The foraminifera in the Lower Cretaceous of Trinidad, W.I. Part 4, Cuche Formation, upper part ; Leupoldina protuberans Zone

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The Foraminifera in the Lower Cretaceous of Trinidad, W.I.

Part 4: Cuche Formation, upper Part; *Leupoldina protuberans* Zone[1])

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ABSTRACT

This paper deals with the benthonic and selected significant planktonic Foraminifera of the uppermost Barremian to lower Upper Aptian in Trinidad, West Indies. It is the fourth part of a series in which all Lower Cretaceous Foraminifera known from the Trinidad Lower Barremian to the middle part of the Lower Albian are recorded. This time interval of about 13 million years comprises many foraminiferal index species of world-wide distribution, occurring in both northern and southern latitudes as well as in the Tethys area which connects the two.

49 species or forms with open nomenclature, assigned to 28 genera, are described here from the *Leupoldina protuberans* Zone of the Cuche Formation. Most of the species are not restricted to this zone and possess a wide geographic distribution.

ZUSAMMENFASSUNG

Mit vorliegender Bearbeitung des stratigraphischen Bereichs vom obersten Barrême bis zum unteren Ober-Apt kann die unterkretazische, meist benthonische Foraminiferenfauna von Trinidad, West Indies, nunmehr lückenlos vom Unter-Barrême bis zum mittleren Teil des Unter-Alb überblickt werden. Dieser Abschnitt entspricht einem Zeitintervall von etwa 13 Millionen Jahren und umfasst viele weltweit gültige Leitformen von Foraminiferen, die in den nördlichen und südlichen gemässigten Faziesgebieten und in dem beide verbindenden tethyalen Faziesgebiet verbreitet sind.

Aus 28 Gattungen werden 49 Arten oder Formen mit «nomenclatura aperta» beschrieben und abgebildet. Sie sind nicht allein der *Leupoldina protuberans*-Zone und den Vorkommen in Trinidad eigentümlich, sondern besitzen meist eine grössere vertikale wie horizontale Reichweite.

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[1]) *Part 1:* Cuche- und Toco-Formation. Eclogae geol. Helv. *50*/1 (1957), 5-67. - *Part 2:* Maridale-Formation (Typlokalität). Eclogae geol. Helv. *59*/1 (1966), 129-177. - *Part 3:* Maridale-Formation (Co-Typlokalität). Eclogae geol. Helv. *66*/2 (1973), 389-418.

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Introduction

This publication of the fauna from the *Leupoldina protuberans* Zone is the fourth part of a series on the Lower Cretaceous Foraminifera of Trinidad. It closes a still existing gap between the Middle-Upper Barremian *Lenticulina ouachensis ouachensis* Zone below and the Upper Aptian to Lower Albian *Planomalina maridalensis* Zone above. Despite the discontinuity of the sections which are all situated in the tectonically strongly disturbed and poorly exposed Central Range area (Part 1, p. 7-9, Fig. 2), an apparently near continuous stratigraphic sequence from the Lower Barremian to the middle part of the Lower Albian is now established in Trinidad. Furthermore, all known Foraminifera from the Toco, Cuche and the lower part of the Maridale Formation are now published. The yet unpublished fifth part will deal with the Albian *Praeglobotruncana rohri* Zone representing the upper part of the Maridale Formation. Figure 1 shows the Trinidad Lower Cretaceous formations and zones, and the stratigraphic intervals that the faunas of Part 1-5 occupy in terms of the European standard stages.

The stratigraphic determinations of the faunas described in this part are based on a scheme proposed by BARTENSTEIN & BETTENSTAEDT (1962) and BARTENSTEIN & KAEVER (1973). This scheme differs somewhat in the Lower Barremian to Middle Albian from the stratigraphic subdivision proposed by CASEY & RAWSON (1973).

Location of Type Locality and previous investigations

The type locality of the *Leupoldina protuberans* Zone was first published by BOLLI (1957), when he described and figured the *Schackoina* and *Leupoldina* species from this locality. It is situated in the Central Range of Trinidad, some 300 m south of the Rebecca Richmond Road where, as part of a slip mass, it forms a small outcrop in the Piparo River. A geological sketch map showing the position of the type locality sample Bo 529 was published in the same paper.

In a later paper BOLLI (1959) listed on his Chart 1 the planktonic Foraminifera recognized in the *Leupoldina protuberans* Zone, considered to be of Lower Aptian age. In this study, two species were shown to range from older beds into this zone: *Globigerina kugleri* becomes extinct in it, but *Hedbergella infracretacea* continues into the Albian. The six species *Leupoldina protuberans, Hastigerinella* aff. *subcretacea, Planomalina blowi, Schackoina pustulans pustulans, Sch. pustulans quinquecamerata* and *Sch. reicheli* were found to occur first in the *Leupoldina protuberans* Zone and to continue, with the exception of *Planomalina blowi,* into younger strata.

Systematic descriptions

The description of taxa follows the same pattern as in Part 1 to 3. However, in this part, figures of each species are restricted here to one to three SEM micrographs for each species. The same frequency symbols are used as in the previous parts: *rare* = 1-4 specimens, *common* = 5-15 specimens, *abundant* = more than 15 specimens.

As in Part 1 to 3, the described species are restricted almost exclusively to benthonic Foraminifera. Attention was paid in particular to the relatively frequent forms and amongst those to the world-wide known index species. Planktonic Foraminifera are here described only as far as they are significant and stratigraphically important. The foraminiferal fauna presented here is in general strongly corroded and often very poorly preserved.

The figured specimens are deposited at the Museum of Natural History, Basel, under the numbers C 33998 to C 34097. The numbers are listed on the plate explanations.

Agglutinated Foraminifera

Reophax sp.

Pl. 1, Fig. 2-3

Remarks. - The few tests available could not be determined specifically.
Occurrence. - Rare.

Haplophragmoides concavus (Chapman 1892)

Pl. 1, Fig. 4-7

1972 *Haplophragmoides concavus* (Chapman) - Maync, Gorringe Bank: 1082; Pl. 1, Fig. 13-14.
1973 *Haplophragmoides concavus* (Chapman) - Damotte & Magniez-Jannin, Aptien inf.: 14; Pl. 2, Fig. 4-5; Textfig. 4 and 27.
1973 *Haplophragmoides concavus* (Chapman) - Bartenstein & Bolli, Trinidad 3: 393; Pl. 3, Fig. 2-26.
1975 *Haplophragmoides concavus* (Chapman) - Neagu, Eocrétacés: 24; Pl. 12, Fig. 3-15.

Remarks. - The tests are strongly compressed in various directions. Small and thin walled specimens appear transitional to *Trochammina* (see: *Trochammina depressa* Lozo).

Occurrence. - Abundant. In Trinidad now recorded from the Upper Barremian to the Lower Albian. From off-shore Portugal Maync (1972) found the species to range from Barremian to Albian and mentioned Middle Valanginian as the oldest known occurrence. Neagu (1975) reported the species from the Upper Valanginian to the Lower Hauterivian of Rumania.

Haplophragmoides (?) sp., *Trochammina* (?) sp.

Pl. 1, Fig. 8-9

Remarks. - Relatively large tests with thick walls occur together with *Haplophragmoides concavus* and *Trochammina depressa* which possess an equally irregular chamber construction. A reliable assignment of these specimens to a genus or species is not possible.

Occurrence. - Rare.

Ammobaculites reophacoides BARTENSTEIN 1952

Pl. 1, Fig. 10-13

1967 *Ammobaculites reophacoides* BARTENSTEIN - MICHAEL, Barrême: 26; Pl. 1, Fig. 18-21.
1975 *Ammobaculites reophacoides* BARTENSTEIN - NEAGU, Eocrétacés: 24; Pl. 13, Fig. 1-6.

Remarks. - Both, normally preserved and flattened, compressed tests do occur. Those with a regular spire are difficult to distinguish from *Ammobaculites subcretaceus* CUSHMAN & ALEXANDER.

Occurrence. - Common. An index form of the boreal and tethyan facies realms from Lower Barremian to Middle Albian.

Ammobaculites subcretaceus CUSHMAN & ALEXANDER 1930

1973 *Ammobaculites subcretaceus* CUSHMAN & ALEXANDER - DAMOTTE & MAGNIEZ-JANNIN, Aptien inf.: 18; Textfig. 8 and 27.
1973 *Ammobaculites subcretaceus* CUSHMAN & ALEXANDER - BARTENSTEIN & BOLLI, Trinidad 3: 394; Pl. 2, Fig. 63-64.
1973 *Ammobaculites subcretaceus* - FLETCHER, Low. Cretac.: Fig. 1-3.
1975 *Ammobaculites suprajurassicus* (SCHWAGER) - NEAGU, Eocrétacés: 25; Pl. 13, Fig. 8-13.

Occurrence. - Rare.

Tritaxia pyramidata REUSS 1863

Pl. 1, Fig. 14

1957 *Tritaxia pyramidata* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 19; Pl. 2, Fig. 37.
1971 *Tritaxia pyramidata* REUSS - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 130; Pl. 1, Fig. 1.
1973 *Tritaxia pyramidata* REUSS - HART, Gault Clay: 279; Fig. 3.
1974 *Tritaxia pyramidata* REUSS - COSTEA, Moesian Platf.: 11; Fig. 2-3.
1975 *Tritaxia pyramidata* REUSS - NEAGU, Eocrétacés: 35; Pl. 15, Fig. 25-35.
1975 *Tritaxia pyramidata* - LUTERBACHER, NW Pacific: Fig. 2-3.
1975 *Tritaxia pyramidata* REUSS - KOVATCHEVA, Bedulian: 38.
1976 *Tritaxia pyramidata* REUSS - KOVATCHEVA, Gargasian: 29.

Occurrence. - Very rare (one specimen only). The species ranges in the Tethys from Upper Valanginian to Albian, in the boreal areas from the Upper Aptian into the Upper Cretaceous.

Verneuilinoides subfiliformis BARTENSTEIN 1952

Pl. 1, Fig. 15-17

1957 *Verneuilinoides subfiliformis* BARTENSTEIN - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 19; Pl. 2, Fig. 41.
1973 *Verneuilinoides subfiliformis* BARTENSTEIN - DAMOTTE & MAGNIEZ-JANNIN, Aptien inf.: 25; Pl. 2, Fig. 29-31, Textfig. 27.
1974 *Verneuilinoides subfiliformis* BARTENSTEIN - COSTEA, Moesian Platf.: 10; Fig. 3.

Remarks and occurrence. - Rare. In the boreal Lower Cretaceous the species evolved from *Verneuilinoides neocomiensis* (MJATLIUK 1939) during the Upper

Hauterivian and Lower Barremian. Its distribution maximum falls in the Barremian and Lower Aptian. During the higher Aptian and Lower Albian the species developed into *Dorothia filiformis* (BERTHELIN 1880). The range in Trinidad, originally described in Part 1 to be higher Middle to Upper Barremian can now be extended to include the Aptian.

DAILEY (1973) reports *Gaudryina tailleuri* (TAPPAN 1957) from the Californian Valanginian to Cenomanian. It is possible that this author also included *Verneuilinoides subfiliformis* in *Gaudryina tailleuri.*

It appears from the investigations by FUCHS (1971), KALANTARI (1969), MICHAEL (1967) and NEAGU (1972) that the replacement of *Verneuilinoides neocomiensis* by *V. subfiliformis* took place in the Middle to Upper Barremian, simultaneously in both the tethyan and boreal realm.

Gaudryinella hannoverana BARTENSTEIN & BRAND 1951

Pl. 1, Fig. 18–20

1967 *Gaudryinella hannoverana* BARTENSTEIN & BRAND - MICHAEL, Barrême: 30; Pl. 2, Fig. 8.
1974 *Gaudryinella hannoverana* BARTENSTEIN & BRAND - COSTEA, Moesian Platf.: 5; Fig. 3.
1975 *Uvigerinammina hannoverana hannoverana* (BARTENSTEIN & BRAND) - NEAGU, Eocrétacés: 36; Pl. 18, Fig. 32–41.

Occurrence. - Rare. An index species of world-wide distribution. BARTENSTEIN & BRAND (1951) recorded the species from Upper Valanginian to Lower Hauterivian. This range was extended by MICHAEL (1967) to Upper Barremian. COSTEA (1974) reported the species from the Valanginian and NEAGU (1975) from the Lower Hauterivian to Lower Aptian of Rumania. The occurrences in Trinidad confirm that the range of the species can be extended to the Lower Aptian.

Gaudryinella sherlocki BETTENSTAEDT 1952

Pl. 1, Fig. 21–22

1967 *Gaudryinella sherlocki* BETTENSTAEDT - MICHAEL, Barrême: 29; Pl. 2, Fig. 9, 15, 16.
1973 *Gaudryinella* aff. *sherlocki* BETTENSTAEDT - DAMOTTE & MAGNIEZ-JANNIN, Aptien inf.: 22; Pl. 3, Fig. 12; Textfig. 13 and 27.
1973 *Gaudryinella sherlocki* BETTENSTAEDT - BARTENSTEIN & BOLLI, Trinidad 3: 396; Pl. 2, Fig. 22 to 26.
1973 *Gaudryinella sherlocki* - FLETCHER, Low. Cretac.: Fig. 3 (pars).

Remarks. - The tests of the Trinidad specimens are compressed like those of the originally described forms, with the individual chambers overlapping each other in a scale-like manner.

Occurrence. - Common. The species is characteristic for boreal faunas where it ranges from higher Lower Barremian to Lower Aptian. Occasionally it is found to continue as high as Middle Albian, and to begin as early as Upper Hauterivian. Its range in Trinidad recorded in Part 2 and 3 is Upper Aptian to Lower Albian. With the present paper it can now be extended downwards to include the Upper Barremian. This is in accordance with the Californian occurrences cited by DAILEY (1970, 1973).

Marssonella kummi ZEDLER 1961

Pl. 1, Fig. 23-24

1957 *Marssonella* cf. *oxycona* (REUSS) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 20; Pl. 2, Fig. 42-43.
1971 *Marssonella kummi* ZEDLER - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 130; Pl. 1, Fig. 2.
1975 *Dorothia kummi* (ZEDLER) - NEAGU, Eocrétacés: 39; Pl. 19, Fig. 7-14; Pl. 22, Fig. 14-35.
1975 *Dorothia* sp. aff. *D. kummi* - LUTERBACHER, NW Pacific: 707-709; Fig. 2-3.
1975 *Marssonella kummi* ZEDLER - KOVATCHEVA, Bedulian: 38.
1976 *Marssonella kummi* ZEDLER - KOVATCHEVA, Gargasian: 29.

Remarks. - Reference is made to the extensive remarks in BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA (1971).

Occurrence. - Rare. The occurrence in the Barremian of Trinidad compares well with the stratigraphic range known world-wide. The species probably became extinct around the Barremian-Aptian boundary, or evolved into *Marssonella subtrochus* BARTENSTEIN which in Trinidad occurs first in the Middle Barremian (lower part of the Cuche Formation).

Marssonella praeoxycona (MOULLADE 1966)

Pl. 1, Fig. 25-26

1972 *Dorothia praeoxycona* MOULLADE - NEAGU, Eo-Cretaceous: 201; Pl. 8, Fig. 1-9.
1973 *Marssonella praeoxycona* (MOULLADE) - BARTENSTEIN & BOLLI, Trinidad 3: 397; Pl. 2, Fig. 57-61.
1975 *Dorothia praeoxycona* - LUTERBACHER, NW Pacific: 707-709; Fig. 2-3.

Remarks and occurrence. - Common. The species is according to MOULLADE (1966) a good index form in the bathyal facies of the Barremian and Lower Aptian of southern France. The occurrence in Trinidad is different; here it ranges from the Barremian-Aptian boundary to the Upper Aptian - Lower Albian *Planomalina maridalensis* Zone (Trinidad Part 2 and 3).

DAILEY (1973, p. 48, Pl. 4, Fig. 2) describes *Marssonella oxycona* (REUSS) as being locally very abundant from the Californian Valanginian to Cenomanian. His rich material might allow to recognize also in California the European *Marssonella* subdivision and phylogenetic sequence *kummi-subtrochus / praeoxycona-oxycona.*

Marssonella subtrochus BARTENSTEIN 1962

Pl. 1, Fig. 27-28

1972 *Dorothia subtrochus* (BARTENSTEIN) - NEAGU, Eo-Cretaceous: 200; Pl. 2, Fig. 35-36.
1973 *Marssonella subtrochus* BARTENSTEIN - BARTENSTEIN & BOLLI, Trinidad 3: 397; Pl. 3, Fig. 29 to 31.
1975 *Dorothia subtrochus* (BARTENSTEIN) - NEAGU, Eocrétacés: 40; Pl. 22, Fig. 1-13; Pl. 23, Fig. 26 to 27.
1975 *Dorothia subtrocha* - LUTERBACHER, NW Pacific: Fig. 2.
1975 *Marssonella subtrochus* BARTENSTEIN - KOVATCHEVA, Bedulian: 37.
1976 *Marssonella subtrochus* BARTENSTEIN - KOVATCHEVA, Gargasian: 29.

Occurrence. - Rare. The range of the species in the boreal and tethyan realms is from Middle Barremian to Lower Turonian, in Trinidad it has so far been recorded from the Middle Barremian to the Lower Albian.

Trochammina depressa LOZO 1944

Pl. 1, Fig. 29-31

1971 *Trochammina depressa* LOZO - FUCHS, tief. Mittel-Barrême: 11; Pl. 2, Fig. 6.
1972 *Trochammina murgeanui* n.sp. - NEAGU, Eo-Cretaceous: 195; Pl. 3, Fig. 35-41.
1974 *Trochammina depressa* LOZO - COSTEA, Moesian Platf.: 9; Fig. 3.

Remarks. - This species originally described from the Middle Albian of Texas is similar to *Haplophragmoides concavus* (CHAPMAN 1892) in that the chambers are strongly to completely compressed and most of the tests asymmetrically deformed. It is present world-wide in the Lower Cretaceous and can be regarded as a facies form of no particular stratigraphic significance.

It is possible that also *Trochammina murgeanui* NEAGU from the Rumanian Barremian belongs to this species.

Occurrence. - Common. Probably world-wide in the Lower Cretaceous, such as Berriasian to Middle Barremian in Britain, Barremian and Aptian in Rumania, Upper Barremian to lower Upper Aptian in Trinidad, and Albian in the U.S.A.

Choffatella decipiens SCHLUMBERGER 1905

Pl. 1, Fig. 32

1949 *Choffatella decipiens* SCHLUMBERGER - MAYNC, *Choffatella:* 539; Pl. 11, Fig. 1-15; Pl. 12, Fig. 1-9.
1952 *Choffatella decipiens* SCHLUMBERGER - MAYNC, Lituolidae: 50; Pl. 11, Fig. 9-10.
1975 *Choffatella decipiens* SCHLUMBERGER - NEAGU, Eocrétacés: 16; Pl. 110, Fig. 12-13.

Occurrence. - In eastern Venezuela the species ranges from the Barremian to the Upper Aptian which corresponds to the distribution in Trinidad. In eastern Canada *Choffatella decipiens* is reported from the Hauterivian and also from the Barremian to higher Aptian (*Choffatella decipiens* Zone).

SUPPLEMENT TO TRINIDAD, PART 3 (p. 397-398)

Dorothia gradata (BERTHELIN 1880)

1973 *Dorothia gradata* (BERTHELIN) - HART, Gault Clay: 279; Fig. 3.
1975 *Dorothia gradata* - LUTERBACHER, NW Pacific: Fig. 2.

Remarks. - This species, quoted in Trinidad Part 2 as *Dorothia* cf. *conula* (REUSS), probably does not occur in the Upper Aptian; its earliest appearance seems to be in the higher Lower Albian. The earliest record of this species in other areas is from the boundary Lower-Middle Albian.

LUTERBACHER's record of this species on Shatsky Rise, North West Pacific, as early as the Barremian-Aptian boundary should be re-investigated in the light of the present world-wide evidence.

Calcareous Foraminifera

Abbreviations for the subgenera of *Lenticulina:*
(L.) = Lenticulina, (A.) = Astacolus, (P.) = Planularia, (S.) = Saracenaria.

Lenticulina (L.) muensteri (Roemer 1839)

Pl. 1, Fig. 33

1957 *Lenticulina (L.) münsteri* (Roemer) - Bartenstein, Bettenstaedt & Bolli, Trinidad 1: 22; Pl. 3, Fig. 54; Pl. 4, Fig. 80-81.
1973 *Lenticulina muensteri* (Roemer) - Dailey, Budden Canyon: 51; Pl. 5, Fig. 5.
1973 *Lenticulina muensteri* (Roemer) - Fletcher, Low. Cretac.: Fig. 1-3.
1974 *Lenticulina muensteri* (Roemer) - Costea, Moesian Platf.: 7; Fig. 4.
1975 *Lenticulina muensterii* (Roemer) - Neagu, Eocrétacés: 61; Pl. 45, Fig. 17-19; Pl. 46, Fig. 4-10; Pl. 48, Fig. 18-21; Pl. 49, Fig. 1-2.
1975 *Lenticulina muensteri* (Roemer) - Kovatcheva, Bedulian: 37.
1976 *Lenticulina muensteri* (Roemer) - Kovatcheva, Gargasian: 29.

Remarks and occurrence. - Common. The species is common in the Lower Cretaceous with numerous specimens apparently transitional to other *Lenticulina* species. In Trinidad it ranges from Middle Barremian to Aptian.

Lenticulina (L.) nodosa (Reuss 1863)

Pl. 1, Fig. 34-36

1957 *Lenticulina (L.) nodosa* (Reuss) - Bartenstein, Bettenstaedt & Bolli, Trinidad 1: 24; Pl. 3, Fig. 49; Pl. 4, Fig. 66-67.
1973 *Lenticulina nodosa* (Reuss) - Fletcher, Low. Cretac.: 165; Fig. 2.
1974 *Lenticulina (L.) nodosa nodosa* (Reuss) - Bartenstein, *Lent. nodosa:* 540; Pl. 1, Fig. 1-17.
1974 *Lenticulina (L.) nodosa* (Reuss) - Michael, Unterkreide-Meer: Pl. 1, Fig. 24.
1975 *Lenticulina nodosa* (Reuss) - Neagu, Eocrétacés: 57; Pl. 43, Fig. 11-26; Pl. 44, Fig. 13-14, 17-18.
1975 *Lenticulina* (sp. aff. *L.*) *nodosa* - Luterbacher, NW Pacific: 709; Fig. 3.
1975 *Lenticulina nodosa* (Reuss) - Kovatcheva, Bedulian: 37.
1976 *Lenticulina nodosa* (Reuss) - Kovatcheva, Gargasian: 29.

Remarks. - The monographic investigation of *Lenticulina nodosa* by Bartenstein (1974) and by Aubert & Bartenstein (1976) contains the present day knowledge on the morphology, phylogeny and world-wide occurrence of this important Lower Cretaceous species.

Occurrence. - Common. With the material now available the range in Trinidad is extended from Lower Barremian to lower Upper Aptian. This is in good agreement with that known from the tethyan Lower Cretaceous in Rumania and Bulgaria (Bartenstein 1974, Fig. 3).

Lenticulina (L.) ouachensis (Sigal 1952)

Pl. 1, Fig. 37; Pl. 2, Fig. 1-2

1957 *Lenticulina (L.) ouachensis ouachensis* (Sigal) - Bartenstein, Bettenstaedt & Bolli, Trinidad 1: 25; Pl. 3, Fig. 50; Pl. 4, Fig. 71, 76.
1971 *Lenticulina (L.) ouachensis ouachensis* (Sigal) - Bartenstein, Bettenstaedt & Kovatcheva, bulg. Barrême: 141; Table 1.

1972 *Lenticulina (L.) ouachensis ouachensis* (SIGAL) - MAYNC, Gorringe Bank: 1087; Pl. 2, Fig. 1-2.
1972 *Lenticulina ouachensis ouachensis* (SIGAL) - LUTERBACHER, NW Atlantic: Fig. 2, 6; Table 3.
1972 *Lenticulina ouachensis* - DOUGLAS & MOULLADE, NW Pacific: 1166; Fig. 3.
1973 *Lenticulina ouachensis* (SIGAL) - DAILEY, Budden Canyon: 52; Pl. 5, Fig. 6.
1975 *Lenticulina ouachensis ouachensis* (SIGAL) - NEAGU, Eocrétacés: 56; Pl. 40, Fig. 8-17; Pl. 41, Fig. 16-17; Pl. 42, Fig. 9, 11-15; Pl. 53, Fig. 1-7; Textfig. 15.
1975 *Lenticulina ouachensis ouachensis* - LUTERBACHER, NW Pacific: 708; Fig. 3.
1975 *Lenticulina ouachensis ouachensis* SIGAL - KOVATCHEVA, Bedulian: 37.

Occurrence. - Rare. In Trinidad now established from Middle Barremian to Lower Aptian and ? lower Upper Aptian. The species has a world-wide distribution from Middle Valanginian to Lower Aptian. It occurs in California from Middle Valanginian to Barremian (DAILEY 1973), in Britain from Hauterivian to Lower Barremian (FLETCHER 1973), offshore Portugal from Barremian to Lower Aptian (MAYNC 1972), in Bulgaria and Rumania from Lower Hauterivian to Lower Aptian (BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA 1971; NEAGU 1972, 1975).

Lenticulina (L.) kugleri BARTENSTEIN, BETTENSTAEDT & BOLLI 1957

*1957 *Lenticulina (L.) kugleri* n.sp. - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 27; Pl. 5, Fig. 95; Pl. 6, Fig. 116.
*1971 *Lenticulina (L.) pseudoatheria* n.sp. - FUCHS, tief. Mittel-Barrême: 22; Pl. 5, Fig. 5.
1973 *Lenticulina kugleri* BARTENSTEIN, BETTENSTAEDT & BOLLI - DAILEY, Budden Canyon: 51; Pl. 5, Fig. 3.

Remarks and occurrence. - Rare. Most specimens are strongly corroded. In Trinidad the species is now known from the Middle Barremian to the uppermost Barremian; in the alpine Lower Cretaceous (FUCHS 1971) in the lower Middle Barremian. DAILEY (1973) describes the species from Northern California where it persists up to the Albian (faunizone III). However, all observations giving a younger age than Barremian should be regarded with caution.

Lenticulina crepidularis (ROEMER 1842)

Pl. 2, Fig. 3-4

1957 *Lenticulina (A.) crepidularis* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 29; Pl. 3, Fig. 55; Pl. 4, Fig. 82-83.
1972 *Lenticulina (P.) crepidularis* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 141; Pl. 2, Fig. 32.
1973 *Planularia crepidularis* ROEMER - DAILEY, Budden Canyon: 53; Pl. 6, Fig. 5.
1974 *Planularia tricarinella* (REUSS) - COSTEA, Moesian Platf.: 12; Fig. 4.
1975 *Planularia crepidularis crepidularis* ROEMER - NEAGU, Eocrétacés: 73; Pl. 66, Fig. 19, 21-23.
1975 *Planularia crepidularis tricarinella* (REUSS) - NEAGU, Eocrétacés: 74; Pl. 62, Fig. 24-31; Pl. 63, Fig. 2-17.
1975 *Astacolus crepidularis* - LUTERBACHER, NW Pacific: Fig. 2-3.
1975 *Planularia crepidularis* (ROEMER) - KOVATCHEVA, Bedulian: 37.
1976 *Planularia crepidularis* (ROEMER) - KOVATCHEVA, Gargasian: 37.

Remarks and occurrence. - Rare. In Trinidad now known from Middle Barremian to Upper Aptian. The recorded range in California is Valanginian to Hauteri-

vian (Barremian ?), in Britain Lower Hauterivian to Middle Barremian, in Bulgaria and Rumania Lower Hauterivian to Lower Aptian. A Middle to Upper Albian assignment in Rumania by COSTEA (1974) is stratigraphically so young that the species determination should be checked again. From world-wide evidence the maximum range of the species is Upper Dogger to Aptian.

Growth optima of comparatively smaller and narrower *Astacolus* resp. *Planularia* tests (*crepidularia* typica) can be distinguished from larger, stronger and compressed *Planularia* tests (*tricarinella* typica) at various stratigraphic levels and in different regions.

Lenticulina (M.) gracilissima (REUSS 1863)

Pl. 2, Fig. 5

1957 *Lenticulina (M.)* cf. *gracilissima* (REUSS) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 31; Pl. 6, Fig. 121.
1967 *Lenticulina (M.) gracilissima* (REUSS) - MICHAEL, Barrême: 44; Pl. 4, Fig. 1-3.

Occurrence. - Rare. Recorded in Trinidad from the Barremian (Part 1) to the Aptian. The species occurs in northwestern Germany from the Valanginian to the Lower Aptian, to become extremely rare in the Upper Aptian and Lower Albian where it also changes morphologically.

Lenticulina (A.) maridalensis BARTENSTEIN & BOLLI 1973

Pl. 2, Fig. 6-8

*1973 *Lenticulina (A.) maridalensis* n. sp. - BARTENSTEIN & BOLLI, Trinidad 3: 401; Pl. 4, Fig. 40.

Occurrence. - Rare. In Trinidad now established from the highest Barremian to the middle Lower Albian.

Lenticulina (S.) frankei DAM 1946

Pl. 2, Fig. 9-10

1957 *Lenticulina (S.) frankei* DAM - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 33; Pl. 3, Fig. 60.
1973 *Lenticulina (S.)* aff. *frankei* (TEN DAM) - DAMOTTE & MAGNIEZ-JANNIN, Aptien inf.: 32; Pl. 4, Fig. 17-18; Textfig. 20 and 27.
1973 *Lenticulina (S.) frankei* DAM - BARTENSTEIN & KAEVER, Helgoland: 235; Fig. 5.
1974 *Lenticulina (S.) frankei* (DAM) - MICHAEL, Unterkreide-Meer: Pl. 1, Fig. 33.
1975 *Saracenaria frankei* TEN DAM - KOVATCHEVA, Aptian: 42; Pl. 3, Fig. 7-8.
1975 *Saracenaria frankei* DAM - NEAGU, Eocrétacés: 64; Pl. 56, Fig. 20-25, 28-30; Pl. 57, Fig. 1-8, 10-11, 21-23; Pl. 78, Fig. 28.
1975 *Saracenaria frankei* TEN DAM - KOVATCHEVA, Bedulian: 37, 42; Pl. 3, Fig. 7-8.

Occurrence. - Rare. In Trinidad present from the Lower Barremian (Part 1) to the lower Upper Aptian. In Central Europe the species has so far been known to occur only in the Hauterivian and in the Barremian of the Alpine area. It has also been reported from Rumania in the Hauterivian and Barremian, and from Bulgaria where it continues into the Lower Aptian.

Lenticulina (S.) spinosa (EICHENBERG 1935)

Pl. 2, Fig. 11-12

1966 *Lenticulina (S.) spinosa* (EICHENBERG) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 151; Pl. 3, Fig. 238-242, 256-259.
1966 *Saracenaria spinosa* EICHENBERG - MOULLADE, Fosse vocont.: 58.
1973 *Lenticulina (S.) spinosa* (EICHENBERG) - BARTENSTEIN & KAEVER, Helgoland: 235; Pl. 6, Fig. 94; Table 5.
1973 *Lenticulina (S.) spinosa* (EICHENBERG) - BARTENSTEIN & BOLLI, Trinidad 3: 403; Pl. 5, Fig. 11 to 15.
1976 *Saracenaria spinosa* EICHENBERG - KOVATCHEVA, Gargasian: 29, 31; Pl. 1, Fig. 10-11.

Occurrence. - Rare. In Trinidad now known from the higher Lower Aptian to the earliest Lower Albian (Part 2 and 3). The species appears to have developed during the high Barremian and Lower Aptian from *L. (S.) frankei* DAM or from *L. (S.) forticosta* BETTENSTAEDT 1952 (? = *Saracenaria pravoslavlevi* FURSENKO & POLENOVA 1950 in NEAGU 1975, 65).

Nodosaria sceptrum REUSS 1863

Pl. 2, Fig. 13

1957 *Nodosaria sceptrum* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 35; Pl. 7, Fig. 150.
1972 *Nodosaria sceptrum* REUSS - GUILLAUME, BOLLI & BECKMANN, Venezuela: Table 2.
1975 *Nodosaria sceptrum* REUSS - NEAGU, Eocrétacés: 90; Pl. 70, Fig. 3-7.
1975 *Nodosaria sceptrum* - LUTERBACHER, NW Pacific: 709; Fig. 3.

Occurrence. - Rare. In Trinidad from Barremian (Part 1) to Aptian.

Vaginulina arguta REUSS 1860

Pl. 2, Fig. 14

1957 *Vaginulina arguta* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 38; Pl. 5, Fig. 104; Pl. 6, Fig. 136.
1972 *Vaginulina* cf. *arguta* REUSS - GUILLAUME, BOLLI & BECKMANN, Venezuela: Table 2.
1974 *Vaginulina arguta* REUSS - COSTEA, Moesian Platf.: 12; Fig. 4.
1975 *Vaginulina arguta* REUSS - NEAGU, Eocrétacés: 87; Pl. 65, Fig. 3, 12; Pl. 66, Fig. 1-2, 7, 12, 16; Pl. 67, Fig. 3.
1975 *Vaginulina arguta* REUSS - KOVATCHEVA, Bedulian: 38.
1976 *Vaginulina arguta* REUSS - KOVATCHEVA, Gargasian: 29.

Occurrence. - Rare. In Trinidad from Barremian (Part 1) to Aptian.

Vaginulina recta REUSS 1863

Pl. 2, Fig. 15-16

1957 *Vaginulina recta* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 38; Pl. 5, Fig. 103; Pl. 6, Fig. 134-135.
1966 *Vaginulina recta* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 155; Pl. 3, Fig. 250-253.
1972 *Vaginulina recta* REUSS - GUILLAUME, BOLLI & BECKMANN, Venezuela: Table 2.

1973 *Vaginulina recta* REUSS - DAILEY, Budden Canyon: 58; Pl. 7, Fig. 11.
1974 *Vaginulina recta* REUSS - COSTEA, Moesian Platf.: 12; Fig. 4.
1975 *Vaginulina recta* REUSS - NEAGU, Eocrétacés: 87; Pl. 65, Fig. 5-6; Pl. 66, Fig. 6.
1975 *Vaginulina recta* - LUTERBACHER, NW Pacific: Fig. 3.

Occurrence. - Rare. In Trinidad from Barremian (Part 1) to Lower Albian (Part 2 and 3).

Citharina acuminata (REUSS 1863)

Pl. 2, Fig. 17

1957 *Citharina acuminata* (REUSS) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 39; Pl. 7, Fig. 159.
1973 *Citharina acuminata* (REUSS) - BARTENSTEIN & KAEVER, Helgoland: 230; Pl. 4, Fig. 62-64; Table 4.
1973 *Citharina* aff. *acuminata* (REUSS) - MAYNC, Gorringe Bank: 1095; Pl. 3, Fig. 15.
1973 *Citharina acuminata* (REUSS) - DAILEY, Budden Canyon: 70; Pl. 10, Fig. 5.
1975 *Citharina acuminata* (REUSS) - KOVATCHEVA, Bedulian: 39; Pl. 3, Fig. 5 (non Fig. 6).
1976 *Citharina acuminata* (REUSS) - KOVATCHEVA, Gargasian: 29.

Occurrence. - Rare, only one specimen seen. In Trinidad now known from Middle Barremian to Upper Aptian. The species occurs in the northern temperate areas from late Upper Hauterivian to early Lower Albian, and in the Tethys from middle Middle Barremian to middle Lower Albian. DAILEY (1943) found it in California between Upper Valanginian (?) and Albian, FLETCHER (1973) in the Speeton Clay from Upper Hauterivian to Middle Barremian.

Orthokarstenia shastaensis DAILEY 1970

Pl. 2, Fig. 18-19

*1970 *Orthokarstenia shastaensis* n.sp. - DAILEY, new Cretac. Foram.: 107; Pl. 12, Fig. 8-10; Textfig. 3.
1973 *Orthokarstenia shastaensis* DAILEY - DAILEY, Budden Canyon: 73; Pl. 11, Fig. 3; Textfig. 10.

Remarks. - The specimens in the uppermost Barremian to Aptian of Trinidad are slimmer than those from the type locality in northern California. Their sequence of uniserial chambers is similar to a *Nodosaria* or *Dentalina,* but the triserial to biserial early part of the test is distinctly shorter. Details of the ornamentation and delicate structures in the Trinidad specimens may have been destroyed during fossilisation.

Occurrence. - Rare. It is an index species from uppermost Barremian to Cenomanian in northern California, in Trinidad it is found only from uppermost Barremian to Upper Aptian. According to F.M. Gradstein, Nova Scotia (personal communication), *O. shastaensis* occurs in the *Ticinella breggiensis* Zone as defined by VAN HINTE (1976, Fig. 8) of the Grand Banks, Scotian Shelf, and of the DSDP Leg 44 Sites 390 and 392 on the Blake Plateau edge. This corresponds to the lower Upper Albian of the European scale.

The opinion in BARTENSTEIN & BOLLI (1973, 414) that *O. shastaensis* is a synonym of *Bigernerina clavellata* LOEBLICH & TAPPAN has to be revised.

We cannot decide whether the closely related species *O. shastaensis* and *Siphogenerina asperula* (CHAPMAN 1896) are synonyms or not. The following citations of *S. asperula* are known up to now:

*1896 *Sagrina asperula* n.sp. - CHAPMAN, Folkestone IX: 581; Pl. 12, Fig. 1.
1933 *Uvigerina asperula* (CHAPMAN) - EICHENBERG, Albien: 18; Pl. 1, Fig. 3.
1947 *Siphogenerina asperula* (CHAPMAN) - DAM, Albien: 25; Fig. 3.
1950 *Siphogenerina asperula* (CHAPMAN) - DAM, Albien: 45.
1973 *"Siphouvigerina" asperula* (CHAPMAN) - HART, Gault Clay: 278; Fig. 3.

Both species have nearly the same stratigraphic distribution, the same sequence of tri-, bi- und uniserial chambers (the uniserial part comprising 4/5 of the test), the same short cylindrical neck and about the same test size.

S. asperula possesses a rough surface with fine spines ("numerous small tubercles" after CHAPMAN), while *O. shastaensis* has a smooth wall without spines (but is "rarely finely papillate" according to DAILEY). Concerning apertures and internal structures DAILEY (1970, 107) writes: "No internal tooth plate was found in *O. shastaensis*, but these delicate structures may have been destroyed during fossilisation", nor do CHAPMAN, EICHENBERG and DAM mention any siphon or internal tooth plate.

The present authors believe that both species are closely related and represent in the northern boreal and tethyan areas good index fossils from the higher Lower Cretaceous (uppermost Barremian) to Albian.

Globulina prisca REUSS 1863

Pl. 2, Fig. 20-22

1957 *Globulina prisca* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 41; Pl. 4, Fig. 166.
1966 *Globulina prisca* REUSS - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 158; Pl. 3, Fig. 286-292, 308.
1975 *Globulina prisca* REUSS - NEAGU, Eocrétacés: 100; Pl. 76, Fig. 34-44, 48-51.
1975 *Globulina prisca* - LUTERBACHER, NW Pacific: Fig. 3.

Occurrence. - Common in the Lower Cretaceous of Trinidad from Barremian (Part 1) to Albian (Part 2 and 3).

Ramulina aculeata WRIGHT 1886

Pl. 2, Fig. 23

1957 *Ramulina spandeli* PAALZOW - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 42; Pl. 5, Fig. 106.
1966 *Ramulina aculeata* WRIGHT - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 159; Pl. 4, Fig. 315-339.
1973 *Ramulina aculeata* WRIGHT - BARTENSTEIN & BOLLI, Trinidad 3: 408; Pl. 6, Fig. 18-34.
1975 *Ramulina* sp. sp. - LUTERBACHER, NW Pacific: 709; Pl. 3, Fig. 6-8; Textfig. 3.
1975 *Ramulina aculeata* WRIGHT - KOVATCHEVA, Bedulian: 37, 43; Pl. 1, Fig. 3.
1976 *Ramulina aculeata* WRIGHT - KOVATCHEVA, Gargasian: 29.

Occurrence. - In Trinidad mostly common to frequent from Barremian (Part 1) to Albian (Part 2 and 3).

Spirillina minima SCHACKO 1892

Pl. 2, Fig. 24-28

1973 *Spirillina minima* SCHACKO - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 147; Pl. 3, Fig. 83.
1973 *Spirillina minima* SCHACKO - BARTENSTEIN & BOLLI, Trinidad 3: 409; Pl. 6, Fig. 47.
1973 *Spirillina minima* SCHACKO - MAYNC, Gorringe Bank: 1099; Fig. 2.
1974 *Spirillina minima* SCHACKO - COSTEA, Moesian Platf.: 6; Fig. 2 and 4.
1975 *Spirillina minima* - LUTERBACHER, NW Pacific: 707; Fig. 3.
1975 *Spirillina minima* SCHACKO - KOVATCHEVA, Bedulian: 37.
1976 *Spirillina minima* SCHACKO - KOVATCHEVA, Gargasian: 29.

Occurrence. - Common. In Trinidad so far known from Lower Barremian (Part 1) to middle Lower Albian (Part 2 and 3). *Spirillina minima* has a world-wide Lower Cretaceous distribution, continuing into the Upper Cretaceous. MAYNC (1972) reported the species from offshore Portugal in the Lower Aptian to Albian.

Patellina subcretacea CUSHMAN & ALEXANDER 1930

Pl. 2, Fig. 29

1957 *Patellina subcretacea* CUSHMAN & ALEXANDER - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 45.
1974 *Patellina subcretacea* CUSHMAN & ALEXANDER - COSTEA, Moesian Platf.: 6; Fig. 4.
1975 *Patellina subcretacea* CUSHMAN & ALEXANDER - KOVATCHEVA, Bedulian: 38.
1975 *Patellina subcretacea* CUSHMAN & ALEXANDER - NEAGU, Eocrétacés: 109; Pl. 82, Fig. 1-16; Pl. 85, Fig. 20-21, 26-29.

Occurrence. - Rare. In Trinidad known from Barremian to Upper Aptian, world-wide from Valanginian to Albian.

Valvulineria loetterlei (TAPPAN 1940)

Pl. 2, Fig. 30-33

1967 *Valvulineria loetterlei* (TAPPAN) - FUCHS, höh. Mittel-Alb: 330; Pl. 19, Fig. 1.
1967 *Valvulineria gracillima* DAM - BETTENSTAEDT, Moçambique: 296, 297.
1972 *Gyroidinoides gracillima* (DAM) - NEAGU, Eo-Cretaceous: 220; Pl. 6, Fig. 43-48; Pl. 8, Fig. 36 to 38.
1973 *Valvulineria loetterlei* (TAPPAN) - BARTENSTEIN & BOLLI, Trinidad 3: 410; Pl. 6, Fig. 66-67.
1973 *Valvulineria loetterlei* (TAPPAN) - DAILEY, Budden Canyon: 75; Pl. 11, Fig. 7.
1975 *Valvulineria loetterlei* - LUTERBACHER, NW Pacific: Fig. 2.
1975 *Valvulineria gracillima* TEN DAM - KOVATCHEVA, Bedulian: 37, 43; Pl. 3, Fig. 15-17.

Remarks. - *Valvulineria gracillima* DAM 1947 from the Dutch and northwestern European Albian is a synonym of *V. loetterlei.*

Occurrence. - Common. In Trinidad now recorded from the uppermost Barremian to middle Lower Albian (Part 2 and 3). According to DAILEY the species ranges in California from Aptian to Turonian. The distribution from Barremian to Cenomanian-Turonian of this species is similar in both the temperate and the tethyan areas.

Epistomina caracolla (ROEMER 1841)

Pl. 2, Fig. 34-36

1957 *Epistomina (Hoeglundina) caracolla caracolla* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 46; Pl. 5, Fig. 113-114; Pl. 6, Fig. 142.
1971 *Epistomina caracolla* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 137; Pl. 2, Fig. 28.
1973 *Epistomina caracolla* (ROEMER) - DAILEY, Budden Canyon: 78; Pl. 14, Fig. 5.
1975 *Epistomina caracolla* (ROEMER) - KOVATCHEVA, Bedulian: 37.
1975 *Epistomina caracolla caracolla* (ROEMER) - NEAGU, Eocrétacés: 122; Pl. 105, Fig. 1-6; Pl. 106, Fig. 16-18.

Occurrence. - Rare. In Trinidad Barremian to ? Lower Aptian. Except for a Lower Aptian occurrence of the species in eastern Canada and now possibly also from Trinidad, the species is known to have become extinct world-wide in the Barremian.

Epistomina ornata (ROEMER 1841)

Pl. 2, Fig. 37

1957 *Epistomina (Brotzenia) ornata* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 46; Pl. 5, Fig. 110, 115; Pl. 6, Fig. 143.
1971 *Epistomina ornata* (ROEMER) - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 138; Pl. 2, Fig. 29.
1975 *Epistomina ornata* (ROEMER) - NEAGU, Eocrétacés: 122; Pl. 106, Fig. 1-15, 19-21.

Occurrence. - Rare in Trinidad and world-wide with the same distribution as the above-mentioned *Epistomina caracolla.*

Epistomina spinulifera spinulifera (REUSS 1863)

1962 *Epistomina (Brotzenia) spinulifera spinulifera* (REUSS) - BARTENSTEIN & BETTENSTAEDT, Boreal u. Tethys: 281; Pl. 41, Fig. 4; Table 18.
1967 *Epistomina spinulifera spinulifera* (REUSS) - OHM, *Reinholdella:* 140; Fig. 35.
1973 *Epistomina spinulifera* - HART, Gault Clay: 278; Fig. 3.
1973 *Epistomina spinulifera* (REUSS) - DAILEY, Budden Canyon: 79; Pl. 15, Fig. 3.
1975 *Epistomina spinulifera spinulifera* (REUSS) - NEAGU, Eocrétacés: 123; Pl. 104, Fig. 1-3, 6-9.

Remarks. - The Middle to Upper Barremian specimens from northwestern Germany (BARTENSTEIN & BETTENSTAEDT 1962) differ from those reported from younger strata (Aptian to Upper Cretaceous - probably Santonian after OHM 1967) by the presence of knobs on the limbate sutures or by sequences of knobs instead of limbate sutures.

Occurrence. - Rare in Trinidad. The species which has a world-wide distribution in the boreal and tethyan areas ranges from Middle Barremian to Upper Albian and into the deeper Upper Cretaceous. HART (1973) found the species in the Middle Albian and deeper Upper Albian of Folkestone, DAILEY (1973) in the Aptian to Cenomanian-Turonian of California. The Trinidad occurrences extend the range reported from California from the Aptian down into the uppermost Barremian. Unfortunately the *Epistomina* specimens of the *Leupoldina protuberans* Zone are strongly corroded.

Gavelinella barremiana BETTENSTAEDT 1952

Pl. 2, Fig. 38; Pl. 3, Fig. 1-3

1957 *Gavelinella barremiana* BETTENSTAEDT - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 1: 47; Pl. 7, Fig. 168-169.
1971 *Gavelinella barremiana* BETTENSTAEDT - BARTENSTEIN, BETTENSTAEDT & KOVATCHEVA, bulg. Barrême: 142; Pl. 2, Fig. 35-40.
1973 *Gavelinella* aff. *barremiana* BETTENSTAEDT - MAYNC, Gorringe Bank: 1099; Pl. 4, Fig. 15.
1974 *Gavelinella barremiana* BETTENSTAEDT - COSTEA, Moesian Platf.: 7; Fig. 2 and 5.
1975 *Lingulogavelinella barremiana* (BETTENSTAEDT) - NEAGU, Eocrétacés: 120; Pl. 89, Fig. 20-27; Pl. 99, Fig. 1-26.
1975 *Gavelinella* sp. aff. *G. barremiana* - LUTERBACHER, NW Pacific: Fig. 2.
1975 *Gavelinella barremiana* BETTENSTAEDT - KOVATCHEVA, Bedulian: 37.

Remarks and occurrence. - Rare to common. In Trinidad now recorded from Middle Barremian to the deeper Upper Aptian. On present knowledge the species became replaced in the Lower Aptian by *Gavelinella intermedia.* The youngest Trinidad specimens are probably also pre-Upper Aptian.

According to NEAGU (1975) *Gavelinella barremiana* developed during the Lower Barremian from *G. sigmoicosta.*

Gavelinella intermedia (BERTHELIN 1880)

Pl. 3, Fig. 4-5

1973 *Gavelinella intermedia* (BERTHELIN) - BARTENSTEIN & BOLLI, Trinidad 3: 410; Pl. 6, Fig. 48-59.
1973 *Gavelinella intermedia* - HART, Gault Clay: 278; Fig. 3.
1974 *Gavelinella intermedia* (BERTHELIN) - COSTEA, Moesian Platf.: 7; Fig. 5.
1975 *Gavelinella* sp. ex gr. *G. intermedia* - LUTERBACHER, NW Pacific: Fig. 2-3.
1976 *Gavelinella intermedia* (BERTHELIN) - KOVATCHEVA, Gargasian: 29, 32; Pl. 1, Fig. 17-19.

Remarks and occurrence. - Rare. In Trinidad recorded from uppermost Barremian to middle Lower Albian. The world-wide boreal and tethyan range is Lower Aptian to Upper Albian, continuing into the lower part of the Upper Cretaceous. It is possible that the oldest occurrence of the species in Trinidad is in fact also Lower Aptian. *G. intermedia* has developed from *G. barremiana.*

Conorotalites aptiensis (BETTENSTAEDT 1952)

Pl. 3, Fig. 6-10

1972 *Globorotalites bartensteini* BETTENSTAEDT s.l. - GUILLAUME, BOLLI & BECKMANN, Venezuela: Table 2 (*G. bartensteini* pars).
1973 *Conorotalites aptiensis* (BETTENSTAEDT) - BARTENSTEIN & BOLLI, Trinidad 3: 411; Pl. 6, Fig. 62 to 65.
1973 *Conorotalites aptiensis* (BETTENSTAEDT) - DAILEY, Budden Canyon: 77; Pl. 13, Fig. 5.
1974 *Conorotalites aptiensis* (BETTENSTAEDT) - COSTEA, Moesian Platf.: 10; Fig. 10.
1975 *Conorotalites* sp. aff. *C. aptiensis* - LUTERBACHER, NW Pacific: 703; Fig. 2.
1976 *Conorotalites aptiensis* (BETTENSTAEDT) - KOVATCHEVA, Gargasian: 29, 32.

Remarks and occurrence. - In Trinidad now known from high Barremian to middle Lower Albian (Part 2 and 3), which is the same as in California (DAILEY 1973) and corresponds to the recorded world-wide boreal and tethyan ranges. Though rare specimens continue into the Middle Albian, the species may be taken as a good index form.

Important planktonic Foraminifera

Hedbergella infracretacea (Glaessner 1937)

Pl. 3, Fig. 11-13

1973 *Hedbergella infracretacea* (Glaessner) - Bartenstein & Kaever, Helgoland: 231; Pl. 5, Fig. 85-88; Pl. 6, Fig. 102-103.
1973 *Hedbergella infracretacea* (Glaessner) - Hart, Gault Clay: 274; Fig. 3.
1974 *Hedbergella infracretacea* (Glaessner) - Costea, Moesian Platf.: 6; Fig. 4.
1975 *Hedbergella infracretacea* (Glaessner) - Kovatcheva, Bedulian: 44; Pl. 3, Fig. 11-13.

Occurrence. - In Trinidad common from Middle Barremian to Albian (Bolli 1959).

Hedbergella planispira (Tappan 1940)

1961 *Hedbergella planispira* (Tappan) - Loeblich & Tappan, Cenomanian: 276; Pl. 5, Fig. 4-11.
1974 *Hedbergella planispira* (Tappan) - Costea, Moesian Platf.: 12; Fig. 4.
1975 *Hedbergella planispira* - Luterbacher, NW Pacific: Fig. 2.

Occurrence. - In Trinidad common from higher Aptian to Upper Cretaceous.

Hedbergella (Globigerina ?) kugleri Bolli 1959

Pl. 3, Fig. 14

*1959 *Globigerina kugleri* n.sp. - Bolli, Plankt. Foram.: 270; Pl. 23, Fig. 3-5.
1973 *Globigerina hoterivica* Subbotina - Dailey, Budden Canyon: 86; Pl. 19, Fig. 4-5; Table 10 (non *Globigerina hoterivica* ?).

Occurrence. - Rare. General distribution from Neocomian (Upper Hauterivian) to Aptian. In Trinidad Upper Barremian to Aptian (Bolli 1959).

Leupoldina protuberans Bolli 1957

Pl. 3, Fig. 15-17

*1957 *Leupoldina protuberans* n.sp. - Bolli, *Schackoina* and *Leupoldina:* 277; Pl. 2, Fig. 1-13.
1959 *Leupoldina protuberans* Bolli - Bolli, Plankt. Foram.: 264; Pl. 20, Fig. 20.
1966 *Leupoldina protuberans* Bolli - Bolli, Zonation Cretac.: 10; Table 1 and 4.

Occurrence. - The small index species of the Lower Cretaceous *Leupoldina protuberans* Zone is infrequent in the zonal sample. It apparently continues in Trinidad to the Cenomanian *Rotalipora appenninica appenninica* Zone.

Clavihedbergella subcretacea (Tappan 1943)

Pl. 3, Fig. 18-19

1959 *Hastigerinella* aff. *subcretacea* Tappan - Bolli, Plankt. Foram.: 271; Pl. 23, Fig. 10-13.
*1975 *Clavihedbergella eocretacea* n.sp. - Neagu, Eocrétacés: 112; Pl. 89, Fig. 1-10; Textfig. 20.

Remarks. - Neagu claims that his *Clavihedbergella eocretacea* from the Barremian and Lower Aptian of Rumania is a predecessor of *C. subcretacea.* To the present authors however the similar morphology and overlapping stratigraphic

range of the two species rather indicates that *C. eocretacea* is a synonym of *C. subcretacea.*

Occurrence. - Common. In Trinidad from uppermost Barremian to Cenomanian (BOLLI 1959).

Schackoina pustulans pustulans BOLLI 1957

Pl. 3, Fig. 20-21

*1957 *Schackoina pustulans pustulans* n.sp., n.subsp. - BOLLI, *Schackoina* and *Leupoldina:* 274; Pl. 1, Fig. 1-4.

1966 *Schackoina pustulans* BOLLI - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 163; Pl. 4, Fig. 381-383 (pars).

Occurrence. - Infrequent. In Trinidad recorded from uppermost Barremian to Cenomanian (BOLLI 1959).

Schackoina pustulans quinquecamerata BOLLI 1957

Pl. 3, Fig. 22-23

*1957 *Schackoina pustulans quinquecamerata* n.sp., n.subsp. - BOLLI, *Schackoina* and *Leupoldina:* 274; Pl. 1, Fig. 6-7.

1966 *Schackoina pustulans* BOLLI - BARTENSTEIN, BETTENSTAEDT & BOLLI, Trinidad 2: 163; Pl. 4, Fig. 381-383 (pars).

Occurrence. - Rare. In Trinidad recorded from uppermost Barremian to Cenomanian (BOLLI 1959).

Planomalina blowi BOLLI 1959

Pl. 3, Fig. 24-26

*1959 *Planomalina blowi* BOLLI, n.sp. - BOLLI, Plankt. Foram.: 260; Pl. 20, Fig. 2-3, Chart 1.

Occurrence. - Frequent. In Trinidad restricted to the *Leupoldina protuberans* Zone.

OTHER MICROFOSSILS

Holothurians

Fig. 3

Remarks. - The figured wheel belongs according to the holothurian nomenclature to the family Theeliidae and its genus *Theelia* SCHLUMBERGER 1890. The figure shows a 25-spoked wheel.

Although only one fragile specimen was found in the foraminiferal assemblages it may be of some significance for the interpretation of the water depth in the Lower Cretaceous of Trinidad. On the occurrence of the holothurian fragments we quote FRIZZELL & EXLINE (1957, 883): "The environment of fossil holothurians is marine and tropical to sub-arctic. Bathymetric range is sub-littoral to moderate depth, sclerites deposited at considerable depth presumably having been dissolved shortly after deposition."

Radiolaria

1962 *Dictyomitra* sp. - BARTENSTEIN & BETTENSTAEDT, Boreal u. Tethys: 283; Pl. 39, Fig. 18 ("Turm-Radiolarie"); Table 18.
1974 *Radiolaria (Dictyomitra)* - COSTEA, Moesian Platf.: 4; Fig. 5.

Occurrence. - Rare in Trinidad. Mostly recorded from Barremian to Albian, but certainly of more exclusive distribution. Locally abundant and often the only microfaunal element which can be determined. COSTEA (1974) described the genus *Dictyomitra* from the Rumanian Berriasian to Hauterivian.

Stratigraphy and Paleogeography

The *Leupoldina protuberans* Zone as referred to in this paper is known so far only from the isolated outcrop Bo259 in the Central Range area of Trinidad. Its exact position within a continuous Lower Cretaceous sequence therefore remains unknown. However, because the rich foraminiferal fauna combines many index species of world-wide distribution, the assemblage can readily be placed in the interval between the uppermost part of the Barremian and the lowermost part of the Upper Aptian.

The foraminiferal faunas in the Lower Cretaceous of Trinidad published so far (Fig. 1) represent the following stratigraphic intervals:

— Upper Aptian - early Lower Albian (Part 2 and 3)
(*Planomalina maridalensis* Zone)
— uppermost Barremian - early Upper Aptian (Part 4)
(*Leupoldina protuberans* Zone)
— Lower Barremian (pars) - Upper Barremian (Part 1)
(*Lenticulina ouachensis ouachensis* Zone - *Lenticulina barri* Zone)

It must be kept in mind that these age intervals and the foraminiferal zones assigned to them are based not on a continuous section but on isolated outcrops of

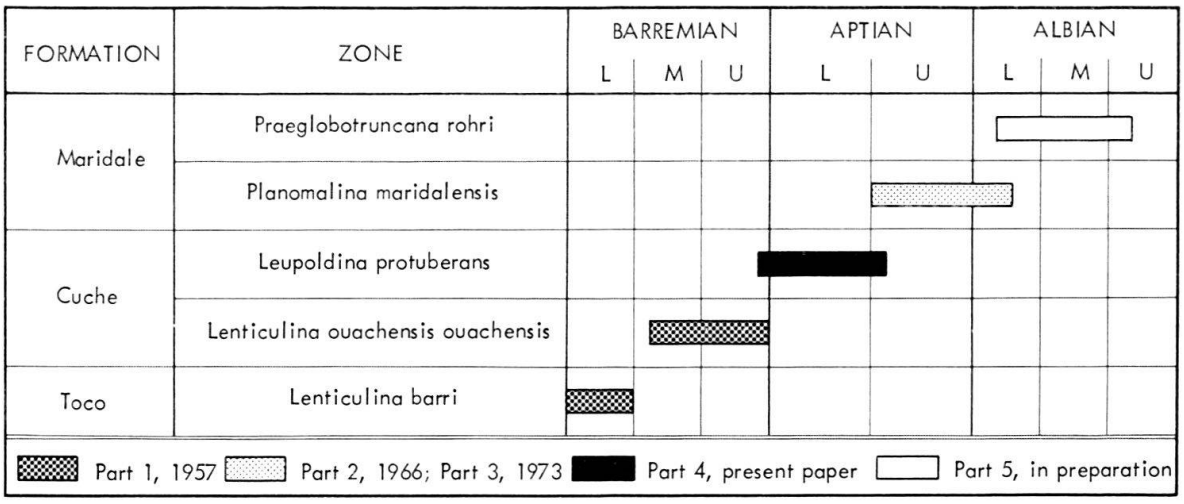

Fig. 1. Trinidad Lower Cretaceous formations and foraminiferal zones, and age of Trinidad Lower Cretaceous Foraminifera of Part 1-5 in terms of European stages.

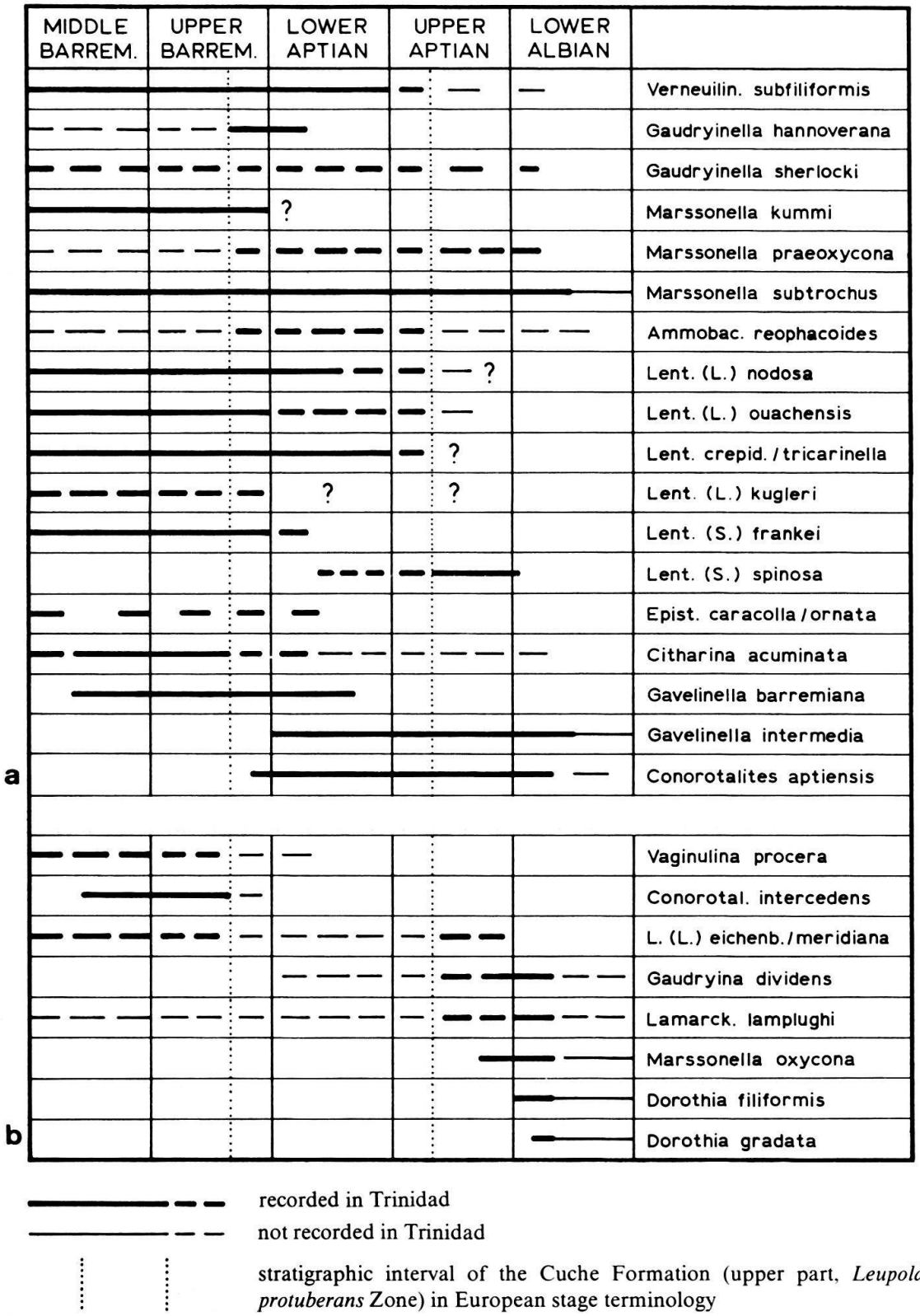

Fig. 2. Distribution of benthonic index Foraminifera in the Lower Cretaceous of Trinidad, compared to their world-wide distribution in the temperate and tethyan areas of the northern hemisphere (BARTENSTEIN 1976*c*).

Part a shows species present in the *Leupoldina protuberans* Zone; *part b* shows species not recorded from the *Leupoldina protuberans* Zone but present in the zones immediately below and above.

reworked blocks and slip masses (Part 1). Therefore, the faunal record as presented in Part 1-4 may not be continuous. Similarly, the sequence of foraminiferal zones does not necessarily cover the whole stratigraphic interval.

Figure 2 (a, b) shows the distribution of benthonic index Foraminifera which have a world-wide distribution in the northern boreal, the tethyan and sporadically also the southern boreal area (BARTENSTEIN 1976 *b, c*). The following benthonic species are regarded as being of particular significance in the *Leupoldina protuberans* Zone (Fig. 2a):

— *Verneuilinoides subfiliformis* and *Gaudryinella sherlocki* both continue into the Lower Albian, slightly beyond the upper boundary of the *Leupoldina protuberans* Zone. *Gaudryinella hannoverana*, originally observed only in the Upper Valanginian to Lower Hauterivian of northwestern Germany, has subsequently been shown to range world-wide into the Lower Aptian, both in the boreal and tethyan areas. The species can thus be taken as diagnostic for the lower part of the *Leupoldina protuberans* Zone.

— *Marssonella kummi* becomes extinct at the Barremian-Aptian boundary and must therefore be absent in the higher part of the *Leupoldina protuberans* Zone.

— *Marssonella praeoxycona* occurs in southern France already in the Barremian. In Trinidad the species has only been recorded from the Aptian and Lower Albian where it is regarded as a good index fossil.

— *Marssonella subtrochus* ranging from the higher Barremian to the Upper Cretaceous is known in Trinidad from the Barremian to the Lower Albian (Part 1 to 4), with a possible extension into the Upper Cretaceous.

— *Ammobaculites reophacoides*, a world-wide index form for the Barremian to Lower Albian, has been observed in Trinidad so far only from the highest Barremian to the Upper Aptian (Part 4).

— *Lenticulina (L.) nodosa, L. (L.) ouachensis*, and also *L. (P.) crepidularis* which on world-wide evidence became extinct prior to the Upper Aptian seem to make good markers for the upper boundary of the *Leupoldina protuberans* Zone.

— *Lenticulina (L.) kugleri* appears to be significant at least for the determination of the lower boundary of the *Leupoldina protuberans* Zone (uppermost Barremian). A continuation into the Aptian and Albian as claimed by DAILEY (1973) for northern California could not be verified in Trinidad.

— *Lenticulina (S.) frankei* and *L. (S.) spinosa* succeed each other in the Lower Aptian, within the *Leupoldina protuberans* Zone.

— The ranges of *Epistomina caracolla* and *E. ornata*, known so far from Upper Valanginian to Barremian, can on evidence from eastern Canada, and now from the *Leupoldina protuberans* Zone of Trinidad, be extended into the Lower Aptian. During the Lower Aptian both species became extinct or possibly evolved into other *Epistomina* species, such as *E. spinulifera* or *E. carpenteri.*

— *Citharina acuminata* ranges world-wide from uppermost Hauterivian to lowermost Albian. As expected, the species also occurs, though only rarely, in the *Leupoldina protuberans* Zone. However, in the higher Lower Cretaceous of Trinidad (Upper Aptian - Lower Albian, Part 2 and 3), it has not been observed.

— Also in the Lower Aptian, we find the concurrence of the stratigraphic ranges of *Gavelinella barremiana, G. intermedia* and *Conorotalites aptiensis.*

Figure 2b contains a number of significant cosmopolitan benthonic species from the interval Middle Barremian to Lower Albian which have not been seen in the *Leupoldina protuberans* Zone of Trinidad. They may be absent for ecological reasons or because of the limited available material.

— *Vaginulina procera* and *Conorotalites intercedens* are known in the high Barremian, the former also continues into the lowermost Aptian. They would be expected to occur in the lower part of the *Leupoldina protuberans* Zone.

— *Lenticulina (L.) eichenbergi,* a boreal species, and *L. (L.) meridiana,* a tethyan species, range from Upper Valanginian to Upper Aptian. One or both species should therefore be present in the *Leupoldina protuberans* Zone. The species were previously reported from Trinidad in Part 1 and 3 from levels below and above this Zone.

— *Gaudryina dividens,* restricted to the Aptian and Lower Albian, is so far known in Trinidad only from the *Planomalina maridalensis* Zone (Part 2 and 3). The same applies to *Lamarckina lamplughi* (= *Conorboides lamplughi* in HART 1973, Gault Clay: 278, Fig. 3) which occurs world-wide from Upper Hauterivian to Middle Albian.

— The last three species listed on Figure 2b, *Marssonella oxycona, Dorothia filiformis* and *D. gradata* (for *Dorothia* species see also HART 1973, Gault Clay, Fig. 3), could be used indirectly for the determination of the *Leupoldina protuberans* Zone in that they appear only in the uppermost Aptian and at the Aptian–Albian boundary respectively, slightly above the *Leupoldina protuberans* Zone. The three species have been recorded in Trinidad from the higher *Planomalina maridalensis* Zone.

In general, the Trinidad Lower Cretaceous benthonic Foraminifera compare well with those known in other parts of the world. Paleogeographically the Trinidad fauna occupies in its composition a position intermediate between the tethyan and the temperate type (BARTENSTEIN 1974, Fig. 6; AUBERT & BARTENSTEIN 1976, Fig. 4).

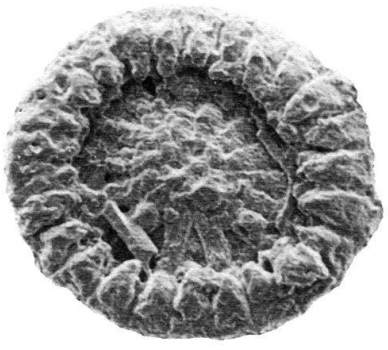

Fig. 3. Holothurian specimen of the genus *Theelia.* Diameter: 0.35 mm. – C 34097.

Planktonic Foraminifera are figured and described here only as far as they are typical for the *Leupoldina protuberans* Zone. Their stratigraphic value has already been sufficiently documented in other publications (BOLLI 1957, 1959). Of particular significance in the zone are *Leupoldina protuberans, Hedbergella (Globigerina ?) kugleri, Schackoina pustulans pustulans, Sch. pustulans quinquecamerata,* and *Planomalina blowi.*

Index to genera and species (alphabetical)

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Plate 1

All Figures about ×55. - Scanning electron micrographs.

Fig. 1 *Reophax guttifer* BRADY 1884.
Length: 0.5 mm; width: 0.32 mm. - C33998. - No description.

Fig. 2-3 *Reophax* sp.
Length: 0.53 and 0.67 mm; width: 0.17 and 0.2 mm. - C33999-34000.

Fig. 4-7 *Haplophragmoides concavus* (CHAPMAN 1892).
Diameter: 0.35-0.33-0.25-0.42 mm. - C34001-34004.

Fig. 8-9 *Haplophragmoides* (?) sp. or *Trochammina* (?) sp.
Diameter: 0.52 mm (both specimens). - C34005-34006.

Fig. 10-13 *Ammobaculites reophacoides* BARTENSTEIN 1952.
Length: 0.44-0.45-0.5-0.55 mm; width: 0.2-0.18-0.18-0.2 mm. - C34007-34010.

Fig. 14 *Tritaxia pyramidata* REUSS 1863.
Length: 0.78 mm; thickness: 0.42 mm. - C34011.

Fig. 15-17 *Verneuilinoides subfiliformis* BARTENSTEIN 1952.
Length: 0.5-0.52-0.62 mm; thickness: 0.15-0.16-0.15 mm. - C34012-34014.

Fig. 18-20 *Gaudryinella hannoverana* BARTENSTEIN & BRAND 1951.
Length: 0.72-0.57-0.68 mm; thickness: 0.2-0.15-0.15 mm. - C34015-34017.

Fig. 21-22 *Gaudryinella sherlocki* BETTENSTAEDT 1952.
Length: 0.42 and 0.41 mm; width: 0.21 and 0.22 mm. - C34018-019.

Fig. 23-24 *Marssonella kummi* ZEDLER 1961.
Length: 0.33 mm (both specimens); thickness: 0.25 and 0.23 mm. - C34020-34021.

Fig. 25-26 *Marssonella praeoxycona* (MOULLADE 1966).
Length: 0.51 and 0.57 mm; thickness: 0.37 and 0.42 mm. - C34022-34023.

Fig. 27-28 *Marssonella subtrochus* BARTENSTEIN 1962.
Length: 0.25 and 0.42 mm; thickness: 0.25 and 0.42 mm. - C34024-34025.

Fig. 29-31 *Trochammina depressa* LOZO 1944.
Diameter: 0.37-0.37-0.28 mm. - C34026-34028.

Fig. 32 *Choffatella decipiens* SCHLUMBERGER 1905.
Diameter: 0.93 mm. - C34029.

Fig. 33 *Lenticulina (L.) muensteri* (ROEMER 1839).
Diameter: 0.52 mm. - C34030.

Fig. 34 *Lenticulina (L.) nodosa* (REUSS 1863).
Diameter: 0.72 mm. - C34031.

Fig. 35-36 *Lenticulina (L.) nodosa* (REUSS 1863).
Length: 0.7 and 0.55 mm. - Coll. Muséum National d'Histoire Naturelle à Paris FG493 (see AUBERT & BARTENSTEIN 1976, Pl. 1, Fig. 18-19).

Fig. 37 *Lenticulina (L.) ouachensis* (SIGAL 1952).
Diameter: 0.5 mm. - C34032.

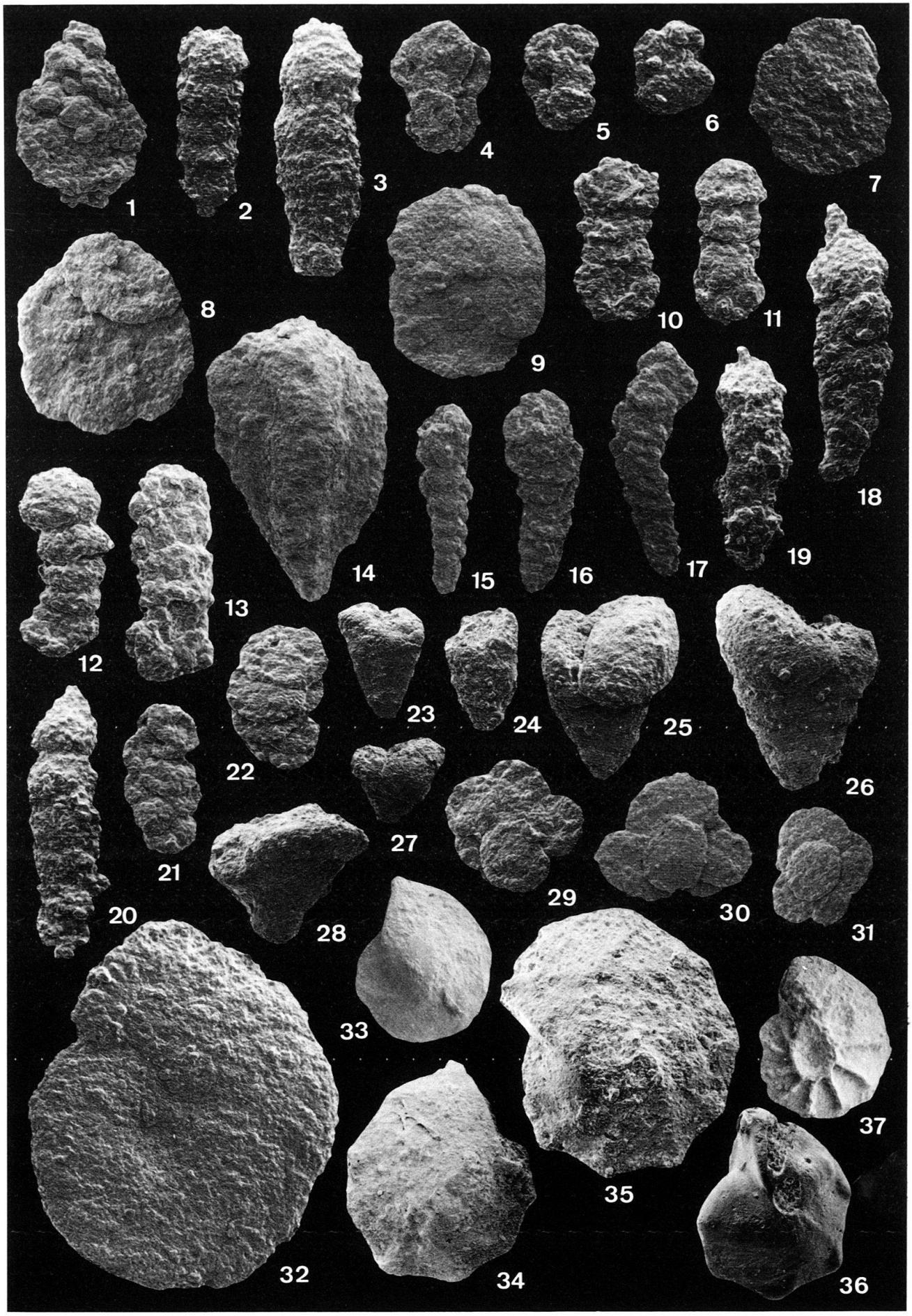
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Plate 2

Scanning electron micrographs.

Fig. 1-2 *Lenticulina (L.) ouachensis* (SIGAL 1952). - ×85.
Diameter: 0.48 and 0.42 mm. - C34033-34034.

Fig. 3-4 *Lenticulina crepidularis* (ROEMER 1842). - ×50.
Length: 0.48 and 0.4 mm. - C34035-34036.

Fig. 5 *Lenticulina (M.) gracilissima* (REUSS 1863). - ×50.
Length: 0.6 mm. - C34037.

Fig. 6-8 *Lenticulina (A.) maridalensis* BARTENSTEIN & BOLLI 1973. - ×50.
Length: 0.42-0.5-0.6 mm. - C34038-34040.

Fig. 9-10 *Lenticulina (S.) frankei* DAM 1946. - ×55.
Length: 0.6 and 0.57 mm. - C34041-34042.

Fig. 11-12 *Lenticulina (S.) spinosa* (EICHENBERG 1935). - ×55.
Length: 0.48 and 0.57 mm. - C34043-34044.

Fig. 13 *Nodosaria sceptrum* REUSS 1863. - ×50.
Length: 0.52 mm. - C34045.

Fig. 14 *Vaginulina arguta* REUSS 1860. - ×50.
Length: 0.8 mm. - C34046.

Fig. 15-16 *Vaginulina recta* REUSS 1863. - ×50.
Length: 0.92 and 0.98 mm. - C34047-34048.

Fig. 17 *Citharina acuminata* (REUSS 1863). - ×55.
Length: 0.68 mm (broken specimen). - C34049. The longitudinal ribs are not clearly visible on the SEM micrograph.

Fig. 18-19 *Orthokarstenia shastaensis* DAILEY 1970. - ×50.
Length: 0.55 and 0.47 mm. - C34050-34051.

Fig. 20-22 *Globulina prisca* REUSS 1863. - ×50.
Length: 0.5-0.35-0.38 mm. - C34052-34054.

Fig. 23 *Ramulina aculeata* WRIGHT 1886. - ×50.
Length: 0.51 mm. - C34055.

Fig. 24-28 *Spirillina minima* SCHACKO 1892. - ×55.
Diameter: 0.23-0.2-0.26-0.2-0.22 mm. - C34056-34060.

Fig. 29 *Patellina subcretacea* CUSHMAN & ALEXANDER 1930. - ×55.
Diameter: 0.23 mm. - C34061.

Fig. 30-33 *Valvulineria loetterlei* (TAPPAN 1940). - ×100.
Diameter: 0.27-0.25-0.24-0.23 mm. - C34062-34065.

Fig. 34-36 *Epistomina caracolla* (ROEMER 1841).
Fig. 34: ×75; diameter: 0.35 mm. - Fig. 35: ×75; diameter: 0.45 mm. - Fig. 36: ×50; diameter: 0.92 mm. - C34066-34068.

Fig. 37 *Epistomina ornata* (ROEMER 1841). - ×50.
Diameter: 0.9 mm. - C34069.

Fig. 38 *Gavelinella barremiana* BETTENSTAEDT 1952. - ×80.
Length: 0.4 mm. - C34070.

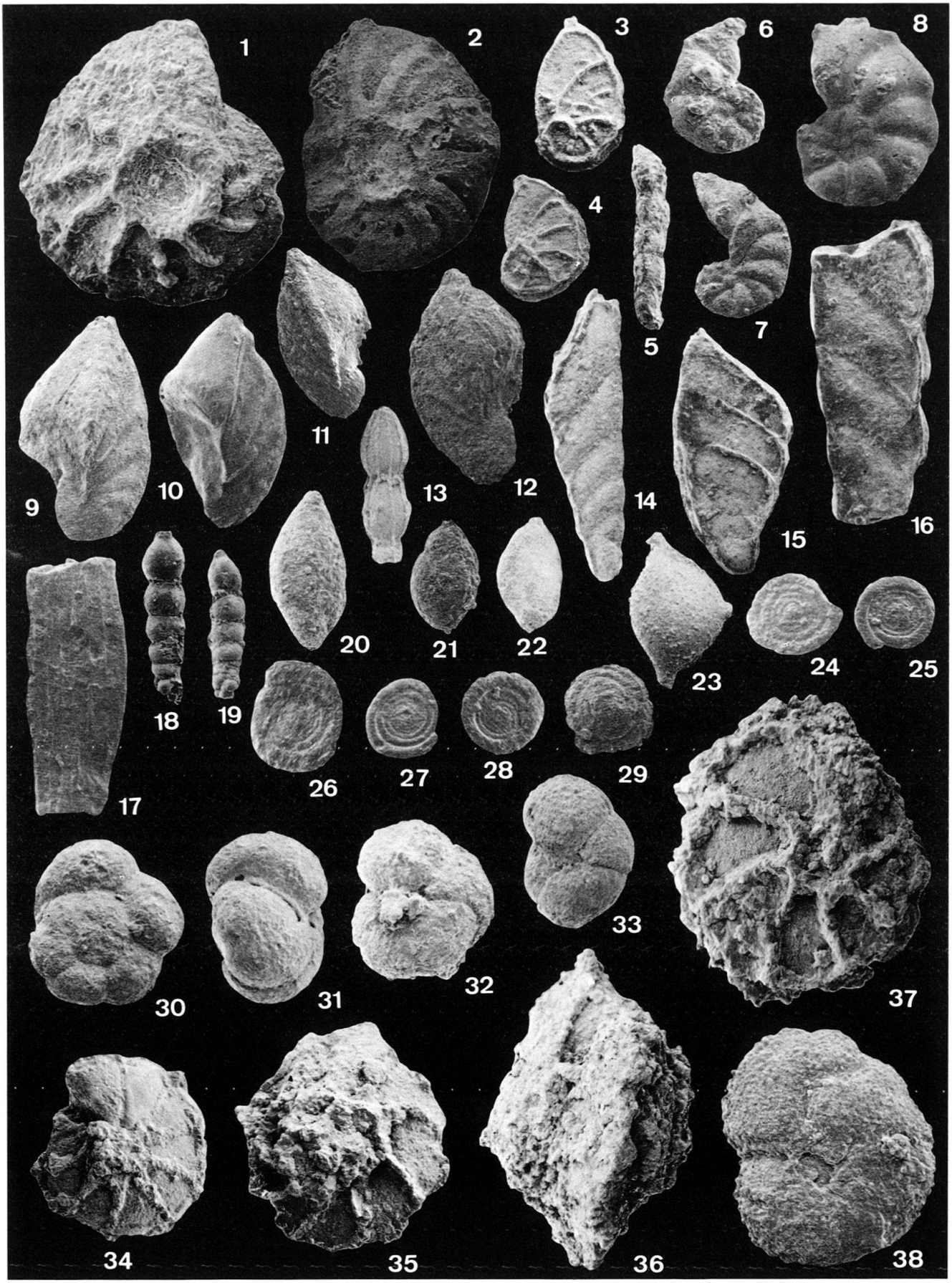
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Plate 3

Fig. 1-5 about ×80, Fig. 6-10 about ×100, Fig. 11-26 about ×110. - Scanning electron micrographs.

Fig. 1-3 *Gavelinella barremiana* BETTENSTAEDT 1952.
Length: 0.3 - 0.27 - 0.4 mm. - C 34071-34073.

Fig. 4-5 *Gavelinella intermedia* (BERTHELIN 1880).
Diameter: 0.5 and 0.4 mm. - C 34074-34075.

Fig. 6-10 *Conorotalites aptiensis* (BETTENSTAEDT 1952).
Diameter: 0.4 - 0.3 - 0.3 - 0.38 - 0.4 mm. - C 34076-34080.

Fig. 11-13 *Hedbergella infracretacea* (GLAESSNER 1937).
Diameter: 0.24 - 0.23 - 0.23 mm. - C 34081-34083.

Fig. 14 *Hedbergella (Globigerina ?) kugleri* BOLLI 1959.
Diameter: 0.23 mm. - C 34084.

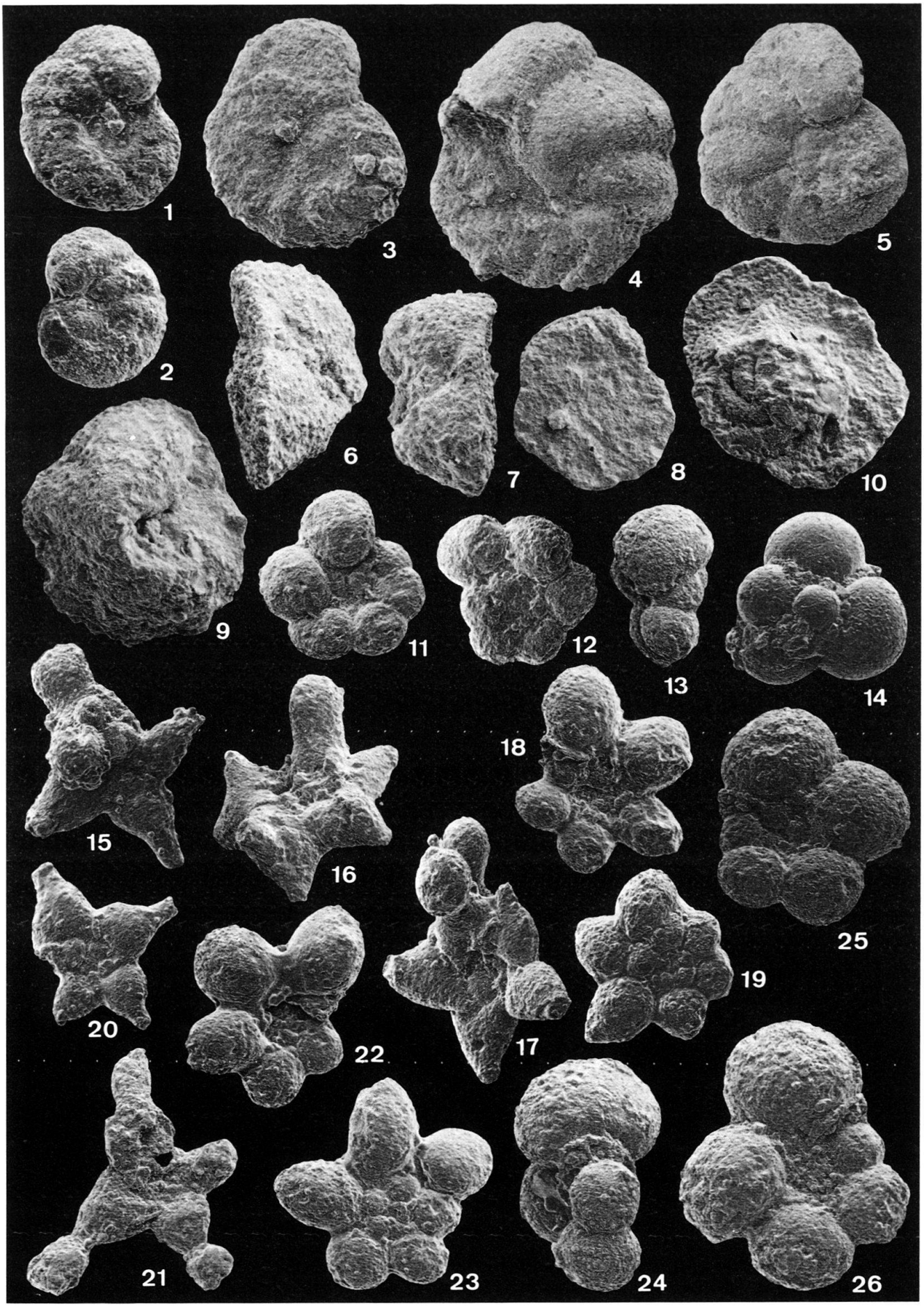
Fig. 15-17 *Leupoldina protuberans* BOLLI 1957.
Diameter: 0.31 - 0.3 - 0.32 mm. - C 34085-34087.

Fig. 18-19 *Clavihedbergella subcretacea* (TAPPAN 1943).
Diameter: 0.27 and 0.23 mm. - C 34088-34089.

Fig. 20-21 *Schackoina pustulans pustulans* BOLLI 1957.
Diameter: 0.27 and 0.33 mm. - C 34090-34091.

Fig. 22-23 *Schackoina pustulans quinquecamerata* BOLLI 1957.
Diameter: 0.3 and 0.28 mm. - C 34092-34093.

Fig. 24-26 *Planomalina blowi* BOLLI 1959.
Diameter: 0.32 - 0.31 - 0.37 mm. - C 34094-34096.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