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 nannofauna. Material adhering to the drillbit 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.

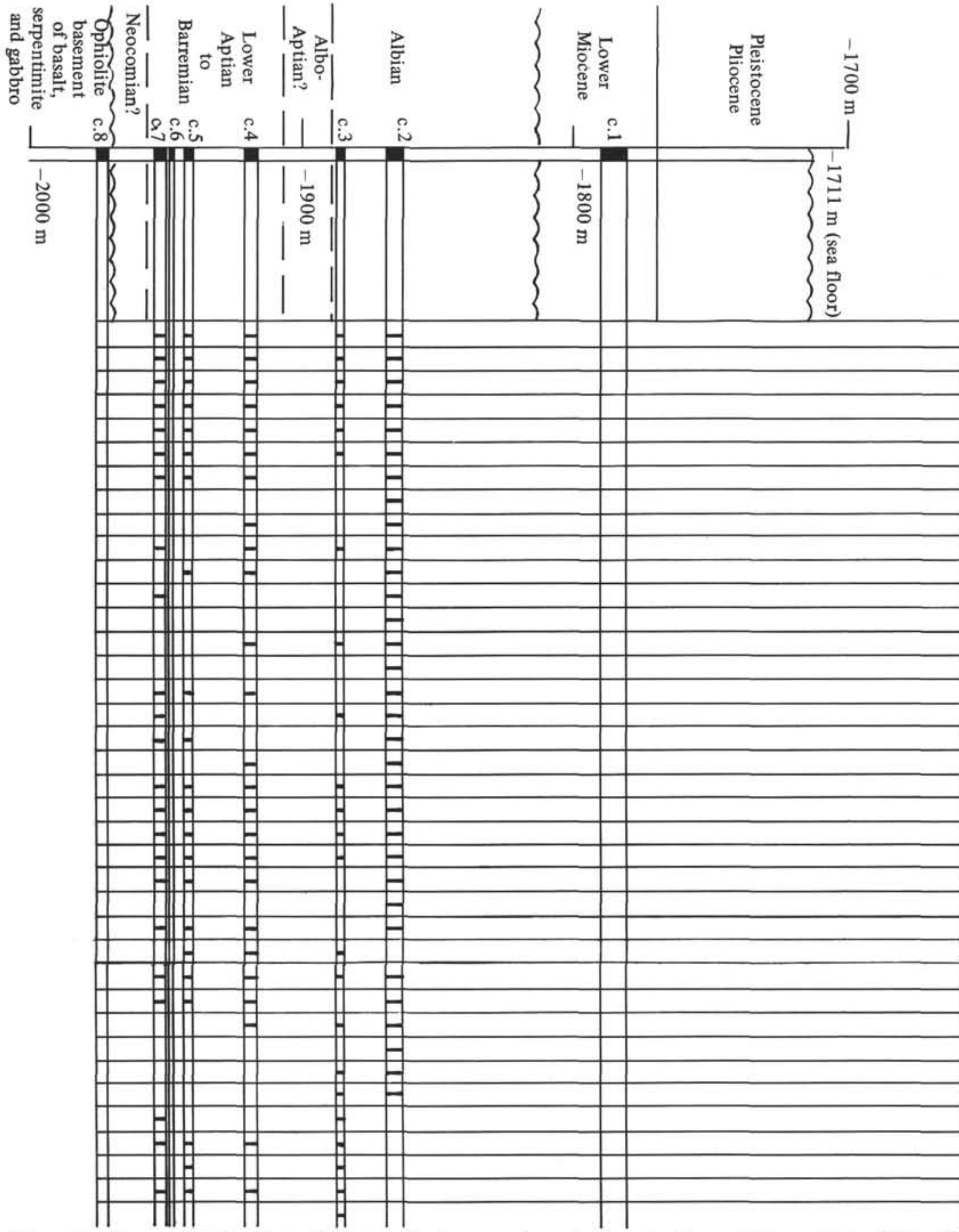
The entire Lower Cretaceous sequence, from 144 (Core 2) to 232 meters (Core 7) below bottom, consists of olive-gray siliceous ooze which is usually indurated and laminated and which has the appearance of shale. Its total thickness may be estimated from the drill logs to be about 90 meters (neither the 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, benthonic 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 *Hedbergella* cf. *infracretacea* (Glaessner) was found in Core 2-1). 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 *Conorotalites bartensteini-intercedens-aptiensis* (Bettenstaedt), *Vaginulina procera* 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" shelf facies, such as *Orbitolina, Orbitolinopsis, Iraqia, Dictyoconus, and Coskinolina,* 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).

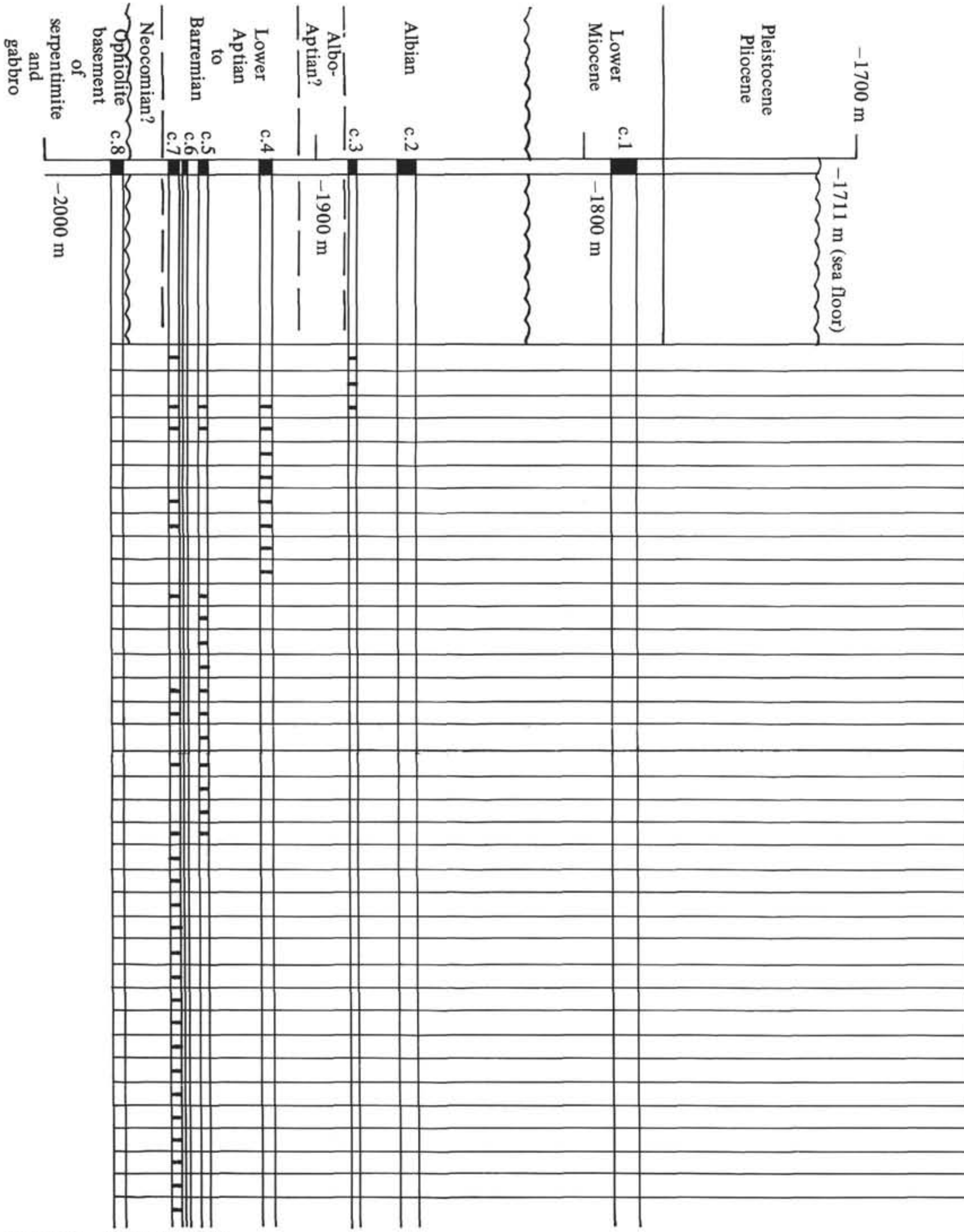
Figure 1. *Location of Site 120 on the northern slope of Gorringe Bank and the distribution of outcrops of Cretaceous and pre-Mesozoic strata in Portugal. Physiographic diagram of the North Atlantic Ocean by Heezen and Tharp, 1968.*

Among the 75 species determined from Cores 2 through 7, only very few, for example, *Lingulogavelinella ciryi 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



Species	Figured in present paper: Plate	Figure
Rhizammina? *indivisa* Brady	1	1-2
Ammodiscus gaultinus Berthelin	1	4-5
Glomospira charoides (Jones & Parker)	1	6-7
Reophax troyeri Tappan	1	11-12
Haplophragmoides concavus (Chapman)	1	13-14
Bigenerina clavellata Loeblich & Tappan	1	25-26
Trochammina globigeriniformis (Parker & Jones)	1	27-28
Dorothia filiformis (Berthelin)	1	34
Marssonella kummi Zedler	1	38-39
Lenticulina subangulata (Reuss)	2	5-6
Planularia strombecki (Reuss)	2	9
Astacolus calliopsis (Reuss)	2	10-11
Astacolus? *planiuscula* (Reuss)	2	15
Astacolus? *scitula* (Berthelin)	2	16-17
Saracenaria gr. *bronnii* (Roemer)	2	20
Vaginulinopsis excentrica (Cornuel)	2	27-29
Vaginulinopsis schloenbachi (Reuss)	2	31-32
Marginulina inaequalis Reuss	3	2
Marginulina linearis Reuss	3	3
Dentalina communis d'Orbigny	3	4-5
Dentalina cylindroides Reuss	3	6
Dentalina distincta Reuss	3	7
Dentalina gracilis d'Orbigny	3	4-5
Dentalina soluta Reuss	3	12
Citharina aff. *acuminata* Reuss var.	3	15
Lingulina loryi (Berthelin)	3	22
Globulina prisca Reuss	4	3
Pyrulina cylindroides (Roemer)	4	3
Ramulina? sp.	4	4-5
Spirillina minima Schacko	–	–
Hedbergella cf. *infracretacea* (Glaessner)	–	–
Lingulogavelinella aff. *ciryi ciryi* Malapr.-Brizouard	4	6-11
Gayelinella barremiana bizouardae n. subsp.	4	12-14
Rhizammina? sp.	1	3
Reophax minuta Tappan	1	10
Ammobaculites euides Loeblich & Tappan	1	17-18
Marssonella hauteriviana Moullade	1	35-37
Astacolus erucaeformia (Wisn.)	2	12

Figure 2. *Range distribution of Lower Cretaceous foraminifera in Cores 2 through 7 of Site 120, Gorringe Bank, eastern North Atlantic.*



Species	Figured in present paper: Plate	Figure
Dentalina legumen Reuss	3	10
Lingulina biformis Bartenstein & Brand	3	21
Pseudonodosaria himilis (Roemer)	3	24-26
Reophax gr. *scorpiurus-horridus*	1	9
Lenticulina ouachensis ouachensis (Sigal)	2	1-2
Lenticulina ouachensis multicella Bart., Bett. & Bolli	2	3
Lenticulina turgidula (Reuss)	2	7-8
Vaginulinopsis cf. *dilecta* (Reuss)	2	26
Marginulina hamulus Chapman	3	1
Citharina sp.	3	18
Haplophragmoides cushmani Loeblich & Tappan	1	15-16
Ammobaculites subcretaceus Cushman & Alexander	1	19
Spiroplectammina cf. *nuda* Lalicker	1	23
Spiroplectinata annectens (Parker & Jones)	1	33
Lenticulina praegaultina Bartenst., Bettenst. & Bolli	2	4
Astacolus cf. *incurvata* (Reuss)	2	14
Astacolus vetusta (d'Orbingy)	2	18
Astacolus sp.	2	19
Marginulinopsis gracilissima (Reuss)	2	25
Vaginulinopsis matutina (d'Orbigny)	2	30
Dentalina linearis (Roemer)	3	11
Glomospira gordialis (Jones & Parker)	1	8
Haplophragmium aequale (Roemer)	1	20-21
Textularia foeda Reuss	1	22
Bigenerina aff. *antiquissima* Bartenstein & Brand	1	24
Verneuilinoides alexus neocomiensis (Mjatliuk)	1	29-30
Gaudryima? aff. *grandis* (Crespin)	1	31-32
Astacolus grata (Reuss)	2	13
Saracenaria cf. *grandstandensis* Tappan	2	21-22
Marginulinopsis cephalotes (Reuss)	2	23-24
Nodosaria lepida Reuss	3	13
Nodosaria zippei Reuss	3	14
Citharina glomarchallengeriana n. sp.	3	16-17
Frondicularia joidesi n. sp.	3	19-20
Lingulina loryi gorringei n. subsp.	3	23
Pseudonodosaria tenuis (Bornemann)	3	27
Gavelinella aff. *barremiana* Bettenstaedt	4	15

Figure 2. *(Continued)*

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 stratigraphical range is not known: *Gavelinella barremiana bizouardae* n. subsp. (Cores 2 and 3), *Citharina glomarchallengeriana* n. sp. (Core 7), *Frondicularia joidesi* n. sp. (Core 7), and *Lingulina loryi gorringei* n. subsp. (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.

Spiroplectinata 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 *Spiroplectammina nuda* Lalicker. On the other hand, *Bigenerina antiquissima* Bartenstein and Brand and *Lingulina biformis* 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 *Bairdia, Saipanetta?, Cytherura*?, *Asciocythere, Pontocyprella?* and *Macrocypris*, but none of the represented, mostly juvenile forms is specifically known so far (Oertli, 1970, in litt.).

REMARKS ON THE LOWER CRETACEOUS OF PORTUGAL

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-Guadalquivir 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 Basis, 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 neocomiensis* (d'Orbigny)) and diagnostic echinoids (*Pygurus rostratus* Ag., *Toxaster*). The marl-limestone series of Hauterivian age, 70 meters thick, contains *Lopha rectangularis* (Roemer), *Exogyra couloni* (d'Orbigny), Brachiopoda, echinoids, and corals, as well as Ostracoda, for example, *Cythereis* gr. *bernardi* Grosdidier, *Schuleridea* aff. *thoerenensis* (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.a., Exogyra tuberculifera* (K. and D.), *Cythereis* gr. *bartensteini* 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 Ostreidae, rudistids, 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 hondaana* 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 rudistids, echinoids, *Exogyra tuberculifera* (K. and D.), Brachiopoda, *Cythereis* gr. *bartensteini* 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 *Knemiceras uhligi* (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 ingression (Rey, 1970).

In the region of Cascais, the Lower Valanginian (14 meters) with *Natica leviathan* (P. and C.) and *Trocholina* is succeeded by the Mexilhoeira beds (20 meters), the age of which is suggested as Upper Valanginian by ammonites such as *Olcostephanus* gr. *astieri* (d'Orbigny), *Neocomites neocomiensis* (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 boussingaulti* (d'Orbigny), echinoids, Brachiopoda, *Choffatella decipiens* Schlumberger, *Pseudocyclammina hedbergi* Maync, *Orbitolina (Palorbitolina) lenticularis* (Blumenbach), *Orbitolinopsis, Cythereis bartensteini* 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.

Stage	N. Torres Vedras	Ericeira	Cascais	Cape Espichel – Serra da Arrabida	Site 120, Gorringe Bank
Cenomanian	Ostreidae limestone	Beds with Ostreidae, rudistids, *Praealveolina* Beds with *Knemiceras uhligi*	Beds with Ostreidae, Rudistids, *Praealyeolina*	Beds with Ostreidae, rudistids, *Pholadomya*, etc.	Cores
Albian					*Lingulogavelinella* aff. *ciryi ciryi* 2, 3
Upper Aptian Lower	Barren sandstone and conglomerate	Praia dos Banhos Sandstone; *Orbitolina* beds with rudistids and echinoids	Barren sandstone Almargem beds: *Exogyra boussingaulti*, Brachiopoda, Gastropoda, Echinoids; *Orbitolina*; *Choffatella decipiens*	Varicolored sandstone complex with Gastropoda Marls–limestones with *Exogyra*, *Natica*, algae, corals	Siliceous laminated oozes and shales 4
Upper Barremian Lower	Barren sandstone and conglomerate	Praia do Peixe Sandstone; *Choffatella* beds with Ostreidae *Trigonia* beds with *T. hondaana*, *T. caudata* *Choffatella decipiens*	*Actaeonella* level "Urgonian" limestone with echinoids	Sandstone–marls with *Exogyra boussingaulti*, echinoids Gypsiferous marls with *Glauconia strombiformis* *Trigonia* beds Sandy marls with algae; lignite *Choffatella decipiens*	5, 6, 7, 8 *Gavelinella* aff. *barremiana* Basement (gabbroid suite)
Upper Hauterivian Lower	Barren Clastics Marine level with arenaceous foraminifera	"Urgonian" limestone with Ostreidae, *Nerinea*, rudistids	Mexilhoeira beds: *Crioceratites*, *Toxaster* marls, *Spitidiscus*, *Neocomites*, *Olcostephanus*, *Pygurus rostratus*	Marls–limestones with Ostreidae, echinoids, *Nerinea*, corals *Toxaster* marls Belemnites marls with Brachiopoda, corals, *Pseudocyclammina lituus*	
Upper Valanginian Lower	White cross-bedded sandstone and conglomerate		Beds with *Natica leviathan*, *Trocholina alpina*, *elongata*	Oolitic ferruginous Limestones; *Neocomites*; *Pygurus rostratus* Barren clastics	Stratigraphical summary of the Lower Cretaceous in the Lusitanian Basin, western Portugal
Purbeckian	Varicolored shale and sandstone; Torres Vedras beds (Wealdian)	Clastics with limestone interbeds with *Anchispirocyclina lusitanica*		Varicolored shale and sandstone	

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.)[1] 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 *Orbitolina*-bearing marls and limestones from Luz and São Braz-Abilheira (Maync, 1959). In a section measured nearby (Lagos), the Albian-Aptian beds carry a rare microfauna with *Paracoskinolina* (=gr. of *Coskinolina sunnilandensis* Maync), Sabaudia, and *Pseudocyclammina* cf. *hedbergi* Maync (P.Y. Berthou, 1971, in litt.).

To sum up, the Barremian-Albian section of continental Portugal is composed of marls, limestones, and clastics (platform-shelf and littoral facies) 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 Gorringe Bank and the Portuguese Lower Cretaceous.

SYSTEMATIC DESCRIPTIONS

Rhizammina Brady, 1879

Rhizammina? indivisa Brady
(Plate 1, Figures 1, 2)

1884 *Rhizammina indivisa* n. sp., Brady, Rep. Voyage Challenger, Zool., p. 277, Pl. 29, fig. 5-7.
1898 *Rhizammina indivisa* Brady, Chapman, J. Roy. Microscop. Soc., Vol. X., p. 11, Pl. 2, fig. 4.
1935 *Rhizammina indivisa* Brady, Eichenberg, Oel und Kohle, 11. Jahrg., No. 22, Pl. IIB, fig. 1; Pl. V, fig. 1.
1938 *Bathysiphon* D-2, Hecht, Senckenberg. Natf. Ges. Abhandl. 443, Pl. 2a, fig. 34-36; Pl. 5a, fig. 35-38; Pl. 5b, fig. 35; Pl. 6a, fig. 33-38.
1938 *Bathysiphon* cf. D-7, Hecht, *ibid.*, Pl. 22, fig. 7-11.
1950 *Rhizammina indivisa* Brady, Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 4.
1951 *Rhizammina indivisa* Brady, Bartenstein and Brand, Senckenberg. Ntf. Ges., Abhandl. 485, p. 265, Pl. 1, fig. 1; Pl. 14C, fig. 7 (*non* 10); Pl. 18, fig. 6.
1957 *Rhizammina indivisa* Brady, Bartenstein, Bettenstaedt and Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 14, Pl. II, fig. 30-31.
?1963 *Hyperammina* sp. B., Crespin, Bureau Min. Resources, Geol. and Geophys., Bull. No. 66, p. 23, Pl. 2, fig. 2-3.
1966 *Hyperammina gaultina* Ten Dam, Bartenstein, Bettenstaedt and Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 137, Pl. I, fig. 6-13.
1967 *Rhizammina 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. 4?.
1967 *Rhizammina indivisa* Brady, Fuchs and Stradner, Jahrb. Geol. Bundesanst., Vol. 110, Pl. 1, fig. 4.
non 1950 *Hyperammina gaultina* n. sp., Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 5, Pl. I, fig. 2.

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

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

Rhizammina? sp.
(Plate 1, Figure 3)

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

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

Ammodiscus Reuss, 1862

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

1880 *Ammodiscus gaultinus* n. sp., Berthelin, Mém. Soc. Géol. France, 3.sér., Vol. 1, No. 5, p. 19, Pl. 1, fig. 3.
1938 *Ammodiscus* D-2, Hecht, Senckenbg. Natf. 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. 17-19.
1940 *Ammodiscus gaultinus* Berth., Tappan, J. of Paleontol., Vol. 14, No. 2, p. 95, Pl. 14, fig. 6.
1943 *Ammodiscus gaultinus* Berth., Tappan, J. of Paleontol. Vol. 17, No. 5, p. 481, Pl. 77, fig. 6.
1943 *Ammodiscus eggeri* n. sp., Majzon, Mitt. Jahrb. kgl. ungar. Geol. Anst., Vol. 37, p. 153, Pl. 2, fig. 6.
1949b *Ammodiscus rotalarius* n. sp., Loeblich and Tappan, J. of Paleontol., Vol. 23, No. 3, p. 247, Pl. 46, fig. 1.
1950 *Ammodiscus gaultinus* Berth., Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 7.
1950 *Ammodiscus kiowensis* n. sp., Loeblich and Tappan, Univ. Kansas Paleontol. Contr., Art. 3, p. 5, Pl. 1, fig. 3.
1951 *Ammodiscus gaultinus* Berth., Bartenstein and Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 267, Pl. 1, fig. 13; Pl. 17A, fig. 14.
1951 *Ammodiscus gaultinus* Berth., Noth, Jahrb. Geol. Bundesanst., Sonderbd. 3, p. 27, Pl. 1, fig. 1; Pl. 6, fig. 12-13.
1953 *Ammodiscus rotalarius* Loebl. and Tappan, Crespin, Contrib. Cushman Found. for Foram. Research, Vol. IV, pt. 1, p. 29, Pl. 5, fig. 2.
1954 *Ammodiscus gaultinus* Berth., Bartenstein, Senckenbg. leth., Vol. 35, p. 38, Pl. 1, fig. 17-18 (non 19-20).
1957 *Ammodiscus gaultinus* Berth., Sztejn, Inst. Geol. Prace, Vol. XXII, p. 206, Pl. II, fig. 3.
1962 *Glomospirella gaultina* (Berth.), Tappan, U. S. Geol. Surv., Profess. Paper 236-C, p. 130, Pl. 29, fig. 17-18 (19-20?).
1962 *Ammodiscus cretaceus* (Reuss), Tappan, *ibid.*, p. 130, Pl. 30, fig. 1-2.
1962 *Ammodiscus rotalarius* Loebl. and Tappan, Tappan, *ibid.*, p. 131, Pl. 30, fig. 5-8.
1963 *Glomospirella gaultina* (Berth.), Crespin, Bureau Min. Resources, Geol. and Geophys., Bull. No. 66, p. 27, Pl. 2, fig. 10.
1966 *Ammodiscus gaultinus* Berth., Bartenstein, Bettenstaedt and Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 140, Pl. I, fig. 29.
1967 *Ammodiscus gaultinus* Berth., Michael, Palaeontogr., Suppl. Bd. 12, p. 21, fig. 6; Pl. XVIII, fig. 14?; Pl. XX, fig. 104; Pl. XXIV, fig. 3-4; Pl. XXV, fig. 21, 31-32.
1969 *Ammodiscus gaultinus* Berth., Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. 3, Pl. 20, fig. 20-21.
non 1966 *Glomospirella gaultina* (Berthelin), Dieni and Massari, Palaeont. Ital., Vol. LXI (n. ser. XXXI), p. 85, Pl. I, fig. 1; Pl. IX, fig. 1.

Ammodiscus gaultinus 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 *Cyclogyra* Wood, 1842 (=*Cornuspira* Schulze, 1854).

The tests of *A. gaultinus* are rather variable but the different species based on slight differences in the character of coiling, overlap of whorls, deformation through fossilization, etc. are

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

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)

1935 *Glomospira charoides* (Jones & Parker), Eichenberg, Oel und Kohle,11.Jahrg., No. 22, Pl. V, fig. 8.
1946 *Glomospira charoides* (Jones & Parker), var. *corona* Cush. & Jarvis, Cushman, U.S. Geol. Surv., Profess. Paper 206, p. 19, Pl. 2, fig. 1-3.
1950 *Glomospira charoides* (Jones & Parker), Subbotina, VNIGRI Trudy, Microfauna USSR, Vol. IV, n. ser. No. 51, p. 74, Pl. II, fig. 5.
1951 *Glomospira charoides* (Jones & Parker), Noth, Jahrb. Geol. Bundesanst., Sonderbd. 3, p. 28, Pl. 2, fig. 7.
1962 *Glomospira corona* Tappan (Cush. & Jarvis, *pars*), Tappan. U.S. Geol. Surv., Profess. Paper 236-C, p. 130, Pl. 29, fig. 13-16.
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)

1892 *Ammodiscus gordialis* (Jones & Parker), Chapman, J. Roy. Microscop. Soc., London, Vol. II, p. 327, Pl. 6, fig. 13.
1935 *Glomospira gordialis* (Jones & Parker), Eichenberg, Oel und Kohle, 11. Jahrg., No. 22, Pl. V, fig. 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. 43?; Pl. 9a, fig. 38, 39?; Pl. 9b, fig. 39-41; Pl. 11a, fig. 1?, 2-3; Pl. 14a, fig. 17-19?
1938 *Glomospira* D-4 (*pars*), Hecht, *ibid.*, Pl. 9b, fig. 10, 42-43; Pl. 10a, fig. 4-6.
1951 *Glomospira gordialis* (Jones & Parker), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 267, Pl. 1, fig. 15-16; Pl. 14C, fig. 10?
1954 *Ammodiscus gaultinus* Berthelin, *pars*, Bartenstein, Senckenberg. leth., Vol. 35, No. 1/2, p. 38, Pl. 1, fig. 19-20.
1960 *Glomospira gordialis* (Jones & Parker), Bielecka, Inst. Geol., Prace, Vol. XXXI, p. 114, Pl. I, fig. 2-3.
1967 *Glomospira gordialis* (Jones & Parker), Michael, Palaeontogr., Suppl. bd. 12, p. 23, Pl. XI, fig. 13.

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

Reophax Montfort, 1808

Reophax gr. *scorpiurus-horridus*
(Plate 1, Figure 9)

1940 *Reophax deckeri* n. sp., Tappan, J. of Paleontol. Vol. 14, No. 2, p. 94, Pl. 14, fig. 3.
1941 *Reophax eckernex* n. ap., 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.
?1950 *Reophax scorpiurus* Montfort, Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 6.
1951 *Reophax scorpiurus* Montf., Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 266, Pl. 1, fig. 9-11.
1957 *Reophax scorpiurus* Montf., Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 15, Pl. I, fig. 2-3.
1963 *Reophax deckeri* Tappan, Crespin, Bureau Min. Resources, Geol. & Geophys., Bull. No. 66, p. 23, Pl. 3, fig. 1-10.
1966 *Reophax horridus* (Schwager), Dieni & Massari, Palaeont. Ital., Vol. LXI (n. ser. XXXI), p. 86, Pl. I, fig. 5-7.
1967 *Reophax scorpiurus* Montf., *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 19, Pl. XVIII, fig. 10-13; Pl. XXI, fig. 18, 29, 64-65; Pl. XXII, fig. 68, 77, 81; Pl. XXIII, fig. 43?, 60-61?; Pl. XXIV, fig. 14-15?, 34?; Pl. XXV, fig. 24-25?, 28?, 59, 83?; Pl. XXVI, fig. 89?, 90, 91?.

Reophax minuta Tappan
(Plate 1, Figure 10)

1938 *Haplostiche* D-1, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 4a, fig. 4-8.
1940 *Reophax minuta* n. sp., Tappan, J. of Paleontol., Vol. 14, No. 2, p. 94, Pl. 14, fig. 4.
1943 *Reophax minuta* Tappan, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 480, Pl. 77, fig. 4.
1950 *Reophax minutus* Tappan, Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 6, Pl. I, fig. 3.
1958 *Reophax minutus* Tappan, Sztejn, Inst. Geol., Biul. 138, p. 7, fig. 2.
1962 *Reophax minuta* Tappan, Bartenstein, Bettenstaedt *et al.*, Leitfossilien d. Mikropal., p. 282, Pl. 39, fig. 16.
1962 *Reophax minuta* Tappan, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 132, Pl. 30, fig. 10.
1967 *Reophax minuta* Tappan, Michael, Palaeontogr., Suppl. bd. 12, p. 19, Pl. I, fig. 14-16.
1967 *Reophax minuta* Tappan, Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 262, Pl. 1, fig. 7.

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 Gorringe Bank is *Reophax troyeri* Tappan (Tappan, 1960) described from the Albian Topagoruk Formation of Alaska.

1960 *Reophax troyeri* n. sp, Tappan, Bull. AAPG, Vol. 44, No. 3, pt. I, p. 291, Pl. 1, fig. 10-12.
1962 *Reophax troyeri* Tappan, Tappan, U.S. Geol. Surv., Profess. Paper 236-C, p. 133, Pl. 30, fig. 11-12 (13?).

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* gr. *scorpiurus-horridus* (see Plate 1, Figure 9). Three to four chambers, sometimes twisted and irregular, separated by horizontal depressed sutures. Some tests are similar to *Haplophragmium* 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* Cush. & 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 concavus (Chapman)
(Plate 1, Figures 13, 14)

1892 *Trochammina concava* n. sp., Chapman, J. Roy. Microscop. Soc. London, ser. C, Vol. II, p. 327, Pl. 6, fig. 14.
1940 *Haplophragmoides concava* (Chapman), Tappan, J. of Paleontol. Vol. 14, No. 2, p. 95, Pl. 14, fig. 7.
1943 *Haplophragmoides concava* (Chapman), Tappan, J. of Paleontol., Vol. 17, No. 5, p. 481, Pl. 77, fig. 7.
1950 *Haplophragmoides concava* (Chapman), Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 9, Pl. I, fig. 5.

1951 *Haplophragmoides concavus* (Chapman), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhand. 485, p. 268, Pl. 1, fig. 24-25; Pl. 14C, fig. 1-2.
1957 *Haplophragmoides concavus* (Chapman), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 16, Pl. 2, fig. 6.
1958 *Haplophragmoides concavus* (Chapman), Sztejn, Inst. Geol., Biul. 138, p. 11, fig. 12.
?1960a *Trochammina concava vocontiana* n. var., Moullade, Revue de Micropal., Vol. 2, No. 4, p. 200, Pl. 1, fig. 1-3.
?1960b *Trochammina vocontiana* Moullade, Moullade, Revue de Micropal., Vol. 3, No. 2, p. 134, Pl. 1, fig. 6-7, 10-12, 15-16.
1966 *Haplophragmoides concavus* (Chapman), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 138, Pl. I, fig. 64-71, 76-78.
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.
1967 *Haplophragmoides concavus* (Chapman), Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 264, Pl. 2, fig. 7.
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 depressed 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 *Trochammina 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 Albian, 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 *Haplophragmoides cushmani* Loebl. & Tappan (Albian of Texas).

1938 *Haplophragmoides* D-5 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 10a, (II, *pars*); Pl. 10b, fig. 63?; Pl. 11a (III, *pars*); Pl 12b, fig. 61-68.
1946 *Haplophragmoides cushmani* n. sp., Loeblich & Tappan, J. of Paleontol., Vol. 20, No. 3, p. 244, Pl. 35, fig. 4.
1951 *Haplophragmoides cushmani* Loebl. & Tappan, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 268, Pl. 1, fig. 23; Pl. 14B, fig. 1?; Pl. 14C, fig. 12?; Pl. 18, fig. 36?, 37-38.
1956 *Haplophragmoides cushmani* Loebl. & Tappan, Bartenstein, Senckenberg. leth., Vol. 37, No. 5/6, p. 512, Pl. 3, fig. 62.
1963 *Haplophragmoides cushmani* Loebl. & Tappan, Crespin, Bureau Min. Resources, Geol. & Geophys., Bull. No. 66, p. 30, Pl. 6, fig. 1-2.
1967 *Haplophragmoides latidorsatus* (*non* Bornemann), Michael, Palaeontogr., Suppl. bd. 12, p. 27, Pl. II, fig. 1; Pl. XXI, fig. 66?, 67, 72-73; Pl. XXIV, fig. 35?, 52-53; Pl. XXVI, fig. 34.

The species *Haplophragmoides cushmani* occurs in the stratigraphic interval Middle Valanginian-Upper Albian.

Ammobaculites Cushman, 1910

Ammobaculites euides Loeblich & Tappan
(Plate I, Figures 17, 18)

1949a *Ammobaculites euides* n.sp., Loeblich & Tappan, J. Washington Acad. Sci., Vol. 39, No. 3, p. 90.
1949b *Ammobaculites euides* Loeblich & Tappan, Loeblich & Tappan, J. of Paleontol., Vol. 23, No. 3, p. 250, Pl. 46, fig. 8.
1950 *Ammobaculites euides* Loeblich & Tappan, Loeblich & Tappan, Univ. Kansas Paleontol. Contrib., Art. 3, p. 6, Pl. 1, fig. 7-11.
1950 *Ammobaculites parvispira* n.nom, Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 10, Pl. I, fig. 8.
1958 *Ammobaculites euides* Loeblich & Tappan, Skolnick, J. of Paleontol., Vol. 32, No. 2, p. 280, Pl. 37, fig. 5.
1958 *Ammobaculites altilis* n.sp., Skolnick, *ibid.*, p. 280, Pl. 36, fig. 1.
1958 *Ammobaculites culmula* n.sp., Skolnick, *ibid.*, p. 280, Pl. 37, fig. 2.
1958 *Ammobaculites impolitus* n.sp., Skolnick, *ibid.*, p. 281, Pl. 36, fig. 2.
1960 *Ammobaculites euides* Loebl. & Tappan, Eicher, Peabody Museum Nat. Hist., Bull. 15, p. 61, Pl. 3, fig. 17-19.
1965 *Ammobaculites parvispira* Ten Dam, Neagu, Micropal., Vol. 11, No. 1, p. 4, Pl. 1, fig. 1-3.
1965 *Ammobaculites subcretaceus* (*non* Cush. & Alex.), Neagu, *ibid.*, p. 5, Pl. 1, fig. 4-6.
1969 *Ammobaculites volskiensis* Dain, Kalantari, Nat. Iran. Oil Co., Geol. Lab., Publ. 3, p. 130, Pl. 16, fig. 2
non 1969 *Ammobaculites parvispira* Ten Dam, Kalantari, *ibid.*, p. 129, Pl. 20, fig.22.

Test small, generally rounded in section, latest chambers often compressed; involute early coil, bulbous, not umbilicate, arrangement and sutures obscure; rectilinear uniserial portion well developed, last-formed chamber large with rounded terminal aperture; sutures straight, depressed, rendering the periphery of the test faintly lobate; surface smoothly finished. Length less than 1 millimeter.

Similar Lower Cretaceous species characterized by *Reophax*-like slender tests with an insignificant rounded initial coil are *Ammobaculites petilus* Eicher, *Ammobaculites tyrelli* Nauss, *Ammobaculites minimus* Crespin, etc.

Ammobaculites sp.

Some rare specimens of *Ammobaculites* from Hole 120, Gorringe Bank, may be placed in or near *Ammobaculites* plexus *torosus-reophacoides,* characterized by an insignificant, but distinct initial spire which is not detached from the uniserial *Reophax*-like test. Others (Plate 1, Figure 19) reveal a broad spiral part like *Ammobaculites subcretaceus* Cush. & Alex.

Haplophragmium Reuss, 1860

Haplophragmium aequale (Roemer)
(Plate 1, Figures 20-21)

1841 *Spirolina aequalis* n.sp., Roemer, Verst. norddeutsch. Kreidegeb., Hannover, p. 98, Pl. XV, fig. 27.
1935 *Haplophragmium aequale* (Roemer), *pars*, Eichenberg, Oel und Kohle, Jahrg. 11, No. 22, Pl. VIII, fig. 1, 3, 2? (*non* Pl. VII, fig. 1).
1938 *Haplophragmium* D-13, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 15a, fig. 86-92, Pl. 16a, fig. 63-69.
1939 *Ammobaculites subaequalis* n. sp. pars, Mjatliuk, Trans, Geol. Oil Inst., ser. A. fasc. 120, p. 70, Pl. II, fig. 19 (*non* 20).
1946 *Haplophragmium aequale* (Roemer), Ten Dam, J. of Paleontol., Vol. 20, No. 6, p. 570, Pl. 87, fig. 3-4.
1952b *Haplophragmium aequale* (Roemer), Bartenstein, Senckenbergiana, Vol. 33, No. 4/6, p. 325 *et al.*, Pl. 1, fig. 2; Pl. 2, fig. 17-26; Pl. 3, fig. 1-6.
1957 *Haplophragmium* cf. *aequale* (Roemer), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 18, Pl. II, fig. 22-23.
1962 *Haplophragmium aequale* (Roemer), Abriss Leitfoss. d. Mikropaleontol., p. 269, Pl. 38, fig. 9.
1963 *Ammobaculites abnormalis* n.sp., Crespin, Bureau Min. Resources, Bull. No. 66, p. 34, Pl. 8, fig. 1-2.
1966 *Triplasia aequalis* (Roemer), *pars*, Dieni & Massari, Palaeont. Ital., Vol. LXI (n. ser. Vol. XXXI), p. 93, Pl. I, fig. 17 (complete synonymy listed).
1967 *Haplophragmium aequale* (Roemer), Michael, Palaeontogr., Suppl. bd. 12, p. 26, Pl. I, fig. 17?; Pl. II, fig. 17, 19-20; Pl. XVIII, fig. 15-16, 28.

1967 *Haplophragmium aequale* (Roemer), Lindenberg, Senckenbg. Natf. Ges., Abhandl. 514, p. 18, fig. 4, No. 27-38.
1969 *Haplophragmium aequale* (Roemer), *pars*, Kalantari, Nat. Iran. Oil Co., Geol. Lab., Publ. No. 3, p. 131, Pl. 17, fig. 4-5.
non 1860 *Haplophragmium aequale* Reuss, Sitz. ber. Akad. Wiss. Wien, Vol. 40, p. 218, Pl. 11, fig. 2-3 (=*Bulbophragmium aequale* Maync, 1952= *Lituola westfalica westfalica* Bartenstein, 1952).

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 pseudoroemeri-georgsdorfensis-emslandensis* Bart. & Brand, *Triplasia quadrata* Bart. & Brand, and *Flabellammina stadthageni* Bart. & Brand are considered by some authors to be A-forms of *Haplophragmium aequale-subaequale* (Gerhardt, 1963; Dieni & Massari, 1966, etc.).

Textularia Defrance, 1824

Textularia foeda Reuss
(Plate 1, Figure 22)

1846 *Textularia foeda* n.sp., Reuss, Verst. böhm. Kreideform., pt. 2, p. 109, Pl. XLIII, fig. 12-13.
1938 *Gaudryina* D-16, Hecht, Senckenberg. 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.
1957 *Textularia topagorukensis* n.sp., Tappan, U.S. Nat. Museum Bull. 215, p. 205, Pl. 66, fig. 8-9.
1962 *Textularia topagorukensis* Tappan, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 141, Pl. 33, fig. 7-9.
1962 *Textularia foeda* Reuss, Arbeitskreis Leitfoss. d. Mikropal., p. 270, Pl. 37, fig. 10; Pl. 39, fig. 19.
1969 *Textularia foeda* Reuss, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 24, No. 18.

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)

1935 *Spiroplectammina nuda* n.sp., Lalicker, Contrib. Cushman Lab. for Foram. Research, Vol. 11, pt. 1, p. 4, Pl. 1, fig. 6-7.
1940 *Spiroplectammina nuda* Lalicker, Tappan, J. of Paleontol., Vol. 14, No. 2, p. 98, Pl. 14, fig. 15-16.
1943 *Spiroplectammina nuda* Lalicker, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 485, Pl. 77, fig. 24.

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 alexanderi Lalicker from the Middle Albian of Texas reveals horizontal limbate sutures. *Spiroplectammina goodlandana* Lalicker from the same formation shows a flaring test but its limbate sutures are horizontal. *Spiroplectammina rectangularis cretosa* 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)

1951 *Bigenerina antiquissima* n.sp., Bartenstein & Brand, Senckenberg. Natf. Ges. Abhandl. 485, p. 275, Pl. 3, fig. 73-74.

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 clavellata Loebl. & Tappan
(Plate 1, Figures 25, 26)

1934 ?*Bigenerina* sp., Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover, p. 152, Pl. XV, fig. 6.
1946 *Bigenerina clavellata* n.sp., Loeblich & Tappan, J. of Paleontol., Vol. 20, No. 3, p. 245, Pl. 35, fig. 7-8.
1951 *Bigenerina clavellata* Loebl. & Tappan., Bartenstein & Brand, Senckenbg. Natf. Ges. Abhandl. 485, p. 275, Pl. 4, fig. 75-76.
1958 *Bigenerina* cf. *clavellata* Loebl. & Tappan, Sztejn, Inst. Geol. Biul. 138, p. 15, fig. 22.
?1966 *Bigenerina* cf. *clavellata* Loebl. & Tappan, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 141, Pl. 1, fig. 60-63.

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 specimens from the Upper Albian Weno Formation of Texas (Loeblich & 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* cf. *clavellata* from the Maridale Formation (Upper Aptian to Middle Albian) of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1966) are twice as large and show a straight *Reophax*-like test.

Bigenerina clavellata is recorded *i.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 (Sztejn, 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)

1865 *Lituola nautiloidea* var. *globigeriniformis* n.var., Parker & Jones, Phil. Trans. Roy. Soc. London, Vol. 155, p. 407, Pl. 15, fig. 46-47.
1892 *Haplophragmium globigeriniforme* (Parker & Jones), Chapman, J. Roy. Microscop. Soc., p. 324, Pl. 5, fig. 16.
1938 *Haplophragmoides* D-7, Hecht, Senckenbg. Natf. Ges. Abhandl. 443, Pl. 9b, fig. 32-36.
1938 *Haplophragmoides* D-6, Hecht, *ibid.*, Pl. 12b, fig. 61-68.
1952b *Haplophragmoides neocomianus* (Chapman), *pars*, Bartenstein, Senckenbergiana, Vol. 33, No. 4/6, p. 298, p. 302.
1960 *Trochammina globigeriniformis* (Parker & Jones), Bielecka, Inst. Geol., Prace, Vol. XXXI, p. 120, Pl. I, fig. 9.
1967 *Trochammina globigeriniformis* (Parker & Jones), Michael, Palaeontogr., Suppl. bd. 12, p. 31, Pl. II, fig. 2-4; Pl. XIX, fig. 11-13, 27; Pl. XXI, fig. 2-5, 14-16, 24, 35; Pl. XXII, fig. 56,

75-76; Pl. XXIII, fig. 1-3, 5-9, 39, 51-52, 56; Pl. XXIV, fig. 26, 47; Pl. XXV, fig. 45, 77-81, 86, 97-98; Pl. XXVI, fig. 35-37, 46, 59, 64-66, 73-74.

Trochammina globigeriniformis has been recorded from beds of Liassic to Recent age.

Verneuilinoides Loeblich & Tappan, 1949

Verneuilinoides plexus neocomiensis (Mjatliuk)
(Plate 1, Figures 29, 30)

1935 *Gaudryina filiformis* (*non* Berth.), Eichenberg. Oel u. Kohle. 11. Jahrg., Nr. 22, p. 396, Pl. VII, fig. 2-3.
1938 *Verneuilina* D-4. Hecht, Senckenberg. Natf. Ges. Abhandl. 443, Pl. 8a, fig. 6-16; Pl. 8b, fig. 23-25; Pl. 9a, fig. 30-31; Pl. 9b, fig. 11-26; Pl. 10a, III; Pl. 10b, fig. 45-52; Pl. 11a, I & II; Pl. 11b, I; Pl. 12a, fig. 1-11; Pl. 12b, fig. 53-58.
1938 *Verneuilina* D-5, *pars*, Hecht, *ibid.*, Pl. 14a, fig. 13; Pl. 20b, fig. 58-60.
1939 *Verneuilina neocomiensis* n.sp., Mjatliuk, Transact. Geol. Oil Inst., Vol. 120, p. 50, 71, Pl. I, fig. 12-13.
1946 *Verneuilina chapmani* n.sp., Ten Dam, J. of Paleontol., Vol. 20, No. 6, p. 572, Pl. 87, fig. 8.
1951 *Verneuilinoides neocomiensis* (Mjatliuk), Bartenstein & Brand, Senckenbg. Natf. Ges. Abhandl. 485, p. 276, Pl. 4, fig. 77, 328; Pl. 16, fig. 1-2; Pl. 18, fig. 13-16, 28-30, 42, 44, 46; Pl. 19A, fig. 3-5, 11; Pl. 19B, fig. 10, 13-17.
1952b *Verneuilinoides subfiliformis* n.sp, Bartenstein, Senckenberg., Vol. 33, p. 308-310, Fig. 1, No. 2-3.
1957 *Verneuilinoides neocomiensis* (Mjatl.), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 19, Pl. II, fig. 39-40.
1957 *Verneuilinoides subfiliformis* Bartenstein, Bettenstaedt & Bolli, *ibid.*, p. 19, Pl. II, fig. 41.
1957 *Verneuilina neocomiensis* Mjatliuk, Sztejn, Inst. Geol., Vol. XXII, p. 210, Pl. II, fig. 13.
1957 *Verneuilinoides tailleuri* n.sp., Tappan, U.S. Nat. Museum, Bull. 215, p. 208, Pl. 66, fig. 19-22.
1957 *Dorothia chandlerensis* n.sp., Tappan, *ibid.*, p. 209, Pl. 66, fig. 29-30.
1958 *Verneuilina neocomiensis* Mjatliuk, Sztejn, Inst. Geol., Biul. 138, p. 15, textfig. 23.
1962 *Gaudryina tailleuri* (Tappan), Tappan, U.S. Geol. Surv., Profess. Paper 236-C, p. 149, Pl. 35, fig. 8-16.
1962 *Verneuilinoides neocomiensis* (Mjatl.), Flandrin, Moullade & Porthault, Revue de Micropal., Vol. 4, No. 4, p. 216, Pl. 1, fig. 4; Pl. 2, fig. 7.
1963 *Verneulinoides asperulus* n.sp., Crespin, Bureau Min. Res. Bull. 66, p. 57, Pl. 15, fig. 8-12.
1967 *Verneuilinoides neocomiensis* (Mjatl.), Michael, Palaeontogr., Suppl. bd. 12, p. 28, Pl. II, fig. 18; Pl. XIX, fig. 5-10, 25; Pl. XX, fig. 103, 114-115.
1967 *Verneuilinoides subfiliformis* Bartenst., Michael, *ibid.*, p. 29, Pl. II, fig. 10; Pl. XXI, fig. 6-7; Pl. XXII, fig. 7-10, 60-63; Pl. XXIII, fig. 44-46, 66-68; Pl. XXIV, fig. 5-9, 37-39, 48; Pl. XXV, fig. 5, 23, 44, 54-55, 58, 61-66, 90; Pl. XXVI, fig. 47-52.
1969 *Verneuilinoides subfiliformis* (Mjatl.), Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 24, No. 25.

According to the original descriptions, *Verneuilinoides neocomiensis* shows 7 to 10 sets of triserial chambers at a length of 0.5 to 0.57 millimeter of the test (Mjatliuk, 1939, p. 71). *Verneulinoides subfiliformis* is stated to have an average of 12 chambers, with a length of 0.58 millimeter of the holotype (Bartenstein, 1952). A gradual replacement of *Verneuilinoides neocomiensis* by the species *V. subfiliformis* in the Lower Barremian and of *V. subfiliformis* by *Dorothia filiformis* (Berthelin) in the Upper Aptian is suggested (Bartenstein, 1952). According to a statistical study on the variation of the genus, the more slender *Verneuilinoides subfiliformis* has developed from the stouter *V. neocomiensis* by a gradual increase of the number of chambers (Al-Abawi, 1964).

A review of the pertinent literature reveals that a non-ambiguous distinction of the widely distributed Lower Cretaceous forms *Verneuilinoides neocomiensis* and *V. subfiliformis* is not always possible because of the transitional forms. The great variability in size and shape of the tests have induced us to consider these species as morphotypes (maybe generations?) of the plexus *Verneuilinoides neocomiensis* (Mjatliuk).

Another group of transitional, highly variable morphotypes which we place in the plexus *V. neocomiensis* is *Verneuilinoides-Gaudryina tailleuri* Tappan/*Dorothia chandlerensis* Tappan (the latter is considered to represent the microspheric generation of the former from the Lower Albian-Aptian? of Alaska (Tappan, 1957, 1962). The larger part of the illustrated tests of *Verneuilinoides borealis* Tappan, described from the Alaskan Albian, only differs from *Verneuilinoides* plexus *neocomiensis* in displaying broader and stouter tests.

In the forms assigned by different authors to *Verneuilinoides neocomiensis*, the ratio α (=length/greatest breadth of the last chambers) varies between 2.2:1 and 4:1 (average 2.8:1). In those determined as *V. subfiliformis* it amounts to 3.5:1 to 4:1 (average 3.7:1, as in *Dorothia filiformis*). The Alaskan forms show an average value α = 3:1 to 4:1, and *Verneuilinoides borealis* 2.3:1. *Verneuilinoides asperulus* Crespin, from the Aptian of Australia, which is included in the plexus *Verneulinoides neocomiensis*, shows a ratio α of 2.6:1.

V. neocomiensis-subfiliformis is a Lower Cretaceous form of wide geographical distribution which appears in the Valanginian and shows a vertical range into the Barremian-Aptian. The Alaskan species included in the plexus *V. neocomiensis* occur in the Lower Albian (-Aptian?).

Gaudryina d'Orbigny, 1839

Gaudryina? aff. *grandis* (Crespin)
(Plate 1, Figures 31, 32)

1963 *Dorothia grandis* n.sp., Crespin, Bureau Min. Resources, Geol. & Geophys., Bull. No. 66, p. 59, Pl. 16, fig. 9-17.

Test elongate, usually slightly curved and compressed; early short portion somewhat globular, apparently with triserially arranged chambers; subsequent chambers biserially arranged; sutures indistinct, faintly depressed; apertural end rounded, aperture not visible due to the compression of the test. Length: 0.5-0.6 millimeter.

The specimens from the Gorringe Bank show a rather fine texture and smooth surface, whereas those described from the Aptian and Neocomian of Australia display a coarser wall structure. Moreover, the figured Australian tests are usually more slender and their length varies between 0.87 and 1.67 millimeters.

The possibility that we have to deal with crushed specimens of *Verneuilinoides* plexus *neocomiensis* (Mjatl.) cannot be ruled out.

Spiroplectinata Cushman, 1927

Spiroplectinata annectens (Parker & Jones)
(Plate 1, Figure 33)

A single test referable to *Spiroplectinata annectens* was found in Core 5-1 of Hole 120.

1863 *Textularia annectens* n.sp., Parker & Jones, Ann. Mag. Nat. Hist., ser. 3, Vol. 11, p. 92, textfig. 1.
1892 *Spiroplecta annectens* Parker & Jones, Chapman, J. Roy. Microscop. Soc., Vol. III, p. 750, Pl. 11, fig. 3.
1937 *Spiroplectinata annectens* (Parker & Jones), Cushman, Cush. Lab. for Foram. Research, Spec. Publ. No. 7, p. 101, Pl. 14, fig. 10-12.
1959 *Spiroplectinata annectens* (Parker & Jones), Grabert, Senckenbg. Nat. Ges. Abhandl. 498, p. 12, Pl. 1, fig. 10-12; Pl. 2, fig. 36-38; Pl. 3, fig. 77-86.
?1962 *Spiroplectinata annectens* (Parker & Jones), Flandrin, Moullade & Porthault, Revue de Micropal., Vol. 4, No. 4, p. 216, Pl. 1, fig. 6; Pl. 2, fig. 5.
1965 *Spiroplectinata annectens* (Parker & Jones), Neagu, Micropal., Vol. 11, No. 1, p. 6, Pl. 2, fig. 19.
1967 *Spiroplectinata annectens* (Parker & Jones), Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 269, Pl. 3, fig. 1.

Certain specimens of *Bigenerina wintoni* Cush. & Alex., figured from the Upper Albian of Oklahoma and Texas (Tappan, 1943) resemble the test from Gorringe Bank but are stated to have a biserial initial portion, whereas the globular early part of our test suggests a triserial arrangement.

Spiroplectinata annectens is so far only described from beds of Albian age (England, Germany, France, the Netherlands, Romania, Czechoslovakia).

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 protion.

1880 *Gaudryina filiformis* n.sp., Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, No. 5, p. 25, Pl. I, fig. 8.

1892 *Gaudryina filiformis* Berthelin, Chapman, J. Roy. Microscopic Soc., p. 4, Pl. 11, fig. 7.

1899 *Gaudryina filiformis* Berthelin, Egger, Abhandl. k. bayer. Akad. Wiss., II. Cl., Vol. XXI, Abh. I, p. 38, Pl. IV, fig. 23-24.

1935 *Gaudryina filiformis* Berthelin, Eichenberg, Oel & Kohle, 11. Jahrg., No. 28, Pl. VII, fig. 2-3.

1937 *Dorothia filiformis* (Berthelin), Cushman, Cush. Lab. for Foram. Research, Special Publ. No. 8, p. 73, Pl. 8, fig. 1-2.

1938 *Gaudryina* D-18 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 4, fig. 1-3; Pl. 6a, fig. 30-32.

1939 *Gaudryina filiformis* Berthelin, Mjatliuk, Trudi, Trans. Geol. Oil Inst., ser. A, fasc. 120, p. 50, Pl. I, fig. 11.

1954 *Dorothia filiformis* (Berthelin), Bartenstein, Senckenbg. leth., Vol. 35, p. 39, Pl. 1, fig. 14-15.

1961 *Gaudryina filiformis* Berthelin, Dain, Microfauna USSR, Vol. XII, p. 29, Pl. I, fig. 7-8.

1963 *Dorothia filiformis* (Berthelin), Crespin, Bureau Min. Resources, Geol. & Geophys., Bull. No. 66, p. 58, Pl. 16, fig. 8.

1965 *Dorothia filiformis* (Berthelin), Neagu, Micropal., Vol. 11, No. 1, p. 10, Pl. 2, fig. 24.

1966 *Dorothia filiformis* (Berthelin), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 144, Pl. I, fig. 43.

The original type of *Dorothia filiformis* was described from the Albian of France. The species has since been recorded from beds of Aptian and Barremian age. The specimen illustrated by J.G. Egger (1899), on the other hand, is derived from the late Cretaceous Gerhardsreuter beds of the Bavarian Alps.

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*, a concept which is not dealt with here.

1961 *Marssonella hauteriviana* n.sp., Moullade, Revue de Micropaleontol., Vol. 3, No. 4, p. 213, Pl. 1, 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 (*non* 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.[2]

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.

The cylindrical Upper Cretaceous species *Marssonella ellisorae* Cushman is even more slender (index length/breadth attains 3.7:1) and shows nearly parallel sides and a less truncate apertural border. *Marssonella ouachensis* Sigal, described from the Barremian of Algeria (Sigal, 1952), also displays an elongate, cylindrical, rather rounded test but clearly differs from the known species of *Marssonella* by its strongly limbate sutures.

Some tests from the Upper Valanginian of Sardinia, Italy, showing more depressed sutures and a more rounded border of the apertural face have been described and figured as *Dorothia praehauteriviana* (Dieni & Massari, 1966). These authors claim that *Marssonella praehauteriviana*, supposed to be a forerunner of *M. hauteriviana*, can be distinguished from the latter species by the length/breadth ratio. This ratio is stated to show values varying between 1.3:1 to 2.8:1 (average 1.9:1), whereas this value varies between 2.5:1 and 3:1 in *M. hauteriviana*. In all the figured specimens, however, the index length/breadth in *M. praehauteriviana* is higher than 2:1 (up to 2.7:1) and also the holotype reveals an index 2.5:1. It remains to be seen whether the Upper Valanginian form can be maintained as a true species or whether there is a gradual transition into *M. hauteriviana*. *Dorothia praehauteriviana* is also reported to occur in DSDP Holes 101A and 105 of Leg 11 in the northwestern Atlantic, in beds referred to as Valanginian.[3] These tests which show a length/breadth ratio of 2.8:1 to 3.3:1 are identical with those from the Gorringe 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 (Bettenstaedt & Wicher, 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 Gorringe Bank in Cores 3, 4, 5 and 7, the concerned species is proved to extend from the Hauterivian-Barremian up into the Aptian and basal Albian.

Marssonella kummi Zedler
(Plate 1, Figures 38, 39)

The species *M. kummi* was created to accomodate Lower Cretaceous tests similar to and often identified with the Upper Cretaceous *M. oxycona* (Reuss). *M. kummi* shows slight morphological differences with the species *M. oxycona*, for example a more slender test of smaller size, more and narrower chambers.

Test gradually tapering, rounded in transverse section; initial portion formed by 3 or 4 chambers (no spiral arrangement), later biserial; chambers low, sutures faintly depressed or flush with the surface; apertural face concave, aperture an elongate opening at the inner margin of the terminal chamber.

1934 *Gaudryina oxycona* Reuss, Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover, p. 153, Pl. 17, fig. 7.

1935 *Gaudryina oxycona* Reuss, Eichenberg, Oel & Kohle, 11. Jahrg., No. 22, Pl. XI, fig. 26.

1938 *Textularia* D-14, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 15a, fig. 60; Pl. 16b, fig. 76-77; Pl. 17b, fig. 10-14; Pl. 18a, fig. 1-19, 36-37; Pl. 18b, fig. 1.

1938 *Textularia* D-17, Hecht, *ibid.*, Pl. 20a, fig. 5-10.

1946 *Marssonella oxycona* (Reuss), Ten Dam, J. of Paleontol., Vol. 20, No. 6, p. 572, Pl. 87, fig. 9.

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

[3]Dr. H.-P. Luterbacher 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, Pl. 4, fig. 80; Pl. 17B, fig. 19; Pl. 18, fig. 45; Pl. 19A, fig. 14-17; Pl. 19B, fig. 48-51.
1955 *Marssonella oxycona* (Reuss), Bettenstaedt & Wicher, Proc. Fourth World Petr. Congr., sect. I/D, p. 493, Pl. 4, fig. 30.
1957 *Marssonella* cf. *oxycona* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 20, Pl. II, fig. 42-43.
1957 *Marssonella oxycona* (Reuss), Sztejn, Inst. Geol. Prace, Vol. XXII, p. 211, Pl. III, fig. 14.
1958 *Marssonella oxycona* (Reuss), Sztejn, Inst. Geol. Biul. 138, pl. 16, fig. 24.
1960b *Marssonella oxycona* (Reuss), Moullade, Revue de Micropal., Vol. 3, No. 2, p. 131, Pl. 1, fig. 1-5.
1961 *Marssonella kummi* n.sp., Zedler, Pal. Zeitschr., Vol. 35, Nr. 1/2, p. 31, Pl. 7, fig. 1.
1962 *Marssonella* aff. *oxycona* (Reuss), Arbeitskreis, Leitfoss. d. Mikropal., Pl. 35, fig. 11.
non 1966 *Marssonella oxycona* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 144, Pl. I, fig. 58-59.

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; 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. 7, fig. 1a).

As shown above in the synonymy, the species *M. kummi* includes *i.a. Textularia* D-14 of F. Hecht (1938, Pl. 18a, fig. 1-19, etc.), specimens which were subsequently placed in the new species *Dorothia 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. trochus* (d'Orbigny) / *M. subtrochus* 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-Barremian age.

Lenticulina Lamarck, 1804

Lenticulina ouachensis ouachensis (Sigal)
(Plate 2, Figure 1, 2)

The species *Lenticulina ouachensis* 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 (Bettenstaedt, 1952). *L. ouachensis* was subsequently split into *L. ouachensis ouachensis* (Sigal) and *L. ouachensis wisselmanni* (Bettenstaedt), the latter showing 2 or 3 encircled umbilical grooves (Bartenstein, Bettenstaedt & Bolli, 1957).

L. ouachensis ouachensis is characterized by its ornamentation, namely by the presence of a ring on the umbilical surface which is formed by the coalescence of the strongly elevated sutural ribs with the raised spiral suture. The periphery of the test is acute, usually provided with a fringed keel.

1938 *Cristellaria* D-113 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 39.
1938 *Cristellaria* D-114, Hecht, *ibid.*, Pl. 22, fig. 34-36.
1952 *Cristellaria ouachensis* n.sp., Sigal, Micropal. Crét., Int. Geol. Congr. Alger, 1. ser.-Alg., No. 26, p. 16, texfig. 10.
1952 *Lenticulina (Lenticulina) wisselmanni* n.sp. (*pars*), Bettenstaedt, Senckenbergiana, Vol. 33, No. 4/6, p. 269, Pl. 1, fig. 7, 8 (*non* 6).
1957 *Lenticulina (L.) ouachensis ouachensis* (Sigal), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 25, Pl. III, fig. 50; Pl. IV, fig. 71, 76.
1962 *Lenticulina ouachensis* (Sigal), Flandrin, Moullade & Porthault, Revue de Micropal., Vol. 4, No. 4, p. 218, Pl. 2, fig. 11.
1967 *Lenticulina (L.) ouachensis wisselmanni* Bettenstaedt (*pars*), Michael, Palaeontogr., Suppl. bd. 12, p. 36, Pl. XXIII, fig. 81; Pl. XXIV, fig. 93; Pl. XXV, fig. 57, 106.
1969 *Lenticulina ouachensis ouachensis* (Sigal), Kalantari, Nat. Iran. Oil. Co., Geol. Publ. No. 3, p. 148, Pl. 18, fig. 5; textfig. 23, No. 15.

L. ouachensis ouachensis shows a stratigraphical range from the Valanginian into the Lower Aptian (Europe, North Africa, Iran). The species is also reported from Site 105 (Core 18) of DSDP Leg 11 (preliminary report by H.-P. Luterbacher).

Lenticulina ouachensis multicella Bartenstein, Bettenstaedt & Bolli
(Plate 2, Figure 3)

1957 *Lenticulina (Lenticulina) ouachensis multicella* n.sp., Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 26, Pl. III, fig. 47; Pl. IV, fig. 68-69.

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

Lenticulina ouachensis multicella is recorded from the Barremian of Trinidad, France, Czechoslovakia, etc. It is also listed from Site 105 (Core 18) of DSDP Leg 11 (north margin of the Hatteras Abyssal Plain), associated with *Lenticulina ouachensis ouachensis*, in beds referred to as Hauterivian to late Valanginian.

Both *L. ouachensis ouachensis* and *L. ouachensis multicella* were found in Core 4 of Hole 120, Gorringe Bank to which a Lower Aptian to Barremian age is assigned.

Lenticulina praegaultina Bartenstein, Bettenstaedt & Bolli
(Plate 2, Figure 4)

1957 *Lenticulina praegaultina* n.sp., Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 24, Pl. III, fig. 48; Pl. IV, fig. 63-65.
1969 *Lenticulina gaultina* (Berthelin), Kalantari, Nat. Iran. Oil Co., Geol. Publ. No. 3, p. 145, Pl. 12, fig. 8-12.

This 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)

1863 *Cristellaria subangulata*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 74, Pl. VIII, fig. 7.
1934 *Robulus subangulatus* (Reuss), Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover; p. 157, Pl. XVI, fig. 4.
1938 *Cristellaria* D-81 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 16a, fig. 55.
1951 *Lenticulina (Lenticulina) subangulata* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 283, Pl. 5, fig. III; Pl. 15C, fig. 16,, 19.
1957 *Lenticulina subangulata* (Reuss), Sztejn, Inst. Geol. Prace, Vol. XXII, p. 217, Pl. IV, fig. 29.
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)

1863 *Cristellaria turgidula* Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 73, Pl. VIII, fig. 4.
1880 *Cristellaria ingenua* n.sp., Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, p. 54, Pl. 3, fig. 20-21.
1880 *Cristellaria circumcidanea* n.sp., Berthelin, *ibid.*, p. 52, Pl. 3, fig. 1.
1896 *Cristellaria turgidula* Reuss, Chapman, J. Roy. Microscopic Soc. London, Vol. VIII, p. l, Pl. 1, fig. 1.
1935 *Lenticulina* cf. *turgidula* (Reuss), Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. V, fig. 43; Pl. XI, fig. 2.
1966 *Lenticulina (Lenticulina) turgidula* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 147, Pl. II, fig. 115-119.
?1967 *Lenticulina (Astacolus) ingenua* (Berthelin), Fuchs & Stradner, Jahrb, Geol. Bundesanst., Vol. 110, p. 292, Pl. 9, fig. 3.

This Lower Cretaceous species shows an acute periphery, partly keeled, and a depressed umbilicus; 5-6 chambers in the last whorl which are separated by depressed sutures, particularly in the adult portion of the test. The last-formed subtriangular chamber is more inflated.

Rare specimens of *L. turgidula* occur in Cores 4 and 7 of Hole 120 (Lower Aptian-Barremian).

The few other specimens of *Lenticulina* found in the drilled Lower Cretaceous section of Gorringe Bank are tests of different size which may partly belong to the plexus *L. münsteri-subalata* of no stratigraphical value.

The assignment of the large group of subgenera of *Lenticulina*, such as *Planularia, Astacolus, Marginulinopsis, Vaginulinopsis*, etc., which may grade into each other, is obviously subject to an arbitrary evaluation of certain morphological features until a satisfactory classification of the *Lenticulina* spectrum will be available.

A comparison of the numerous illustrations of the different subgenera and species of this extensive group discloses the chaotic taxonomic confusion which is in many respects quite subjective and artificial. Nonequivocal subgeneric and specific delimitations do not exist which accounts in the transitional forms failing to fit into the definition of a given subgenus or species. Hence, another author might prefer to place a number of the forms listed on the following pages into different taxa.

Planularia Defrance, 1824

Planularia strombecki (Reuss)
(Plate 2, Figure 9)

1863 *Cristellaria strombecki*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 68, Pl. VII, fig. 7.
1962 *Astacolus strombecki* (Reuss), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 178, Pl. 46, fig. 14-15.
1965 *Lenticulina (Planularia) strombecki* (Reuss), Neagu, Micropal., Vol. 11, No. 1, p. 17, Pl. 4, fig. 31-32.
1966 *Lenticulina (Lenticulina) strombecki* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 147, Pl. II, fig. 111-114.

Compressed tests with a slightly broader ventral margin and flush sutures referable to the Lower Cretaceous species *Planularia strombecki* were observed in Cores 2, 4 and 5 of the Gorringe Bank section (Albian to Barremian).

Astacolus Montfort, 1808

Astacolus calliopsis (Reuss)
(Plate 2, Figures 10, 11)

Astacolus calliopsis belongs to a highly variable plexus of different intergrading morphotypes which have been given different specific names and partly reflect mere dimorphism. The tests are either curved or almost straight, with an insignificant spiral and strongly recurved sutures.

1863 *Marginulina calliopsis*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 60, Pl. V, fig. 16.
1863 *Cristellaria linearis*, Reuss, *ibid.*, p. 66, Pl. XII, fig. 1.
1863 *Cristellaria parallela*, Reuss, *ibid.*, p. 67, Pl. VII, fig. 1-2.
1894 *Cristellaria linearis* Reuss, Chapman, J. Roy. Microscopic Soc. London, Vol. VII, p. 645, Pl. 9, fig. 1.
1935 *Astacolus schloenbachi* (Reuss), *pars*, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. V, fig. 42; 38?.
1938 *Cristellaria* D-97 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 18b, fig. 53.
?1940 *Vaginulina linearis* (Reuss), Tappan, J. of Paleontol. Vol. 14, No. 2, p. 110, Pl. 17, fig. 6.
1951 *Lenticulina (Astacolus) calliopsis* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 286, Pl. 5, fig. 120-122.
1956 *Lenticulina (Astacolus) calliopsis* (Reuss), Bartenstein, Senckenbg. leth., Vol. 37, p. 515, Pl. 2, fig. 56.
1957 *Lenticulina (Astacolus) calliopsis* (Reuss), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 219, Pl. V, fig. 33.
1963 *Astacolus* sp. 3307, Espitalié & Sigal, Ann. Geol. Madagascar, fasc. XXXII, p. 28, Pl. VI, Fig. 5.
1966 *Lenticulina (Astacolus) calliopsis* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 149, Pl. II, fig. 151-154, 169-173.
1966 *Lenticulina (Astacolus) calliopsis* (Reuss), Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 123, Pl. IV, fig. 6-7.
1967 *Lenticulina (Astacolus) gladius* (Philippi), *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 42, Pl. XIX, fig. 73.
non 1958 *Astacolus calliopsis* (Reuss), Sztejn, Inst. Geol., Biul. 138, p. 25, textfig. 49.

The above synonymy is by no means complete. Other authors favor a still more comprehensive concept of the species, for example E. Michael (1967), who interprets *Astacolus calliopsis* (Reuss) as a junior synonym of *Astacolus compressus* (d'Orbigny), described in 1839 from the Upper Cretaceous of the Paris basin, and other rather different forms such as *Vaginulinopsis matutina* (d'Orbigny), *Vaginulinopsis schloenbachi* (Reuss), etc.

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.

Astacolus erucaeformis (Wisniowski)
(Plate 2, Figure 12)

1939 *Cristellaria erucaeformis* Wisniowski, Mjatliuk, Transact. Geol. Oil Inst., Ser. A, fasc. 120, p. 58, Pl. IV, fig. 47.
1960 *Astacolus erucaeformis* (Wisn.), Bielecka, Inst. Geol., Prace, Vol. XXXI, p. 127, Pl. IV, fig. 26.

The determination of the few tests from Core 3-CC as *Astacolus erucaeformis* 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 *Vaginulinopsis harpa* (Reuss), another Jurassic species (Bartenstein, Bettenstaedt & Bolli, 1966). A. E. Reuss's original specimens of *Cristellaria harpa* from the late Senonian of Germany (Reuss, 1960, Pl. X, fig. 1-2) differ, however, from the Trinidadian 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 *Vaginulinopsis harpa* Bartenstein, Bettenstaedt & Bolli (*non* Reuss).

Astacolus grata (Reuss)
(Plate 2, Figure 13)

As pointed out above with respect to the synonymy of *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 spira, low chambers separated by oblique sutures and with the apertural face extending far downwards towards the spira. 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 gladius* (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, Planularia strombecki, Marginulinopsis lituola, Vaginulinopsis dilecta*, etc. Without a thorough taxonomic revision of these variable groups, based on large populations rather than on scattered tests, any determination remains equivocal.

1863 *Cristellaria grata*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 71, Pl. VII, fig. 14.
1935 *Robulus gratus* Reuss, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. V, fig. 37.
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.
1956 *Lenticulina (Astacolus) grata* (Reuss), Bartenstein, Senckenbergiana leth., Vol. 37, p. 515, Pl. 1, fig. 5-6.
1957 *Astacolus gratus* (Reuss), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 221, Pl. V, fig. 36.
1958 *Astacolus gratus* (Reuss), Sztejn, Inst. Geol. Biul. 138, p. 27, textfig. 54.
1962 *Vaginulinopsis grata* (Reuss), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 179, Pl. 46, fig. 6-7.
1966 *Lenticulina (Astacolus) grata* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 148, Pl. II, fig. 130-133.
1967 *Lenticulina (Astacolus) gladius* (Philippi), *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 42, Pl. VIII, fig. 15, ?16; Pl. XIX, fig. 61.

The test figured from the Barremian of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1957, Pl. III, fig. 58), identified as *Lenticulina (Astacolus)* cf. *grata* (Reuss) shows the features of *Saracenaria*.

The specimen illustrated as *Astacolus grata* (Reuss) by T. Neagu (1965, Pl. 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 referred to as *Cristellaria gibba* forma *grata* and *C. gibba* forma *multisepta* (Franke, 1925, Pl. V, fig. 30 and 31) seem to be close to the Lower Cretaceous species.

The forms listed in the above synonymy of *Astacolus grata* (Reuss) occur in the stratigraphical interval Valanginian-Albian. The few tests observed in Core 7 of Hole 120 are of Barremian age (associated with *Gavelinella* aff. *barremiana* Bettenstaedt).

Astacolus? cf. *incurvata* (Reuss)
(Plate 2, Figure 14)

1863 *Cristellaria incurvata*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 66, Pl. VI, fig. 18.
1863 *Cristellaria perobliqua* Reuss, *ibid*., p. 67, Pl. VII, fig. 3.
1938 *Dentalina* D-9 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 56-57.
1938 *Cristellaria* D-85 (*pars*), Hecht, *ibid*., Pl. 10a, fig. 16; Pl. 11b, fig. 95.
1952b *Lenticulina (Astacolus) incurvata* (Reuss), Bartenstein, Senckenbg., Vol. 33, p. 301. (=*Cristellaria* D-85, *pars*, Hecht)
1957 *Lenticulina (Astacolus) incurvata* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 30, Pl. III, fig. 57; Pl. IV, fig. 86.
1966 *Lenticulina (Vaginulinopsis) incurvata* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 150, Pl. II, fig. 164-168.
1966 *Lenticulina (Astacolus)* cf. *incurvata* (Reuss), *pars*, Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 124, Pl. IV, fig. 3, 5; 4? (*non* fig. 2).
?1967 *Lenticulina (Astacolus) incurvata* (Reuss), Michael, Palaeontogr., Suppl. bd. 12, p. 43, Pl. XII, fig. 14.
1967 *Lenticulina (Astacolus) incurvata* (Reuss), Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 292, Pl. 8, fig. 7.

These slender tests lack an early spiral coil (developed in the similar *Astacolus calliopsis* (Reuss)) but have the chambers added from the initial blunt point in an oblique manner, therefore, an attribution to the subgenus *Astacolus* is questionable and inconsistent. 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 curved and subacute; sutures faintly depressed or flush with the surface of the tests. Apertural face elongate, convex, sometimes subtriangular (*Saracenaria* morphotype).

1863 *Cristellaria planiuscula*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 71, Pl. VII, fig. 15.
1880 *Cristellaria planiuscula* Reuss, Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, p. 53, Pl. 3, fig. 25.
1894 *Cristellaria planiuscula* Reuss, Chapman, J. Roy. Microscopic Soc. London, Vol. VII, p. 654, Pl. X, fig. 14.
1935 *Saracenaria planiuscula* (Reuss), Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. I, fig. 6.
1938 *Cristellaria* D-116, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 22, fig. 38-39.
1951 *Lenticulina (Astacolus) planiuscula* (Reuss), Noth, Jahrb. Geol. Bundesanst., Sonderbd. 3, p. 44, Pl. 3, fig. 6.
1962 *Marginulina planiuscula* (Reuss), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 170, Pl. 43, fig. 8-11.
1966 *Lenticulina (Astacolus) planiuscula* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 148, Pl. II, fig. 142-146.
1967 *Lenticulina (Astaolus) planiuscula* (Reuss), Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 292, Pl. 9, fig. 6.
non 1951 *Lenticulina (Astacolus)* cf. *planiuscula* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 287, Pl. 5, fig. 129.

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)

1880 *Cristellaria scitula*, Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, No. 5, p. 54, Pl. 3, fig. 3.
1938 *Cristellaria* D-63 (*pars*), Hecht, Senckenberg, Natf. Ges., Abhandl. 443, Pl. 2a, fig. 72-77; Pl. 2b, fig. 50; Pl. 3a, fig. 72?, 73; Pl. 3b, fig. 40? (*non* 39); Pl. 4b, fig. 26-31?; Pl. 5a, fig. 60-61?; Pl. 5b, fig. 37?; Pl. 6a, fig. 76-80; Pl. 9a, fig. 13?.
?1938 *Cristellaria* D-83, Hecht, *ibid*., Pl. 16a, fig. 58. = *Lenticulina (Marginulinopsis) scitula* (Berthelin) *fide* Bartenstein, 1952, Senckenbg. Vol. 33, No. 1/3, p. 175, 181.
1940 *Vaginulina tripleura* (Reuss), *pars*, Tappan, J. of Paleontol. Vol. 14, No. 2, p. 111, Pl. 17, fig. 12 (*non* 11).
1954 *Citharina tripleura* (Reuss) = *Enantiomarginulina* ? *enigmata* Bullard, *pars*, Frizzell, Bureau of Econ. Geol., Univ. Texas, Rep. of Invest. No. 22, p. 96, 158, Pl. 11, fig. 34 (*non* 33).
1954 *Lenticulina scitula* (Berthelin), Bartenstein, Senckenbg. leth., Vol. 35, No. 1/2, p. 46.

1962 *Lenticulina (Astacolus)* cf. *schloenbachi* (Reuss), *pars*, Bartenstein & Bettenstaedt, Arbeitskreis, Leitfoss. d. Mikropal., p. 285, Pl. 37, fig. 9.
1966 *Lenticulina (Astacolus) scitula* (Berthelin), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 149, Pl. II, fig. 147-150.
1966 *Lenticulina (Astacolus)* cf. *incurvata* (Reuss), *pars*, Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 124, Pl. IV, (fig. 2,; fig. 4?.
1967 *Lenticulina (Astacolus) gladius* (Philippi), *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 42, Pl. IV, fig. 12; Pl. VIII, fig. 16?.
non 1935 *Astacolus humilis* (Reuss), Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, p. 395, Pl. V, fig. 38. = *Lenticulina (Astacolus) scitula* (Berthelin) *fide* Bartenstein & Bettenstaedt, 1962, Arbeitskreis, Leitfoss. d. Mikropal., p. 285.
non 1935 *Astacolus schloenbachi* (Reuss), Eichenberg, *ibid.*, p. 395, Pl. V, fig. 42. = *Lenticulina (Astacolus) scitula* (Berthelin) *fide* Bartenstein & Bettenstaedt, 1962, Arbeitskreis, Leitfoss. d. Mikropal., p. 285.
non 1943 *Vaginulina tripleura* (Reuss), Tappan, J. of Paleontol., Vol. 17, No. 5, p. 501, Pl. 80, fig. 25-26.
non 1953 *Enantiomarginulina similis* n. sp., Bullard, J. of Paleontol., Vol. 27, No. 3, p. 340, Pl. 45, fig. 1-4.
non 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.
non 1962 *Lenticulina (Astacolus) scitula* (Berthelin), *pars*, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 149, *pro Lenticulina (Astacolus)* cf. *schloenbachi* (Reuss), *pars*, Arbeitskreis, Leitfoss. d. Mikropal., p. 285, Pl. 39, fig. 7.

The forms present in Cores 2, 3 and 4 of Hole 120 seem to be identical with those described and figured as *Lenticulina (Astacolus) scitula* (Berthelin) from the Upper Aptian-Middle Albian Maridale 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 (*non* Pl. 39, fig. 7).

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 scitula* Berthelin is, however, usually placed in *Astacolus*.

Astacolus scitula is considered by E. Michael (1967) to be a junior synonym of *Astacolus gladius* (Philippi), *A. cymboides* (d'Orbigny), *A. lituola* (Reuss), *A. grata* (Reuss), *A. planiuscula* (Reuss), *A. dilecta* (Reuss), *Planularia strombecki* (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 other new species *Enantiomarginulina similis* Bullard. Both the latter species occur in the Lower Cenomanian of Texas (Bullard, 1953).

In a later publication, the name *Vaginulina tripleura* was applied to different forms from the Albian 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 also cannot be used for our tests which we refer herewith to *Astacolus? scitula* (Berthelin).

The tests of *Astacolus? scitula* 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? scitula* are also known from the Jurassic, for example, Terquem's *Cristellaria anceps, hybrida, semi-involuta, Astacolus inconstans* (Schwager), etc.

Astacolus? scitula (Berthelin) is reported from beds of Barremian to Albian age.

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

1849-1850 *Cristellaria vetusta* n. sp., d'Orbigny, Prodrome de Pal., Vol. 1, p. 242, No. 267.
1936 *Cristellaria vetusta* d'Orbigny, MacFadyen, J. Roy. Microscopic. Soc., Vol. LVI, p. 151, Pl. I, fig. 267.
1937 *Cristellaria (Astacolus) vetusta* (d'Orbigny), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 439, p. 172, Pl. 3, fig. 43; 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 Albian of Holland (Fuchs & Stradner, 1967, Pl. 9, fig. 7).

Saracenaria Defrance, 1825
Saracenaria gr. *bronnii* (Roemer)
(Plate 2, Figure 20)

The forms belonging to the spectrum *Saracenaria bronnii* 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 *Vaginulinopsis* as well as with *Marginulinopsis* (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. *bronnii*. 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 Albian of Alaska (Tappan, 1960, 1962).

1960 *Saracenaria grandstandensis* n. sp., Tappan, Bull. AAPG, Vol. 44, No. 3, pt. I, p. 293, Pl. 2, fig. 8-10.
1962 *Saracenaria grandstandensis* Tappan, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 162, Pl. 41, fig. 3-5.

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 Albian of Trinidad (Bartenstein, Bettenstaedt & Bolli, 1966, Pl. II, fig.

147-150), assigned to *Lenticulina (Astacolus) scitula* (Berthelin), seem to be close to *Saracenaria grandstandensis.*

Marginulinopsis Silvestri, 1904
Marginulinopsis cephalotes (Reuss)
(Plate 2, Figures 23, 24)

Available are only two juvenile stout tests which display a strongly depressed suture between the early part and the final inflated chamber which is also observed in several specimens figured in the pertinent literature on *Marginulinopsis cephalotes* (Reuss).

1863 *Cristellaria cephalotes*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 67, Pl. VII, fig. 5-6.
?1880 *Cristellaria trunculata* n. sp., Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, p. 53, Pl. 3, fig. 26-27.
1934 *Robulus* sp., Eichenberg, 26. Jahresber. Niedersächs. geol Ver., Hannover, p. 155, Pl. XIII, fig. 7.
1950 *Vaginulinopsis cephalotes* (Reuss), Ten Dam, Mém. Soc. Géol. France, Vol. XXIX, No. 4, Mém. No. 63, p. 39, Pl. III, fig. 9.
1957 *Astacolus cephalotes* (Reuss), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 219, Pl. V, fig. 34.
1958 *Astacolus cephalotes* (Reuss), Sztejn, Inst. Geol., Biul. 138, p. 25, textfig. 48.
1962 *Marginulina cephalotes* (Reuss), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 168, Pl. 43, fig. 14-17.
1965 *Lenticulina (Vaginulinopsis) cephalotes* (Reuss), Neagu, Micropal., Vol. 11, No. 1, p. 12, Pl. 4, fig. 12.
1966 *Lenticulina (Marginulinopsis) cephalotes* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 150, Pl. II, fig. 179-180.
1967 *Lenticulina (Marginulinopsis) cephalotes* (Reuss), Michael, Palaeontogr. Suppl. bd. 12, p. 46, Pl. XI, fig. 20.
1967 *Lenticulina (Marginulinopsis) cephalotes* (Reuss), Fuchs & Stradner, Jahrb. Geol. Bundesanst., p. 296, Pl. 11, fig. 6.

Forms referable to *Marginulinopsis cephalotes* (Reuss) are represented in many Lower Cretaceous foraminiferal associations from the Hauterivian up to the Albian (Europe, Trinidad, Alaska, Madagascar, etc.). Core 7-1 which has yielded the figured tests is assigned to the Barremian Stage.

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

1863 *Cristellaria gracilissima*, Reuss, Stiz. 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.
1935 *Astacolus gracilissimus* Reuss, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. XI, fig. 8.
1938 *Marginulina* D-21, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 66; Pl. 8a, fig. 19; Pl. 9a, fig. 29; Pl. 10a, fig. 15; Pl. 11b, fig. 1-9; 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. 15b, fig. 51-55; Pl. 19b, fig. 31-50; 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.
1938 *Marginulina* D-27 *(pars)*, Hecht, *ibid*., Pl. 23, fig. 87-88.
1938 *Cristellaria* D-102 *(pars)*, Hecht, *ibid*., Pl. 18a, fig. 62-63.
1939 *Marginulina 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 (Marginulinopsis) gracilissima* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 288, Pl. 6, fig. 139; Pl. 14C, fig. 23-26.
1956 *Lenticulina (Marginulinopsis) gracilissima* (Reuss), Bartenstein, Senckenberg. leth., Vol. 37, p. 516, Pl. 2, fig. 59.
1956 *Lenticulina (Marginulinopsis) foeda* (Reuss), Bartenstein, *ibid*., p. 516, Pl. 2, fig. 57-58.
1957 *Lenticulina (Marginulinopsis)* cf. *gracilissima* (Reuss), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 31, Pl. VI, fig. 121.
1961 *Lenticulina (Marginulinopsis) gracilissima* (Reuss), Zedler, Pal. Zeitschr., Vol. 35, No. 1/2, p. 39, Pl. 8, fig. 8-10; textfig. 3 (p. 40).
1962 *Lenticulina (Marginulinopsis) gracilissima* (Reuss), Arbeitskreis, Leitfoss. d. Mikropal., p. 256, Pl. 38, fig. 2.
1963 *Marginulina gracilissima* (Reuss), Espitalié & Sigal, Ann. Géol. Madagascar, fasc. XXXII, p. 44, Pl. XVIII, fig. 17.
?1966 *Lenticulina (Astacolus) schloenbachi mediterranea* n. subsp., Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 126, Pl. IV, fig. 8-10.
1967 *Lenticulina (Marginulinopsis) 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, 40, 62, 78, 100; Pl. XXI, fig. 38, 80-82; Pl. XXII, fig. 53; Pl. XXIII, fig. 20, 25, 73, 85-86; Pl. XXIV, fig. 79; Pl. XXV, fig. 41; Pl. XXVI, fig. 10, 40.
1969 *Marginulinopsis gracilissima* (Reuss), Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 25, No. 10.

Marginulinopsis 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 Albian of Iran (Kalantari, 1969).

Vaginulinopsis Silvestri, 1904

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

Vaginulinopsis dilecta was originally described from Hauterivian beds of Germany (Reuss, 1863). It is placed in synonymy with *Vaginulinopsis pachynota* known from the Hauterivian and Barremian 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. dilecta*, 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.

1863 *Cristellaria dilecta*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 71, Pl. VII, fig. 12.
1938 *Cristellaria* D-111 *(pars)*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 14a, fig. 8, 10-12.
1938 *Cristellaria* D-115, Hecht, *ibid*., Pl. 12b, fig. 70-71; Pl. 13a, fig. 4-5; Pl. 14a, fig. 5-6; Pl. 15b, fig. 1-13.
1946 *Vaginulinopsis pachynota* n.sp., Ten Dam, J. of Paleontol., Vol. 20, No. 6, p. 575, Pl. 88, fig. 5-6.
1956 *Lenticulina (Vaginulinopsis) pachynota* Ten Dam, Bartenstein, Senckenberg. leth., Vol. 37, p. 516, Pl. 2, fig. 55.
1961 *Lenticulina (Astacolus) pachynota* Ten Dam, Zedler, Pal. Zeitschr., Vol. 37, p. 37, Pl. 8, fig. 7.
1962 *Lenticulina (Astacolus) pachynota* (Ten Dam), = *Cristellaria* D-115, Hecht, 1938. Bartenstein, Senckenbg. leth., Vol. 43, No. 2, p. 126.
1967 *Lenticulina (Astacolus) pachynota* Ten Dam, Michael, Palaeontogr., Suppl. bd. 12, p. 43, Pl. IV, fig. 13.
non 1962 *Vaginulinopsis pachynota* Ten Dam, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 180, Pl. 47, fig. 6.

The specimen figured from the Lower Albian of Alaska (Tappan, 1962), showing thin depressed sutures, cannot be identified with *Vaginulinopsis pachynota* Ten Dam.

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 *Vaginulinopsis prima* (d'Orbigny) (Bartenstein, Bettenstaedt & Bolli, 1966).

1848 *Cristellaria excentrica,* Cornuel, Mém. Soc. Géol. France, 2e sér., Vol. III, Mém. No. 3, p. 254, Pl. II, fig. 11-13.
1849 *Cristellaria prima* n.sp., d'Orbigny, Prodrome de Pal., Vol. 1, p. 242, No. 266.
1936 *Cristellaria prima* d'Orbigny, MacFadyen, J. Roy. Microscop. Soc., Vol. LVI, p. 151, Pl. I, fig. 266.

1937 *Cristellaria (Astacolus) prima* d'Orbigny, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 439, p. 172, Pl. 1A, fig. 25; Pl. 3, fig. 44; Pl. 4, fig. 82; Pl. 5, fig. 54; Pl. 6, fig. 32; Pl. 9, fig. 48; Pl. 10, fig. 37; Pl. 11A, fig. 12, Pl. 12B, fig. 13; Pl. 13, fig. 33; Pl. 15C, fig. 17. ? Pl. 2A, fig. 17; Pl. 12A, fig. 15.
1938 *Cristellaria* D-82 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 11b, fig. 75.
1957 *Lenticulina (Vaginulinopsis) prima* (d'Orbigny), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 31, Pl. III, fig. 59; Pl. IV, fig. 89-90.
1966 *Lenticulina (Vaginulinopsis) excentrica* (Cornuel), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 149, Pl. II, fig. 136-138.
non 1965 *Lenticulina (Vaginulinopsis)* cf. *prima* (d'Orbigny), Neagu, Micropal., Vol. 11, No. 1, p. 16, Pl. 4, fig. 13.

Vaginulinopsis excentrica is a widely distributed form known from the Liassic up into the Cretaceous.

Vaginulinopsis matutina (d'Orbigny)
(Plate 2, Figure 30)

1849 *Cristellaria matutina*, d'Orbigny, Prodrome de Pal., Paris, p. 242, No. 264.
1936 *Cristellaria matutina* d'Orbigny, MacFadyen, J. Roy. Microscopic Soc. London, Vol. LVI, p. 151, Pl. 1, fig. 264.
1957 *Lenticulina (Vaginulinopsis) matutina* (d'Orbigny), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 31, Pl. VI, fig. 120.

This Jurassic-Cretaceous species differs from *Vaginulinopsis excentrica-prima* by its straight uncoiled part. This being the main morphological criterion, those two species intergrade and can only be differentiated in typical specimens.

Vaginulinopsis schloenbachi (Reuss)
(Plate 2, Figures 31, 32)

1863 *Cristellaria schloenbachi*, Reuss, Sitz, ber. k. Akad. Wiss, Wien, Vol. 46, p. 65, Pl. VI, fig. 14-15.
1894 *Cristellaria schloenbachi* Reuss, Chapman, J. Roy. Microscopic Soc. London, Vol. VII, p. 649, Pl. IX, fig. 9.
1935 *Astocolus schloenbachi* (Reuss) *pars*, Eichenberg. Oel u. Kohle, 11. Jahrg., No. 22, Pl. XII, fig. 6. Non Pl. V, fig. 42.
1938 *Cristellaria* D-85 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 9a, fig. 12 (*non* 13); Pl. 9b, fig. 8; Pl. 10b, fig. 104-106.
1938 *Cristellaria* D-102 (*pars*), Hecht, *ibid.*, Pl. 15a, fig. 36; Pl. 16b, fig. 51; Pl. 18a, fig. 63; Pl. 18b, fig. 51; Pl. 19a, fig. 49; Pl. 19b, fig. 20-21.
1951 *Lenticulina (Astacolus) schloenbachi* (Reuss), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 286, Pl. 5, fig. 124-125.
?1957 *Astacolus schloenbachi* (Reuss), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 223, Pl. V, fig. 40.
?1958 *Astacolus schloenbachi* (Reuss), Sztejn, Inst. Geol., Biul. 138, p. 26, textfig. 51.
1958 *Astacolus calliopsis* (Reuss), *pars*, Sztejn, Inst. Geol., Biul. 138, p. 25, textfig. 49b (*non* 49a).
1962 *Vaginulinopsis schloenbachi* (Reuss), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 180, Pl. 46, fig. 12-13.
?1967 *Lenticulina (Astacolus) gladius* (Philippi), *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 42, Pl. XIX, fig. 61.
1969 *Marginulina planitesta* Tappan, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, p. 155, textfig. 24, No. 12; Pl. 15, fig. 15.
non 1962 *Lenticulina (Astacolus)* cf. *schloenbachi* (Reuss), Arbeitskreis, Leitfoss. d. Mikropal., p. 285, Pl. 37, fig. 9; Pl. 39, fig. 7.
non 1967 *Lenticulina (Marginulinopsis) schloenbachi* (Reuss), Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 298, Pl. 12, fig. 14.

The species *Vaginulinopsis schloenbachi*, orginally described on material from the Lower Cretaceous of Germany (Reuss, 1863), is represented by slender curved tests with a rudimentary incomplete spira (or an arcuate initial portion) which is succeeded by chambers of different size. The separating sutures are oblique and depressed and both back and ventral side are more or less rounded (oval in transverse section), whereas the similar *Astacolus calliopsis* (Reuss) shows a subacute dorsal periphery and usually a better developed spira. The occurrence of transitional forms between *V. schloenbachi* and *A. calliopsis* renders a clear-cut denomination of both genus and species often difficult and subjective.

Vaginulinopsis schloenbachi is known from beds of Valanginian to Albian age. In Hole 120, it is represented rarely in Cores 2, 3 and 7.

The different forms listed and figured as *Astacolus* cf. *schloenbachi* (Reuss) by H. Bartenstein & F. Bettenstaedt (1962, Leitfoss. d. Mikropal., Pl. 37, fig. 9, and Pl. 39, fig. 7) cannot be aligned with that species. Both were subsequently referred to *Astacolus scitula* (Berth.) (Bartenstein, Bettenstaedt & Bolli, 1966). One of the specimens (Pl. 37, fig. 9) would be better placed in *Saracenaria* (*S.* cf. *grandstandensis* Tappan), the other in *Vaginulinopsis dilectapachynota*.

The illustrated *Marginulina*-like test of *Lenticulina (Marginulinopsis) schloenbachi* from the Albian of Holland (Fuchs & Stradner, 1967, Pl. 12, fig. 14) fails to show the principal features of that species, namely the individually inflated chambers and depressed sutures.

Marginulina d'Orbigny, 1826

Marginulina hamulus Chapman
(Plate 3, Figure 1)

1894 *Marginulina hamulus* n.sp., Chapman, J. Roy. Microscopic Soc. London, Vol. V, p. 161, Pl. IV, fig. 13.
1934 *Marginulina hamulus* Chapman, Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover, p. 161, Pl. XI, fig. 16.
1967 *Marginulina hamulus* Chapman, Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 305, Pl. 12, fig. 11.
non 1941 *Marginulina hamulus* Chapman, Marie, Mém. Mus. Nat. d'Hist. Nat., n.s., Vol. XII, fasc, 1, p. 106, Pl. XIII, fig. 153.

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. hamulus* 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. hamulus* 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 which truncates and covers all the previous chambers to a great extent, an attribution to the Cretaceous *Astacolus obvelata* (Reuss) (for example, Reuss, 1850, Pl. II, fig. 11; Eichenberg, 1934, Pl. XV, fig. 9) is evident.

Marginulina hamulus as figured from the Hauterivian of Germany (Eichenberg, 1934, Pl. XI, fig. 16) shows transitional features to certain tests of the late Cretaceous species *Marginulina elongata* d'Orbigny (d'Orbigny, 1839, p. 17, Pl. I, fig. 22), which again is very close to *Marginulina inflata* Neugeboren from the Hungarian Tertiary. Certain Upper Cretaceous specimens figured as *Marginulina elongata* d'Orbigny (Reuss, 1846, Pl. XXIV, fig. 31-34), on the other hand, show a pronouncedly pointed aboral end and a strongly inflated, overlapping final chamber and, hence, seem closer to *Marginulina hamulus.*

Marginulina hamulus occurs in the Albian (England, Holland) as well as in the German Hauterivian. A single specimen was found in Core 4 of Hole 120 on Gorringe Bank (Lower Aptian-Barremian).

Marginulina inaequalis Reuss
(Plate 3, Figure 2)

1860 *Marginulina inaequalis*, Reuss, Sitz. ber. k. Akad. Wiss. Wien. Vol. 40, p. 207, Pl. V, fig. 3.
1863 *Marginulina inaequalis* Reuss, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 59, Pl. V, fig. 13; Pl. VI, fig. 8.
1890 *Marginulina inaequalis* Reuss, Chapman, J. Roy. Microscopic Soc., London, Vol. XIV, p. 160, Pl. IV, fig. 12.
1950 *Marginulina inaequalis* Reuss, Ten Dam, Mém. Soc. Géol. France, n.sér., Vol. XXIX, fasc. 4, Mém. No. 63, p. 22, Pl. II, fig. 3.

1965 *Marginulina inaequalis* Reuss, Neagu, Micropal., Vol. 11, No. 1, p. 17, Pl. 4, fig. 33.
1967 *Marginulina inaequalis* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanst., Vol. 110, p. 306, Pl. 10, fig. 7.

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 and 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 Reuss
(Plate 3, Figure 3)

1863 *Marginulina linearis*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 60, Pl. V, fig. 15.
1894 *Marginulina linearis* Reuss, Chapman, J. Roy. Microscop. Soc. London, Vol. V, p. 161, Pl. IV, fig. 14.
1934 *Marginulina linearis* Reuss, Eichenberg, 26. Jahresber. Niedersächs. Geol. Ver., Hannover, p. 161, Pl. XI, fig. 2, 7.
1935 *Marginulina linearis* Reuss, Eichenberg, Oel u. Kohle, Jahrg. 11, No. 22, p. 395, Pl. VI, fig. 5.
1938 *Dentalina* D-8, *pars*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 11b, fig. 17-21; Pl. 15b, fig. 39-45.
1938 *Dentalina* D-16, Hecht, *ibid.*, Pl. 5a, fig. 45-46.
?1940 *Vaginulina linearis* (Reuss), Tappan, J. of Paleontol., Vol. 14, No. 2, p. 110, Pl. 17, fig. 6.
1966 *Marginulina linearis* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 151, Pl. II, fig. 160-163; Pl. III, fig. 210.
1967 *Lenticulina (Marginulinopsis) linearis* (Reuss), *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 45, Pl. XXIII, fig. 26-27; Pl. XXIV, fig. 60; Pl. XXV, fig. 107.

This species, too, discloses a high variability if the relevant literature is consulted. Its rounded test shows distinct, oblique sutural restrictions, certain forms have a rudimentary spira developed (*Marginulinopsis* type), but in most cases the initial globular portion is curved forward without a spira. The last-formed chamber is large and inflated and carries an apertural neck. Certain types bear the characteristics of *Dentalina*.

Some authors consider *Marginulina linearis* to represent the megalospheric generation of forms like *Marginulinopsis gracilissima* (Reuss) or *Vaginulinopsis schloenbachi* (Reuss).

According to the given synonymy, *Marginulina linearis* ranges from the Hauterivian into the basal Cenomanian.

In Hole 120, there are only two juvenile tests referable to *Marginulina linearis* (Cores 2 and 4).

Dentalina d'Orbigny, 1826

Dentalina communis d'Orbigny
(Plate 3, Figures 4, 5)

Dentalina communis is one of the most common species of the genus in Cretaceous, Tertiary, and Recent populations. Although not justified by morphological differences, the new species *Dentalina praecommunis* was erected for the Lower Cretaceous forms (Tappan, 1960).

1840 *Dentalina communis* d'Orbigny, d'Orbigny, Mém. Soc. Géol. France, Vol. 4, Mém. No. 1, p. 13, Pl. I, fig. 4.
1845 *Nodosaria (Dentalina) communis* d'Orbigny, Reuss, Verst. Böhm. Kreideform., p. 28, Pl. XII, fig. 21.
1893 *Nodosaria cylindroides* Reuss, Chapman, J. Roy. Microscop. Soc. London, p. 589, Pl. VIII, fig. 34.
1935 *Dentalina communis* d'Orbigny, Eichenberg, Oel u. Kohle, Jahrg. 11, No. 22, Pl. V, fig. 16.
1938 *Dentalina* D-8, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 5a, fig. 42-44.
1938 *Dentalina* D-17, Hecht, *ibid.*, Pl. 5a, fig. 49-51, 54-56.
1938 *Dentalina* D-12, Hecht, *ibid.*, Pl. 11b, fig. 22-26; Pl. 13a, fig. 11-16; Pl. 14b, fig. 35-36; Pl. 16b, fig. 47.
1938 *Dentalina* D-9 (*pars*), Hecht, *ibid.*, Pl. 9a, fig. 24-26.
1940 *Dentalina communis* d'Orbigny, Tappan, J. of Paleontol., Vol. 14, No. 2, p. 102, Pl. 16, fig. 1.
1943 *Dentalina communis* d'Orbigny, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 495, Pl. 79, fig. 28-29.
1944 *Dentalina communis* d'Orbigny, Lozo, Am. Midl. Nat., Vol. 31, p. 554, Pl. 4, fig. 9.
?1950 *Enantiodentalina communis* d'Orbigny, Ten Dam, Mém. Soc. Géol. France, Mém. No. 63, p. 41, Pl. III, fig. 12.
1951 *Dentalina communis* d'Orbigny, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 308, Pl. 9, fig. 228-231; Pl. 14a, fig. 18; Pl. 16, fig. 34?; Pl. 18, fig. 61-65.
1951 *Dentalina communis* d'Orbigny, Noth, Jahrb. Geol. Bundesanstalt, Sonderbd. 3, p. 53, Pl. 4, fig. 17.
1957 *Dentalina communis* d'Orbigny, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 34, Pl. VII, fig. 144-145.
1957 *Dentalina communis* d'Orbigny, Sztejn, Inst. Geol., Prace, Vol. XXII, p. 225, Pl. V, fig. 41.
1958 *Dentalina communis* d'Orbigny, Sztejn, Inst. Geol., Biul. 138, p. 37, textfig. 82.
1960 *Dentalina praecommunis* n. sp., Tappan, Bull, AAPG, Vol. 44, No. 3, pt. I, p. 295, Pl. 2, fig. 3-4.
1962 *Dentalina praecommunis* Tappan, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 175, Pl. 45, fig. 15-16.
1966 *Dentalina communis* d'Orbigny, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 153, Pl. III, fig. 195-199.
1966 *Dentalina communis* d'Orbigny, Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. S. XXXI), p. 137, Pl. V, fig. 2-3.
1967 *Dentalina communis* d'Orbigny, Michael, Palaeontogr., Suppl. bd. 12, p. 61, Pl. V, fig. 1-2; Pl. XVIII, fig. 32, 39; Pl. XIX, fig. 43; Pl. XX, fig. 70; Pl. XXII, fig. 29; Pl. XXIII, fig. 23, 93 (*non* 28); Pl. XXVI, fig. 15.
1967 *Dentalina communis* d'Orbigny, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 284, Pl. 8, fig. 5.
1969 *Dentalina communis* d'Orbigny, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, p. 159, Pl. 15, fig. 16.
non 1965 *Dentalina communis* d'Orbigny, Neagu, Micropal., Vol. 11, No. 1, 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.

1860 *Dentalina cylindroides*, Reuss, Sitz. ber. k. Akad. Wiss, Wien, Vol. 40, p. 185, Pl. I, fig. 8.
1863 *Nodosaria (Dentalina) cylindroides* Reuss, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 41, Pl. II, fig. 16.
1925 *Dentalina cylindroides* Reuss, Franke, Abhandl. geol.-pal. Inst. Univ. Greifswald, Vol. VI, p. 28, Pl. II, fig. 14.
1935 *Dentalina cylindroides* Reuss, Eichenberg, Oel. u. Kohle, 11. Jahrg., No. 22, Pl. V, fig. 13.
1938 *Dentalina* D-9, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 55; Pl. 8a, fig. 26; Pl. 9a, fig. 25 (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 Paleontol., Vol. 14, No. 2, p. 102, Pl. 16, fig. 2.
1951 *Dentalina cylindroides* Reuss-Brotzen, Noth, Jahrb. Geol. Bundesanstalt, Sonderbd. 3, p. 52, Pl. 2, fig. 17.
1966 *Dentalina cylindroides* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 153, Pl. III, fig. 200-202, 218-219.
1967 *Dentalina soluta* Reuss (*pars*), Michael, Palaeontogr., Suppl. bd. 12, p. 62, Pl. XXVI, fig. 24.
?1967 *Dentalina cylindroides* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 285, Pl. 7, fig. 8.
non 1893 *Nodosaria cylindroides* (Reuss), Chapman, J. Roy. Microscop. Soc. London, Vol. IV, p. 589, Pl. 8, fig. 34.

non 1943 *Dentalina cylindroides* Reuss, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 495, Pl. 79, fig. 30-31.

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.

1860 *Dentalina distincta*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 40, p. 184, Pl. II, fig. 5.
1938 *Dentalina* D-11 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 5a, fig. 47-48, 52-53; Pl. 6b, fig. 37-39.
1950 *Dentalina distincta* Reuss, Ten Dam, Mém. Soc. Géol., France, Mém. No. 63, p. 28, Pl. II, fig. 15.
1962 *Dentalina distincta* Reuss, Arbeitskreis, Leitfoss. d. Mikropal., p. 280, Pl. 39, fig. 21.
1962 *Dentalina distincta* Reuss, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 175, Pl. 45, fig. 18.
1966 *Dentalina distincta* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 153, Pl. III, fig. 203-204, 209, 217.
1967 *Dentalina distincta* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 286, Pl. 7, fig. 6-7.

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 *D. communis, D. cylindroides, D. distincta,* and *D. soluta* (Cores 2-5, 7).

1840 *Dentalina gracilis* d'Orbigny, d'Orbigny, Mém. Soc. Géol. France, Vol. 4, Mém. No. 1, p. 14, Pl. I, fig. 5.
1938 *Dentalina* D-7, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 5a, fig. 39-41.
1946 *Dentalina gracilis* d'Orbigny, Cushman, U.S. Geol. Surv. Profess. Paper 206, p. 65, Pl. 23, fig. 3-6.
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.
1966 *Dentalina gracilis* d'Orbigny, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 153, Pl. III, fig. 187-194, 208.

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, are, 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.

1845 *Nodosaria (Dentalina) legumen*, Reuss, Verst. Böhm. Kreideform., p. 28, Pl. XIII, fig. 23-24.
1850 *Dentalina legumen* Reuss, Reuss, Haidingers Naturw. Abhandl., Vol. IV, Abt. 1, p. 26, Pl. I, fig. 14.
1860 *Dentalina legumen* Reuss, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 40, p. 187, Pl. III, fig. 5.
1893 *Dentalina legumen* Reuss, Chapman, J. Roy. Microscop. Soc. London, Vol. IV, p. 589, Pl. 8, fig. 37.
1934 *Dentalina* sp., Eichenberg, 26. Jahresber. Niedersächs. Geol. Ver., Hannover, p. 167, Pl. XII, fig. 11.
1935 *Dentalina legumen* Reuss, Eichenberg, Oel u. Kohle, Jahrg. 11, No. 22, Pl. V, fig. 19.
1946 *Dentalina legumen* Reuss, Cushman, U.S. Geol. Surv. Profess. Paper 206, p. 65, Pl. 23, fig. 1-2.
1951 *Dentalina legumen* Reuss, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 309, Pl. 9, fig. 232.
?1951 *Dentalina legumen* Reuss, Noth, Jahrb. Geol. Bundesanstalt, Sonderbd. 3, p. 51, Pl. 2, fig. 18.
1957 *Dentalina legumen* Reuss, Sztejn, Inst., Geol., Prace, Vol. XXII, p. 225, Pl. V, fig. 42.
1958 *Dentalina legumen* Reuss, Sztejn, Inst. Geol., Biul. 138, p. 37, textfig. 83.
1965 *Dentalina legumen* Reuss, Neagu, Micropal., Vol. 11, No. 1, p. 20, Pl. 5, fig. 32, 34.
1966 *Dentalina legumen* Reuss, Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n.S. XXXI), p. 138, Pl. V, fig. 4.
?1967 *Dentalina legumen* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 287, Pl. 8, fig. 3.

Dentalina linearis (Roemer)
(Plate 3, Figure 11)

1841 *Nodosaria linearis*, Roemer, Verst. norddeutsch. Kreidegeb., p. 95, Pl. XV, fig. 5.
1934 *Dentalina linearis* (Roemer), Eichenberg, 26. Jahresber. Niedersächs. geol Ver., Hannover, p. 164, Pl. X, fig. 13.
1934 *Dentalina* spp., Eichenberg, *ibid.*, Pl. XIV, fig. 9, 14.
?1934 *Dentalina farcimen* (Soldani), Eichenberg, *ibid.*, p. 168, Pl. XIV, fig. 10.
1934 *Dentalina* cf. *soluta* Reuss, Eichenberg. *ibid.*, p. 164, Pl. X, fig. 14.
1938 *Glandulina* D-11 (*pars*), Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 20b, fig. 80-81.
1938 *Dentalina* D-12 (*pars*), Hecht, *ibid.*, Pl. 18a, fig. 74-75.
?1938 *Dentalina* D-14, Hecht, *ibid.*, Pl. 16b, fig. 48.
1951 *Dentalina linearis* (Roemer), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 309, Pl. 9, fig. 234-236, 337.
1956 *Dentalina linearis* (Roemer), Bartenstein, Senckenbg. leth., Vol. 37, p. 520, Pl. 1, fig. 18.
1957 *Dentalina linearis* (Roemer), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 35, Pl. VII, fig. 148.
1957 *Dentalina linearis* (Roemer), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 225, Pl. V. fig. 43.
1958 *Dentalina linearis* (Roemer), Sztejn, Inst. Geol., Biul. 138, p. 37, textfig. 84.
1965 *Dentalina linearis* (Roemer), Neagu, Micropal., Vol. 11, No. 1, p. 20, Pl. 5, fig. 1.
1966 *Dentalina linearis* (Roemer), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 153, Pl. III, fig. 205.
?1967 *Dentalina cylindroides* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 285, Pl. 7, fig. 8.

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 marginulinoides* 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 5 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.

1851 *Dentalina soluta*, Reuss, Haidingers Naturw. Abhandl. Vol. IV, Abt. 1, Wien, p. 60, Pl. III, fig. 4.
1893 *Nodosaria (Dentalina) soluta* Reuss, Chapman, J. Roy. Microscop. Soc. London, Vol. IV, p. 587, Pl. VIII, fig. 26-28.
1935 *Dentalina soluta* Reuss var. *discrepans* Reuss, Eichenberg, Oel u. Kohle, 11, Jahrg., No. 22, Pl. V, fig. 20.
1935 *Dentalina* sp. 2, Eichenberg, *ibid.*, Pl. V, fig. 22.

1950 *Dentalina* cf. *soluta* Reuss, Ten Dam, Mém. Soc. Géol. France, Mém. No. 63, p. 29, Pl. II, fig. 18.
1951 *Dentalina soluta* Reuss, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 309, Pl. 9, fig. 237.
1966 *Dentalina soluta* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 152, Pl. II, fig. 155-159; Pl. III, fig. 183-186.
1967 *Dentalina soluta* Reuss (*pars*), Michael, Palaeontogr., Suppl. bd. 12, p. 62, Pl. V, fig. 3-4, 7-8, 15; Pl. XXVI, fig. 24.
1967 *Dentalina soluta* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 289, Pl. 7, fig. 10.

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 original test (Reuss, 1860, Pl. I, fig. 2) shows more globular chambers and, hence, a more lobate periphery.

1860 *Nodosaria lepida* Reuss, Sitz, ber. k. Akad. Wiss. Wien, Vol. 40, p. 178, Pl. I, fig. 2.
?1938 *Nodosaria* D-55, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 9b, fig. 65.
1940 *Nodosaria lepida* Reuss, Tappan, J. of Paleontol., Vol. 14, No. 2, p. 104, Pl. 16, fig. 6.
?1962 *Nodosaria lepida* Reuss, Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 174, Pl. 45, fig. 7-8.

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

Nodosaria zippei Reuss
(Plate 3, Figure 14)

1845 *Nodosaria zippei*, Reuss, Verst. Böhm. Kreideform., pt. I, p. 25, Pl. VIII, fig. 1-3.
1891 *Nodosaria zippei* Reuss, Beissel, Abhandl. kgl. preuss. geol. Landesanstalt, N.F., Heft 3, Pl. VI, fig. 10-29.
1893 *Nodosaria (Dentalina) zippei* Reuss, Chapman, J. Roy. Microscop. Soc. London, Vol. IV, p. 593, Pl. IX, fig. 12.
1951 *Nodosaria* cf. *zippei* Reuss, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 312, Pl. 10, fig. 249.
1967 *Nodosaria zippei* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 282, Pl. 6, fig. 5.

This Upper Cretaceous species with its characteristic longitudinal costae 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 *costae* 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.

1863 *Vaginulina acuminata*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 49, Pl. IV, fig. 1.
1935 *Vaginulina acuminata* Reuss, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, p. 396, Pl. VIII, fig. 7.
1938 *Vaginulina* D-9, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 9a, fig. 48, Pl. 10b, fig. 95-98; Pl. 11b, fig. 97 (96?); Pl. 12b, fig. 97-98 (96?); Pl. 13a, fig. 50-51 (52?).
1938 *Vaginulina* D-19 (*pars*), Hecht, *ibid*., Pl. 14b, fig. 46 (47?).
1957 *Vaginulina acuminata* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 39, Pl. VII, fig. 159.
1962 *Citharina acuminata* (Reuss), Arbeitskreis, Leitfoss. d. Mikropal., p. 271, Pl. 38, fig. 13.
1966 *Vaginulina acuminata* Reuss, Kroboth, Diss. Univ. Tübingen, p. 35, Pl. 3, fig. 5-10; textfig. 11 (p. 37).
1967 *Vaginulina acuminata* Reuss, Michael, Palaeontogr., Suppl. bd. 12, p. 51, Pl. VII, fig. 1; Pl. XVIII, fig. 53; Pl. XIX, fig. 66; Pl. XX, fig. 15-16; Pl. XXV, fig. 118; Pl. 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 ornamentational striae; aperture radiate at the dorsal angle. Length: 0.45 millimeter.

Only two specimens 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 *costae* 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 (Bartenstein, 1956, Pl. 2, fig. 36; Michael, 1967, Pl. VIII, fig. 1; Pl. XVIII, fig. 51), but the latter lacks both the longitudinal *costae* on the flanks and the peripheral dorsal rib.

Citharina discors (Koch) has an oblique-triangular outline and is ornamented by curved *costae* 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. cristellarioides* (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 curved back but a convex and faintly lobate ventral margin. The test of *Vaginulina biochei elongata* Eichenberg, 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.

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 *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: Frondicularia joidesi n. sp. is named after the inter-institutional consortium JOIDES (Joint Oceanographic Institutions for Deep Earth Sampling) which provides advice and guidance to the U.S. National Science Foundation's Deep Sea Drilling Project.

Holotype: Pl. 3, fig. 19.

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

Stratum typicum: Barremian.

Diagnosis: A lanceolate-rectangular form of *Frondicularia* similar to *F. archiaciana* d'Orbigny and *F. simplissima* Ten Dam which shows an angled instead of a broadly truncated periphery (marginal keel in 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 *F. archiaciana* d'Orbigny and *F. simplissima* Ten Dam. Both differ from the new species by the flat truncate periphery (square-cut edges). Certain forms referred to *F. archiaciana* show up to 11 chambers, sigmoid sutures, often a more lubulate outline, and a more slender test.

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

Lingulina d'Orbigny, 1826

Lingulina biformis Bartenstein & Brand.
(Plate 3, Figure 21)

1951 *Lingulina biformis* n. sp., Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 300, Pl. 8, fig. 188-190.

The single specimen available from Hole 120 drilled on Gorringe 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 biformis was described from the Valanginian of Germany. Our test was found in Core 3-CC (Albian).

Lingulina loryi (Berthelin)
(Plate 3, Figure 22)

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

1880 *Lingulina furcillata* n. sp., Berthelin, *ibid*., p. 65, Pl. 4, fig. 6.

1894 *Frondicularia loryi* Berthelin, Chapman, J. Roy. Microscop. Soc., London, p. 154, Pl. 3, fig. 5.

1938 *Lingulina* D-2, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 23, fig. 79.

1940 *Lingulina furcillata* Berthelin, Tappan, J. of Paleontol., Vol. 14, No. 2, p. 106, Pl. 16, fig. 18.

1943 *Lingulina furcillata* Berthelin, Tappan, J. of Paleontol., Vol. 17, No. 5, p. 449, Pl. 80, fig. 11.

1943 *Lingulina nodosaria* (Reuss), Tappan, *ibid*., p. 499, Pl. 80, fig. 12-13.

1944 *Lingulina furcillata* Berthelin, Lozo, Am. Midl. Nat., Vol. 31, No. 3, p. 557, Pl. 4, fig. 14.

1946 *Lingulina praelonga* n. sp., Ten Dam, J. of Paleontol., Vol. 20, No. 6, p. 576, Pl. 88, fig. 12.

1949a *Lingulina furcillata* Berthelin, Loeblich & Tappan, Univ. Kansas Pal. Contrib., Vol. 39, No. 3, p. 12, Pl. 2, fig. 13.

1950 *Lingulina loreyi* (Berthelin), Ten Dam, Mém. Soc. Géol. France, Mém. 63, p. 30, Pl. II, fig. 20.

1951 *Frondicularia loryi* Berthelin, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl., 485, p. 303, Pl. 8, fig. 202-203.

1954 *Frondicularia loryi* Berthelin, Bartenstein, Senckenbg. leth., Vol. 35, No. 1/2, p. 49, Pl. 1, fig. 16.

1957 *Lingulina praelonga* Ten Dam, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 38, Pl. VII, fig. 157-158.

1957 *Lingulina furcillata* Berthelin, Said & Barakat, Micropal., Vol. 3, No. 1, p. 43, Pl. 1, fig. 10-11.

?1963 *Lingulina praelonga* Ten Dam, Espitalié & Sigal, Ann. Géol. Madagascar, Fasc. XXXII, p. 61, Pl. XXVIII, fig. 9.

1965 *Frondicularia loryi* Berthelin, Neagu, Micropal., Vol. 11, No. 1, p. 26, Pl. 6, fig. 13-16.

1966 *Lingulina loryi* (Berthelin), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 155, Pl. III, Fig. 243-245.

1966 *Lingulina loryi* (Berthelin), Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 154, Pl. VI, fig. 20-21.

1967 *Lingulina loryi* (Berthelin), Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 314, Pl. 14, fig. 2.

1969 *Frondicularia loryi* Berthelin, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 25, No. 30.

non 1951 *Frondicularia loryi* Berthelin, Noth, Jahrb. Geol. Bundesanstalt, Sonderbd. 3, p. 56, Pl. I, fig. 5.

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 *Lingulina loryi* was originally placed in the genus *Frondicularia*, but has been referred since to *Lingulina* by a number of authors. *Frondicularia* shows angled or strongly arched sutures and a radiate terminal aperture. *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 *Frondicularia simplicissima* Ten Dam differs from the species *loryi* by its more arched sutures.

Tests with subhorizontal-horizontal sutures and a pointed early chamber have been placed in *Lingulina nodosaria* Reuss.

Lingulina loryi (Berthelin) is known from beds of Hauterivian to Albian age.

Lingulina loryi gorringei n. subsp.
(Plate 3, Figure 23)

1962 *Lingulina loryi* (Berthelin), Tappan, U.S. Geol. Surv. Profess. Paper 236-C, p. 172, Pl. 44, fig. 19-21.

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 slit 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 of Hole 120), is very close to *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 *Frondicularia 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 Boomgaart, 1949

Pseudonodosaria humilis (Roemer)
(Plate 3, Figures 24-26)

1841 *Nodosaria humilis* Roemer, Verst. norddeutsch. Kreidegeb., p. 95, Pl. XV, fig. 6.
1935 *Glandulina humilis* (Roemer), 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. Oil Inst., fasc. 120, p. 74, Pl. IV, fig. 57-58.
1940 *Pseudoglandulina* sp., Tappan, J. of Paleontol. Vol. 14, No. 2, p. 105, Pl. 16, fig. 14.
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 humilis* (Roemer), *pars*, 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.
1955 *Rectoglandulina turbinata* (Terquem & Berthelin), Tappan, U.S. Geol. Surv., Profess. Paper 236-B, p. 75, Pl. 26, fig. 10-11.
1956 *Pseudoglandulina humilis* (Roemer), Bartenstein, Senckenbg. leth., Vol. 37, p. 521, Pl. 2, fig. 45, 54.
1957 *Pseudoglandulina humilis* (Roemer), Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 37, Pl. VII, fig. 153-155.
1957 *Pseudoglandulina humilis* (Roemer), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 229, Pl. VI, fig. 51.
1957 *Pseudoglandulina mutabilis* (Reuss), Sztejn, *ibid*., p. 230, Pl. VI, fig. 52.
?1958 *Pseudoglandulina humilis* (Roemer), Sztejn, Inst. Geol., Biul. 138, p. 39, textfig. 91.
1958 *Pseudoglandulina mutabilis* (Reuss), *pars*, Sztejn, *ibid*., p. 40, fig. 92a.
1960 *Rectoglandulina netrona* n. sp., Tappan, Bull. AAPG, Vol. 44, No. 3, pt. I, p. 293, Pl. 2, fig. 11-12.
1963 *Rectoglandulina* sp. 2363, Espitalié & Sigal, Ann. Géol. Madagascar, fasc. XXXII, p. 63, Pl. XXX, fig. 1.
1963 *Rectoglandulina tutkowskii* (Mjatliuk), Espitalié & Sigal, *ibid*., p. 63, Pl. XXX, fig. 5-6.
1966 *Rectoglandulina humilis* (Roemer), *pars*, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 155, Pl. III, fig. 246.
1966 *Rectoglandulina mutabilis* (Reuss), Bartenstein, Bettenstaedt & Bolli, *ibid*., p. 154, Pl. III, fig. 231-235.
1966 *Rectoglandulina* cf. *mutabilis* (Reuss), Bartenstein, Bettenstaedt & Bolli, *ibid*., p. 154, Pl. III, fig. 236-237, 248-249.
1967 *Pseudonodosaria appressa* (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.
non 1962 *Pseudoglandulina humilis* (Roemer), Leischner, Neues Jahrb. Geol. Pal., Monatshefte, p. 215, fig. 10-11.
non 1962 *Rectoglandulina humilis* (Roemer), Tappan, U.S. Geol. Surv., Profess. Paper 236-C, p. 170, Pl. 44, fig. 8-10.
non 1963 *Rectoglandulina* gr. *humilis* (Roemer), Espitalié & Sigal, Ann. Géol. Madagascar, fasc. XXXII, p. 64, Pl. XXX, fig. 10-15.
non 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 (Boomgaart, 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 of 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. *Pseudonodosaria humilis* (Roemer) is a typical species of the *Rectoglandulina* morphotype. *Pseudonodosaria tenuis* (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. pupoides* (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. tenuis* (Bornemann).

Intermediate between these groups are forms like *P. manifesta* (Reuss), *P. metensis* (Terq.), *P. mutabilis* (Reuss), *P. sowerbyi* (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 tenuis (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 tenuis* Bornemann, Eichenberg, 26. Jahresber. Niedersächs. geol. Ver., Hannover, p. 175, Pl. XVI, fig. 9-10.
1935 *Glandulina tenuis* Bornemann, Eichenberg, Oel u. Kohle, 11. Jahrg., No. 22, Pl. IX, fig. 17.
1938 *Glandulina* D-11 *(pars)*, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 15a, fig. 71-73; Pl. 18b, fig. 59; Pl. 19b, fig. 68-69 (*non* 67, 70-71); Pl. 20a, fig. 19; Pl. 20b, fig. 80-81; Pl. 21, fig. 29.
1938 *Guttulina* D-7 *(pars)*, Hecht, *ibid*., Pl. 20b, fig. 79.
1940 *Pseudoglandulina scotti* n. sp., Tappan, J. of Paleontol., Vol. 14, No. 2, p. 105, Pl. 16, fig. 13.
1943 *Pseudoglandulina scotti* Tappan, Tappan, J. of Paleontol, Vol. 17, No. 5, p. 497, Pl. 80, fig. 5.
1951 *Pseudoglandulina tenuis* (Bornemann), Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 315, Pl. 13, fig. 349; Pl. 14C, fig. 33; Pl. 15C, fig. 12; Pl. 15D, fig. 11; Pl. 16, fig. 42.
1951 *Pseudoglandulina mutabilis mutabilis* (Reuss), Bartenstein & Brand, *ibid*., p. 315, Pl. 14C, fig. 36; Pl. 15C, fig. 10.

1956 *Pseudoglandulina tenuis* (Bornemann), Bartenstein, Senckenbg. leth., Vol. 37, No. 5/6, p. 521, Pl. 2, fig. 53.
?1957 *Pseudoglandulina tenuis* (Bornemann), Sztejn, Inst. Geol., Prace, Vol. XXII, p. 230, Pl. VI, fig. 53.
1957 *Rectoglandulina humilis* (Roemer), Said & Barakat, Micropal., Vol. 3, No. 1, p. 43, Pl. 1, fig. 14.
1958 *Pseudoglandulina tenuis* (Bornemann), *pars*, Sztejn, Inst. Geol., Biul. 138, p. 40, textfig. 93b (*non* 93a).
1962 *Rectoglandulina humilis* (Roemer), Tappan, U.S. Geol. Surv., Profess. Paper 236-C, p. 170, Pl. 44, fig. 8-10.
?1962 *Rectoglandulina kirschneri* Tappan, *pars*, Tappan, *ibid*., p. 171, Pl. 44, fig. 18 (*non* 12-17).
1963 *Rectoglandulina* gr. *humilis* (Roemer), Espitalié & Sigal, Ann. Géol. Madagascar, fasc. XXXII, p. 64, Pl. XXX, fig. 10-15.
1966 *Pseudonodosaria tenuis* (Bornemann), Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n. Ser. XXXI), p. 147, Pl. VI, fig. 7.
1966 *Pseudonodosaria vulgata* (Bornemann), Dieni and Massari, *ibid*., p. 148, Pl. VI, fig. 8.
1966 Rectoglandulina humilis (Roemer), *pars*, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 155, Pl. III, fig. 247.
1967 *Pseudoglandulina tenuis* (Bornemann), Michael, Palaeontogr., Suppl.bd. 12, p. 71, Pl. VIII, fig. 6-7; Pl. XVIII, fig. 47; Pl. XIX, fig. 72; Pl. XX, fig. 77.
1967 *Nodosaria humilis* Roemer, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 279, Pl. 5, fig. 9; Pl. 6, fig. 3-4.
1969 *Pseudoglandulina humilis* (Roemer), *pars*, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, p. 121, textfig. 24, No. 28.

Pseudonodosaria tenuis (Bornemann) is known from the Liassic to the Upper Cretaceous, and comparable tests were figured from the Triassic of the Austrian Alps and Alaska. A few typical specimens were observed in Core 7 of Hole 120.

Globulina d'Orbigny, 1826

Globulina prisca Reuss
(Plate 4, Figures 1, 2)

1863 *Polymorphina prisca*, Reuss, Sitz. ber. k. Akad. Wiss. Wien, Vol. 46, p. 79, Pl. IX, fig. 8.
1880 *Polymorphina prisca* Reuss, Berthelin, Mém. Soc. Géol. France, 3e sér., Vol. 1, p. 57, Pl. 4, fig. 20-21.
1938 *Guttulina* D-13, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 5a, fig. 83-91.
1938 *Guttulina* D-18, Hecht, *ibid*., Pl. 15b, fig. 65-70.
1938 *Guttulina* D-7, Hecht, *ibid*., Pl. 16b, fig. 78-80.
1948 *Globulina prisca* Reuss, Ten Dam, J. of Paleontol. Vol. 22, No. 2, p. 185, Pl. 32, fig. 15.
1951 *Globulina prisca* Reuss, Bartenstein & Brand, Senckenbg. Natf. Ges., Abhandl. 485, p. 320, Pl. 10, fig. 286; Pl. 14C, fig. 29; Pl. 16, fig. 48, 50, 52.
1957 *Globulina* cf. *prisca* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 41, Pl. VII, fig. 166.
1957 *Globulina prisca* Reuss, Sztejn, Inst. Geol., Prace, Vol. XXII, p. 244, Pl. IX, fig. 83.
1958 *Globulina prisca* Reuss, Sztejn, Inst. Geol. Biul. 138, p. 43, textfig. 102.
1962 *Globulina prisca* Reuss, Tappan, U.S. Geol. Surv., Profess. Paper 236-C, p. 184, Pl. 47, fig. 25-26.
1965 *Globulina prisca* Reuss, Neagu, Micropal., Vol. 11, No. 1, p. 28, Pl. 7, fig. 3-4, 5?.
1966 *Globulina prisca* Reuss, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 59, No. 1, p. 158, Pl. III, fig. 286-292, 308.
1966 *Globulina prisca* Reuss, Dieni & Massari, Palaeontogr. Ital., Vol. LXI (n.Ser. XXXI), p. 157, Pl. VII, fig. 3-4.
1967 *Globulina prisca* Reuss, Fuchs & Stradner, Jahrb. Geol. Bundesanstalt, Vol. 110, p. 316, Pl. 15, fig. 9-10.
non 1946 *Globulina prisca* Reuss, Cushman, U.S. Geol. Surv., Profess. Paper 206, p. 97, Pl. 40, fig. 15-17.
non 1969 *Globulina prisca* Reuss, Kalantari, Nat. Iran. Oil Co., Geol. Lab. Publ. No. 3, textfig. 23, No. 6.

As evident from the relevant literature on Lower Cretaceous foraminifera, the shape of the tests assigned to *Globulina prisca* varies individually from broadly globular, subspherical-ovoid, and slender spindle-shaped. The sutures of all the tests referable to *Globulina* and *Pyrulina* from Hole 120 are hardly visible, so that the given determinations are open to some doubt. Some small hyaline slender forms with pointed ends belong to *Lagena apiculata* Reuss.

The vitreous-transparent test of *Globulina prisca* is composed of only three chambers arranged in a spiral. The sutures (mostly invisible) are delicate and flush with the smooth surface. The initial end is pointed or rounded, and the aperture radiate.

The specimen depicted by J. A. Cushman (1946, Pl. 40, fig. 15) shows more than 3 chambers; the one figured by A. Kalantari (1969, textfig. 23, No. 6) shows depressed sutures on which account these specimens cannot be placed in *Globulina prisca* Reuss.

Globulina prisca is a cosmopolitan form known from the entire Lower Cretaceous. In Hole 120, the species was observed in Cores 2, 3, 4 and 5.

Pyrulina d'Orbigny, 1839

Pyrulina cylindroides (Roemer)
(Plate 4, Figure 3)

1838 *Polymorphina cylindroides* n. sp., Roemer, Neues Jahrb. Min., Geol. & Pal., p. 385, Pl. 3, fig. 26
1938 *Pyrulina* D-5, Hecht, Senckenbg. Natf. Ges. Abhandl. 443, Pl. 8a, fig. 22; Pl. 10a, fig. 30; Pl. 10b, fig. 86-87; Pl. 11b, fig. 57-63.
1940 *Pyrulina cylindroides* (Roemer), Tappan, J. of Palentol., Vol. 14, No. 2, p. 114, Pl. 18, fig. 1.
1943 *Pyrulina cylindroides* (Roemer), Cushman, Contr. Cushman Lab. for Foram. Research, Vol. 19, pt. 3, p. 62, Pl. 11, fig. 2.
?1944 *Pyrulina* cf. *cylindroides* (Roemer), Cushman, *ibid*., Vol. 20, pt. 1, p. 9, Pl. 2, fig. 16.
?1946 *Pyrulina cylindroides* (Roemer), Cushman, U.S. Geol. Surv., Profess. Paper 206, p. 97, Pl. 40, fig. 18-19.
1953 *Pyrulina cylindroides* (Roemer), Bullard, J. of Paleontol., Vol. 27, No. 3, p. 343, Pl. 46, fig. 5-6.
?1967 *Pyrulina infracretacea* Bartenstein, *pars*, Michael, Palaeontogr., Suppl. bd. 12, p. 76, Pl. VIII, fig. 13-14; Pl. XXIV, fig. 85; Pl. XXVI, fig. 29.

The smooth, fusiform-cylindrical, vitreous tests with more or less pointed extremities and very indistinct sutures are herewith referred to the genus *Pyrulina*. Without 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, Eoguttulina*, etc. often remains questionable unless the arrangement of the chambers is explicit (Bartenstein, 1952a, p. 311).

Different types have been assigned to the species *Pyrulina cylindroides* (Upper and Lower Cretaceous), not only the slender spindle-shaped but also oviform ones.

The type specimen of *Pyrulina infracretacea* Bartenstein (Bartenstein, 1952a, textfig. 5, p. 309) shows a broader thicker form, but there also exist more slender and elongate ones. *Pyrulina longa* Tappan is also of larger and stouter size.

One single specimen of *Pyrulina* was observed in the core catcher of Core 3; this specimen shows an adult fistulose growth. A similar test is figured from the Barremian of NW Germany (Michael, 1967, Pl. X, fig. 1). The fistulose specimen reproduced from the Middle Albian of the Netherlands (Fuchs & Stradner, 1967, Pl. 15, fig. 9) is more slender than that from Hole 120.

Both elongate and globular fistulose specimens have been figured as *Pyrulina longa* Tappan (Tappan, 1940, Pl. 18, fig. 2; Bullard, 1953, Pl. 46, fig. 7-8) and as *Globulina prisca* Reuss from the Campanian of the Paris basin (Marie, 1941, Pl. XXII, fig. 239).

Ramulina Rupert Jones, 1875

Ramulina? sp.
(Plate 4, Figures 4, 5)

The genus *Ramulina* is characterized by irregular, branching chambers.

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 aptiensis 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 character of the wall.

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

Spirillina Ehrenberg, 1843

Spirllina minima Schacko

The small hyaline and perforate tests of *Spirillina 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.

Spirillina minima is a cosmopolitan form which is present throughout the Cretaceous. In Hole 120 on Gorringe Bank, it occurs in very rare specimens in Cores 2, 3 and 4.

Hedbergella Brönnimann & Brown, 1958

Hedbergella cf. *infracretacea* (Glaessner)

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 Globigerinids here is apparently due to facies control.

Hedbergella infracretacea ranges from the Barremian into the Cenomanian, with an optimum in the Aptian-Albian.

Lingulogavelinella Malapris, 1965

Lingulogavelinella aff. *ciryi ciryi* Malapris-Bizouard
(Plate 4, Figures 6-11)

1965 *Lingulogavelinella* aff. *thalmanniformis* Plotnikova, Malapris, Revue de Micropal., Vol. 8, No. 3, p. 142, Pl. 3, fig. 7-13.
1967 *Lingulogavelinella ciryi ciryi* n. sp. n. subsp. Malapris-Bizouard, *ibid*., Vol. 10, No. 2, p. 137, Pl. 1, fig. 16-19.

Some rare tiny 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.[4]

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 lingulate chamber lobes protruding in a star-like manner from the last 4 or 5 chambers.

The test of *Lingulogavelinella ciryi 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. On the umbilical face, the younger chambers extend with linguiform lips into the umbilical area. The aperture is an interio-marginal ventral slit with a thickened rim.

Lingulogavelinella ciryi ciryi was described and figured from the type Albian of France. It is rare in the Lower Albian and common in the Middle and Upper Albian.

The presence of *Lingulogavelinella* aff. *ciryi ciryi* in Hole 120 is the most useful indication of an Albian age of the section represented by Cores 2 and 3.

Gavelinella Brotzen, 1942

Gavelinella barremiana bizouardae n. subsp.
(Plate 4, Figures 12-14)

Test small, with a diameter of 0.3 to 0.4 millimeter, thin-compressed, with an acute periphery tending to keel. There are 9 to 10 chambers per last whorl. Sutures are curved, limbate; contour of the last 4 to 5 chambers lobate. Last-formed chamber is large; true umbilicus without a spiral plug.

The available three specimens were found in Core 2-1 (143 to 147 centimeters) and in Core 3, namely in beds of Albian age (with *Lingulogavelinella* aff. *ciryi ciryi*).

The compressed test, the developed umbilicus lacking a plug, and the slanted sutures are held to be features of the early representatives of *Gavelinella,* and the figured tests actually seem to be very close to the species *Gavelinella barremiana* Bettenstaedt. It is regrettable that merely very few specimens, not populations, are represented in the available core material. *Gavelinella barremiana* is known to have a range from the Middle Barremian to the basal Aptian; our tests, on the other hand, were found in Cores 2 and 3 of Albian age. Accordingly, the writer feels justified in designating the concerned form from Hole 120 by a special name as *Gavelinella barremiana bizouardae* n. subsp. in honor of Madeleine Bizouard-Malapris, Marseille, who has had the kindness to examine the few Gavelinellidae encountered in the section of Gorringe Bank.

Gavelinella aff. *barremiana* Bettenstaedt
(Plate 4, Figures 15, 15a)

1938 *Anomalina* D-14, Hecht, Senckenbg. Natf. Ges., Abhandl. 443, Pl. 7b, fig. 50-54.
1938 *Anomalina* D-11 (*pars*), Hecht, *ibid.*, Pl. 9b, fig. 55-58; Pl. 106, fig. 71-78; Pl. 11b, fig. 48-49; Pl. 12a, fig. 66-83.
1952b *Gavelinella barremiana* n. sp., Bettenstaedt, Senckenbg., Vol. 33, No. 4/6, p. 275, Pl. 2, fig. 26-29.
1955 *Gavelinella barremiana* Bettenstaedt, Bettenstaedt & Wicher, Proceed. IVth World Petr. Congr., ser. 1/D, p. 13, Pl. IV, fig. 28.
1957 *Gavelinella barremiana* Bettenstaedt, Bartenstein, Bettenstaedt & Bolli, Eclog. Geol. Helv., Vol. 50, No. 1, p. 47, Pl. VII, fig. 168-169.
1960b *Gavelinella barremiana* Bettenstaedt, Moullade, Revue de Micropal., Vol. 3, No. 2, p. 137, Pl. 2, fig. 6-8.
1962 *Gavelinella barremiana* Bettenstaedt, Arbeitskreis, Leitfoss. d. Mikropal., p. 282, Pl. 37, fig. 7; Pl. 39, fig. 5.
1962 *Gavelinella barremiana* Bettenstaedt, Flandrin, Moullade & Porthault, Revue de Micropal., Vol. 4, No. 4, p. 220, Pl. 3, fig. 14-16.
1966 *Gavelinella barremiana* Bettenstaedt, Michael, Senckenbg. leth., Vol. 47, No. 5/6, p. 430, Pl. 50, fig. 1-3.
1967 *Gavelinella barremiana* Bettenstaedt, Michael, Palaeontogr., Suppl. bd. 12, p. 82, Pl. IX, fig. 11; Pl. XI, fig. 8; Pl. XXII, fig. 26-28; Pl. XXIII, fig. 82-83; Pl. XXIV, fig. 59, 66-67; Pl. XXV, fig. 42-43, 89; Pl. XXVI, fig. 32-33.
?1969 *Gavelinella barremiana* Bettenstaedt, Kalantari, Nat. Iran. Oil Co., Geol. Lab., Publ. No. 3, p. 175, Pl. 18, fig. 7.

The encountered specimens with a sharpened margin show seven chambers in the last-formed whorl, whereas *Gavelinella barremiana* usually has 8 or 9. One of the tests (Plate 4, Figure 15) reveals a rather oval, not circular, outline and the sutures are less curved than in the typical representatives of *Gavelinella barremiana.* It is quite possible, however, that the few available tests fall in the variability of the species *G. barremiana* in a larger population. Nonetheless, we prefer to designate the few specimens at hand from Core 7 as

[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 Gorringe Bank (Core 7).

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PLATE 1

(Scale bar represents 100 microns)

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 globigeriniformis* (Parker and Jones). 27: Core 2-1. 28: Core 5-1.
Figures 29, 30	*Verneuilinoides 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.
Figures 35-37	*Marssonella hauteriviana* Moullade. 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.

PLATE 1

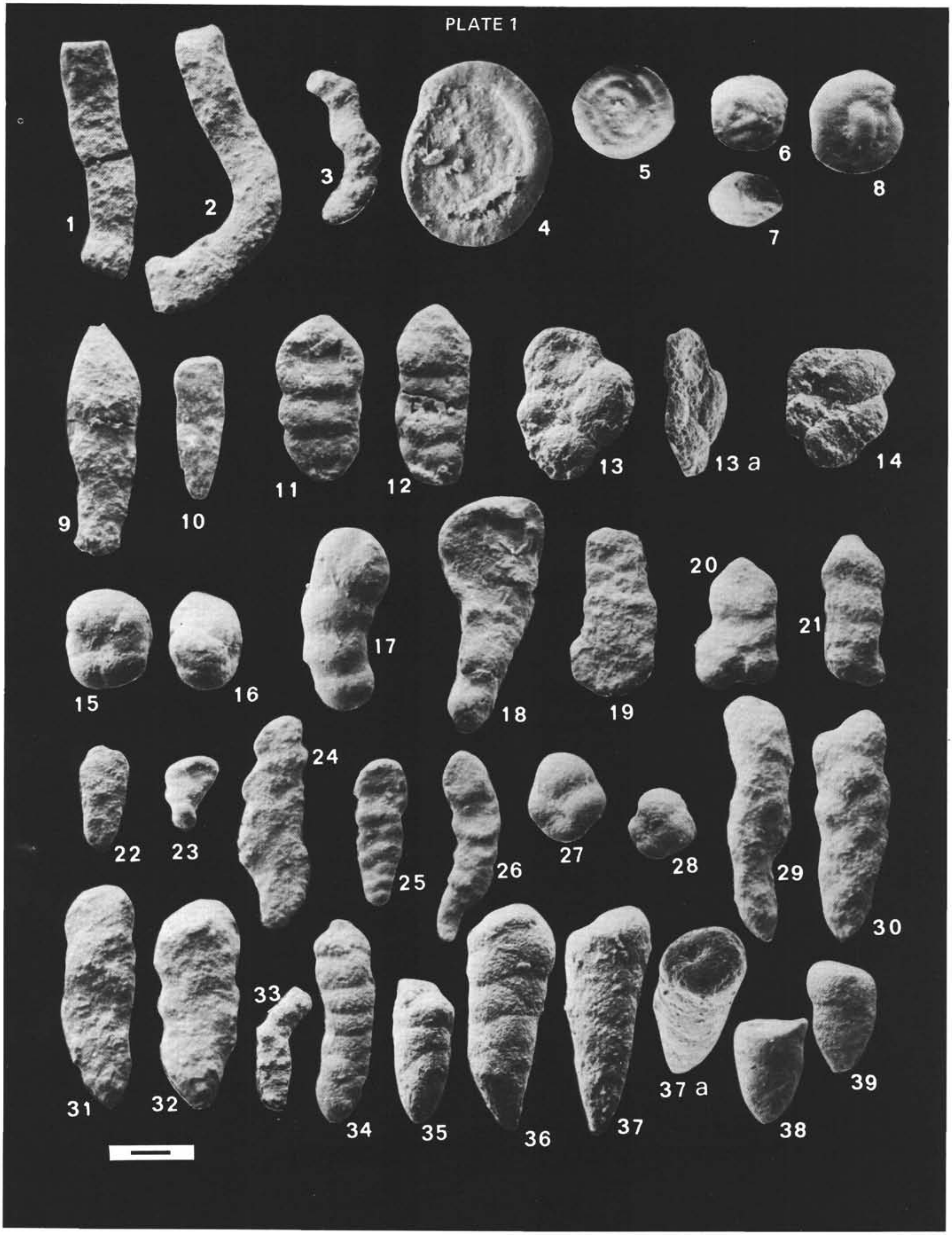
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PLATE 2

(Scale bar represents 100 microns)

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 erucaeformis* (Wisniowski). 3-CC.
Figure 13	*Astacolus grata* (Reuss). Core 7-1.
Figure 14	*Astacolus?* cf. *incurvata* (Reuss). Core 5-1.
Figure 15	*Astacolus? planiuscula* (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. *bronnii* (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.

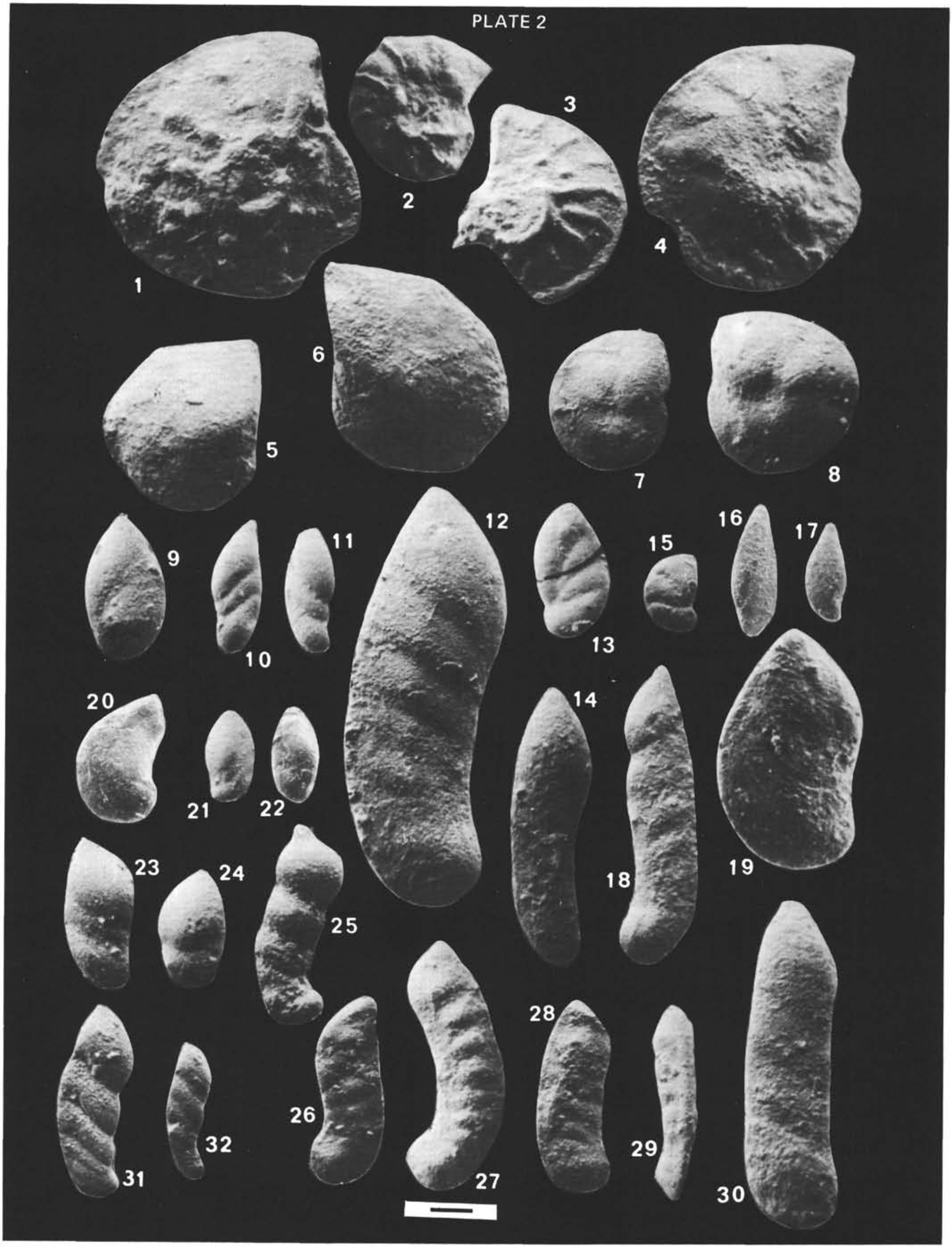
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PLATE 3

(Scale bar represents 100 microns)

Figure 1	*Marginulina hamulus* Chapman. Core 4-1.
Figure 2	*Marginulina inaequalis* Reuss. Core 2-1.
Figure 3	*Marginulina 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 zippei* Reuss. Core 7-1.
Figure 15	*Citharina* aff. *acuminata* (Reuss) var. Core 2-1.
Figures 16, 17	*Citharina glomarchallengeriana* 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 biformis* 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.

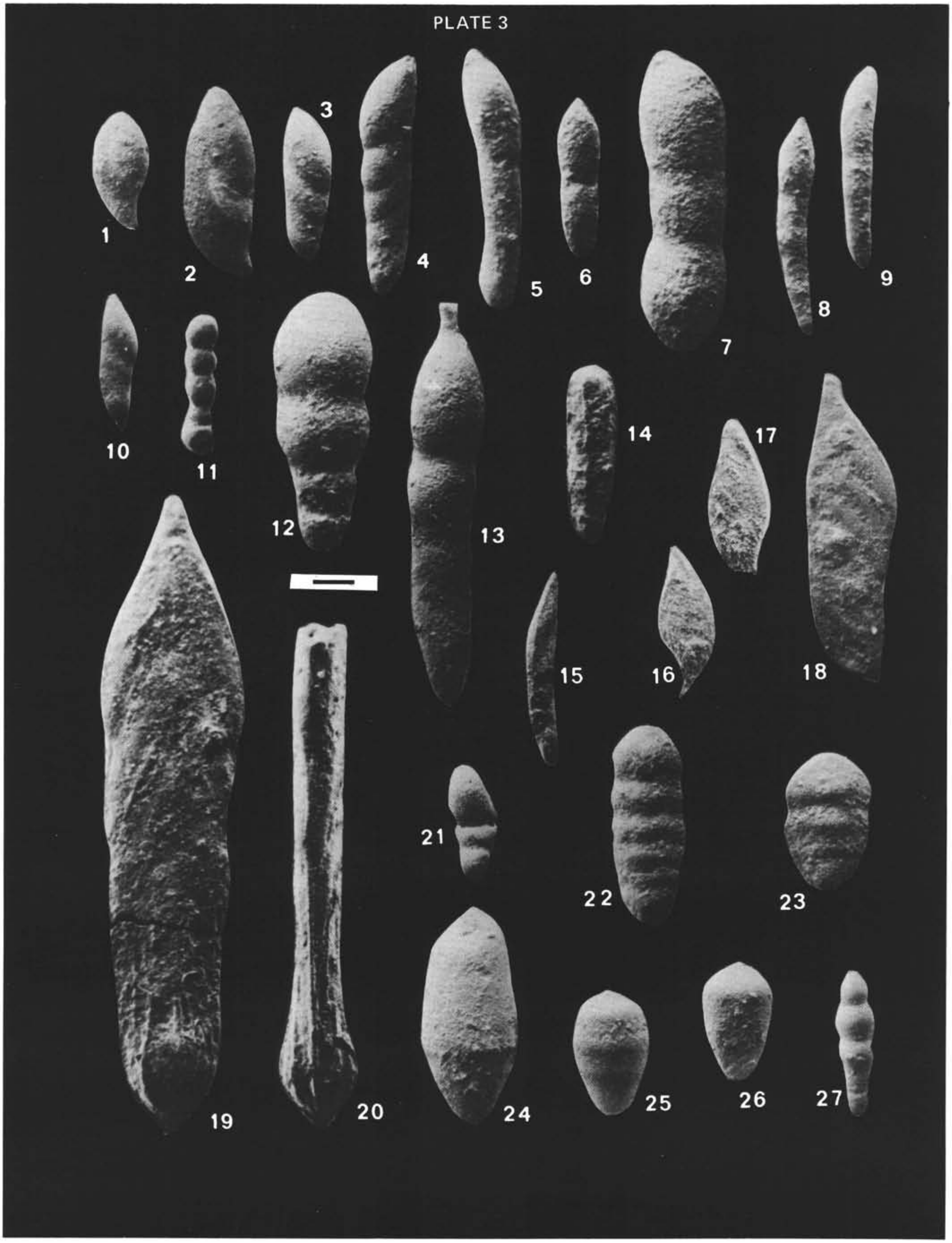
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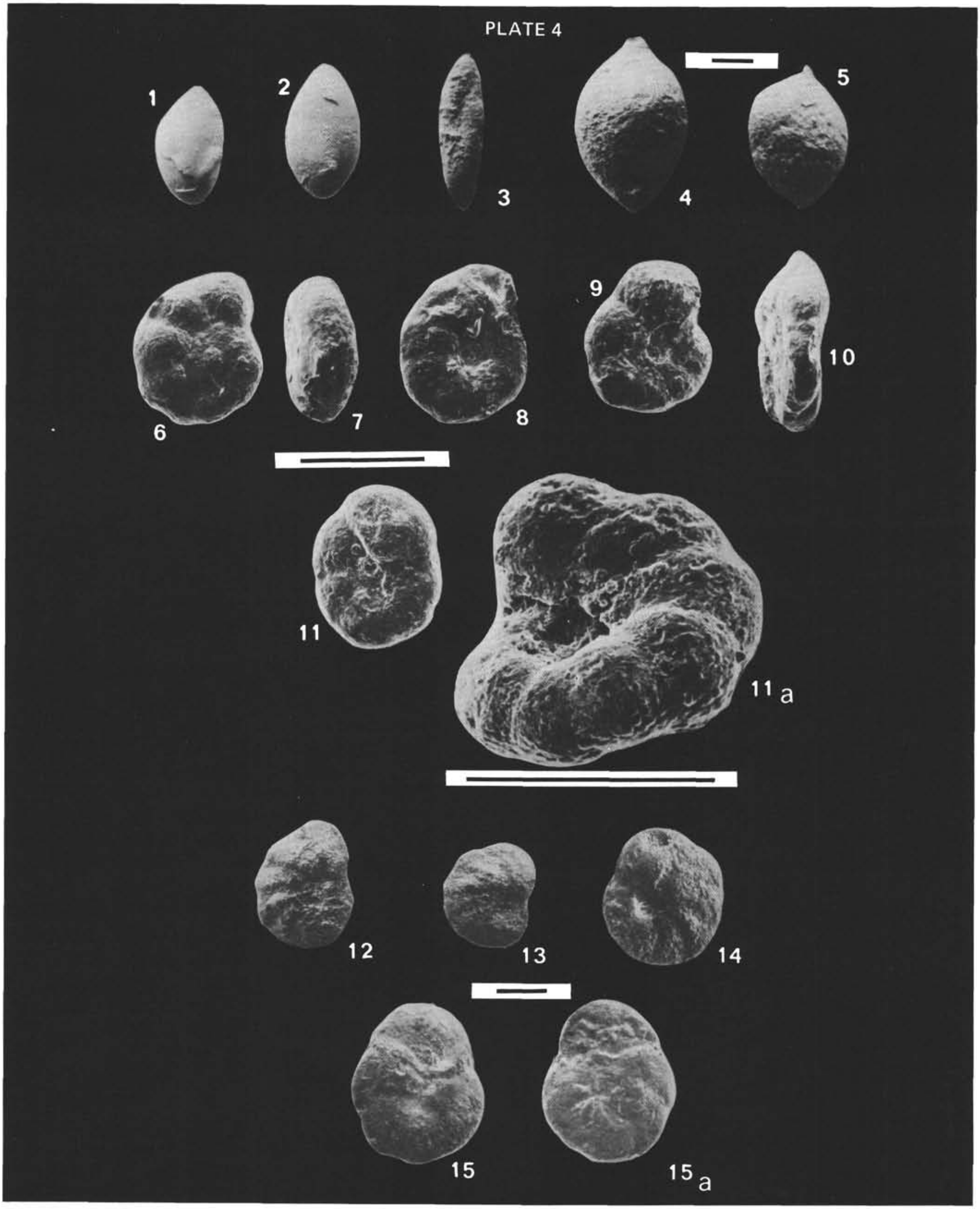
PLATE 4

(Scale bars represent 100 microns. Upper scale bar for Figures 1-5. Next bar for Figures 6-11. Longest scale bar for Figure 11a. Lowermost scale bar for Figures 12-15a.)

Figures 1, 2	*Globulina prisca* Reuss. 4-CC.
Figure 3	*Pyrulina cylindroides* (Roemer). Core 2-1.
Figures 4, 5	*Ramulina?* sp. Core 5-1.
Figures 6-11	*Lingulogavelinella* aff. *ciryi ciryi* Malapris-Bizouard. 6: Spiral side. 3-CC. 7: Peripheral view. 3-CC. 8: Umbilical face. 3-CC. 9. Umbilical side. Core 2-1. 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.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