightly oblique sutures. Radiate aperture on a neck-like prolongation of the last large and oblique chamber.

Dentalina distincta is recorded from beds of Barremian to Albian age. In Hole 120, the species was found in Cores 2, 3, 4, 5 and 7.


1938 Dentalina D-11 (pars), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 5a, fig. 47-48, 52-53; Pl. 6b, fig. 37-39.


Dentalina gracilis d’Orbigny
(Plate 3, Figures 8, 9)

This delicate Upper Cretaceous species is also represented by similar faintly arcuate tests in beds of Barremian-Albian age. In Hole 120, it is associated with the species Dentalina communis, Dentalina cylindroides, Dentalina distincta, and Dentalina soluta (Cores 2-5, 7).


1957 Dentalina gracilis d’Orbigny, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 34, Pl. VII, fig. 146.

1965 Dentalina communis d’Orbigny, Neagu, Micropal., Vol. 11, No. 1, p. 20, Pl. 5, fig. 3.


Dentalina legumen Reuss
(Plate 3, Figure 10)

As other species of the genus Dentalina legumen is a rather variable form which cannot always be distinguished, for example from Dentalina communis.

Typical specimens are more tapering than D. communis, show a globular initial chamber with a basal spine, and a largely extended oval final chamber. The depressed sutures, as a rule, more oblique than those of D. communis.

Dentalina legumen is known from the entire European Cretaceous as well as from the American Upper Cretaceous. In Hole 120, the species was observed in Cores 3 and 7.


1965 Dentalina legumen Reuss, Neagu, Micropal., Vol. 11, No. 1, p. 20, Pl. 5, fig. 1.


The test of Dentalina linearis is rather straight, Nodosaria-like, similar to a string of pearls. Chambers more or less globular or low-rectangular, often of irregular size and separated by horizontally depressed sutures. The aperture is slightly backwards.

The species Dentalina soluta Reuss shows only a few larger, globular-oviform chambers which are separated by horizontally depressed, broad sutures. Dentalina linearis and Dentalina soluta cannot always be distinguished. Similar forms are also Dentalina lilli Reuss and Dentalina marginuloides Reuss. Certain forms seem to be transitional with Pseudoglandulina tenuis (Bornemann).

Dentalina linearis is recorded from the Valanginian up to the Albian. The few forms observed in Hole 120 (Cores 3 and 7) are of Barremian age.

Dentalina soluta Reuss
(Plate 3, Figure 12)

Typical specimens of Dentalina soluta show rather stout tests with 3-4 globular chambers limited by broad horizontal sutures.


1935 Dentalina sp. 2, Eichenberg, ibid., Pl. V, fig. 22.


1967 *Dentalina soluta* Reuss (pars), Michael, Palaeontogr., Suppl. bd. 12, p. 62, PI. V, fig. 3-4, 7-8, 15; PI. XXVI, fig. 24.


*Dentalina soluta* is reported from the European Lower Cretaceous (Valanginian-Albian) and from the Aptian-Albian of Trinidad. It was found in Cores 2, 4, 5 and 7 of Hole 120, Gorringe Bank.

*Nodosaria* Lamarck, 1812

*Nodosaria lepida* Reuss

(Plate 3, Figure 13)

Simple test, with small initial chambers followed by larger ones, horizontal sutures between the last-formed highest chamber and the preceding one more depressed than the others. Contour of test even or slightly lobate. Aperture is a long central neck.

The single test of the very slender form with pointed ends found in Core 7 encountered in Core 7-1.


*Nodosaria lepida* occurs in the Upper Cretaceous and Albian. The figured test referred to this banchal species from Hole 120 was encountered in Core 7-1.

*Nodosaria zippei* Reuss

(Plate 3, Figure 14)


1891 *Nodosaria zippei* Reuss, Beissel, Abhandl. kgl. preuss. geol. Landesanstalt, N.F., Heft 3, PI. VI, fig. 10-29.


This Upper Cretaceous species with its characteristic longitudinal costa which are restricted at the sutures was also found in the Albian (England, Holland) and in the German Barremian and Hauterivian.

The single test found in the Gorringe Bank hole comes from Core 7 (Barremian). *Citharina* d’Orbigny, 1839

*Citharina aff. acuminata* (Reuss) var.

(Plate 3, Figure 15)

The single test of the very slender form with pointed ends found in Core 2 is close to *Citharina acuminata* (Reuss), in particular to the narrow types such as are figured by different authors (see list below). Our specimen lacks, however, the numerous fine longitudinal costa or striae which are typical of the species; the dorsal margin is not straight but faintly convex and the ventral margin is curved, both being somewhat truncated. The flanks are bordered by an edge, and a single faint short longitudinal costa on either side of the earliest portion of the test is visible. In spite of these morphological differences, we refer the present specimen to *Citharina aff. acuminata* (Reuss) var., as the creation of a new species based on one single test is not warranted.


1938 *Vaginulina D-9*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, PI. 9a, fig. 48, PI. 10b, fig. 95-96; PI. 11b, fig. 97 (967); PI. 12b, fig. 97-98 (967); PI. 13a, fig. 50-51 (527).

1938 *Vaginulina D-19* (pars), Michael, Palaeontogr., Suppl. bd. 12, p. 51, PI. VII, fig. 1; PI. XVIII, fig. 53; PI. XIX, fig. 66; PI. XX, fig. 15-16; PI. XXV, fig. 118; PI. XXVI, fig. 22.

*Citharina acuminata* (Reuss) is known from beds of Upper Hauterivian to Lower Albian age.

*Citharina glomarchallengeriana* n. sp.

(Plate 3, Figures 16, 17)

Test small, translucent, much compressed, attaining its maximum breadth in the central area. Dorsal margin curved and acute; ventral contour sigmoid with a squarely truncated surface of the last-formed chamber. Six or seven strongly oblique chambers, the youngest one extending far down without reaching the base of the test; initial end pointed, with a delicate thorn. The apertural end is extended and gradually tapers to a point; sutures dark, not raised, sigmoid; surface smooth without ornamental striae; aperture radiate at the dorsal angle. Length: 0.45 millimeter.

Only two species of this delicate form were found in Hole 120 (Core 7).

Certain tests of *Citharina intumescens* (Reuss) show a less subtriangular flaring outline with a straight or faintly curved dorsal margin and a rather protuberant rounded ventral periphery. However, *C. intumescens* displays a fine surface ornamentation (longitudinal costa or striae).

The small-sized and compressed *Citharina eichenbergi* (Ten Dam), known from the Albian of Germany and Holland, also shows strongly oblique chambers and no straight dorsal margin but differs from our form in its general shape (largely protruding ventral margin formed by the last downward extended chambers, dentate margin of its basal part).

*Citharina glomarchallengeriana* n. sp. differs from *Citharina geinitzi* (Reuss) by its curved back—on which account it lacks the more or less triangular outline of the latter.

With regard to its general shape and chamber arrangement, *Citharina complanata perstriata* (Terquem) (= *C. subrotunda* (Ten Dam)) from the Barremian of Germany is close to our form (Barrenstorf, 1956, PI. 2, fig. 36; Michael, 1967, PI. XVII, fig. 1; PI. XVIII, fig. 51), but the latter lacks both the longitudinal costa on the flanks and the peripheral dorsal rib.

*Citharina discors* (Koch) has an oblique-triangular outline and is ornamented by curved costa which radiate from the initial pointed portion to the last-formed chamber of the test. Other species like *Citharina sparsicostata* (Reuss), *C. orthonata* (Reuss), *C. cristiellii* (Reuss), etc. likewise show striated flanks and, therefore, differ from *Citharina glomarchallengeriana* n. sp.

The new species is named after the drilling vessel *Glomar Challenger* of the Deep Sea Drilling Project.

*Citharina* sp.

(Plate 3, Figure 18)

The elongate, compressed test reveals a hardly tapering and hence more rectangular shape than most of the known Cretaceous species. Both margins are subacute, not truncated, the dorsal one is slightly convex, the inner side is sigmoid, namely concave in the posterior half, convex in the younger part. The initial, forward-pointing chamber carries a tiny spine. The nine inclined chambers are separated by faintly depressed sutures and the extended apertural end is narrow. Length: 0.85 millimeter.

The similar *Citharina tappani* (Ten Dam) (= *Vaginulina biochei* var. elongata Eichenberg), from the Aptian-Albian shows a slightly

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curved back but a convex and faintly lobate ventral margin. The test of \textit{Vaginulina biochei elongata} Eichberger, figured from the Hauterivian-Valanginian of Poland (Sztejn, 1957, Pl. VII, fig. 62), discloses a broad early portion similar to our form, however, it spreads abruptly to attain its greatest width much earlier than the specimen figured here. Moreover, the former only has five oblique and faintly inflated chambers.

\textit{Vaginulina truncata} (Reuss) displays a more triangular shape tapering upwards; moreover, it has a squarely truncated margin as well as raised sutures.

The test of \textit{Vaginulina kochii} Roemer is more flaring-triangular than our specimen and shows a truncate sharp-edged periphery.

In view of the great variability of the Cretaceous representatives of the genus and of the fact that only one specimen is available (from core 4), we prefer to use an open nomenclature.

**Frondicularia Defrance, 1826**

**Frondicularia joidesi** n. sp.

*(Plate 3, Figures 19, 20)*

**Derivatio nominis:** \textit{Frondicularia joidesi} n. sp. is named after the W. MAYNC Germany. Our test was found in Core 3-CC (Albian).

**Bank shows an early globular chamber succeeded by two more**

**The concerned test is not quite straight and its margin faintly angled.**

**Bank shows an angled instead of a broadly truncated periphery.**

**In view of the great variability of the Cretaceous representatives of the genus and of the fact that only one specimen is available**

**from core 4**, we prefer to use an open nomenclature.

**Holotype:** Pl. 3, fig. 19.

**Locus typicus:** Hole 120, Gorgine Bank, Core 7, drilled by the Deep Sea Drilling Project, Leg 13.

**Stratum typicum:** Barremian.

**Diagnosis:** A lanceolate-rectangular form of \textit{Frondicularia} similar to \textit{F. archiaciana} d'Orbigny and \textit{F. simplissima} Ten Dam which shows an angled instead of a broadly truncated periphery (marginal keel lower part).

**Description:** Test compressed, broad-lanceolate, faintly tapering and hence nearly rectangular with long pointed oral end. The greatest diameter is at the base of the last-formed chamber. Borders are almost parallel and very faintly lobate; periphery is acute, not truncated, with a marginal rib-like keel in the posterior portion. Proloculus is pronounced, globular and apiculate with short central thorn, followed by 5-6 equitant chambers. Sutures are acute-angled, not sigmoid, steeply sloping downward, limbate and slightly raised, discontinuous in the axial region. There are 4-6 thin longitudinal costae extending from the proloculus to the early chambers. Aperture is on top of the pointed end of the last chamber.

**Frondicularia joidesi** n. sp. is close to \textit{F. archiaciana} d'Orbigny and \textit{F. simplissima} Ten Dam, both differ from the new species by the flat truncate periphery (square-cut edges). Certain forms referred to \textit{F. archiaciana} show up to 11 chambers, sigmoid sutures, often a more lobulate outline, and a more slender test.

Another similar species is \textit{Frondicularia lanceolata} Perner from the Cenomanian and Turonian of Bohemia which shows, however, more and much lower chambers.

**Lingulina d'Orbigny, 1826**

**Lingulina biforis** Bartenstein & Brand.

*(Plate 3, Figure 21)*


The single specimen available from Hole 120 drilled on Gorgine Bank shows an early globular chamber succeeded by two more chambers of different size and shape. The adult chamber is very high and pointed, the sutures horizontal and depressed. The growth of the concerned test is not quite straight and its margin faintly angled.

**Lingulina biforis** was described from the Valanginian of Germany. Our test was found in Core 3-CC (Albian).

**Lingulina loryi** (Berthelin)

*(Plate 3, Figure 22)*

1880 \textit{Frondicularia loryi} n. sp., Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, No. 5, p. 60, Pl. 4, fig. 5.

1888 \textit{Lingulina furcillata} n. sp., Berthelin, ibid., p. 65, Pl. 4, fig. 6.


1944 \textit{Lingulina furcillata} Berthelin, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 449, Pl. 80, fig. 1.


1954 \textit{Lingulina loryi} Berthelin, Bartenstein, Senckenbg. lth., Vol. 35, No. 1/2, p. 49, Pl. 1, fig. 16.


1957 \textit{Lingulina furcillata} Berthelin, Saïd & Barakat, Micropal., Vol. 3, No. 1, p. 43, Pl. 1, fig. 10-11.


1965 \textit{Lingulina loryi} Berthelin, Neagu, Micropal., Vol. 11, No. 1, p. 26, Pl. 6, fig. 13-16.

1966 \textit{Lingulina loryi} (Berthelin), Bartenstein, Bettenstaedt & Bolli, Ecol. Geol. Helv., Vol. 59, No. 1, p. 155, Pl. III, Fig. 243-245.


The tests encountered in Hole 120 (Cores 2, 4, 5 and 7) are elongated, transparent, and compressed, with a smooth surface and a lobate subacute periphery. The initial circular chamber is succeeded by 6 to 8 chambers in a rectilinear series, broader than high, separated by moderately arched to subhorizontal, depressed sutures. The aperture is an indistinct slit in the plane of compression on the broad, much higher and rounded (or slightly pointed) terminal chamber which is distinctly set off from the preceding one of smaller size.

Our specimens have almost parallel borders and, hence, are less tapering than many of the forms figured in the literature. In this respect they closely agree with the tests figured from the Albian of Holland (Ten Dam, 1950), France (Bartenstein, 1954), Romania (Neagu, 1965), from the Aptian-Albian and Barremian of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1957, 1966).

The common species \textit{Lingulina loryi} was originally placed in the genus \textit{Frondicularia}, but has been referred since to \textit{Lingulina} by a number of authors. \textit{Frondicularia} shows angled or strongly arched sutures and a radiate terminal aperture. \textit{Lingulina} has slightly arched or horizontal sutures and an elongate apertural slit. There seem to exist transitional forms of which the determination of the genus remains questionable, particularly when the apertural character cannot be made out.

The similar \textit{Frondicularia simplissima} Ten Dam differs from the species \textit{loryi} by its more arched sutures.

Tests with subhorizontal-horizontal sutures and a pointed early chamber have been placed in \textit{Lingulina nodosaria} Reuss.

\textit{Lingulina loryi} (Berthelin) is known from beds of Hauterivian to Albian age.

\textit{Lingulina loryi} goringeii n. subsp.

*(Plate 3, Figure 23)*

The test of this subspecies is similar to that of Lingulina loryi (Berthelin) but much broader and shorter. Test is compressed, smooth, and transparent; blunt end with globular initial chamber followed by a series of 3 or 4 low and very broad chambers. Sutures are subhorizontal or slightly arched, the one between the final chamber and the preceding one is strongly depressed showing on the contour of the test as nicks; the aperture is a silt on the slightly pointed terminal chamber.

Except for its much broader chambers which result in an oviform outline of the test, the present form (found only in Core 7) differs from the Neocomian of Mallorca, Spain (Leischner, 1962), shows an oviform outline of the test, the present form (found only in Core 7) is quite similar to that of Lingulina loryi on which account we consider it as a mere subspecies.

The broad tests figured from the Albian of Alaska (Tappan, 1962) are identical with the specimens found in Hole 120. The very broad specimen referred to Pronticularia loryi from the Neocomian of Mallorca, Spain (Leischner, 1962), shows an elliptical cross-section and the maximum diameter is in the middle portion of the test whereas, our form is strongly compressed and discloses an acute periphery.

*Pseudonodosaria* Boogaart, 1949

**Pseudonodosaria humilis** (Roemer)

(Plate 3, Figures 24-26)

1967 *Pseudonodosaria* *apressa* (Loeblich & Tappan), Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 307, Pl. 10, fig. 5.

non 1957 Rectoglandulina *humilis* (Roemer), Said & Barakat, Micropal., Vol. 3, No. 1, p. 43, Pl. 1, fig. 14.


1967 *Nodosaria* *humilis* Roemer, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 279, Pl. 5, fig. 9; Pl. 6, fig. 3-4.

The genus *Pseudonodosaria* was created (Boogaart, 1949) for rectilinear *Glandulina*-like tests with inflated chambers and horizontal, strongly restricted sutures leading to a lobate nodosarioid outline.

The later established genus *Rectoglandulina* (Loeblich & Tappan, 1955) includes tests with strongly embracing appressed chambers separated by horizontal sutures which are either merely faintly depressed or flush with the surface. *Rectoglandulina* with the Upper Cretaceous type species *R. appressa* Loebl. & Tappan, was subsequently deleted (Loeblich & Tappan et al., 1964).

There exist a great number of varying forms which are now all included in *Pseudonodosaria*, namely fusiform, ovate, subcylindrical, or conical forms with more or less inflated overlapping chambers, with a rounded or pointed basal chamber, *Nodosaria*-like forms with strongly restricted sutures, others in which the sutures of the smooth and even-outlined test are flush or hardly visible, etc. *Pseudoglandulina* *humeilis* (Roemer) is a typical species of the *Rectoglandulina* morphotype. *Pseudonodosaria tenius* (Bornemann) is characteristic of the *Nodosaria*-like group with deeply restricted sutures and a lobate contour of the test. Other species of the smooth *Rectoglandulina* type are *Pseudonodosaria appressa* (Loeblich & Tappan), *P. brandi* Tappan, *P. obesa* Loeblich & Tappan, *P. papyroidea* (Bornemann). Species such as *P. discreta* (Reuss), *P. larva* (Carsey), *P. major* (Bornemann), *P. scotti* Tappan, *P. vulgata* (Bornemann), however, belong to the nodosarioid group of *P. tenius* (Bornemann).

Intermediate between these groups are forms like *P. manifesta* (Reuss), *P. metensis* (Terquem), *M. mutabilis* (Reuss), *P. squamulosa* (Schwager), etc. Many of the above listed forms are, however, not different biological species but just morphotypes (partly different generations), and the splitting up into a number of "species" within this greatly varying banal group is rejected (see Lutze, 1960).

*Pseudonodosaria humilis* (Roemer) has a great vertical range from the Lower Jurassic into the Upper Cretaceous, and similar types have also been described from the Triassic (Alps, Alaska) under different specific names.

In Hole 120, it occurs in the Cores 3, 4, 5 and 7 (Albian to Barremian).

*Pseudonodosaria tenius* (Bornemann)

(Plate 3, Figure 27)

1863 *Glandulina* *mutabilis* (pars), Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 58, Pl. V, fig. 8 (non 7, 9-11).

1934 *Glandulina* *tenius* Bornemann, Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover, p. 175, Pl. XVI, fig. 9-10.

1935 *Glandulina* *tenius* Bornemann, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. IX, fig. 16.

1938 *Glandulina* *D-16*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 13a, fig. 10, Pl. 156, fig. 71.

1938 *Glandulina* *D-8*, Hecht, ibid., Pl. 15a, fig. 69, 70.

1938 *Glandulina* *D-11* (pars), Hecht, ibid., Pl. 18b, fig. 60, Pl. 19b, fig. 67, 70-71.

1939 *Pseudoglandulina* *tutkowskii* n. sp., Mjatliuk, Transact. Geol. Inst., fasc. 120, p. 74, Pl. IV, fig. 57-58.


1950 *Pseudoglandulina* *sp.* Loeblich & Tappan, Univ. Kansas Pal. Contrib., No. 3, p. 12, Pl. 2, fig. 10.

1951 *Pseudoglandulina* *humilis* (Roemer), Noth, Jahrb. Geol. Bundesanstalt, Sonderbd. 3, p. 59, Pl. 2, fig. 35.

1951 *Pseudoglandulina* *mutabilis* (Reuss), Noth, ibid., p. 58, Pl. 4, fig. 15, Pl. 6, fig. 29.

1951 *Pseudoglandulina* *mutabilis* (Roemer), parr, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 315, Pl. 10, fig. 266-270; Pl. 14C, fig. 34; Pl. 16, fig. 41, 43; Pl. 17B, fig. 21-22, 25-26.


1956 *Pseudoglandulina* *humilis* (Roemer). Bartenstein, Senckenbg. Inst., ibid., Vol. 37, Pl. 2, fig. 45, 54.


1957 *Pseudoglandulina* *humilis* (Roemer), Sztejn, Ist. Geol., Prace, Vol. XXII, p. 229, Pl. VI, fig. 51.

1957 *Pseudoglandulina* *mutabilis* (Reuss), Sztejn, ibid., p. 230, Pl. VI, fig. 52.

1958 *Pseudoglandulina* *mutabilis* (Roemer), Sztejn, Ist. Geol., Biul. Madagascar, fasc. XXXII, p. 63, Pl. XXX, fig. 1.

1960 *Rectoglandulina* *netrona* n. sp., Tappan, Bull. AAPG, Vol. 44, No. 3, pt. 1, p. 293, Pl. 2, fig. 11-12.


1963 *Rectoglandulina* *tutkowskii* (Mjatliuk), Espitalié & Sigal, ibid., p. 63, Pl. XXX, fig. 6-6.


1965 *Rectoglandulina* *mutabilis* (Reuss), Bartenstein, Bettenstaedt & Bolli, ibid., p. 154, Pl. III, fig. 231-235.

1956 Pseudogloboina tenuis (Bornemann), Bartenstein, Senckenberg, lth., Vol. 37, No. 5/6, p. 521, Pl. 2, fig. 53.
1957 Pseudogloboina tenuis (Bornemann), Szejna, Inst. Geol., Prace, Vol. XXII, p. 230, Pl. VI, fig. 53.
1957 Rectogloboina humilis (Roemer), Said & Barakat, Micropal., Vol. 3, No. 1, p. 3, fig. 2.
1962 Rectogloboina kirschneri Tappan, Tappan, ibid., p. 171, Pl. 44, fig. 18 (non 12-17).
1966 Pseudonodosaria vulgata (Bornemann), Dieni and Massari, ibid., p. 148, Pl. VI, fig. 8.
1967 Pseudogloboina tenuis (Bornemann), Michael, Palaeontogr., Supplbd. 12, p. 71, Pl. VIII, fig. 6-7; Pl. XVIII, fig. 47; Pl. XIX, fig. 72; Pl. XX, fig. 77.
1969 Pseudonodosaria humilis (Roemer), Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 279, Pl. 5, fig. 9; Pl. 6, fig. 5-4.
1971 Pseudonodosaria tenuis (Bornemann) is known from the Liassic of the Netherlands (Fuchs & Stradner, 1967, Pl. 15, fig. 9) is as Pyrulina longa Tappan (Tappan, 1940, Pl. 18, fig. 2; Bullard, 1952, Pl. 32, fig. 32). The type specimen of Pyrulina cylindroides (Roemer), 1952, is illustrated by scattered tests in Cores 2, 3, 4, 5 and 7, assignment to a given determinations are open to some doubt. Some small hyaline pyrulines are also of larger and stouter size. Pseudonodosaria humilis (Roemer) from the Barremian of NW Germany (Michael, 1967, textfig. 15). Different types have been assigned to the species Pyrulina cylindroides (Upper and Lower Cretaceous), not only the slender spindle-shaped but also oval forms.

The type specimen of Pyrulina infracretacea Bartenstein, 1955, is also of larger and stouter size.

One single specimen of Pyrulina was observed in the core catcher of Core 3; this specimen shows a great number of well-preserved specimens at hand, the determination of these forms, represented by scattered tests in Cores 2, 3, 4, 5 and 7, assignment to a given species cannot be carried out and even the generic attribution to Pyrulina, Eogloboina, etc. often remains questionable unless the arrangement of the chambers is explicit (Bartenstein, 1952a, p. 311).
Ramulina aculeata Wright shows semiglobular chambers with a finely spinose surface, but a number of authors also refer coarsely spinose forms to the species R. aculeata (d’Orbigny).

The Lagena-like regular spinose forms had been placed in the species Ramulina tappanae (Bartenstein & Brand, 1951) but have subsequently been realigned with the different, irregularly bifurcated and thick-walled forms in Ramulina aculeata Wright (Bartenstein, Bettenstaedt & Bolli, 1966).

Ramulina aiptensis Bartenstein & Brand includes fusiform tests covered with coarse spines. Some rare tests found in Cores 2, 4 and 5 of Hole 120 show a single globular chamber with a faintly acuminate base and a pointed oral end. The densely pitted surface is suggestive of the spinose covered with coarse spines.

The possibility cannot be excluded, however, that the represented specimens might belong to Lagena, for example Lagena globosa (Montagu) or Lagena aculeata (Reuss) which display a similar shape and size.

Spiritilla Ehrenberg, 1843

Spiritilla minima Schacko

The small hyaline and perforate tests of Spiritilla minima have often been described and figured. They show considerable variations as far as the number of convolutions and the regularity of coiling are concerned (partly di- or trimorphism). The granulated, pitted surface is due to the calcination of the pores. Spiritilla minima is a cosmopolitan form which is present throughout the Cretaceous. In Hole 120 on Gorgine Bank, it occurs in very rare specimens in Cores 2, 3 and 4.

Hedbergella Brönnimann & Brown, 1958

Hedbergella cf. infracretacea (Glassner)

Only a single specimen of a tiny Hedbergella was found in the Lower Cretaceous sequence drilled at Site 120 (Core 2-1, 123 centimeters); it was assigned to Hedbergella cf. infracretacea (Glassner) in the shipboard report (M. B. Cita).

The extreme scarcity of Globigerinidae here is apparently due to facies control. Hedbergella infracretacea ranges from the Barremian into the Upper Albian. The test of Hedbergella barremiana, as established in 1965 by Mrs. Madeleine Malapris-Bizouard, is characterized by very small forms which show a nearly planispiral dorsal face and a ventral side without an umbilicus. The latter face is masked by Ungulate chamber lobes protruding in a star-like manner from the last 4 or 5 chambers.

Some rare tests with a diameter of 0.2 millimeter were found in Core 2-1 (106 to 107 centimeters, 143 to 147 centimeters) and 3-CC; they were identified as Lingulogavelinella aff. ciryi ciryi Malapris-Bizouard by the author of that form.

The genus Lingulogavelinella, established in 1965 by M. Malapris-Bizouard, is characterized by very small forms which show a nearly planispiral dorsal face and a ventral side without an umbilicus. The latter face is masked by Ungulate chamber lobes protruding in a star-like manner from the last 4 or 5 chambers.

The test of Lingulogavelinella ciryi, about 0.2 millimeters in diameter with a broadly rounded and slightly lobate periphery, reveals a convex and evolute spiral face (early whorl visible) and a plano-concave and involute umbilical face. The 6 to 7 chambers of the last-formed whorl are separated by radiate depressed sutures which are strongly curved (sigmoid) toward the margin of the test.

4 Mrs. Madeleine Malapris-Bizouard, the well-known specialist on the Gavelinellidae, has been kind enough to check and complete the writer’s determinations.
Gavelinella aff. barremiana Bettenstaedt because of the slight differences stressed above and the lack of a sufficient number of tests.

Gavelinella barremiana is a cosmopolitan species which appears in the Middle Barremian. In the Lower Aptian it is replaced by the species G. intermedia (Berthelin) which shows a thicker, more rounded test and a spiral face with a conspicuous plug.

Mainly based on the occurrence of Gavelinella aff. barremiana Bettenstaedt, we have assigned a Barremian age to the lowermost sedimentary core taken in the section of Gorrinage Bank (Core 7).

REFERENCES TO THE LOWER CRETACEOUS PALEONTOLOGY


46. -Gerhardt H., 1963. Biometrische Untersuchungen zur Phylogenie von Harpalliastrum und Triplasia (Foram.) aus der
REFERENCES


Figures 1, 2  *Rhizammina? indivisa* Brady.
Core 5-1.

Figure 3  *Rhizammina?* sp.
Core 7-1.

Figures 4, 5  *Ammodiscus gaultinus* Berthelin.
Core 5-1.

Figures 6, 7  *Glomospira charoides* (Jones and Parker). Side view showing horizontal planes of coiling.
Core 5-1.

Figure 8  *Glomospira gordialis* (Jones and Parker).
Core 7-1.

Figure 9  *Reophax* gr. *scorpiurus-horridus*.
Core 4-1.

Figure 10  *Reophax minuta* Tappan.
Core 5-1.

Figures 11, 12  *Reophax troyeri* Tappan.
11: Core 5-1.
12: 3 CC

Figures 13, 14  *Haplophragmoides concavus* (Chapman).
13a: Oblique view of specimen shown in Figure 13. 3 CC.
14: Core 7-1.

Figures 15, 16  *Haplophragmoides cushmani* Loeblich and Tappan.
15: Core 7-1.
16: Peripheral view. Core 5-1.

Figures 17, 18  *Ammobaculites euides* Loeblich and Tappan.
Core 5-1.

Figure 19  *Ammobaculites subcretaceus* Cushman and Alexander.
Core 5-1.

Figures 20, 21  *Haplophragmium aequale* (Roemer).
Core 7-1.

Figure 22  *Textularia foeda* Reuss.
Core 7-1.

Figure 23  *Spiroplectammina cf. nuda* Lalicker.
Core 5-1.

Figure 24  *Bigenerina aff. antiquissima* Bartenstein and Brand.
Core 7-1.

Figures 25, 26  *Bigenerina clavellata* Loeblich and Tappan.
Core 5-1.

Figures 27, 28  *Trochammina globigeriformis* (Parker and Jones).
27: Core 2-1.
28: Core 5-1.

Figures 29, 30  *Verneuilhoides plexus neocomiensis* (Mjatliuk).
Core 7-1.

Figures 31, 32  *Gaudryina?* aff. *grandis* (Crespin).
Core 7-1.

Figure 33  *Spiroplectinata annectens* (Parker and Jones).
Core 5-1.

Figure 34  *Dorothia filiformis* (Berthelin).
Core 2-1.

35: Core 5.
36: 3-CC.
37: Core 7.
37a: Apertural view of specimen shown in Figure 37.

Figures 38, 39  *Marssonella kummi* Zedler.
38: 2-CC.
39: Core 4-1.
Figures 1, 2  *Lenticulina ouachensis ouachensis* (Sigal).
   Core 4-1.
Figure 3  *Lenticulina ouachensis multicella* Bartenst., Bettenstaedt and Bolli.
   Core 5-1.
Figure 4  *Lenticulina praegaultina* Bartenstein, Bettenstaedt and Bolli.
   Core 5-1.
Figures 5, 6  *Lenticulina subangulata* (Reuss).
   5: Core 4-1.
   6: Core 7-1.
Figures 7, 8  *Lenticulina turgidula* (Reuss).
   7: Core 4.
   8: 4-CC.
Figure 9  *Planularia strombecki* (Reuss).
   Core 2-1.
Figures 10, 11  *Astacolus calliopsis* (Reuss).
   Core 7-1.
Figure 12  *Astacolus eruciformis* (Wisniowski).
   3-CC.
Figure 13  *Astacolus grata* (Reuss).
   Core 7-1.
Figure 14  *Astacolus? cf. incurvata* (Reuss).
   Core 5-1.
Figure 15  *Astacolus? plantiuscula* (Reuss).
   Core 2.
Figures 16, 17  *Astacolus? scitula* (Berthelin).
   Core 2-1.
Figure 18  *Astacolus vetusta* (d'Orbigny).
   Core 5-1.
Figure 19  *Astacolus* sp.
   Core 7-1.
Figure 20  *Saracenaria gr. bronni* (Roemer).
   Core 2-1.
Figures 21, 22  *Saracenaria cf. grandstandensis* Tappan.
   Core 7-1.
Figures 23, 24  *Marginulinopsis cephalotes* (Reuss).
   Core 7-1.
Figure 25  *Marginulinopsis gracilissima* (Reuss).
   5-CC.
Figure 26  *Vaginulinopsis cf. dilecta* (Reuss).
   Core 7-1.
Figures 27-29  *Vaginulinopsis excentrica* (Cornuel).
   29: Dorsal view.
   Core 4-1.
Figure 30  *Vaginulinopsis matutina* (d'Orbigny).
   Core 5-1.
Figures 31, 32  *Vaginulinopsis schloenbachi* (Reuss).
   31: Core 7-1.
   32: 3-CC.
PLATE 2

1. LOWER CRETACEOUS FORAMINIFERAL FAUNA
PLATE 3
(Scale bar represents 100 microns)

Figure 1  
*Marginulinina hamulus* Chapman.  
Core 4-1.

Figure 2  
*Marginulinina inaequalis* Reuss.  
Core 2-1.

Figure 3  
*Marginulinina linearis* Reuss.  
2-CC.

Figures 4, 5  
*Dentalina communis* d'Orbigny.  
4: Core 5-1.  
5: Core 2-1.

Figure 6  
*Dentalina cylindroides* Reuss.  
Core 2-1.

Figure 7  
*Dentalina distincta* Reuss.  
Core 5-1.

Figures 8, 9  
*Dentalina gracilis* d'Orbigny  
Core 7-1.

Figure 10  
*Dentalina legumen* (Reuss).  
Core 7-1.

Figure 11  
*Dentalina linearis* (Roemer).  
Core 7-1.

Figure 12  
*Dentalina soluta* Reuss.  
Core 7-1.

Figure 13  
*Nodosaria lepida* Reuss.  
Core 7-1.

Figure 14  
*Nodosaria zippeii* Reuss.  
Core 7-1.

Figure 15  
*Citharina aff. acuminata* (Reuss) var.  
Core 2-1.

Figures 16, 17  
*Citharina giormarchallengeriana* n. sp.  
Core 7-1.

Figure 18  
*Citharina* sp.  
Core 4-1.

Figures 19, 20  
*Frondicularia joidesi* n. sp.  
20: Peripheral view.  
Core 7-1.

Figure 21  
*Lingulina biforis* Bartenstein and Brand.  
3-CC.

Figure 22  
*Lingulina loryi* (Berthelin).  
Core 4-1.

Figure 23  
*Lingulina loryi gorringei* n. subsp.  
Core 7-1.

Figures 24-26  
*Pseudonodosaria humilis* (Roemer).  
24-25: Core 4-1.  
26: Core 5-1.

Figure 27  
*Pseudonodosaria tenuis* (Bornemann).  
Core 7-1.
Figures 1, 2  *Globulina prisca* Reuss.
Core 4-CC.

Figure 3  *Pyrulina cylindroides* (Roemer).
Core 2-1.

Figures 4, 5  *Ramulina?* sp.
Core 5-1.

6: Spiral side. 3-CC.
7: Peripheral view. 3-CC.
8: Umbilical face. 3-CC.
10: Peripheral view. Core 2-1.
11: Umbilical face. 3-CC.
11a: Same specimen as shown in Figure 11; 40° tilted.

Figures 12-14  *Gavelinella barremiana bizouardae* n. subsp.
3-CC.

Figure 15  *Gavelinella* aff. *barremiana* Bettenstaedt.
Core 7-1.
15a: Umbilical view of the same specimen as shown in Figure 15.