New taxa of foraminifera from the Cretaceous and basal Tertiary of Trinidad, West Indies

Autor(en): **Beckmann, Jean-Pierre**

Objekttyp: **Article**

Zeitschrift: **Eclogae Geologicae Helvetiae**

Band (Jahr): **84 (1991)**

Heft 3: **[Emile Argand 1879-1940]**

PDF erstellt am: **20.04.2024**

Persistenter Link: https://doi.org/10.5169/seals-166799

Nutzungsbedingungen

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.
Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.
Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

Haftungsausschluss

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

Ein Dienst der *ETH-Bibliothek*
ETH Zürich, Rämistrasse 101, 8092 Zürich, Schweiz, www.library.ethz.ch

http://www.e-periodica.ch

Eclogae geol. Helv. 84/3: 819–835 (1991)

0012-9402/91/030819–17 $ 1.50 + 0.20/0
Birkhäuser Verlag, Basel

New taxa of foraminifera from the Cretaceous and basal Tertiary of Trinidad, West Indies

By Jean-Pierre Beckmann[1])

ABSTRACT

Nine new species, three new subspecies and one new name are proposed for smaller benthic foraminifera of Albian to Early Eocene age from Trinidad, West Indies. A more detailed description of the fauna will be published in a forthcoming paper.

ZUSAMMENFASSUNG

Neun neue Arten, drei neue Unterarten und ein neuer Artname werden für benthische Kleinforaminiferen aus der Kreide und dem basalen Tertiär (Albian bis Unter-Eozän) von Trinidad, West Indien, vorgeschlagen. Eine Publikation der Beschreibung der Gesamtfauna ist in Vorbereitung.

Introduction

The essential part of this paper is a description of new foraminiferal taxa (9 species, 3 subspecies, 1 new name) from the late Early Cretaceous (Albian) to Early Eocene of Trinidad (West Indies). It is connected with a project entitled "Benthic foraminiferal biostratigraphy of the southern Caribbean region" which is in preparation for publication by Cambridge University Press (Bolli et al., in prep.). The purpose of this project is to present an overview of benthic foraminifera of the area and their stratigraphic distribution and to tie it into the biostratigraphic schemes established on the basis of the planktic foraminifera and nannofossils (Bolli 1966, Bolli et al., ed. 1985).

As a part of the project, the benthic foraminifera of the mid-Cretaceous (Late Albian) to Early Eocene of Trinidad will be described by the present author (Beckmann, in prep.). The faunas of this interval in Trinidad are either practically unknown up to now (Cretaceous) or are incompletely recorded and in need of a taxonomic and biostratigraphic revision (Paleocene-Early Eocene).

The principal geologic features of Trinidad are summarized in Kugler (1936, 1961) and Suter (1960). The highly mobile tectonics of this area and the resulting very complicated structure are an important reason why microfaunas have been extensively used since early in this century as a tool in geologic studies and petroleum exploration.

[1]) Geological Institute, ETH Zentrum, 8092 Zürich, Switzerland.

Generalized compilations of basic stratigraphic data can be found in Renz (1942), Kugler (1953, 1956) and Barr & Saunders (1968); an overview of the Cretaceous is given in Kugler & Bolli (1967). A paleoecological interpretation of the Cretaceous sequence has been published by Koutsoukos & Merrick (1986). The essential data on the Cretaceous to basal Tertiary lithostratigraphic and biostratigraphic units and their planktic foraminiferal sequence are presented by Bolli (1951, 1957a, 1957b, 1966). The presently used biostratigraphic zonation relies essentially on these four papers and is summarized, with minor modifications, in Saunders & Bolli (1985). The stratigraphic ranges of the new species described below are also calibrated with the biostratigraphic scheme of Bolli et al. (ed. 1985, Fig. 1, p. 5).

The classical taxonomic papers on the smaller benthic foraminifera are those of Cushman & Jarvis (1928, 1932) and Cushman & Renz (1946, 1947). They dealt with faunas from scattered localities in the uppermost Cretaceous and the Paleocene-Early Eocene, at that time all regarded as Cretaceous in age. These ages have been subsequently corrected by Grimsdale (1947), Bolli (1952) and Beckmann (1960).

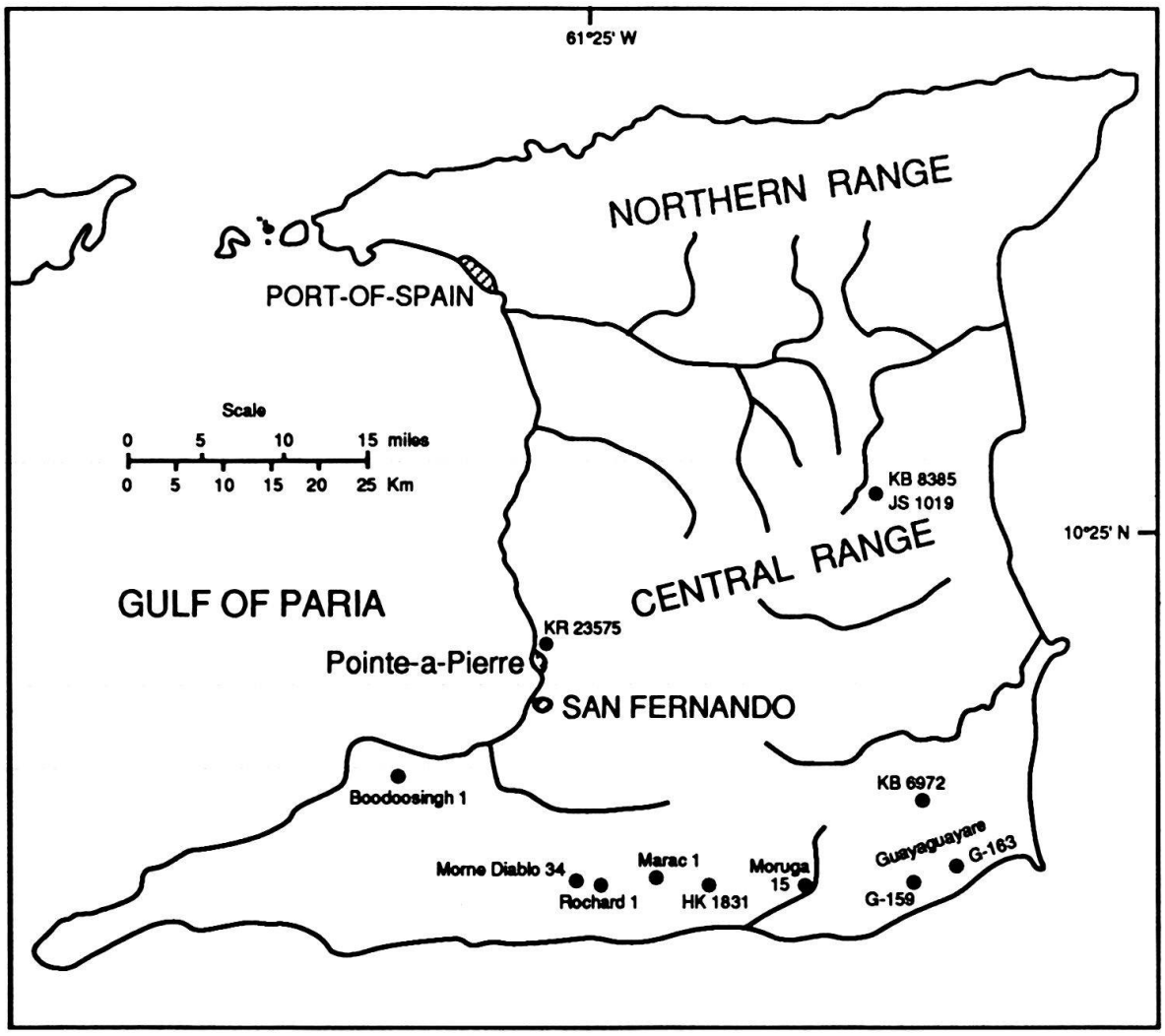


Fig. 1. Map of Trinidad showing sample localities.

A more modern study of the same interval (Kaminski et al. 1988) includes a more thorough biostratigraphic and paleoecologic interpretation but considers the agglutinated faunas only.

The Trinidad localities mentioned in the text are shown on the map (Fig. 1).

Description of new taxa

The arrangement of the genera follows that of Loeblich & Tappan (1987). The ages and stratigraphic ranges of the species mentioned in the text are indicated using the biostratigraphic units listed on Table 1. The figured holotypes, paratypes and hypotypes will be deposited in the collections of the Natural History Museum, Basel, Switzerland (Catalog numbers C 36848 to C 36894).

AGE		PLANKTIC FORAMINIFERAL ZONES			FORMATION
		BOLLI et al. (ed. 1985)		SAUNDERS & BOLLI (1985)	
EOCENE	EARLY	Morozovella aragonensis	P8	Globorotalia aragonensis	UPPER LIZARD SPRINGS
		Morozovella formosa formosa	P7	Globorotalia formosa formosa	
		Morozovella subbotinae	P6	Globorotalia subbotinae	
		Morozovella edgari		Globorotalia edgari	
PALEOCENE	LATE	Morozovella velascoensis	P5	Globorotalia velascoensis	LOWER LIZARD SPRINGS
		Planorotalites pseudomenardii	P4	Globorotalia pseudomenardii	
	MIDDLE	Planorotalites pusilla pusilla	P3	Globorotalia pusilla pusilla	
		Morozovella angulata		Globorotalia angulata	
		Morozovella uncinata	P2	Globorotalia uncinata	
	EARLY	Morozovella trinidadensis	c	Globorotalia trinidadensis	
		Morozovella pseudobulloides	P1 b	Globorotalia pseudobulloides	
		Globigerina eugubina	a	Globigerina eugubina Re	
CRETACEOUS	MAASTRICHTIAN	Abathomphalus mayaroensis		Abathomphalus mayaroensis	GUAYAGUAYARE
		Gansserina gansseri		Globotruncana gansseri	
		Globotruncana aegyptiaca		Globotruncana lapparenti tricarinata	
		Globotruncanella havanensis			
	CAMPANIAN	Globotruncana calcarata			not recorded
		Globotruncana ventricosa		Globotruncana stuarti	NAPARIMA HILL
		Globotruncanita elevata			
	SANTONIAN	Dicarinella asymetrica		Globotruncana fornicata	
	CONIACIAN	Dicarinella concavata		Globotruncana concavata	
		Dicarinella primitiva		Globotruncana renzi	
	TURONIAN	Marginotruncana sigali		Globotruncana inornata	
		Helvetoglobotruncana helvetica			
		Whiteinella archaeocretacea			not recorded
	CENOMANIAN	Rotalipora cushmani			
		Rotalipora reicheli			
		Rotalipora brotzeni		Rotalipora appenninica appenninica	GAUTIER
	ALBIAN	Rotalipora appenninica		Favusella washitensis	
		Rotalipora ticinensis		Rotalipora ticinensis ticinensis	

Table 1: Biostratigraphic subdivision of Albian to Early Eocene formations in Trinidad. [Re = *Rzehakina epigona* zonule, as defined in Bolli (1957b) for the presumably Early Paleocene non-calcareous facies of the lowermost Lizard Springs Formation].

Order **Foraminiferida** EICHWALD 1830
Superfamily **Lituolacea** DE BLAINVILLE 1827
Family **Haplophragmoididae** MAYNC 1952

Evolutinella MYATLYUK 1971
Type species: *Evolutinella subevoluta* NIKITINA & MYATLYUK, in MYATLYUK 1971

Evolutinella renzi n. sp.

Plate 1, Figures 1–3

Description. Planispiral, evolute, with slightly deepened umbilicus. 8 to 12 chambers in the final whorl which increase very gradually in size, varying in shape from not inflated and almost unrecognizable to subglobular. Sutures radial, flush with the chamber wall surface or slightly to moderately depressed. Wall fairly coarsely arenaceous. Aperture semicircular, at the base of the apertural face, but sometimes hardly visible. Diameter 0.55–1.05, thickness 0.16–0.3 mm.

Remarks. In the older samples *(Favusella washitensis* Zone), the specimens usually have a somewhat depressed umbilical area and not more than 10 chambers in the final whorl (Pl. 1, Fig. 1); the final chambers are often inflated but sometimes secondarily collapsed. The stratigraphically younger specimens (Pl. 1, Fig. 3) have a less depressed umbilicus and up to 12 chambers which are often less distinctly inflated.

The superficially similar species *Haplophragmoides fraseri* WICKENDEN and *H. gilberti* EICHER are considerably smaller. *H. yukonensis* CHAMNEY has more (14) chambers. All three species show more involute coiling than the present species.

The species is named after Dr. H.H. RENZ, former Trinidad micropaleontologist.

Holotype. Plate 1, Figure 3, side view. Diameter 0.96 mm, thickness 0.21 mm. Catalog no. C 36450 (Natural History Museum, Basel, Switzerland).

Occurrence. Late Albian-Early Cenomanian, *Favusella washitensis* Zone and *Rotalipora appenninica appenninica* Zone *(Rotalipora appenninica* Zone and *R. brotzeni* Zone of BOLLI et al., ed. 1985). Rather rare.

Haplophragmoides CUSHMAN 1910
Type species: *Nonionina canariensis* D'ORBIGNY 1839

Haplophragmoides neochapmani n. name

Plate 1, Figure 12

1892 *Haplophragmium latidorsatum* CHAPMAN, J. Royal Micr. Soc., 1892, p. 324, Pl. 5, Fig. 12 (non *Nonionina latidorsata* BORNEMANN 1855).

1948 *Haplophragmoides chapmani* MOROZOVA, Byull. Obshch, Ispyt. Prirody, Otdel Geol., n. ser. 53, 23, p. 33, Pl. 1, Figs. 2, 3 (primary homonym of *H. chapmani* CRESPIN 1944).

Description. Test thick involute, sometimes deformed, with 4½–6 chambers in the final whorl. Periphery not lobate. Wall fine-grained, often glossy. Diameter 0.46–0.68 mm.

Occurrence. Late Albian to Santonian, *Favusella washitensis* Zone to *Globotruncana fornicata* Zone *(Rotalipora appenninica* Zone to *Dicarinella asymetrica* Zone of BOLLI et al., ed. 1985). Fairly common.

Family **Lituolidae** De Blainville 1827

Ammobaculites Cushman 1910
Type species: *Spirolina agglutinans* D'Orbigny 1846

Ammobaculites lacertae, n. sp.

Plate 1, Figures 4, 5, 10, 11

1988 *Ammobaculites* sp. 2, Kaminski et al. 1988, p. 188, Pl. 4, Fig. 3.

Description. Test elongated, round to oval in cross section but occasionally compressed. Initial coil with 5–6 visible subglobular chambers in the last whorl, mostly with an open umbilicus. Uniserial part consisting of up to 5 chambers which are rather broader than high, usually all about equal in shape and slightly to distinctly inflated; more rarely they show a very gradual increase in size. Wall fairly coarsely arenaceous. Aperture terminal, often on a short neck. Length 0.4–1.55, width 0.3–0.55, thickness 0.2–0.53 mm; diameter of spiral 0.3–0.65 mm.

Remarks. The tests show considerable variability and, on the average, an increase in size from their first to their last stratigraphic occurrence. Some transitional forms to *A. fragmentarius* Cushman are present and may indicate a possible relationship or ancestry in this direction. *Ammobaculites chiranus* Cushman & Stone and *A. subagglutinans* Bandy resemble some extreme variants of the present species; the former has a greater number of chambers whereas the latter is distinctly cylindrical with indistinct sutures.

The species is named after its type locality, Lizard Springs (lat. lacerta = lizard).

Holotype. Plate 1, Figure 4, side view. Length 0.84 mm, thickness 0.32 mm, diameter of spiral 0.45 mm. Museum Catalog no. C 36851.

Occurrence. Early Eocene, *Morozovella subbotinae* Zone to *M. formosa formosa* Zone. Rather rare.

Sculptobaculites Loeblich & Tappan 1984
Type species: *Ammobaculites goodlandensis* Cushman & Alexander 1930

Sculptobaculites barri n. sp.

Plate 1, Figures 6–9

1988 *Ammobaculites* sp. 3, Kaminski et al., p. 188, Pl. 4, Figs. 5, 6.

Description. Early part of the test discoid, planispiral, evolute, with 7–11 chambers in the last whorl; periphery rounded. This may be followed by up to three uniserial chambers. Chambers about as broad as high, moderately inflated, in the early spiral increasing very gradually in size but later remaining constant. Sutures radial, straight or very slightly curved, depressed but sometimes obscured by abundant or coarse wall material. Wall variable from coarse to fine grained, resulting accordingly in a very rough to relatively smooth chamber surface. Aperture terminal, apparently a simple rounded opening. Length 0.65–1.35, diameter of spiral part 0.5–1.1, thickness 0.13–0.36 mm.

Remarks. Specimens in the Upper Lizard Springs Formation (Early Eocene, Pl. 1, Fig. 9) often have somewhat coarser wall material than the specimens from the Paleo-

cene. A variant with a rather thick fine grained wall (Pl. 1, Fig. 8) is found in the *Planorotalites pseudomenardii* Zone of Guayaguayare well no. 159. Planispiral specimens without unserial chambers may resemble small specimens of *Trochamminoides proteus* (KARRER) but normally the wall material is distinctly coarser.

The species is named after Dr. K.W. BARR, former Chief Geologist of Trinidad Leaseholds Ltd./Texaco Trinidad Inc.

Holotype. Plate 1, Figure 6, side view. Length 1.2 mm, thickness 0.24 mm, diameter of spiral 0.88 mm. Museum Catalog no. C 36855.

Occurrence. Paleocene to Early Eocene, *Rzehakina epigona* zonule (arenaceous basal Lizard Springs Formation, see BOLLI 1957b) and also from *Morozovella trinidadensis* Zone to *M. formosa formosa* Zone. Rather rare.

Superfamily **Trochamminacea** SCHWAGER 1877
Family **Trochamminidae** SCHWAGER 1877

Trochammina PARKER & JONES 1859
Type species: *Nautilus inflatus* MONTAGU 1808

Trochammina globolaevigata n. sp.

Plate 1, Figures 13–19

Description. Test subspherical, sometimes with a tendency towards becoming either somewhat flattened or subconical. Chambers moderately inflated, arranged trochospirally, mainly triserial but sometimes with four chambers in the initial coil and occasionally becoming irregularly biserial in the final stage. Sutures depressed, those of the larger specimens sometimes slightly sinuous. Wall smooth to finely hispid, finely agglutinated, slightly calcareous. Aperture basal, varying from a broad low slit to a low arch, rarely with a thin raised rim. Maximum diameter 0.3–0.85 mm.

Remarks. The presence of two intergrading morphological types, one subspherical (Pl. 1, Figs. 13–15) to flattened ovoid (Pl. 1, Figs. 18, 19) and the other subconical (Pl. 1, Figs. 16, 17), is also found in other superficially similar species of about the same age like *Trochammina rutherfordi* STELCK & WALL or *Eggerellina mariae* TEN DAM. The former species has a greater number of chambers, and the latter shows an *Eggerellina*-type aperture. In Trinidad, the subspherical type is more common in the older samples *(Favusella washitensis* Zone), where the specimens also reach their maximum size, whereas in the younger samples *(Rotalipora appenninica appenninica* Zone) the tests become rather smaller and may show a subconical initial stage.

Praecystammina globigerinaeformis KRASHENINNIKOV includes specimens with a very similar general test morphology but with an areal aperture. *Ammosphaeroidina* sp. in MCNULTY (1984) and possibly also *Eggerellina cenomana* AKIMEZ (1970) very much resemble some of the small subspherical specimens in Trinidad.

Holotype. Plate 1, Figure 13, spiral view. Maximum diameter 0.62 mm, thickness 0.42 mm. Museum Catalog no. C 36860.

Occurrence. Late Albian to Coniacian, *Favusella washitensis* Zone to *Globotruncana renzi* Zone *(Rotalipora appenninica* Zone to *Dicarinella primitiva* Zone in BOLLI et al., ed. 1985). Rather rare.

Superfamily **Verneuilinacea** CUSHMAN 1911
Family **Prolixoplectidae** LOEBLICH & TAPPAN 1985

Plectina MARSSON 1878
Type species: *Gaudryina ruthenica* REUSS 1851

Plectina kugleri n. sp.

Plate 1, Figures 20, 21

Description. Test subcylindrical to slightly conical; thick oval or even subquadrangular in cross section. Early part rounded, multiserial but usually without distinct chamber sutures, then changing fairly abruptly to a biserial chamber arrangement. Chambers of the biserial part of the test somewhat inflated with slightly depressed sutures, rather broader than high except for the last two or three which may become either more globular or, in a last stage, obliquely truncated. Wall rough, including rather coarse sand grains. Apertural face obliquely sloping; aperture variable, occasionally semicircular and situated at the basal sutures, but more often oval to circular with a tendency to migrate into an areal position. Length 0.5–1.25, width 0.36–0.8, thickness 0.38–0.74 mm.

Remarks. Comparable species like *P. ruthenica (Gaudryina ruthenica* REUSS) or *P. watersi* CUSHMAN both have higher chambers and a more pointed and subtriangular early portion.

The species is named after Dr. H.G. KUGLER, eminent promotor of Trinidad geology.

Holotype. Plate 1, Figure 20, side view. Length 0.92 mm, width 0.60 mm, thickness 0.48 mm. Museum Catalog no. C 36867.

Occurrence. Campanian to Maastrichtian, *Globotruncana stuarti* Zone *(Globotruncanita elevata* Zone in BOLLI et al., ed. 1985) to *Abathomphalus mayaroensis* Zone. Rare.

Superfamily **Textulariacea** EHRENBERG 1838
Family **Eggerellidae** CUSHMAN 1937

Eggerina TOULMIN 1941
Type species: *Eggerina cylindrica* TOULMIN 1941

Eggerina subovata n. sp.

Plate 1, Figures 22–24

1960 *Bulimina* sp. A BECKMANN, p. 62, Fig. 12.

Description. Test ovoid to fusiform with the initial part rounded to subpointed. Chambers hardly to distinctly inflated, somewhat embracing, arranged in a triserial manner. Sutures steeply oblique, sometimes curved, often depressed but occasionally almost flush with the surface and then hardly visible. Wall smooth, fine grained, slightly calcareous, not glossy. Aperture an arched slit at the basal suture of the final chamber. Length 0.35–0.57, thickness 0.2–0.33 mm.

Remarks. E. cylindrica TOULMIN 1941 from the Early Eocene differs in being somewhat larger; its shape is more cylindrical with a more distinctly pointed initial end, and the chambers are rather more inflated.

Holotype. Plate 1, Figure 22, apertural side view. Length 0.52 mm, thickness 0.28 mm. Museum Catalog no. C 36869.

Occurrence. Maastrichtian, *Globotruncana gansseri* Zone to *Abathomphalus mayaroensis* Zone. Rare.

Superfamily **Nodosariacea** EHRENBERG 1838
Family **Nodosariidae** EHRENBERG 1838

Nodosaria LAMARCK 1812
Type species: *Nautilus radicula* LINNÉ 1758

Nodosaria aspera parvavermiculata n. subsp.

Plate 2, Figures 1, 2

Description. Test short, thick, subcylindrical, consisting of 3 to 4 subglobular chambers; greatest thickness either at the proloculus or the final chamber. Base rounded. Chambers spherical but in the middle of the test somewhat embracing and therefore rather short. Sutures moderately depressed. Wall surface covered with a mixture of pustules and short irregular costae. Aperture rounded, on a short neck. Length 0.88–1.65, thickness 0.38–0.85 mm.

Remarks. This subspecies differs from *N. aspera* REUSS (1845, Versteinerungen d. böhm. Kreideformation, Abt. 1, Stuttgart, p. 26) in its relatively short and thick test and its characteristic wall surface.

Holotype. Plate 2, Figures 1 and 2, side view. Length 1.02 mm, thickness 0.41 mm. Museum Catalog no. C 36872.

Occurrence. Campanian to Paleocene, *Globotruncana stuarti* Zone *(Globotruncanita elevata* Zone in BOLLI et al., ed. 1985) to *Morozovella angulata* Zone. Rare.

Family **Vaginulinidae** REUSS 1860

Cristellariopsis RZEHAK 1895
Type species: *Cristellariopsis punctata* RZEHAK 1895

Cristellariopsis wirzi n. sp.

Plate 2, Figures 3, 4, 9

Description. Test ovate to thick hook-shaped; periphery broadly rounded. Initial part showing 5 planispirally coiled, subglobular and partially embracing chambers which are gradually increasing in size; this is followed by 1 to 3 similar chambers which have a tendency to uncoil and to keep an almost constant size. Sutures radial, almost straight, those of the uncoiling chambers moderately depressed. Wall smooth or slightly roughened. Aperture terminal, sitting on a small neck, not typically radiate but rounded with a beaded rim. Length 0.45–1.25, thickness 0.32–0.53 mm.

Remarks. Apart from the variable number of chambers, the morphologic characteristics are fairly constant. The most similar species is *Cristellariopsis trinitatensis (Marginulina trinitatensis* CUSHMAN), which differs in having a peripheral keel and longitudinal costae. *C. inops (Cristellaria inops* REUSS) has only 4 chambers in the final

whorl and a more distinctly pointed final chamber. *C. proinops (Cristellaria proinops* Israelsky) differs in the absence of an uncoiled stage and in having a subangular and slightly thickened periphery; its sutures are distinctly curved.

The species is named after Dr. A.E. Wirz, former Trinidad micropaleontologist.

Holotype. Plate 2, Figure 3, side view. Length 0.74 mm, thickness 0.36 mm. Museum Catalog no. C 36873.

Occurrence. Paleocene, *Morozovella angulata* Zone to *M. pusilla pusilla* Zone. Rare.

Lenticulina Lamarck 1804
Type species: *Lenticulites rotulatus* Lamarck 1804

Lenticulina lepida morugaensis n. subsp.

Plate 2, Figures 5–8

Description. Test compressed, in side view elongated subovoid in outline with a pointed apex, occasionally slightly angled. Periphery acute, not distinctly keeled. Mostly 6–8 chambers in the final whorl which are slightly if at all inflated; the final one or two may become uncoiled. Sutures somewhat curved to almost straight, slightly depressed at least between the final chambers. Umbilicus closed, often somewhat depressed. Wall smooth, slightly glossy. Apertural face high, convex, with an apical radiate aperture. Length 0.3–0.48 (atypical specimens up to 0.64), width 0.17–0.3, thickness 0.07–0.13 mm.

Remarks. The present subspecies differs from *Lenticulina lepida (Robulina lepida* Reuss 1846, Versteinerungen d. böhm. Kreideformation, Abt. 2, Stuttgart, p. 109) mainly in the lesser number of chambers and in the absence of an umbilical disk.

The subspecies is named after its type locality, Moruga well no. 15.

Holotype. Plate 2, Figure 5, side view. Length 0.45 mm, width 0.27 mm, thickness 0.095 mm. Museum Catalog no. C 36876.

Occurrence. Turonian to Coniacian, *Globotruncana inornata* Zone to *G. renzi* Zone *(Helvetoglobotruncana helvetica* Zone (?) to *Dicarinella primitiva* Zone of Bolli et al., ed. 1985). Rather rare.

Superfamily **Discorbinellacea** Sigal 1952
Family **Parrelloididae** Hofker 1956

Cibicidoides Thalmann 1939
Type species: *Truncatulina mundula* Brady, Parker & Jones 1890

Cibicidoides tuxpamensis laxispiralis n. subsp.

Plate 2, Figures 10, 14, 15

Description. Test relatively large, biconvex to planoconvex with more or less flattened dorsal (spiral) side; periphery subacute, sometimes with a keel. 7–10 chambers in the last whorl. Dorsal side moderately to nearly involute, with oblique and slightly curved sutures and a distinct, sometimes spirally shaped central glassy thickening. Ventral side convex with a prominent clear plug. Aperture peripheral, extending to both sides of the test. Diameter 0.4–1.1, thickness 0.24–0.55 mm.

Remarks. This subspecies may be an ancestral form of *Cibicidoides tuxpamensis (Cibicides tuxpamensis* Cole 1928, Bulls. Amer. Paleont., vol. 14/53, p. 219). It shows a relatively wider spiral and semi-involute coiling on the dorsal side. *C. tuxpamensis jabacoensis* (Bermudez; *Cibicides tuxpamensis* var. *jabacoensis)* is quite similar in dorsal view but has more (12–13) chambers in the final whorl.

Holotype. Plate 2, Figure 14, dorsal view. Diameter 0.75 mm, thickness 0.33 mm. Museum Catalog no. C 36881.

Stratigraphic range: Early Eocene, *Morozovella subbotinae* Zone to *M. formosa formosa* Zone. Fairly common.

Superfamily **Chilostomellacea** Brady 1881
Family **Gavelinellidae** Hofker 1956

Gyroidinoides Brotzen 1942
Type species: *Rotalina nitida* Reuss 1844

Gyroidinoides kaminskii n. sp.

Plate 2, Figures 11–13, 16–18

Description. Test thick biconvex, sometimes slightly flattened on the dorsal side; periphery broadly rounded. 6 to 8 chambers in the final whorl which increase slowly in size as added and are moderately to distinctly inflated. Sutures on both sides depressed and slightly curved, usually slightly oblique on the dorsal side. Umbilicus open but rather small, often partially covered by broad but short umbilical chamber extensions. Wall smooth, glossy. Aperture interiomarginal-umbilical. Diameter 0.18–0.35, thickness 0.12–0.26 mm.

Remarks. There is a gradual but distinct change in morphology from the older to the younger specimens: The chambers decrease in number from 7–8 to 6–7 and become higher, and the spiral may become slightly wider. The most similar species, *G. primitivus* Hofker and *G. subglobosus* Dailey, both have a wider spiral and straighter and more radial sutures.

The species is named after M.A. Kaminski for his most valuable research on deep-water benthic faunas.

Holotype. Plate 2, Figure 16, dorsal view. Diameter 0.33 mm, thickness 0.19 mm. Museum Catalog no. C 36886.

Stratigraphic range: Turonian to Santonian, *Globotruncana inornata* Zone to *G. fornicata* Zone *(Helvetoglobotruncana helvetica* Zone (?) to *Dicarinella asymetrica* Zone of Bolli et al., ed. 1985). Fairly common.

Gavelinella Brotzen 1942
Type species: *Discorbina pertusa* Marsson 1878

Gavelinella rochardensis n. sp.

Plate 2, Figures 19–24

Description. Test planoconvex to nearly biconvex, normally with a more flattened dorsal side but exceptionally more convex dorsally; periphery subrounded to suban-

gular, occasionally very slightly lobate. 7 to 9 chambers in the final whorl. Sutures on both sides somewhat curved, usually more so on the spiral side, but sometimes almost radial, hardly depressed except in the final chambers. Umbilicus open, sometimes fairly large and deep. Wall smooth, glossy. Aperture extending from the periphery to the umbilicus, often with a distinct umbilical flap. Diameter 0.3–0.66, thickness 0.16–0.27 mm.

Remarks. This species resembles *Gavelinella turbinata* MARTIN and *"Discorbis" pseudoscopos* NAKKADY. The former shows a more rounded periphery and very oblique sutures on the dorsal side; the latter has a flattened ventral (umbilical) side and a convex dorsal side. *"Eponides" huaynai* FRIZZELL occurs also in Trinidad in Late Cretaceous samples and may be an ancestral form; it has a rather more acute periphery, hardly depressed sutures and an interiomarginal to umbilical aperture.

The species is named after its type locality, Rochard, South Trinidad.

Holotype. Plate 2, Figure 20, dorsal view. Diameter 0.59 mm, thickness 0.24 mm. Museum Catalog no. C 36890.

Stratigraphic range: Paleocene, probably *Morozovella pseudobulloides* Zone (shelf facies of the Lower Lizard Springs Formation). Rather rare.

REFERENCES

AKIMETS, W.C. 1970: Age of the foraminifera from sandy-chalk of Byelorussia and the adjacent regions of the Russian Federation (in Russian with English abstract). In: Palaeontology and stratigraphy of the Baltic and the Byelorussia, Vilnius, no. 2, 1970, 175–211.

BARR, K.W. & SAUNDERS, J.B. 1968: An outline of the geology of Trinidad. Trans. 4th Carib. Geol. Conf., Port-of-Spain, 1965, 1–10.

BECKMANN, J.-P. 1960: Distribution of benthonic foraminifera at the Cretaceous-Tertiary boundary of Trinidad (West Indies). Report Int. Geol. Congr., XXI Session, Norden, V, 57–69.

— (in prep.): Late Albian to Early Eocene benthic foraminifera from Trinidad. In: BOLLI, BECKMANN & SAUNDERS (in prep.).

BOLLI, H.M. 1951: The genus *Globotruncana* in Trinidad, B. W. I. J. Paleont. 25, 187–199.

— 1952: Note on the Cretaceous-Tertiary boundary in Trinidad. J. Paleont. 26, 669–675.

— 1957a: The genera *Praeglobotruncana, Rotalipora, Globotruncana,* and *Abathomphalus* in the Upper Cretaceous of Trinidad, B. W. I. U.S. National Mus. Bull. 215, 51–60.

— 1957b: The genera *Globigerina* and *Globorotalia* in the Paleocene-Lower Eocene Lizard Springs Formation of Trinidad, B.W. I. U.S. National Mus. Bull. 215, 61–81.

— 1966: Zonation of Cretaceous to Pliocene marine sediments based on planktonic foraminifera. Boletin Informativo, Caracas 9, 3–32.

BOLLI, H.M., BECKMANN, J.-P. & SAUNDERS, J.B. (in prep.): Benthic foraminiferal biostratigraphy of the southern Caribbean region. Cambridge University Press.

BOLLI, H.M., SAUNDERS, J.B. & PERCH-NIELSEN, K. (eds.) 1985: Plankton Stratigraphy. Cambridge University Press, 1032 p.

CUSHMAN, J.A. & JARVIS, P.W. 1928: Cretaceous foraminifera from Trinidad. Contrib. Cushman Lab. Foram. Res. 4, 85–103.

— 1932: Upper Cretaceous foraminifera from Trinidad. Proc. U.S. National Mus. 80/14, 1–60.

CUSHMAN, J.A. & RENZ, H.H. 1946: The foraminiferal fauna of the Lizard Springs Formation of Trinidad, British West Indies. Cushman Lab. Foram. Res., Special Publ. 18, 1–48.

— 1947: Further notes on the Cretaceous foraminifera of Trinidad. Contrib. Cushman Lab. Foram. Res. 23, 31–51.

GRIMSDALE, T.F. 1947: Upper Cretaceous foraminifera: a criticism. J. Paleont. 21, 586–587.

KAMINSKI, M.A., GRADSTEIN, F.M., BERGGREN, W.A., GEROCH, S. & BECKMANN, J.P. 1988: Flysch-type agglutinated foraminiferal assemblages from Trinidad: Taxonomy, stratigraphy and paleobathymetry. Abhandl. Geol. Bundesanstalt, Vienna, 41, 155–227.

Koutsoukos, E.A. & Merrick, K.A. 1986: Foraminiferal paleoenvironments from the Barremian to Maestrichtian of Trinidad, West Indies. Trans. First. Conf. Geol. Soc. Trinidad & Tobago (1985), 85–101.

Kugler, H.G. 1936: Summary digest of geology of Trinidad. Bull. Amer. Assoc. Petrol. Geol. 20, 1439–1453.

— 1953: Jurassic to Recent sedimentary environments in Trinidad. Bull. Verein. Schweiz. Petrol. Geol. und Ing. 20/59, 27–60.

— 1956: Trinidad. Lexique Strat. Internat., Centre National Rech. Scientifique (Paris), V, fasc 2b, 39–116.

— 1961: Geological map of Trinidad and Tobago (compiled 1959). Orell Füssli S.A., Zürich.

Kugler, H.G. & Bolli, H.M. 1967: Cretaceous biostratigraphy in Trinidad. Bol. Informativo, Caracas, 10, 209–236.

Renz, H.H. 1942: Stratigraphy of northern South America, Trinidad and Barbados. Proc. Eighth Amer. Sci. Congr., Washington D.C., IV, Geol. Sci., 513–571.

McNulty, C.L. 1984: Cretaceous foraminifers of Hole 530A, Leg 75, Deep Sea Drilling Project. Init. Reports DSDP 75, 547–564.

Loeblich, A.R. Jr. & Tappan, H. 1987: Foraminiferal genera and their classification. New York (Van Nostrand Reinhold), 2 vols.

Saunders, J.B. & Bolli, H.M. 1985: Trinidad's contribution to world biostratigraphy. Trans. Fourth Latin Amer. Geol. Congr., Trinidad and Tobago (1979), 2, 781–795.

Suter, H.H. 1960: The general and economic geology of Trinidad, B.W.I. Overseas Geol. Surveys, London, 2d ed., 145 p.

Manuscript received 29 May 1991
Revision accepted 2 September 1991

Plate 1

Fig. 1–3. *Evolutinella renzi* n. sp.
1: Side view, × 50. Late Albian, *Favusella washitensis* Zone, Marac well no. 1, South Trinidad, core at 9853–9891 feet, sample at 9883 feet. Catalog no. C 36848 (Natural History Museum, Basel, Switzerland).
2: Peripheral view, × 50. Same locality as for Figure 3. Museum Catalog no. C 36849.
3: Holotype, side view, × 45. Late Albian-Early Cenomanian, *Rotalipora appenninica appenninica* Zone, Morne Diablo well no. 34, South Trinidad, core 81, at 13889–13936 feet, sample at 13928 feet. Museum Catalog no. C 36850.

Figs. 4, 5, 10, 11. *Ammobaculites lacertae* n. sp.
4: Holotype, side view, × 40. Early Eocene, *Globorotalia subbotinae* Zone. Sample Hk. 1831, left bank of Cascas River, Moruga area, South Trinidad; type locality of *Globorotalia rex* Zone (see Bolli 1957b, p. 64). Museum Catalog no. C 36851.
5: Peripheral view, × 35. Early Eocene, *Globorotalia formosa formosa* Zone. Sample KB 6972, Lizard Springs, southeast Trinidad (see Bolli 1957b, p. 76). Museum Catalog no. C 36852.
10: Side view of long specimen, × 30. Early Eocene, *Globorotalia subbotinae* Zone. B.D. (Boodoosingh) well no. 1, southwest Trinidad, core at 6892–6909 feet. Museum Catalog no. C 36853.
11: Side view of coiled stage, × 40. Same locality as for Figure 5. Museum Catalog no. C 36854.

Figs. 6–9. *Sculptobaculites barri* n. sp.
6: Holotype, side view, × 25. Paleocene, *Globorotalia uncinata* Zone. Moruga well no. 15, South Trinidad, core at 4296–4316 feet. Museum Catalog no. C 36855.
7: Peripheral view, × 25. Paleocene, *Globorotalia pseudomenardii* Zone. Guayaguayare well no. 159, southeast Trinidad, core at 3986–4000 feet. Museum Catalog no. C 36856.
8: Side view of a specimen with abundant fine wall material and indistinct chambers, × 25. Same locality as for Figure 7. Museum Catalog no. C 36857.
9: Side view of a coarsely agglutinated specimen, × 25. Early Eocene, *Globorotalia subbotinae* Zone. Same locality as for Figure 4. Museum Catalog no. C 36858.

Fig. 12. *Haplophragmoides neochapmani* n. name, Oblique peripheral view, × 50. Late Turonian-Coniacian, *Globotruncana renzi* Zone. Morne Diablo well no. 34, South Trinidad, core at 13260–13300 feet. Museum Catalog no. C 36859.

Figs. 13–19. *Trochammina globolaevigata* n. sp.
13: Holotype, spiral view, × 50. Late Albian, *Favusella washitensis* Zone. Marac well no. 1, South Trinidad, core at 9853–9891 feet. Museum Catalog no. 36860.
14: Large spherical specimen with collapsed final chamber, × 40. Same locality. Museum Catalog no. C 36861.
15: Apertural view, × 40. Same locality. Museum Catalog no. C 36862.
16: Side view of a slightly conical specimen, × 50. Late Albian to Early Cenomanian, *Rotalipora appenninica appenninica* Zone. Sample JS 1019, Gautier River, north of Chert Hill, East Central Trinidad (see Bolli 1957b, p. 52). Museum Catalog no. C 36863.
17: Side view of a conical specimen, × 50. Late Albian or Early Cenomanian, *Rotalipora appenninica appenninica* Zone. Marac well no. 1, South Trinidad, core at 9578–9621 feet, sample at 9602 feet. Museum Catalog no. C 36864.
18: Side view of a flat specimen, × 50. Same locality as for Figure 16. Museum Catalog no. C 36865.
19: Apertural view of a juvenile (?) specimen, × 50. Sample K 8385f, same locality as for Figure 16. Museum Catalog no. C 36866.

Figs. 20, 21. *Plectina kugleri* n. sp.
20: Holotype, side view, × 40. Maastrichtian, *Abathomphalus mayaroensis* Zone. Guayaguayare well no. 163, southeast Trinidad, core 19 at 5588–5598 feet. Museum Catalog no. C 36867.
21: peripheral view showing position of aperture, × 40. Maastrichtian, *Globotruncana gansseri* Zone. Guayaguayare well no. 163, screen sample at 5744–5754 feet. Museum Catalog no. C 36868.

Figs. 22–24. *Eggerina subovata* n. sp.
22: Holotype, side view showing aperture, × 65. Maastrichtian, *Abathomphalus mayaroensis* Zone. Guayaguayare well no. 163, southeast Trinidad, core 19 at 5588–5598 feet. Museum Catalog no. C 36869.
23: Side view opposite to aperture, showing embracing final chamber, × 65. Same locality. Museum Catalog no. C 36870.
24: Side view at right angle to apertural view, × 65. Same locality. Museum Catalog no. C 36871.

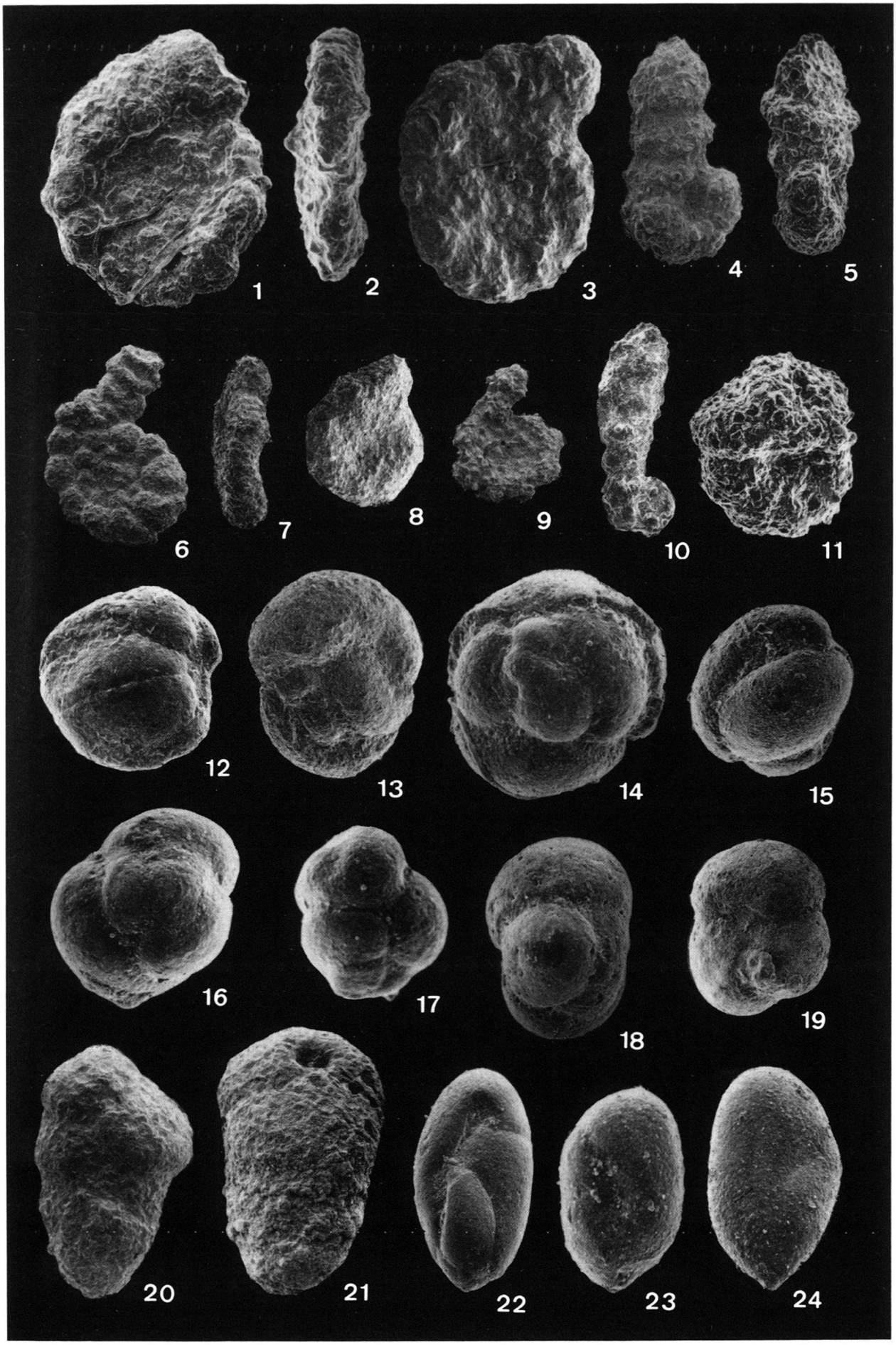

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Plate 2

Figs. 1, 2. *Nodosaria aspera parvavermiculata* n. subsp.
1: Holotype, side view, × 40. Paleocene, *Globorotalia uncinata* Zone. Moruga well no. 15, South Trinidad, core at 4296–4316 feet. Museum Catalog no. C 36872.
2: Same specimen, enlarged to show surface ornamentation, × 100.

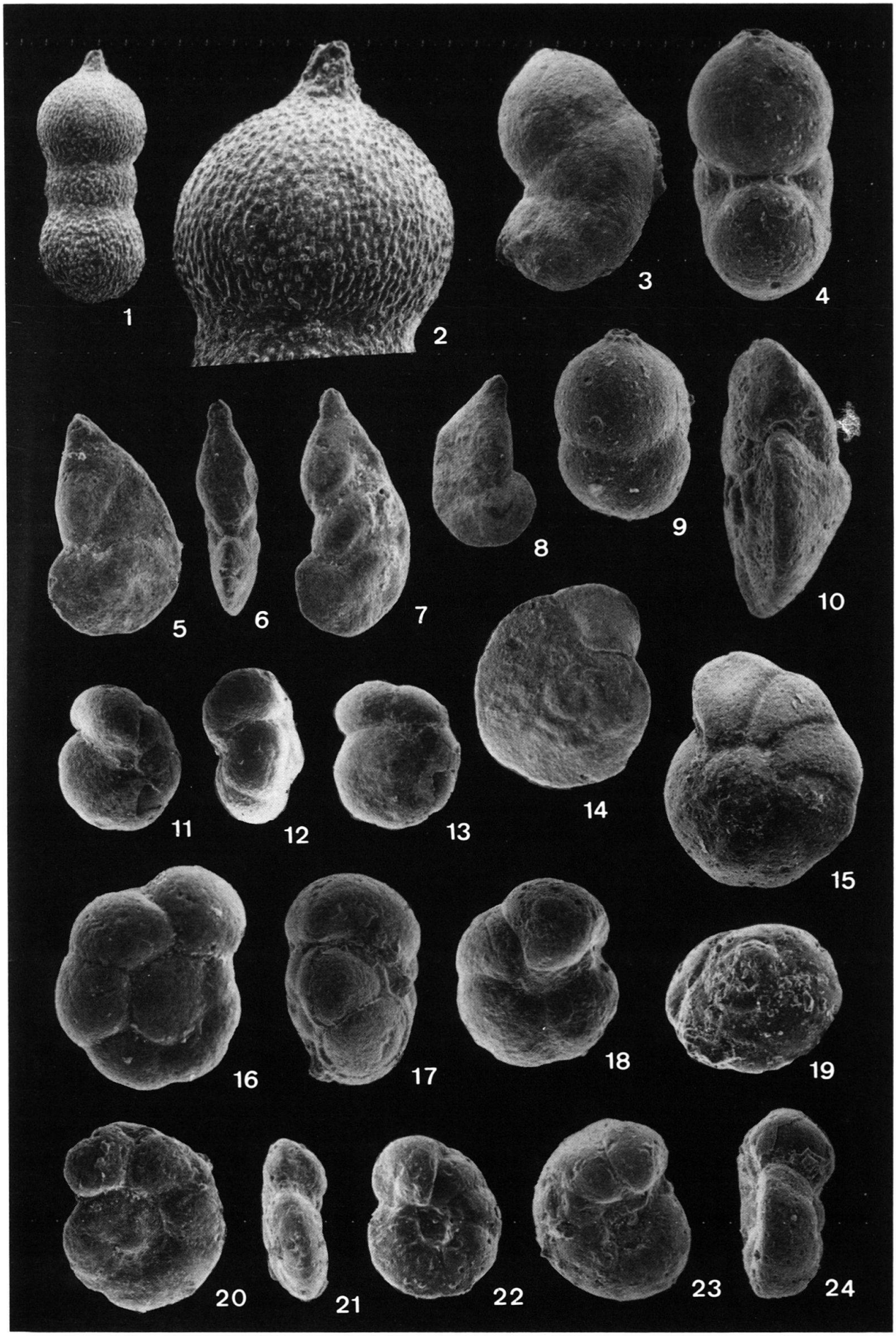
Figs. 3, 4, 9. *Cristellariopsis wirzi* n. sp.
3: Holotype, side view, × 50. Paleocene, *Globorotalia angulata* Zone. Sample KR 23575, south of Pointe-a-Pierre Railway Station, 565 feet from level crossing of Station Road (see Bolli 1957b, p. 64, former type locality of *Globorotalia uncinata* Zone). Museum Catalog no. C 36873.
4: Peripheral view, × 50. Paleocene, *Globorotalia pusilla pusilla* Zone, Guayaguayare well no. 159, southeast Trinidad, core at 4524–4536 feet. Museum Catalog no. C 36874.
9: Side view of a small, immature (?) specimen, × 50. Same locality. Museum Catalog no. C 36875.

Figs. 5–8. *Lenticulina lepida morugaensis* n. subsp.
5: Holotype, side view, × 75. Late Turonian-Coniacian, *Globotruncana renzi* Zone. Moruga well no. 15, South Trinidad, core at 6802–6827 feet. Museum Catalog no. C 36876.
6: Peripheral view, × 75. Same locality. Museum Catalog no. C 36877.
7: Uncoiled specimen, × 75. Same locality. Museum Catalog no. C 36878.
8: Small specimen with slightly angular periphery, × 75. Same locality. Museum Catalog no. C 36879.

Figs. 10, 14, 15. *Cibicidoides tuxpamensis laxispiralis* n. subsp.
10: Peripheral view, × 40. Early Eocene, *Morozovella formosa formosa* Zone. Same locality as Fig. 14. Museum Catalog no. C 36880.
14: Holotype, dorsal view, × 40. Early Eocene, *Morozovella formosa formosa* Zone. Sample KB 6972, Lizard Springs, southeast Trinidad (see Bolli 1957b, p. 76). Museum Catalog no. C 36881.
15: Ventral view, × 40. Same locality. Museum Catalog no. C 36882.

Figs. 11–13, 16–18. *Gyridinoides kaminskii* n. sp.
11: Ventral view, × 100. Late Turonian, *Globotruncana inornata* Zone. Moruga well 15, South Trinidad, core at 6980–7005 feet. Museum Catalog no. C 36883.
12: Peripheral view, × 100. Same locality. Museum Catalog no. C 36884.
13: Dorsal view, × 100. Same locality. Museum Catalog no. C 36885.
16: Holotype, dorsal view, × 100. Coniacian-Santonian, *Globotruncana concavata* Zone. Marac well no. 1, core at 8657–8698 feet, sample at 8657 feet. Museum Catalog no. C 36886.
17: Peripheral view, × 100. Same locality. Museum Catalog no. C 36887.
18: Ventral view, × 100. Same locality. Museum Catalog no. C 36888.

Figs. 19–24. *Gavelinella rochardensis* n. sp.
19: Oblique dorsal view of a specimen with convex dorsal side, × 50. Paleocene, probably *Morozovella pseudobulloides* Zone. Same locality as for Fig. 20. Museum Catalog no. C 36889.
20: Holotype, dorsal view, × 50. Paleocene, probably *Morozovella pseudobulloides* Zone. Rochard well no. 1, South Trinidad, core at 8565–8571 feet. Museum Catalog no. C 36890.
21: Peripheral view of a biconvex specimen, × 50. Same locality. Museum Catalog no. C 36891.
22: Ventral view, × 50. Same locality. Museum Catalog no. C 36892.
23: Ventral view showing apertural flaps, × 50. Same locality. Museum Catalog no. C 36893.
24: Peripheral view of a planoconvex specimen with flat dorsal side, × 50. Same locality. Museum Catalog no. C 36894.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24