FORAMINIFERAL ECOLOGY IN THE RIA DE AROSA, GALICIA, SPAIN

by

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With 18 text-figures, 14 plates and 16 tables

SUMMARY

The Ria de Arosa is a large inlet of the Atlantic in western Galicia, NW Spain. It is little influenced by river discharge, the salinity is therefore the normal one for seawater, 33-36‰. According to Cadée (1968) the rocks exposed on the coast are for for the greater part granites; the rest, especially on the northwestern and northern coast, being gneisses and micaschists. Seven foraminiferal facies could be made. The L/D ratio is extremely low. It varies from zero to 18.5; the medium ratio is 2.3. Transport of shells from the continental shelf into the bay is rather high and more or less confined to the outer bayzone.

The Recent foraminiferal fauna of the Arosa Bay has a fairly large number of species in common with the littoral Pliocene and the oldest littoral Pleistocene of the North Sea Basin. On the other hand the Recent and Holocene faunae of the North Sea Basin show hardly any resemblance with that of the Ria de Arosa, nor with that of the Mediterranean.

193 species of Foraminifera were found, of which 3 were new. The areal distribution of 15 species has been plotted on maps.

INTRODUCTION

The present study forms part of a biological, oceanographical and sedimentological investigation carried out in the Ria de Arosa, northwestern Spain, 1962-1964.

The present paper deals with the Foraminifera collected during these investigations.

A representative collection of all species of Foraminifera obtained in the Arosa Bay is kept in the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands and in the Rijks Geologische Dienst, Haarlem, Netherlands.

For the description of the area with reference to its topography, climate, hydrography and sediments we refer to Cadée (1968), Koldijk (1968) and Bless (1973).

I am greatly indebted to Mrs. W. van Es for correcting the English text, to Mr. F. Willemsen for photographing the Foraminifera, and to Mr. A. H. Koers for drawing the figures.

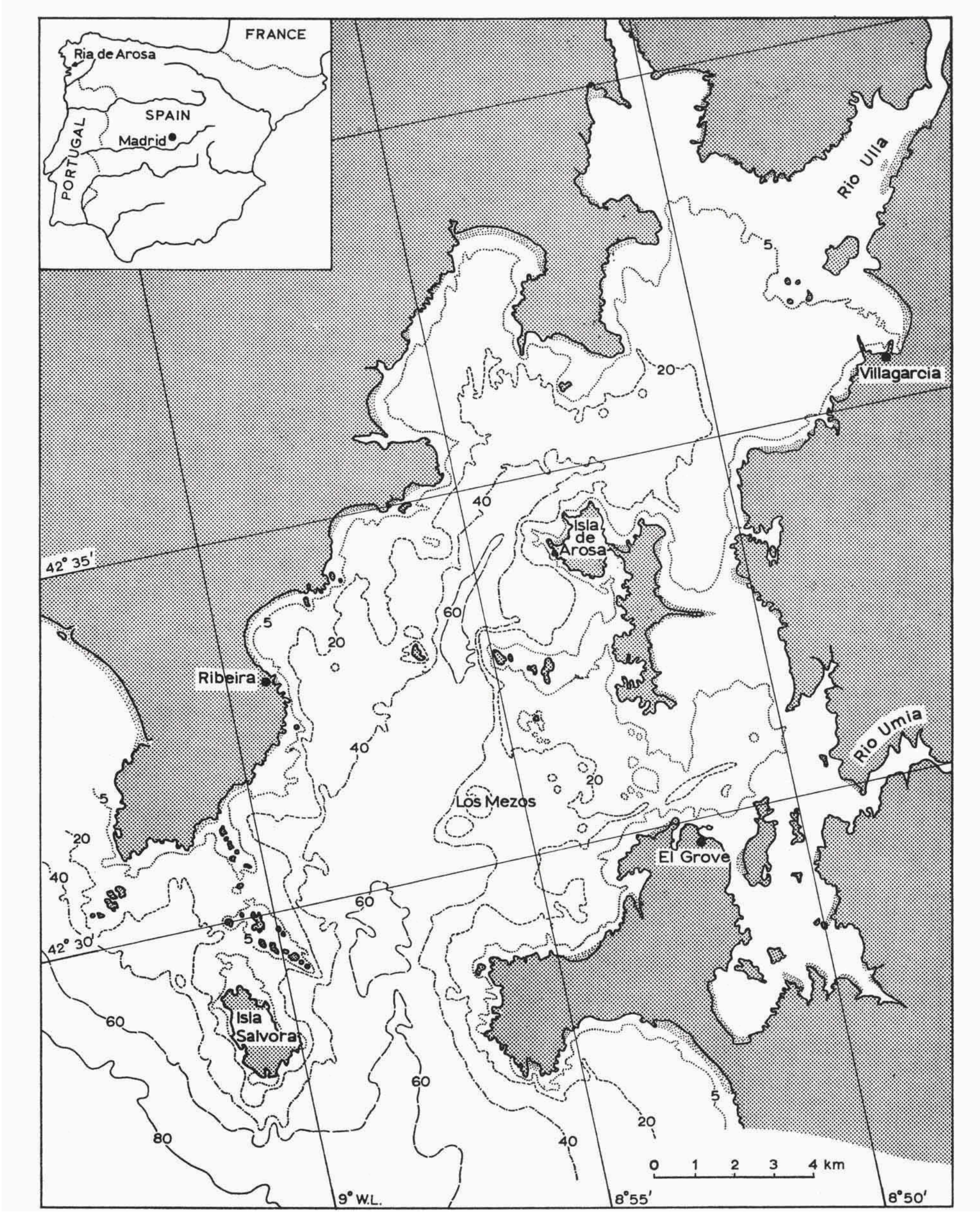

Fig. 1. Situation map and bathymetry of the Ria de Arosa. (After Cadée, 1968).

Methods of Study

Field Methods. — The collecting of samples has already been described by Cadée (1968). We received about 60 samples of which we could use about 40, owing to the fact that many samples were collected too close together. The counting of such samples takes much time and does not yield any new data. In some cases samples did not contain Foraminifera, in other cases the little bottles filled with alcohol contained only a few clay particles without Foraminifera.

Nevertheless the 40 samples enabled us to give a general impression of the foraminiferal ecology in the Ria de Arosa (fig. 2).

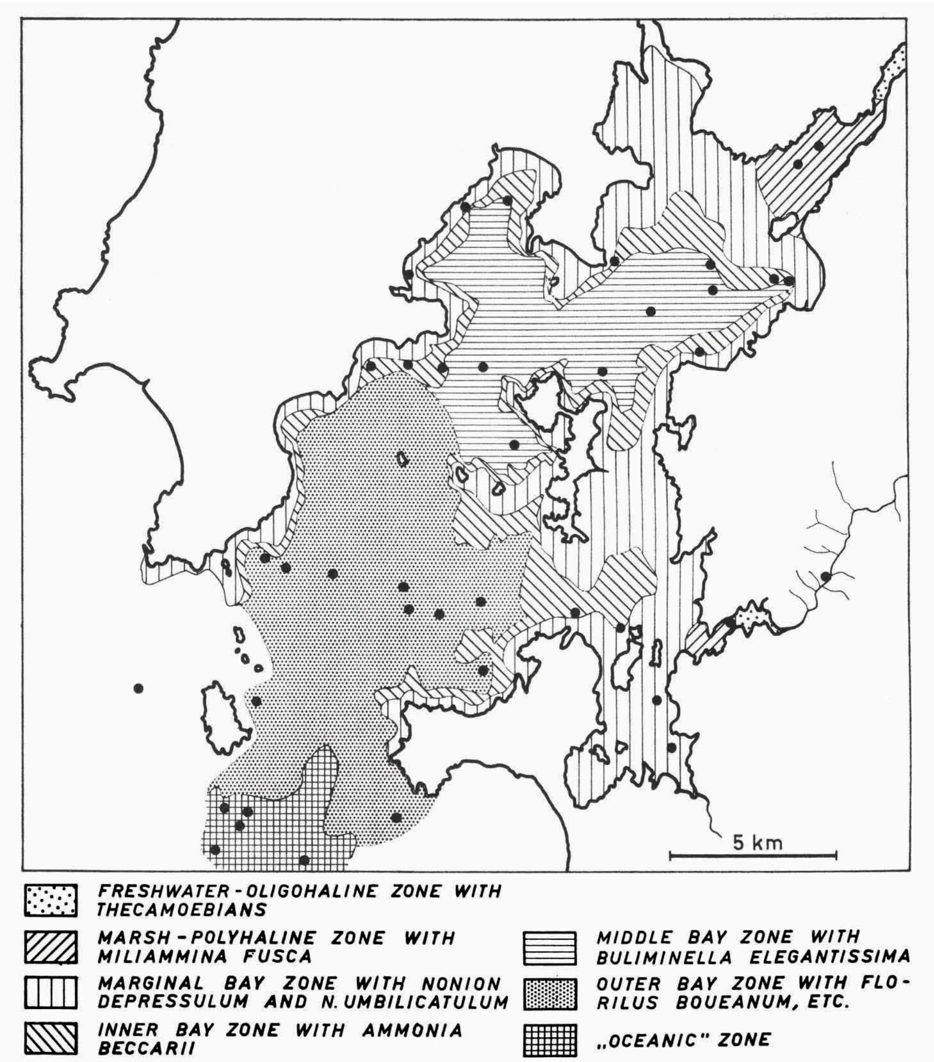

Fig. 2. Foraminiferal facies of the Ria de Arosa.

Laboratory work. — The living population has been determined by the Rose Bengale staining method of Walton (1952); instead of 10% neutralized formalin 70% alcohol was used. Each sample was washed through a bank of 4 sieves, 1 mm, 0.3 mm, 0.15 mm and 0.05 mm. The quantity of sediment, often less than one gram, varied so much that we could not use the so called foraminiferal number.

Results

Foraminiferal facies of the Arosa Bay (fig. 2)

In the Arosa Bay we could in general distinguish 7 foraminiferal facies:

(a) Freshwater-oligohaline zone with Thecamoebina

The Thecamoebians do not belong to the Foraminifera, but include most of the freshwater testaceous Rhizopoda. Present are the genera *Difflugia* and *Centropyxis*.

(b) Marsh-polyhaline zone with *Miliammina fusca*

(c) Marginal bay zone

The dominant species are *Nonion depressulum* and *Nonion umbilicatulum* (see fig. 15).

(d) Inner bay zone

The dominant species is *Ammonia beccarii* (see fig. 12). Moreover *Cribrononion, Cribroelphidium* and *Nonion* are present.

(e) Middle bay zone

The dominant species is *Buliminella elegantissima* (see fig. 13). Moreover *Siliconodosaria delicatula* (fig. 14) and *Textularia earlandi* are present.

(f) Outer bay zone

This zone is characterised by *Florilus boueanum* (fig. 11), *Cancris auriculus* (fig. 5), *Cassidulina neocarinata* (fig. 6), *Textularia bocki* and *Uvigerina compressa* (fig. 8).

(g) "Oceanic zone"

The dominant species is *Globocassidulina subglobosa* (fig. 7), moreover *Globigerina* (fig. 4), *Orbulina* and *Acervulina,* all probably derived from the open ocean are present.

Generally speaking the zonation based on the ecology of Mollusca corresponds with that of the Foraminifera (cf. Cadée, 1968, fig. 32).

Areal Distributions

Areal distribution of L/D ratios (fig. 3 and table 1)

The relationship between the living and dead populations has been established by means of the L/D ratio: $R = \frac{\text{living population}}{\text{dead population}} \times 100$. This ratio varies from zero to 18.5. The medium ratio is 2.3. This is very low as compared with the medium ratio in the Todos Santos Bay (California) which is 24.9 (Walton, 1955) and in profile VII (14 samples) of the Duach tidal flats, which is 23.5 (Van Voorthuysen, 1960).

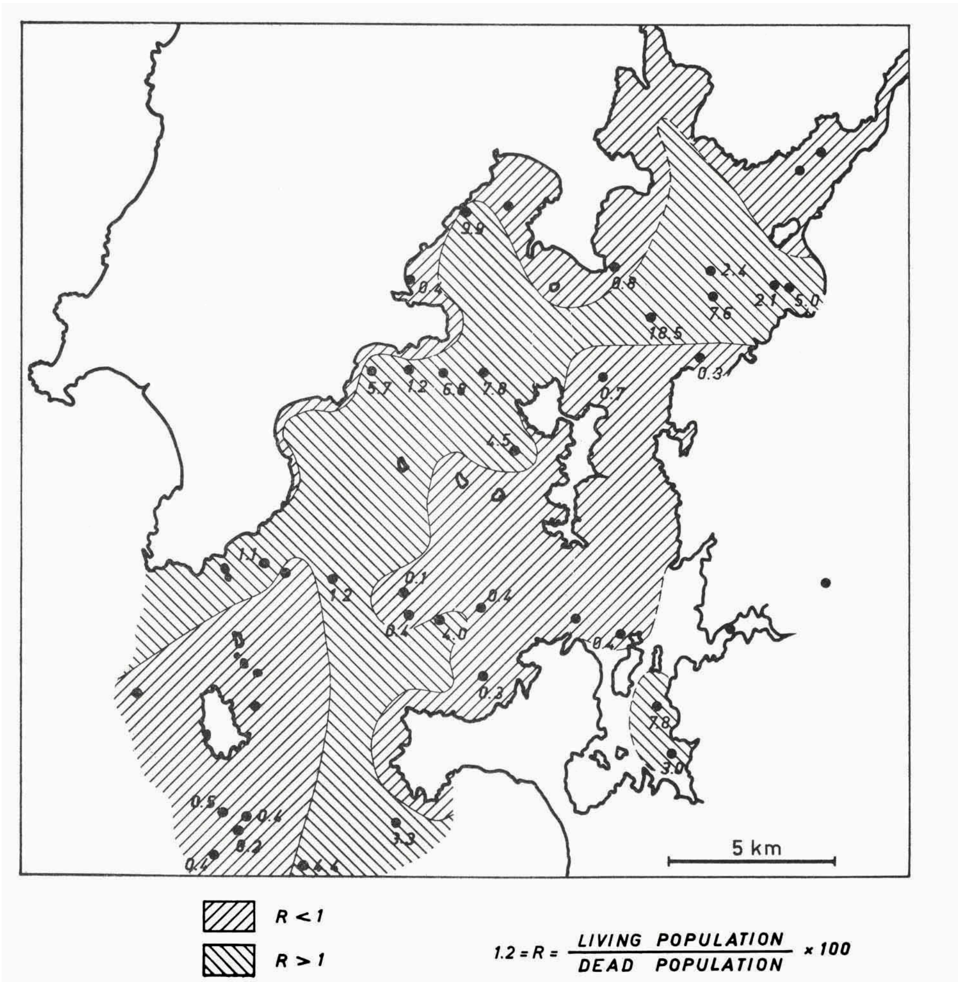

Fig. 3. Areal distribution of L/D ratios.

TABLE I

Total living and dead populations and L/D ratios

Station no.	Depth in m	Living	Dead	R
1.123	0.0	—	27	—
1.121	0.0	—	51	—
1.102	0.8	4	133	3.0
1.694	2.0	—	3	—
1.695	2.0	—	18	—
1.99	3.0	19	243	7.8
1.588	5.0	1	46	2.1
1.56	5.0	1	309	0.3
1.90	5.5	1	271	0.4
1.96	7.0	1	231	0.4
1.43	9.0	13	268	5.0
1.85	9.0	22	224	9.9
1.93	9.0	—	73	—
1.632	11.0	5	410	1.2
1.59	11.5	2	84	2.4
1.66	12.0	32	558	5.7
1.713	12.0	1	124	0.8
1.58	13.5	14	185	7.6
1.78	15.0	—	204	—
1.45	24.0	49	226	18.5
1.200	25.0	1	327	0.3
1.832	25.0	5	444	1.1
1.50	25.0	1	126	0.7
1.51	25.0	28	625	4.5
1.61	27.0	31	451	6.8
1.833	30.0	—	656	—
1.837	35.0	2	472	0.4
1.902	38.0	—	608	—
1.195	44.0	17	455	4.0
1.836	45.0	1	796	0.1
1.776	45.0	11	326	3.3
1.579	45.0	3	780	0.4
1.835	50.0	8	657	1.2
1.13	52.0	24	306	7.8
1.815	60.0	—	139	—
1.901	70.0	2	473	0.4
1.774	75.0	18	409	4.4
1.771	78.0	2	422	0.5
1.772	82.0	1	400	0.2
1.900	85.0	2	473	0.4

Looking at fig. 3 we may conclude that the areal distribution with the relatively highest living population roughly corresponds with the areas where the silt-clay content of the sediment and the organic carbon content

(Cadée, 1968, figs. 15 and 16) is the highest, which is a question of food supply of the benthonic foraminiferal population.

Derived *Globigerina* (fig. 4 and table 2)

The planctonic Foraminifera derived from the open sea are *Globigerina bulloides, G. eggeri* and *Globorotalia inflata. Globigerinella aequilateralis* is practically absent in the Arosa Bay.

From the studies of Rottgardt (1952), Freydanck (1955) and Haake (1962) it has become evident that the hydraulic aequivalent of calcareous Foraminifera with a diameter of 0.40-0.55 mm corresponds with quartz-

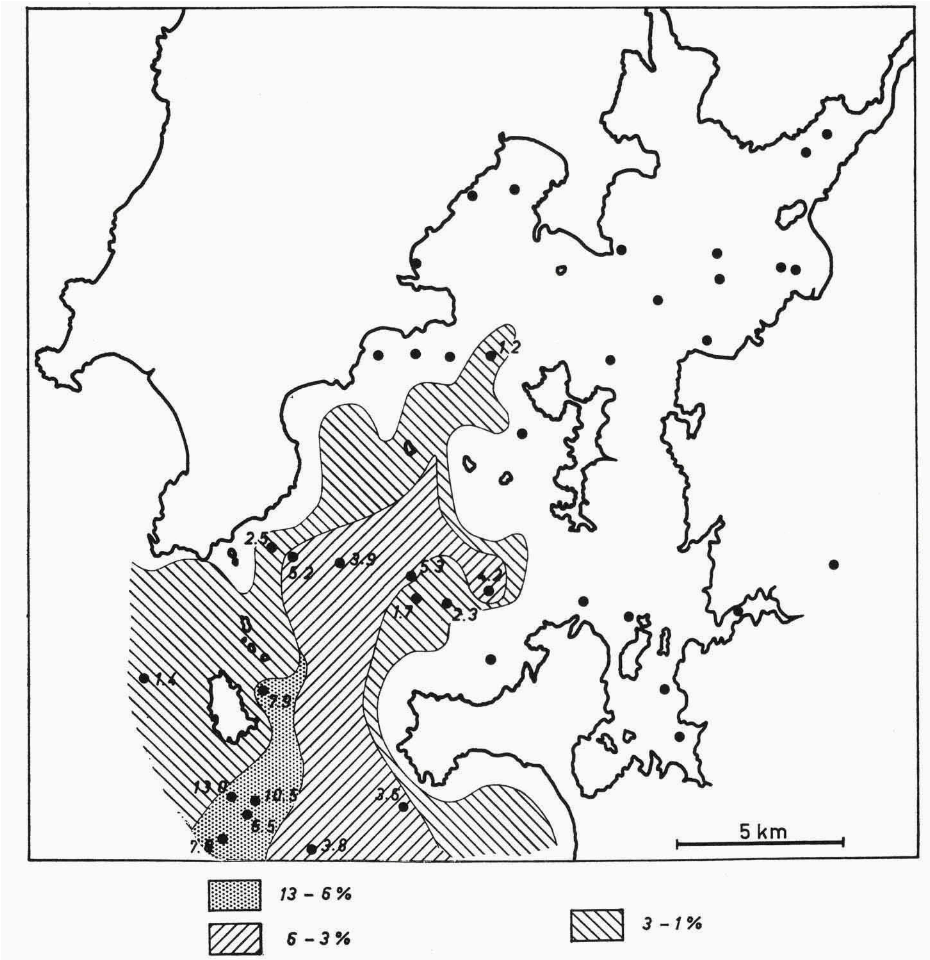

Fig. 4. Areal distribution of dead derived *Globigerina*'s in percentage of total population.

TABLE 2

Areal distribution of dead derived *Globigerina*'s in percentage of total population

Station no.	Depth in m	Total population	Total number of *Globigerina* spp.	%
1.832	25.0	449	11	2.5
1.833	30.0	656	34	5.2
1.837	35.0	474	19	4.2
1.902	38.0	608	48	7.9
1.195	44.0	472	11	2.3
1.836	45.0	797	42	5.3
1.776	45.0	337	12	3.6
1.579	45.0	783	13	1.7
1.835	50.0	665	26	3.9
1.13	52.0	330	4	1.2
1.815	60.0	139	2	1.4
1.901	70.0	475	50	10.5
1.774	75.0	427	16	3.8
1.771	78.0	424	65	13.0
1.772	82.0	401	26	6.5
1.900	85.0	475	37	7.8

grains of 0.1-0.25 mm diameter. To transport this heterogeneous sediment along the bottom of the bay a velocity of 20-25 cm/sec is needed.

The *Globigerina*'s derived from the open ocean in the Arosa Bay have a diameter of 0.20-0.56 mm, so they fall partly within the hydraulic aequivalent of quartzgrains of 0.1-0.25 mm diameter. Fig. 4 shows the distribution of the dead, derived *Globigerina* shells in the bay; the current velocity along the bottom in this area must be about 20-25 cm/sec, moreover, the size of the quartzgrains must be between 0.1 and 0.25 mm diameter. This is not contradicted by a comparison of fig. 15 in Cadée (1968), showing the silt-plus-clay content of the Arosa bay, with the areal distribution of the *Globigerina*'s. It would be interesting to check this hypothesis.

Cancris auriculus (fig. 5 and table 3)

Colom (1952) studied the Foraminifera along the coast of Galicia. He found *Cancris auriculus* to be rare at a depth of 42 to 607 m, except at a depth of 94 m, where it is common. From his data and those we collected ourselves we may conclude that this species prefers the shelf environment of the open ocean, but can maintain itself in the deeper parts of bays, where it has been brought from the open ocean. In the Arosa Bay it is also rare (0.2-2.9%), but forms an important indicator, because it proves that the bay has a good connection with the open ocean.

TABLE 3

Areal distribution of *Cancris auriculus* in percentage of total population

Station no.	Depth in m	Total population	Number of *C. auriculus*	Number of living *C. auriculus*	%
1.61	27.0	482	3	1	0.6
1.833	30.0	656	10	—	1.5
1.837	35.0	474	11	—	2.3
1.902	38.0	608	5	—	0.8
1.195	44.0	472	8	3	1.7
1.836	45.0	797	20	—	2.5
1.776	45.0	337	1	—	0.3
1.579	45.0	783	16	1	2.3
1.835	50.0	665	2	—	0.3
1.13	52.0	330	1	—	0.3
1.815	60.0	139	1	—	0.7
1.901	70.0	475	6	—	1.3
1.774	75.0	427	6	1	1.4
1.771	78.0	424	3	—	0.7
1.772	82.0	401	8	—	0.2
1.900	85.0	475	14	—	2.9

Cassidulina neocarinata (fig. 6 and table 4).

The distribution and percentage of total population are nearly the same as those of *Cancris auriculus* (fig. 5 and table 3). Colom (1952) found *C. neocarinata* at a depth of 35-540 m, but common from 99-540 m. It is a form which is more common and occurs in much higher percentages of the total population in the open ocean, just like *Cancris auriculus*. Nevertheless the areal distribution and percentage of the total population (0.2-3.6) in the Arosa Bay are nearly the same as in the case of *C. auriculus*. This means that *C. neocarinata* can maintain itself at a low percentage in the deeper parts of bays having a good connection with the open ocean. From the 129 specimens found in the Arosa Bay only one was alive, that is 0.8%. Of the 121 specimens of *Cancris auriculus* 6 were alive, that is 5.2%. These percentages suggest that fewer specimens of *C. auriculus* are derived from the open ocean than there are of *Cassidulina neocarinata*. In other words *Cancris auriculus* can maintain itself more easily in a deeper bay facies than *Cassidulina neocarinata* does.

Globocassidulina subglobosa (fig. 7 and table 5)

Colom (1952) does not mention *Globocassidulina subglobosa* in his list of faunae along the Atlantic coast of Galicia. Phleger, Parker & Peirson (1953) reported this species from 37-1610 m, usually deeper than 185 m. It is widely distributed in the bottom samples of the North Atlantic. Parker

(1958) mentioned this species from the North Atlantic at all depths down to 5532 m. She found it in the eastern Mediterranean at ten stations from 179-1016 m (up to 2%). This species does not reach a very large size in Mediterranean samples, the maximum diameter being about 0.36 mm. This is in accordance with our experience in the Ria de Arosa. The maximum diameter of this species is here about 0.29 mm. It is the dominant species of the "oceanic zone". According to the ostracod ecology (Bless, 1973) this zone is characterized by a mixed ostracod fauna, which may contain predominantly allochthonous material.

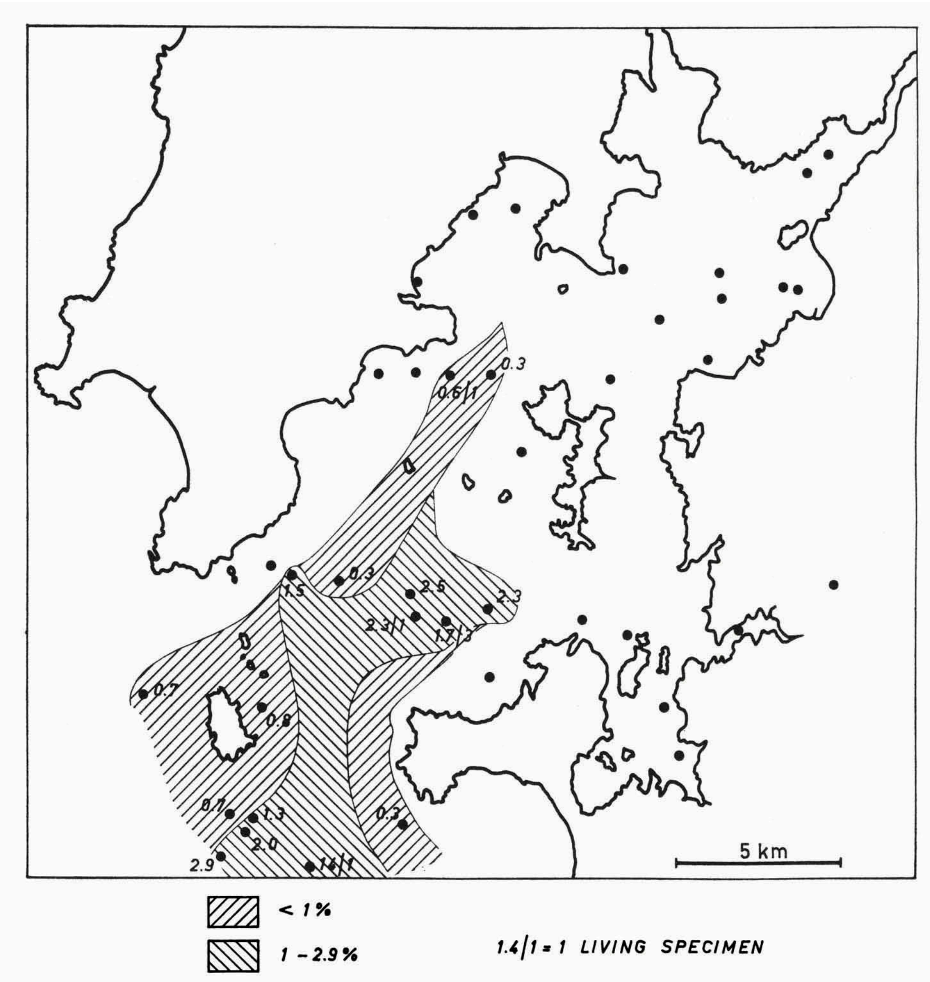

Fig. 5. Areal distribution of *Cancris auriculus* in percentage of total population.

TABLE 4

Areal distribution of *Cassidulina neocarinata* in percentage of total population

Station no.	Depth in m	Total population	Number of *C. neocarinata*	Number of living *C. neocarinata*	%
1.832	25.0	449	2	—	0.4
1.833	30.0	656	4	—	0.6
1.837	35.0	474	5	—	1.1
1.902	38.0	608	1	—	0.2
1.195	44.0	472	7	1	1.5
1.836	45.0	797	24	—	3.0
1.776	45.0	337	2	—	0.6
1.579	45.0	783	14	—	1.8
1.835	50.0	665	22	—	3.3
1.13	52.0	330	1	—	0.3
1.815	60.0	139	2	—	1.4
1.901	70.0	475	7	—	1.5
1.774	75.0	427	12	—	2.8
1.771	78.0	424	2	—	0.5
1.772	82.0	401	8	—	2.0
1.900	85.0	475	16	—	3.6

TABLE 5

Areal distribution of *Globocassidulina subglobosa* in percentage of total population

Station no.	Depth in m	Total population	Number of *G. subglobosa*	Number of living *G. subglobosa*	%
1.832	25.0	449	13	—	3.0
1.837	35.0	474	4	—	0.8
1.195	44.0	472	2	—	0.5
1.776	45.0	337	15	1	4.5
1.579	45.0	783	9	—	1.1
1.835	50.0	665	14	—	2.1
1.13	52.0	330	3	—	0.9
1.901	70.0	475	54	—	11.4
1.774	75.0	427	21	—	5.0
1.771	78.0	424	63	—	15.0
1.772	82.0	401	26	—	6.5
1.900	85.0	475	27	—	6.0

Uvigerina compressa (fig. 8 and table 6)

Colom (1952) found *U. compressa* sparingly in two samples at 118 and 128 m depth along the coast of Galicia. Although we did not find it alive its distribution suggests that it is able to live in the outer bay zone, because in the deepest "oceanic" samples at the inlet of the Ria de Arosa it is absent or occurs in a very low percentage.

TABLE 6

Areal distribution of *Uvigerina compressa* in percentage of total population

Station no.	Depth in m	Total population	Number of *U. compressa*	Number of living *U. compressa*	%
1.832	25.0	449	12	—	2.7
1.833	30.0	656	14	—	2.1
1.837	35.0	474	18	—	3.8
1.902	38.0	608	16	—	2.6
1.836	45.0	797	6	—	0.8
1.579	45.0	783	58	—	7.4
1.835	50.0	665	30	—	4.5
1.13	52.0	330	2	—	0.6
1.901	70.0	475	5	—	1.0
1.774	75.0	427	8	—	1.9
1.771	78.0	424	2	—	0.5

TABLE 7

Areal distribution of *Valvulineria complanata* in percentage of total population

Station no.	Depth in m	Total population	Number of *V. complanata*	Number of living *V. complanata*	%
1.200	25.0	328	2	—	0.6
1.832	25.0	449	2	—	0.4
1.837	35.0	474	13	—	2.7
1.195	44.0	472	14	—	3.0
1.836	45.0	797	18	—	2.3
1.579	45.0	783	38	—	4.9
1.835	50.0	665	15	—	2.3
1.901	70.0	475	4	—	0.8
1.771	78.0	424	3	—	0.7

This species of *Uvigerina* has been mentioned by Colom only from this region. Phleger, Parker & Peirson (1953) figured a *Rectuvigerina* sp. on pl. 8 fig. 8. It is somewhat compressed and decorated with fine costae. They found it only in one core. It may represent *Uvigerina compressa.*

Valvulineria complanata (fig. 9 and table 7)

With Parker (1958) we believe that *V. complanata* d'Orbigny, 1846, from the Miocene of Baden, Austria, is synonymous with the recent *V. bradyana* (Fornasini, 1900) from the Adriatic. Therefore we use the first name, not the second as did Colom (1952). Colom (1952) found this to be a rare species from 54-142 m depth along the coast of Galicia. Parker

(1958) mentioned *V. complanata* up to 2% from 51-799 m in the eastern Mediterranean. In the Arosa Bay the species occurs from 25-78 m, forming up to 4.9% of the total population. We found not a single living specimen. Notwithstanding this negative result we presume that they are not transported from the open ocean into the bay, but are able to live in the deeper parts of larger bays with a good connection with the open sea, as the highest percentages were not found at the inlet of the bay but at about the centre of what we called the outer bay zone. This is also observed in *Uvigerina compressa* (fig. 8) and *Florilus boueanum* (fig. 11).

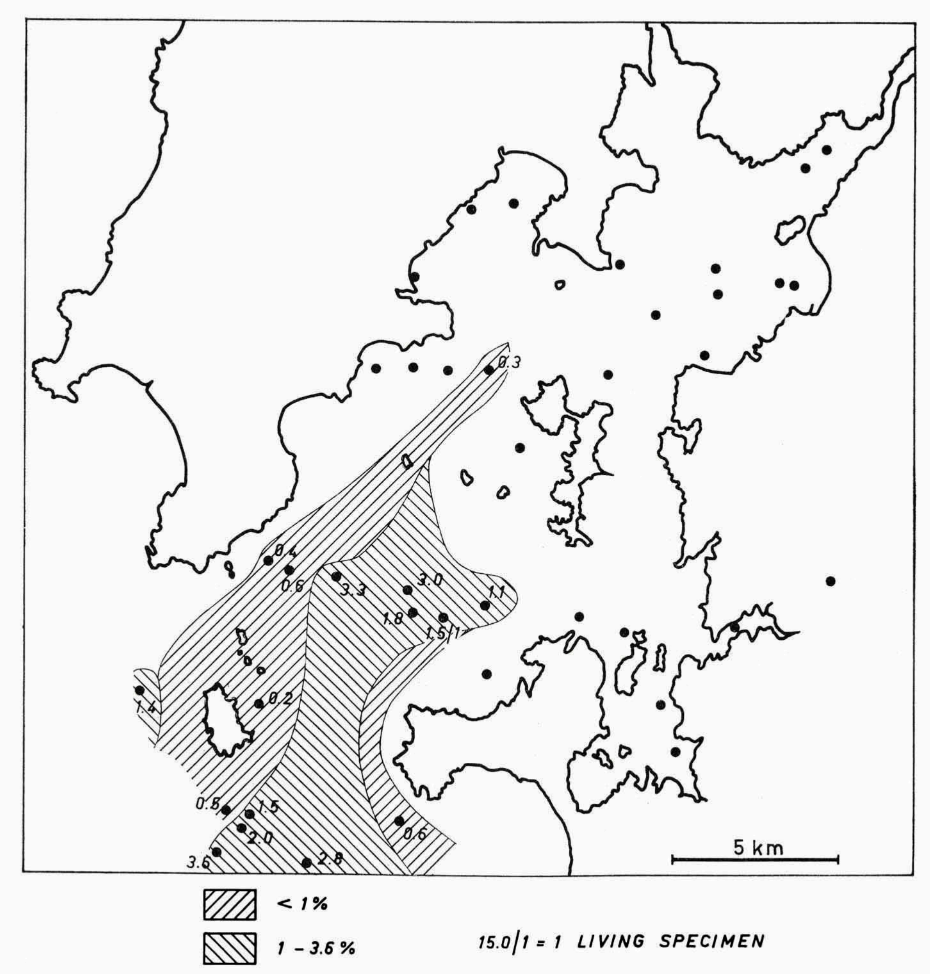

Fig. 6. Areal distribution of *Cassidulina neocarinata* in percentage of total population.

Planorbulina mediterranensis (fig. 10 and table 8)

According to Parker (1958) this species is reported in the North Atlantic mostly shallower than 150 m. In the bay of Piraeus (Greece) it is most abundant (13%) at a depth believed to be shallower than 25 m, to 100 m it is found up to 4%. The most abundant species in the Piraeus bay and the Arosa bay are:

	Piraeus	Arosa (sample 1.832)
	%	%
Asterigerina mamilla	4	2
Cibicides lobatulus	5	21 (*Cibicides* spp.)
Elphidium crispum	6	3
Miliolidae	40	9
Peneroplidae	6	—
Planorbulina mediterranensis	13	16
Rosalina obtusa	7	—
R. globularis	×	6
Florilus boueanum	—	9
Bulimina gibba	—	4
Ammonia inflata	×	3
Globocassidulina subglobosa	—	3

According to Parker (1958) the assemblage of Piraeus shows many similarities to the "Posidonia caulini" fauna of Colom (1942), which occurs shallower than 32 m in the bay of Palina, Majorca. The assemblage of the Arosa bay shows a certain similarity to that of Piraeus with the exception of the Peneroplidae, which may be due to the more northern character of the fauna of the Ria de Arosa. In fact we never found in the Neogene of the North Sea Basin a specimen belonging to the Peneroplidae.

Our preliminary results lead us to presume that the optimum living conditions of *P. mediterranensis* are on the continental shelf and in open bays with a good connection with the open ocean at a depth between about 25 and 50 m, as nearly everywhere in the Arosa bay we found only a few living specimens (0.9%). A comparison with fig. 15 of Cadée (1968), showing the grainsize of the sediments, suggests that this species prefers a sandy bottom.

Florilus boueanum (fig. 11 and table 9)

Florilus boueanum is widespread in the Ria de Arosa, but the area of optimum living conditions is in the outer bay zone with a percentage up to

38.3% of the total population. It has also been found in the "oceanic" zone and the middle bay zone with a percentage up to 11%. The fact that we found a relatively high percentage of living specimens (2.8%) seems to indicate that their optimum living conditions in the bay are between about 25 and 50 m.

Parker (1958) studied 60 surface samples of the eastern Mediterranean running from 51 to 3974 m depth but did not mention a single specimen of *F. boueanum.*

Colom (1952) found this species from 15-310 m, but most common from 42-128 m. He calls this zone the "Nonionatum boueanum" environment of the continental shelf.

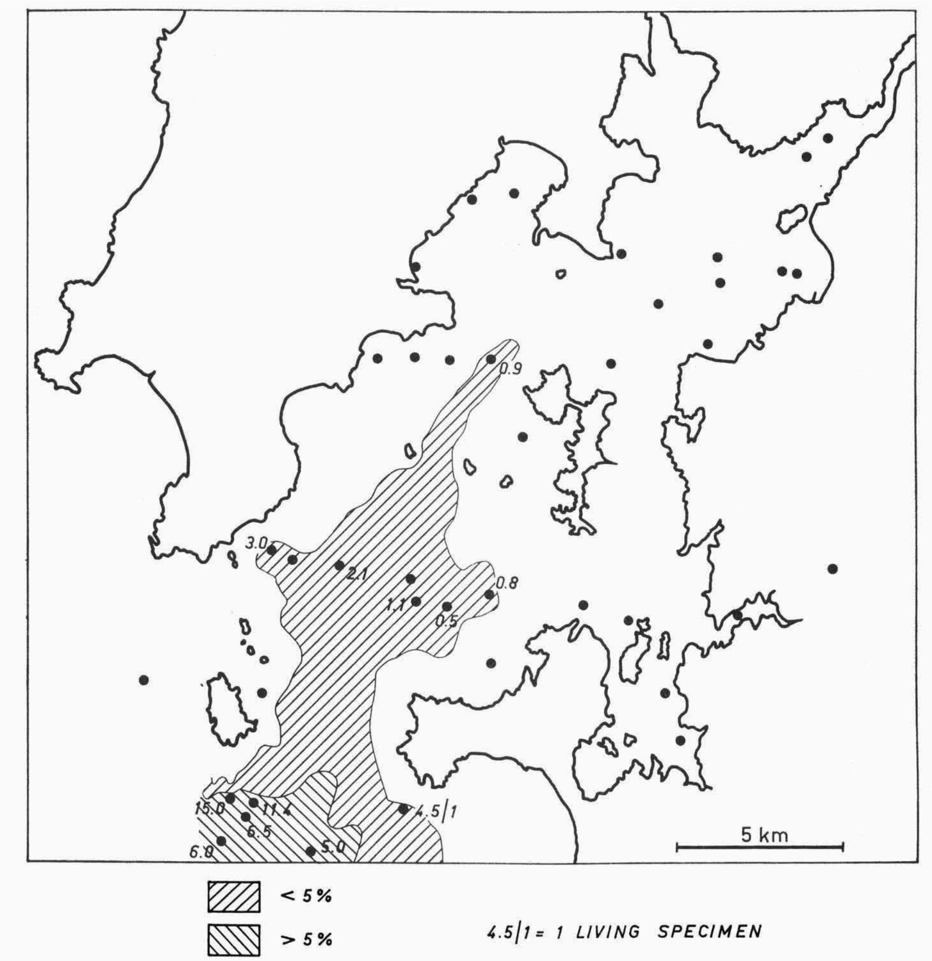

Fig. 7. Areal distribution of *Globocassidulina subglobosa* in percentage of total population.

TABLE 8

Areal distribution of *Planorbulina mediterranensis* in percentage of total population

Station no.	Depth in m	Total population	Number of *P. mediterranensis*	Number of living *P. mediterranensis*	%
1.200	25.0	328	10	—	3.0
1.832	25.0	449	71	2	16.0
1.61	27.0	482	12	—	2.5
1.833	30.0	656	56	—	8.5
1.837	35.0	474	6	—	1.3
1.902	38.0	608	71	—	11.7
1.195	44.0	472	4	—	0.8
1.836	45.0	797	15	—	1.9
1.776	45.0	337	27	1	8.0
1.579	45.0	783	3	—	0.4
1.835	50.0	665	4	—	0.6
1.901	70.0	475	16	—	3.4
1.771	78.0	424	16	—	3.8
1.772	82.0	401	16	—	4.0
1.900	85.0	475	11	—	2.1

TABLE 9

Areal distribution of *Florilus boueanum* in percentage of total population

Station no.	Depth in m	Total population	Number of *F. boueanum*	Number of living *F. boueanum*	%
1.713	12.0	125	13	—	10.4
1.78	15.0	204	8	—	4.0
1.45	24.0	275	17	9	7.0
1.200	25.0	328	27	1	8.2
1.832	25.0	440	43	1	9.8
1.50	25.0	127	5	—	0.4
1.51	25.0	653	64	2	9.8
1.61	27.0	482	35	2	7.3
1.833	30.0	656	36	—	5.5
1.837	35.0	474	137	1	29.0
1.902	38.0	608	11	—	1.8
1.195	44.0	472	100	6	21.2
1.836	45.0	797	112	—	14.0
1.776	45.0	337	4	—	1.2
1.579	45.0	783	178	1	22.7
1.835	50.0	665	255	6	38.3
1.13	52.0	330	53	—	16.0
1.815	60.0	139	2	—	1.4
1.901	70.0	475	14	—	3.0
1.774	75.0	427	43	6	10.0
1.771	78.0	424	5	—	1.2
1.772	82.0	401	40	—	10.0
1.900	85.0	475	31	—	6.7

Bless (1973) found in the outer bay zone of the Ria de Arosa heavily ornamented ostracods, whereas the rest of the bay yielded ostracods with less ornamentation.

Ammonia beccarii and *A. inflata* (fig. 12, tables 10, 11)

Parker (1958) mentioned "*Streblus beccarii* (Linné) and vars" from about 20 to 179 m in the eastern Mediterranean. She added that possibly more than one species is included in the group. Phleger, Parker & Peirson (1953) mentioned and figured in the North Atlantic "*Rotalia beccarii* (Linné) variants". They found several variant forms in small numbers.

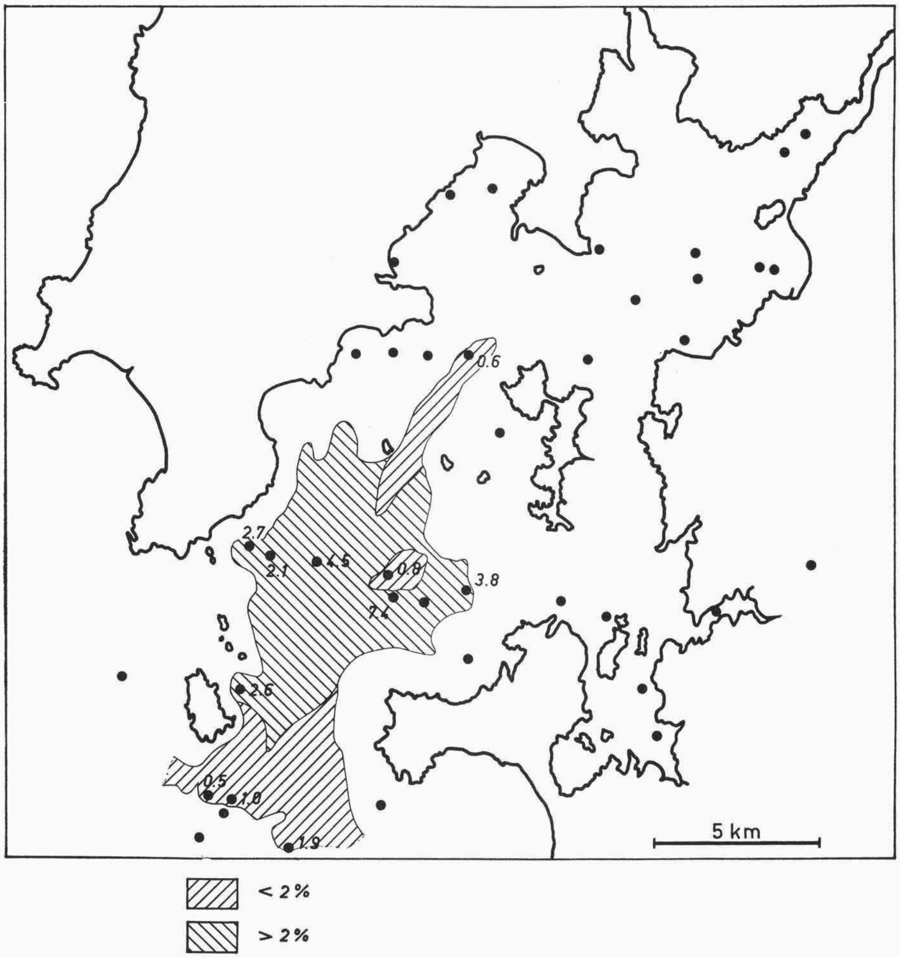

Fig. 8. Areal distribution of *Uvigerina compressa* in percentage of total population.

TABLE 10

Areal distribution of *Ammonia beccarii* in percentage of total population

Station no.	Depth in m	Total population	Number of *A. beccarii*	Number of living *A. beccarii*	%
1.99	3.0	262	2	—	0.8
1.588	5.0	47	5	—	10.6
1.56	5.0	310	2	—	0.6
1.90	5.5	272	10	—	3.7
1.96	7.0	232	2	—	0.9
1.632	11.0	415	27	—	6.5
1.59	11.5	86	1	—	1.2
1.66	12.0	590	18	—	3.0
1.713	12.0	125	24	—	19.2
1.78	15.0	204	23	—	11.3

TABLE 11

Areal distribution of *Ammonia inflata* in percentage of total population

Station no.	Depth in m	Total population	Number of *A. inflata*	Number of living *A. inflata*	%
1.66	12.0	590	16	1	2.8
1.200	25.0	328	32	—	9.8
1.832	25.0	449	3	—	0.7
1.51	25.0	653	13	—	2.0
1.61	27.0	482	12	—	2.5
1.833	30.0	656	9	—	1.4
1.837	35.0	474	111	—	23.4
1.902	38.0	608	11	—	1.8
1.195	44.0	472	51	1	10.8
1.836	45.0	797	14	—	1.8
1.579	45.0	783	68	1	8.7
1.835	50.0	665	21	—	3.2
1.13	52.0	330	10	—	3.0
1.901	70.0	475	1	—	0.2
1.774	75.0	427	5	—	1.2
1.771	78.0	424	1	—	0.2
1.772	82.0	401	15	—	3.7
1.900	85.0	475	8	—	1.7

We identified the flat and unsculpted specimens as *A. beccarii*; it appears that this form has a restricted distribution as can be seen in fig. 12, being more or less confined to the inner bay zone where it occurs together with *Ammonia tepida*, which is also unsculpted and has a smaller size than *A. beccarii*.

The distribution of *Ammonia inflata* is quite different and corresponds rather well with the outer bay zone with a slight overlap in the middle bay zone.

Colom (1952) did not find *A. beccarii,* because he did not possess samples from a lesser depth than 15 m. He mentioned *A. inflata* along the continental shelf of Galicia from 15 to 540 m, common from 42 to 54 m and frequent from 71 to 110 m.

If we consider the distribution of *A. inflata* as a percentage of total population (table 11) a little more in detail, we find that the highest percentages are concentrated south of Los Mezos (see fig. 1) between 25 and 45 m. Only 3 specimens were found alive, two of them in the Los Mezos

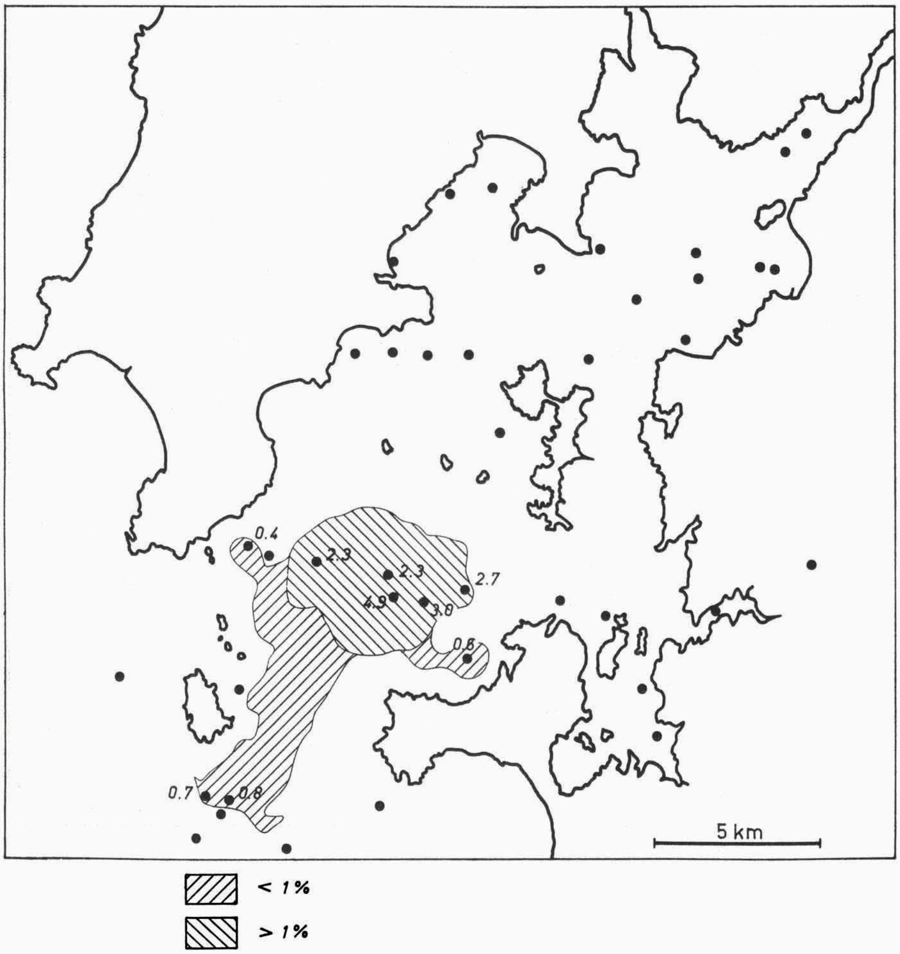

Fig. 9. Areal distribution of *Valvulineria complanata* in percentage of total population.

region. Why *A. inflata* seems to prefer this region we could not detect. Most probably it will be a combination of environmental factors which we do not know in detail at present.

Buliminella elegantissima (fig. 13 and table 12)

Colom (1952) did not find this cosmopolitan species in his fauna assemblage of the continental shelf of Galicia, nor did Moncharmont-Zei (1964) in the Gulf of Pozzuoli (Naples) or Hofker (1960) in the Gulf of Naples.

Walton (1955) found *B. elegantissima* most abundant above 55 m depth

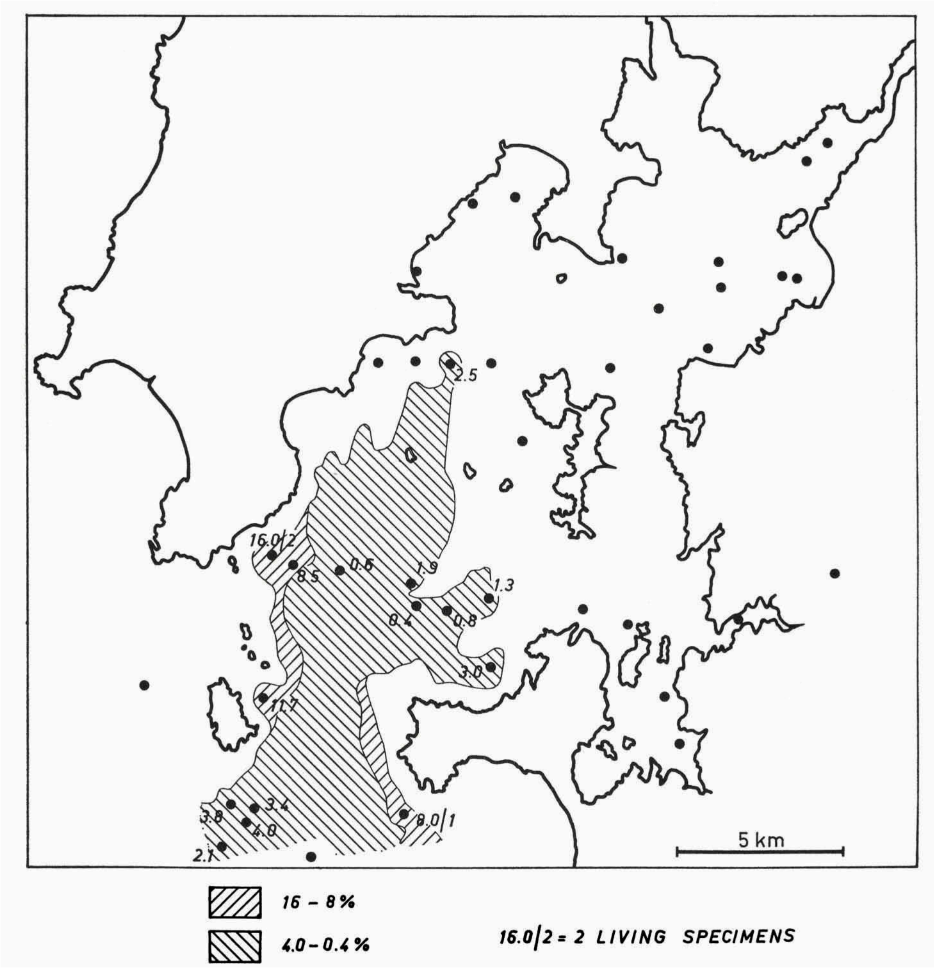

Fig. 10. Areal distribution of *Planorbulina mediterranensis* in percentage of total population.

in the Bahia and Todos Santos Bay in California. It occurs there alive from 10 to 300 m depth, but he found the highest average number of living species between 18 and 36 m.

The distribution of this species in the Ria de Arosa corresponds rather well with our middle bay zone, which is the most clayey part of the bay (see Cadée, 1968, fig. 15). Moreover, it is according to Cadée (1968) also the environment of the opisthobranchiate gastropod *Philine aperta*. *B. elegantissima* is most abundant in our fourth fraction (0.15-0.05 mm), probably owing to the fact that this small spindle-shaped species has a length of up to 0.2 mm and a breadth of up to 0.1 mm. Of this species we found relatively many living specimens (average 10.5%).

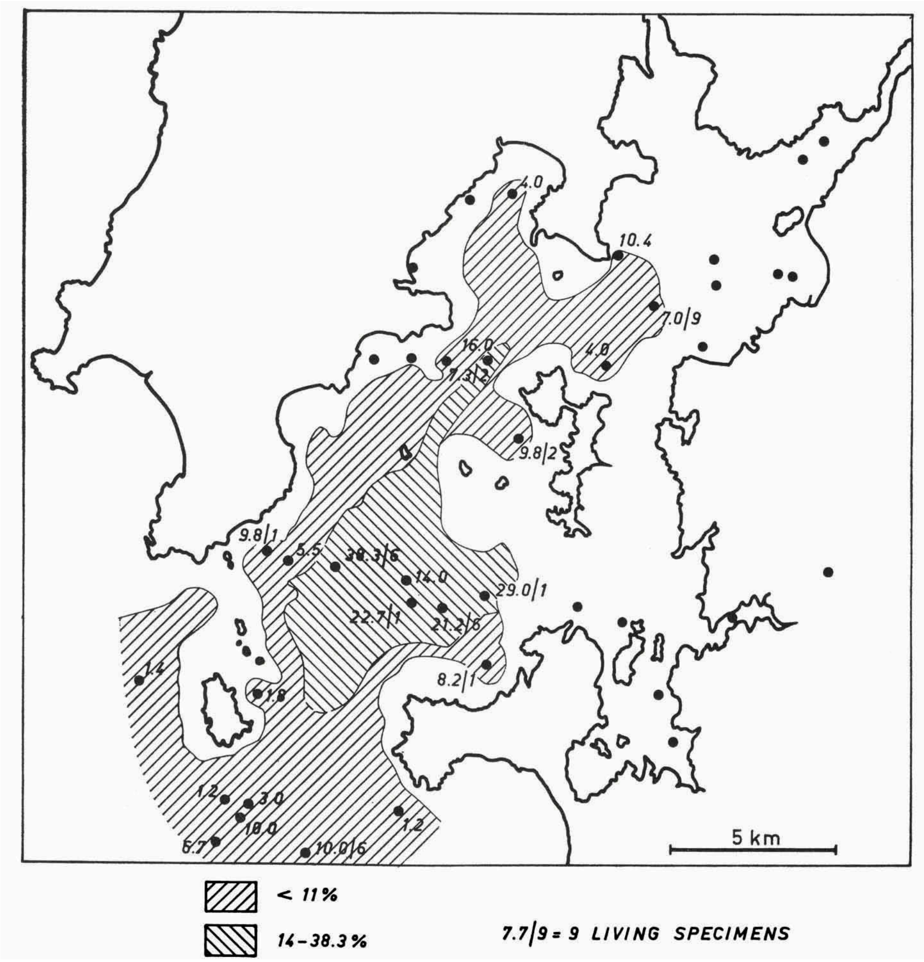

Fig. 11. Areal distribution of *Florilus boucanum* in percentage of total population.

Siliconodosaria delicatula (fig. 14 and table 13)

Siliconodosaria delicatula has like *Buliminella elegantissima* its optimum living conditions in the middle bay zone from 9-25 m. It seems to be a typical bay foraminifer, since Colom (1963) found his new genus for the first time in Vigo Bay, which is also situated on the Galician coast south of Arosa Bay. Of *S. delicatula* we found relatively many living specimens (average 11.9%), which is slightly higher than the percentage of *B. elegantissima*.

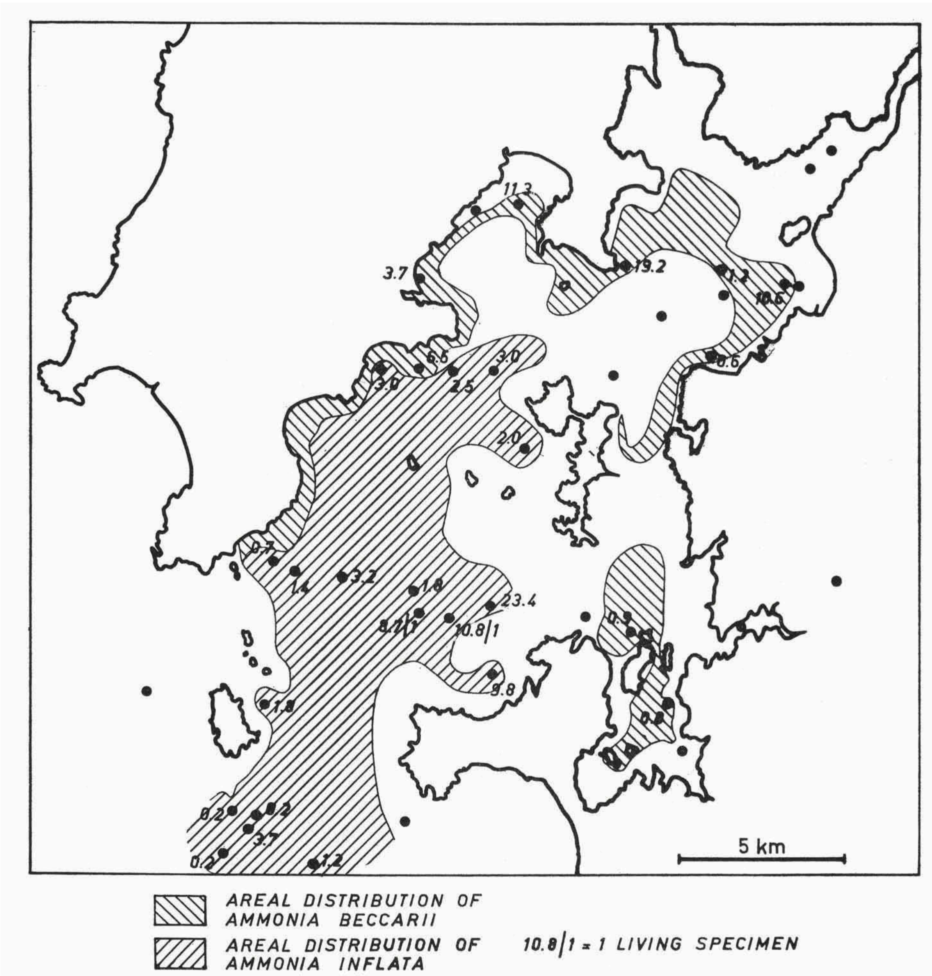

Fig. 12. Areal distribution of *Ammonia beccarii* and *Ammonia inflata* in percentage of total population.

TABLE 12

Areal distribution of *Buliminella elegantissima* in percentage of total population

Station no.	Depth in m	Total population	Number of *B. elegantissima*	Number of living *B. elegantissima*	%
1.56	5.0	310	4	—	1.3
1.90	5.5	272	16	—	6.0
143	9.0	281	40	5	14.0
1.85	9.0	246	35	5	14.2
1.59	11.5	86	21	1	24.4
1.66	12.0	590	1	—	0.2
1.713	12.0	125	1	—	0.8
1.58	13.5	199	37	6	18.6
1.78	15.0	204	74	—	36.6
1.45	24.0	275	20	10	7.2
1.50	25.0	127	8	—	6.3
1.51	25.0	653	3	—	0.5
1.61	27.0	482	2	1	0.4
1.13	52.0	330	4	—	1.2

TABLE 13

Areal distribution of *Siliconodosaria delicatula* in percentage of total population

Station no.	Depth in m	Total population	Number of *S. delicatula*	Number of living *S. delicatula*	%
1.43	9.0	281	14	3	5.0
11.59	11.5	86	16	—	18.6
1.58	13.5	199	7	—	3.5
1.78	15.0	204	10	—	5.0
1.45	24.0	275	42	11	15.3
1.50	25.0	127	44	1	37.7
1.61	27.0	482	2	1	0.4

Nonion depressulum and *N. umbilicatulum* (fig. 15 and table 14)

In the North Sea Basin *Nonion depressulum* and *N. umbilicatulum* are the indicators of more or less brackish coastal waters. In the tidal flats of Germany (Haake, 1962) and the Netherlands (Van Voorthuysen, 1960) they belong to the 5 (or 6) most common species, and hitherto we admitted they were endemic in the North Sea Basin. In the open North Sea *N. depressulum* does not occur or is rare (Haake, 1962).

The distribution, represented in fig. 15, is rather scanty, owing to lack of stations near the bay coast. The two species occur together and in the Ria de Arosa are indicators of the mariginal bay zone. Moncharmont-Zei

(1964) mentions *Nonion depressulum* as very rare in the Gulf of Pozzuoli (Naples) from 5 to 30 m depth.

Bolivina pseudoplicata (fig. 16 and table 15)

This is one of the species of which the areal distribution in Arosa Bay seems to be confined to very special environmental conditions. The highest percentage of the total population (14.2 and 12.0) occurs at two isolated locations at depths of 5 and 7 m. The next highest percentage (9.3-8.0) is from an area on the north coast of the bay from 34 to 37 m depth. A third area is situated more or less at the inlet of the bay with a percentage of 6.6-3.3 at a depth of 35 to 82 m. Scattered all over the bay are localities with

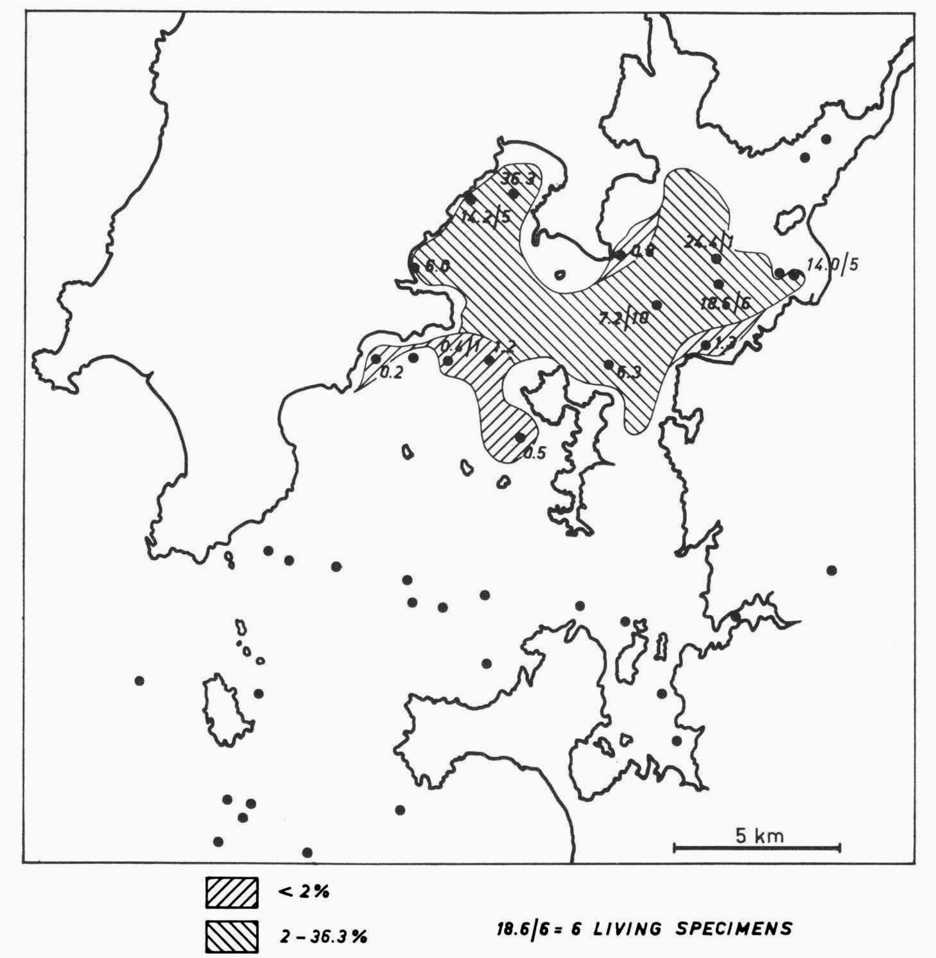

Fig. 13. Areal distribution of *Buliminella elegantissima* in percentage of total population.

TABLE 14

Areal distribution of *Nonion depressulum* and *Nonion umbilicatulum* in percentage of total population

Station no.	Depth in m	Total population	Number of *Nonion* spp.	Number of living spp.	%
1.102	0.8	137	52	3	37.9
1.99	3.0	262	78	13	30.0
1.588	5.0	47	30	1	63.8
1.56	5.0	310	5	—	1.6
1.90	5.5	272	41	—	15.0
1.96	7.0	232	11	—	4.7
1.43	9.0	281	129	4	46.0
1.85	9.0	246	93	14	38.0
1.59	11.5	86	11	—	13.0
1.713	12.0	125	13	—	10.4
1.58	13.5	199	21	—	10.5
1.78	15.0	204	22	—	10.8
1.45	24.0	275	7	—	2.6

TABLE 15

Areal distribution of *Bolivina pseudoplicata* in percentage of total population

Station no.	Depth in m	Total population	Number of *B. pseudoplicata*	Number of living *B. pseudoplicata*	%
1.99	3.0	262	5	—	1.9
1.56	5.0	310	37	—	12.0
1.96	7.0	232	33	—	14.2
1.43	9.0	281	3	—	1.0
1.632	11.0	415	34	—	8.2
1.66	12.0	590	47	2	8.0
1.713	12.0	125	3	1	2.4
1.78	15.0	204	2	—	1.0
1.45	24.0	275	3	—	1.1
1.832	25.0	449	7	—	1.6
1.51	25.0	653	17	—	2.6
1.61	27.0	482	45	—	9.3
1.833	30.0	656	6	—	0.9
1.837	35.0	474	21	—	4.4
1.902	38.0	608	24	—	3.9
1.195	44.0	472	30	—	6.3
1.836	45.0	797	12	—	1.5
1.776	45.0	337	7	—	2.1
1.579	45.0	783	52	—	6.6
1.835	50.0	665	16	—	2.4
1.13	52.0	330	9	1	2.7
1.901	70.0	475	8	—	1.7
1.774	75.0	427	11	1	2.6
1.771	78.0	424	14	—	3.3
1.772	82.0	401	17	—	4.2
1.900	85.0	475	13	—	2.7

less than 3.3% or with no *B. pseudoplicata* at all. This coincides with the experience of Parker (1952b: 444): "*B. pseudoplicata* occurs at scattered localities in facies 2 (Long Island Sound, Gardiners Bay and Buzzards Bay), where it reaches a maximum of 6 percent of the fauna. It is confined to depths between 15 and 90 m on the adjacent shelf" (see also Parker, 1948: 221).

Phleger (1952: 351) stated that *B. pseudoplicata* (among others) appears to be confined to the inshore sandy areas and generally is not present in the offshore sandy areas. Comparing with Cadée (1968, fig. 15) we may conclude that the highest percentage of this species occurs in the more sandy areas in the Ria de Arosa.

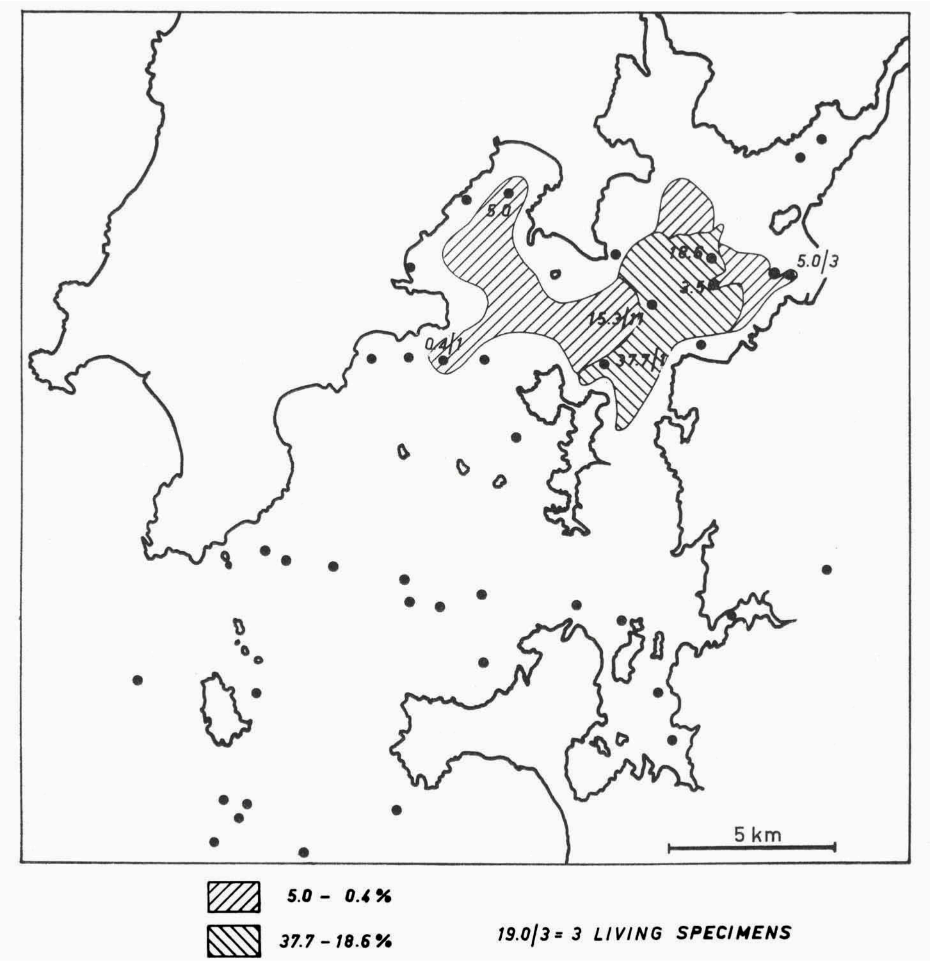

Fig. 14. Areal distribution of *Siliconodosaria delicatula* in percentage of total population.

Figures 4 to 16 show the areal distribution of 17 species which occur in environments most probably for the greater part controlled by bathymetrical factors. Many species on the other hand are found all over the Ria and therefore are no environmental indicators within the bay. These species e.a., are *Brizalina dilatata, B. variabilis, Bulimina gibba, Cibicides* spp., *Cribrononion advenum* and *Miliolinella circularis.*

The following 17 species (figs. 4-16) more or less act as zone indicators within the Ria:

TABLE 16

	In percentage of total population	Number of specimens	From which are found living	L/D ratio
Derived *Globigerina* spp. (plankton)	13.0-1.2	396	0	0.0
(M) *Cancris auriculus*	2.9-0.2	121	6	5.2
(M) *Cassidulina neocarinata*	3.6-0.2	130	1	0.8
(M) *Globocassidulina subglobosa*	15.0-0.5	252	1	0.4
(M) *Uvigerina compressa*	7.4-0.5	171	0	0.0
(M) *Valvulineria complanata*	4.9-0.4	109	0	0.0
(M) *Planorbulina mediterranensis*	16.0-0.4	341	3	0.9
(M) *Florilus boucanum*	38.3-0.4	1268	35	2.8
(C) *Ammonia beccarii*	19.2-0.6	114	0	0.0
(M) *A. inflata*	23.4-0.2	404	3	0.7
(C) *Buliminella elegantissima*	36.6-0.2	294	28	10.5
(M) *Siliconodosaria delicatula*	37.7-0.4	151	16	11.9
(N) *Nonion depressulum* & *N. umbilicatulum*	46.0-1.6	548	35	6.8
(C) *Bolivina pseudoplicata*	14.2-1.0	481	5	1.0

(M) = recently living in the Medítterranean, most probably not in the North Sea
(C) = cosmopolitan
(N) = recently living in the North Sea region

If we consider the L/D ratios of these 14 benthonic species it is evident that six out of nine which are recently living in the Medítterranean and most probably not in the North Sea region, possess ratios even smaller than the medium ratio for the Ria de Arosa of 2.3, which is extremely low. Most probably these forms are not well adapted to the environment of the Ria. Two of these nine species have certainly derived from the open ocean, viz., *Cassidulina neocarinata* and *Globocassidulina subglobosa*; to these derived forms also belong the planctonic species: *Globigerina bulloides, G. eggeri* and *Globorotalia inflata.*

Cancris auriculus and *Florilus boueanum* prefer the open shelf environment, but can maintain themselves more or less in the outer bay. *Siliconodosaria delicatula* is the type of a new genus which Colom (1963) first found in the Rio de Vigo, south of the Rio de Arosa; it seems to be a typical bay form.

Cadée (1968: 12) stated that upwelling outside the rias and influx of cold bottom waters in the rias are of great biological interest, because they give the fauna and flora a more northern character as compared with the north coast of Spain, where no upwelling occurs. This fact is reflected in the occurrence of *Nonion depressulum, Cribrononion gerthi, Nonion umbilicatulum* and *Florilus pauperatum.* The first species is of a northern character, the other three are, as far as known, confined to the North Sea

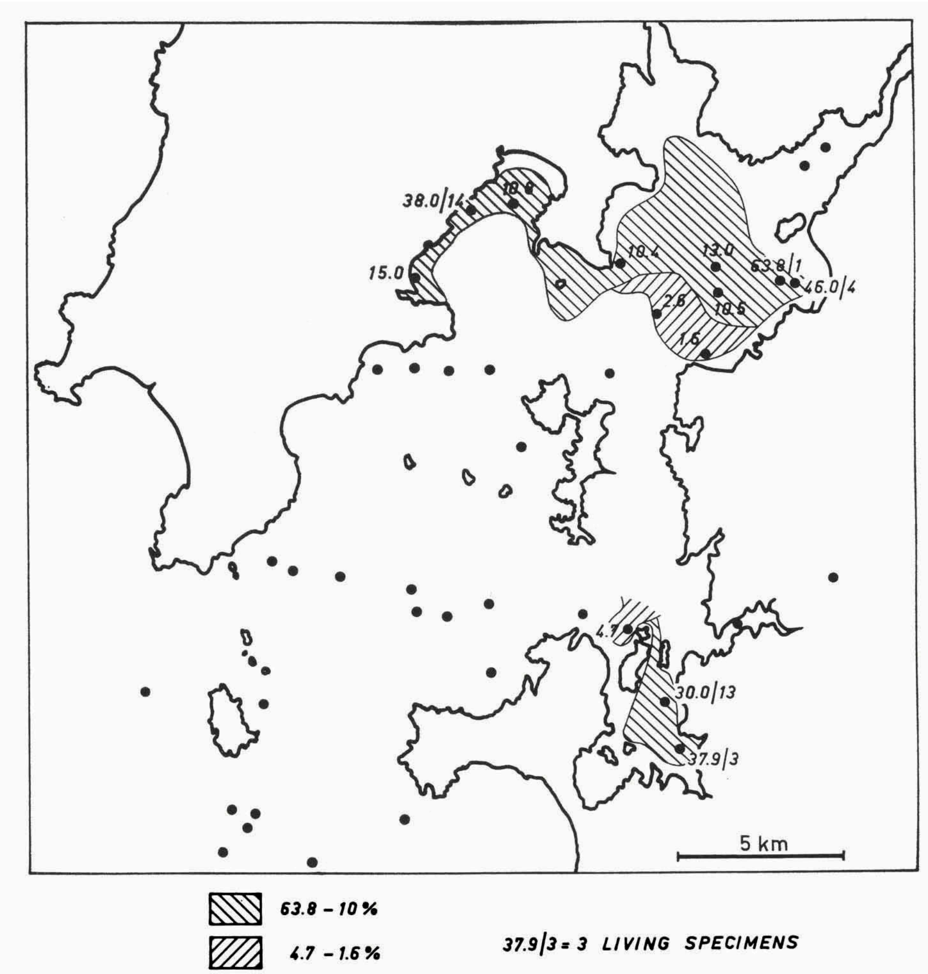

Fig. 15. Areal distribution of *Nonion depressulum* and *Nonion umbilicatulum* in percentage of total population.

region. In the Arosa Bay these northern species are indicators of the marginal bay zone, as is the case in the North Sea region. Their L/D ratios are rather high for the Ria, *Florilus pauperatum* excepted, of which no living specimens have been found.

Nonion depressulum is a form found in northern regions in great quantities as an indicator of littoral and estuarine environments. The fact that in the Ria de Arosa this species has been found as an indicator for the marginal bay zone proves the northern supply of the fauna in the bay. *Cribrononion poeyanum* occupies the same environment in the Ria as the distribution map of *N. depressulum* shows. The former has recently not

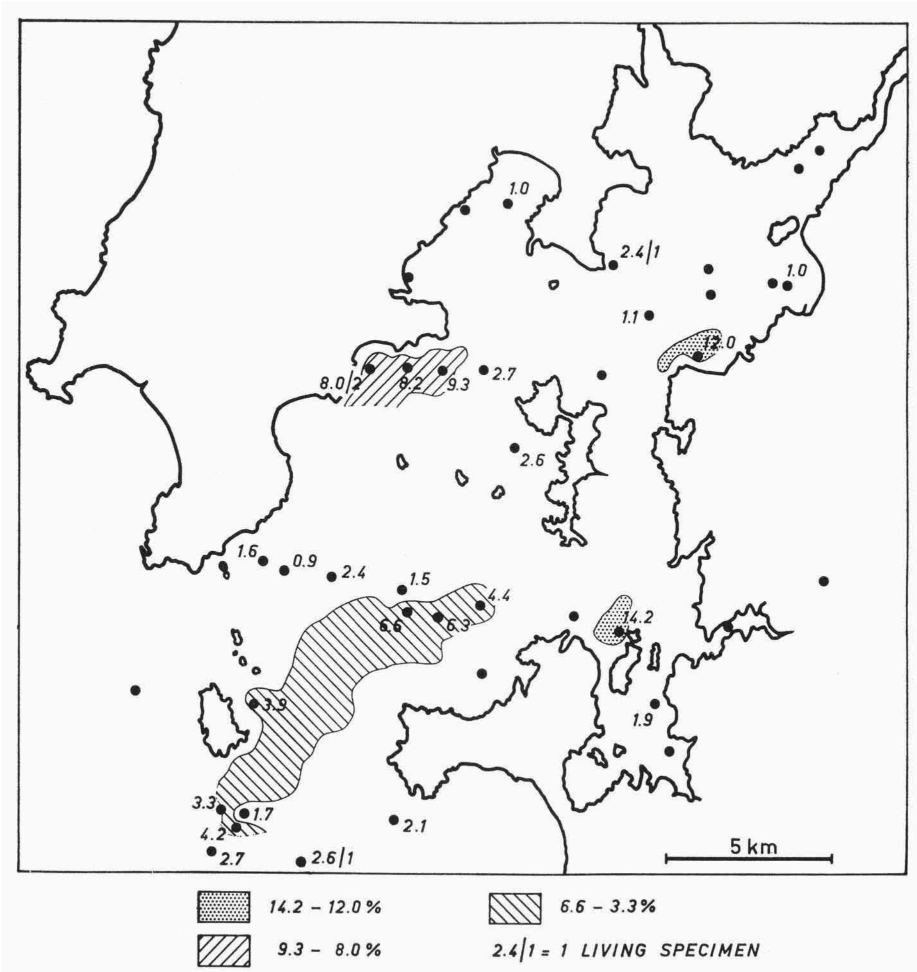

Fig. 16. Areal distribution of *Bolivina pseudoplicata* in percentage of total population.

been found in the North Sea region and is most probably a species which inhabits warmer regions. The occurrence in the same biofacies of a species of northern habitat (*Nonion depressulum*) and one of a more southern character (*Cribrononion poeyanum*) proves the mixed character of the foraminiferal assemblage of the Ria de Arosa. Prof. Ruggieri (Bologna) kindly enabled us to study a sample of the beach sand of Rimini (Adriatic). In this foraminiferal assemblage occur, among others, many *Cribrononion poeyanum* and *Streblus ? perlucidus*, but no *Nonion depressulum*. *Streblus ? perlucidus* (Heron-Allen & Earland, 1913: 139, pl. 13 figs. 7-9), a trochispiral form, most probably does not belong to the genus *Streblus* (= *Ammonia*) but to *Nonionellina* Voloshinova, 1958. *Nonion depressulum* is indistinguishable from *Streblus ? perlucidus* if lying on its spiral side. In the North Sea basin *Streblus ? perlucidus* has been found locally in pleisto-

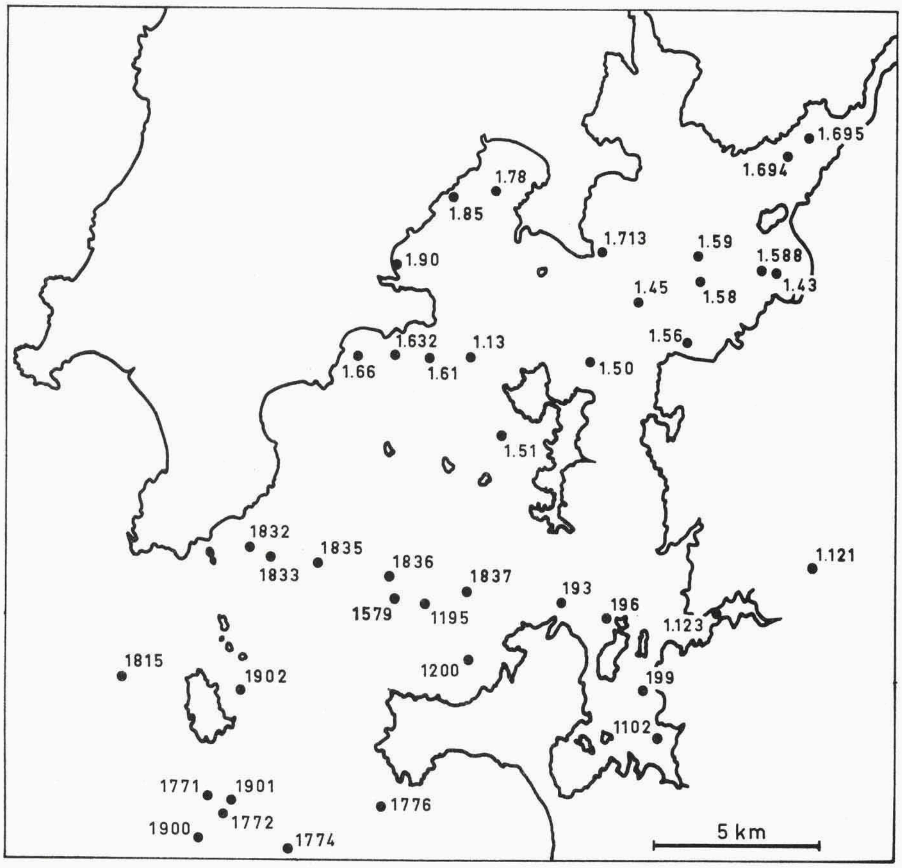

Fig. 17. Position of stations in the Ria de Arosa.

cene and holocene tidal marshes; it is therefore a cosmopolitan species (Van Voorthuysen, 1950: 45, pl. 4 fig. 7).

The indicators of the littoral and estuarine biofacies in the North Sea region are, among others, *Nonion depressulum, N. umbilicatulum, Florilus pauperatum* and locally a few *Streblus ? perlucidus*. In the Mediterranean area (Rimini) the indicators are *Cribrononion poeyanum* and *Streblus ? perlucidus,* while in the Ria de Arosa they are *Nonion depressulum, Cribrononion poeyanum, Nonion umbilicatulum* and *Florilus pauperatum*.

The cosmopolitan *Buliminella elegantissima* has a still higher ratio and is an indicator of the middle bay zone. The cosmopolitan *Ammonia beccarii* has not been found alive. It is an indicator of the inner bay zone and easily distinguishable from the thick-set mediterranean species *Ammonia inflata,* of which only three living specimens have been found, which gives a L/D ratio of 0.7, which in strikingly low. The cosmopolitan *Bolivina pseudoplicata* is scattered all over the Ria with a few concentrations with L/D ratios from 14.2 to 3.3% of total population; the medium L/D ratio is 1.0, which is also very low.

It is evident that the living conditions for benthonic Foraminifera must be unfavourable in the Ria de Arosa. Current velocities of more than 20-25 cm/sec near the bottom would prevent the Foraminifera of a normal diameter (0.5-0.1 mm diameter) to settle, because in that case they would be transported. According to Cadée (1968) an intermediate layer from 10 to 30 m gives a mean maximum current of 20 cm/sec. The bottom current has not been measured, but here the current velocity will even be lower. Therefore it seems that the effect of current action near the bottom cannot be the cause of the very low production rate. On the other hand the current velocity in the tidal channels and gullies of the Dutch Wadden Sea (Van Voorthuysen, 1960) seems to be the main cause of the very low production rate on the bottom of these streams; it is the transportation of the foraminiferal tests that predominates. As to the transportation of the foraminiferal tests, an exception has to be made for the bay inlet between Isla de Salvora and the Peninsula del Grove. Here it is evident (see fig. 4) that the dead tests of the *Globigerina*'s and most probably also those of *Cassidulina neocarinata* and *Globocassidulina subglobosa* have been transported from the open sea into the bay; this phenomenon is only possible by means of a current velocity near the bottom > 20-25 cm/sec.

It seems that also the temperature and salinity conditions are normal; moreover the waters in the Ria are rather clear with the exception of the estuaries of the rivers Ulla and Umia. According to Cadée (1968) the surface temperature in the bay varies from 11° to 20° C. This is lower than in the Atlantic west of Gibraltar. According to Parker (1956) this area possessses a surface temperature varying from 16° to 22° C. In the western Mediterranean it is 13° to 24° C and in the eastern Mediterranean 16° to 28° C. This slightly lower temperature in the Ria could not be the main cause of the low production rate. As Cadée (1968) has already stated it only gave the fauna and flora a more or less northern character and could possibly slightly deteriorate the living conditions of some of the typical mediterranean Foraminifera.

One of the causes of the extremely low production rate could be the environment condition prevailing on the bottom. Food supply in the inner bay is high, but this advantage is for the greater part nullified by the reducing circumstances in this region (see Cadée, 1968, fig. 16).

In the outer bay oxygen conditions are normal, but here the food supply has been reduced. It remains a little puzzling that Cadée (1968) should not have found a low production rate of the Molluscs. It seems likely that only the benthonic Foraminifera did not find a favourable habitat in the Ria de Arosa.

A comparison of the Recent Atlantic foraminiferal fauna of the Ria de Arosa with the Pliocene and Pleistocene faunae of the North Sea Basin

During an excursion of the committee of the Nordic Neogene Stratigraphy in November, 1965, in the harbour of Antwerp, conducted by Ir. Gulinck and Dr. Paepe of the Belgische Aardkundige Dienst at Brussels, we were able to collect many samples of the littoral Pliocene, the marine Pleistocene and, moreover, the Miocene.

In these littoral Plio-Pleistocene sediments of the North Sea Basin we found 107 species, with which the Recent Arosa Bay fauna has 39 species in common (Van Voorthuysen & Toering, 1969).

The following is a list giving the occurrence of the 39 species in the North Sea basin (harbour of Antwerp), stratigraphycally indicated by means of numbers:

1, Sands of Merksem (oldest marine Pleistocene);
2, Sands of Kallo (Upper Pliocene);
3, Sands of Luchtbal (Upper Pliocene);
4, Sands of Kattendijk (Lower Pliocene).

1	*Bolivina pseudoplicata*	rare 4
2	*Brizalina dilatata*	locally rare 3
3	*Bulimina elongata*	rare 4

4 *Bulimina gibba* (= ? *aculeata*)	rare 4, 3, 2, 1
5 *Cancris auriculus*	rare 3
6 *Cassidulina neocarinata*	common 3, rare 2
7 *Cibicides lobatulus*	frequent 4, 3, 2, 1
8 *Cibicidina boueana*	rare 4, 3, 2
9 *Cribrononion advenum*	locally rare 3
10 *Elphidium complanatum*	locally rare 3
11 *E. crispum*	frequent 2, 1
12 *E. margaritaceum*	rare 3
13 *Fissurina* cf. *formosa*	rare 3
14 *Fissurina marginata*	rare 3, 2
15 *F. orbignyana*	rare 4, 3, 2, 1
16 *F. quadrata*	locally rare 3, 2
17 *Globigerina bulloides*	common 4, 3; rare 2
18 *Globulina gibba*	common 4, 3, 2, 1
19 *G. inaequilis*	rare 2, 1
20 *Heterolepa pseudoungeriana*	rare 2, 1
21 *Lagena globosa*	rare 3, 2, 1
22 *L. laevis*	rare 4, 3
23 *L. sulcata*	rare 3
24 *Neoconorbina millettii*	locally rare 4, 3
25 *N. terquemi*	locally rare 3
26 *N. williamsoni*	rare 4, 3
27 *Oolina hexagona*	rare 4, 3, 2, 1
28 *O. melo*	rare 4, common 3, rare 2, 1
29 *O. squamosa*	rare 3
30 *Planorbulina mediterranensis*	common 3
31 *Quinqueloculina bicornis*	rare 3
32 *Q. seminulum*	common 3
33 *Q. vulgaris*	locally common 3
34 *Rosalina globularis*	rare 4, 3
35 *Spiroloculina depressa*	common to rare 3
36 *Textularia pseudotrochus*	locally common 3
37 *T. sagittula*	rare 4, common 3, locally rare 2
38 *T. truncata*	common 4, 3, locally rare 2
39 *Triloculina inflata*	rare 4, 3

Species which we did not find in the recent Ria de Arosa fauna but occur in the Plio-Pleistocene of the North Sea basin (harbour of Antwerp) are:

1	*Elphidiella hannai*	frequent, not in 4
2	*Buccella frigida*	frequent
3	*Cribrononion haagensis*	frequent, not in 4
4	*Nonion crassesuturatus*	frequent
5	*Ammonia pseudotepida*	common
6	*Pararotalia* cf. *calcar*	common, not in 4
7	*Globulina paucicrassecosta*	rare 4, common 3, 2
8	*Oolina borealis*	locally rare, not in 4
9	*Fissurina orbignyana clathrata*	common 3, locally rare 2
10	*Neoconorbina lingulata*	locally rare 4, 3, 2
11	*Globulina gibba punctata*	rare 4 and 2
12	*G. gibba fissicostata*	rare 4 and 2
13	*G. gibba tuberculata*	rare 3
14	*G. gibba longitudinalis*	rare 3
15	*Oolina acuticosta*	rare 3 and 2
16	*Trifarina bradyi*	common 4, locally rare 3, rare 2
17	*Textularia decrescens*	locally 3, in other regions of the North Sea Basin typically 4!

We presume that of these 17 species 6 do not live in the recent sediments of the Arosa Bay or in the Mediterranean:

Elphidiella hannai
Cribronion haagensis
Nonion crassesuturatus
Globulina paucicrassicosta
Oolina borealis
Textularia decrescens

On the other hand many species living nowadays in the Arosa Bay or on the continental shelf in the neighbourhood were not found in the Pleistocene of the North Sea basin. They are:

Ammonia inflata
Asterellina pulchella
Brizalina colomi spec. nov.
B. seminuda
Bulimina costata (occurred in the Miocene of the North Sea Basin)
Buliminella arosaensis spec. nov.
Cibicidina rarescens
Cribrononion ibericum
Epistominella exigua
Glabratella minima spec. nov.
Haplophragmoides emaciatum

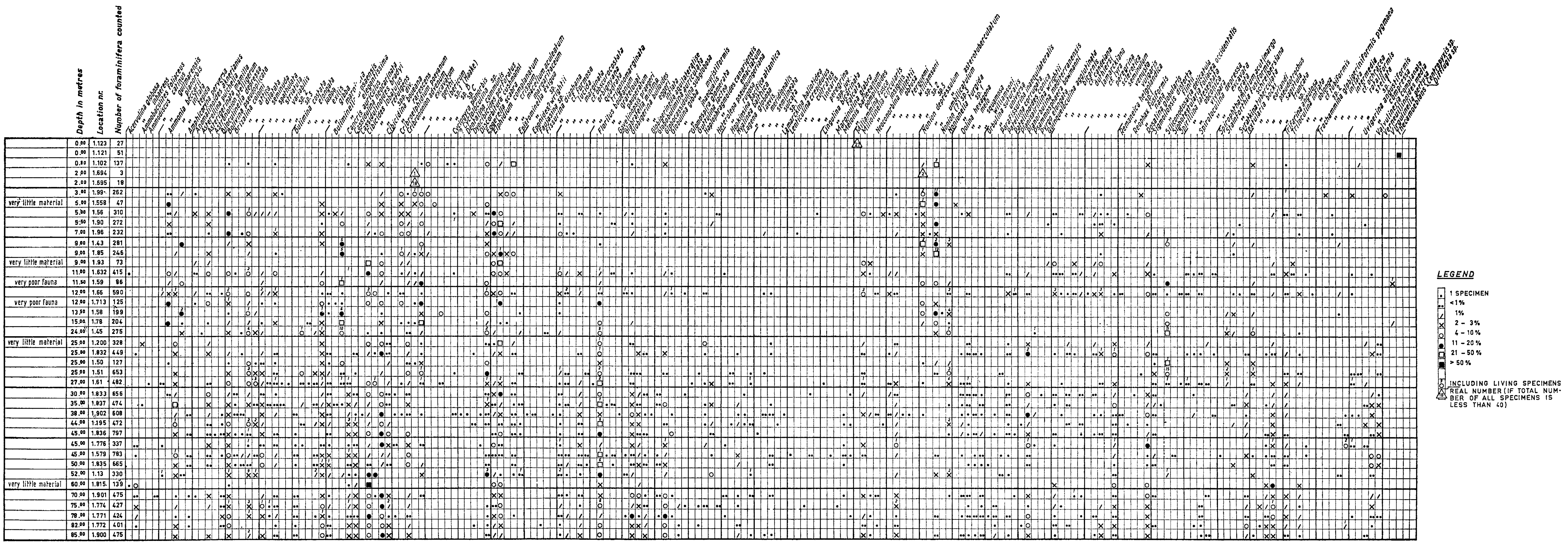

Fig. 18. Table illustrating the distribution of the Foraminifera in the Ria de Arosa.

Heterolepa rugosa
Hyalinea balthica
Miniacina miniacea
Orbulina suturalis
O. universa (very rare in the Miocene of the North Sea Basin)
Quinqueloculina duthiersi
Q. lamarckina
Q. peregrina
Q. sclerotica
Siliconodosaria delicatula
Siphotextularia foliacea
Uvigerina angustiformis
U. compressa

To sum up we may state that the Atlantic fauna of the Ria de Arosa (and that of the recent Mediterranean) has rather many species in common with the oldest Pleistocene and Pliocene faunae of the North Sea Basin. The recent fauna of the North Sea Basin on the other hand has very little resemblance with the Arosa Bay or Mediterranean fauna. A few forms which we thought were restricted to the North Sea Basin and other northern regions, we found in the Arosa bay, e.g. *Nonion depressulum, Nonion umbilicatulum* and *Florilus pauperatum.*

Alphabetical list of species

For the classification of the Foraminifera in this study Loeblich & Tappan (1964a) has been used, because this is still the most comprehensive and authoritative treatise we have on the subject. As the authors will know even better than we do, this does not mean it is a perfectly taxonomic system of the Foraminifera.

We have followed the nomenclature of this treatise, although we are also convinced that still more taxonomic research on microstructure, chemical composition etc., is needed before a perfect system can be composed, if ever it will be (Loeblich & Tappan, 1964b).

1. *Acervulina globosa* Schultze, 1854 (pl. 1 fig. 2)
   Acervulina globosa Schultze, 1854, Ueber den Org. d. Polythalamien (Foram.), Engelmann, Leipzig: 68, pl. 6 figs. 13-14.
2. *Acervulina inhaerens* Schultze, 1854 (pl. 1 fig. 5a, b)
   Acervulina inhaerens Schultze, 1854, Ueber den Org. d. Polythalamien (Foram.), Engelmann, Leipzig: 68, pl. 6 fig. 12.

3. *Ammobaculites foliaceus* (H. B. Brady, 1884) (pl. 1 fig. 6)
Haplophragmium foliaceum H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 304, pl. 33 figs. 20-25.
Ammobaculites foliaceus, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 15, pl. 3 figs. 16-18, pl. 5 figs. 37-39.

4. *Ammodiscus catinus* Höglund, 1947 (pl. 1 fig. 3)
Ammodiscus catinus Höglund, 1947, Zool. Bidrag Uppsala, 26: 122, figs. 82-84, 105-107, 109, pl. 8 figs. 1, 7, pl. 28 figs. 19-23.

5. *Ammodiscus gullmarensis* Höglund, 1947 (pl. 1 fig. 1)
Ammodiscus planus Höglund, 1947, Zool. Bidrag Uppsala, 26: 123, figs. 85-89, 105, 106, 109, pl. 8 figs. 2, 3, 8; pl. 28 figs. 17, 18.
Ammodiscus gullmarensis Höglund, 1948, Contr. Cushm. Lab. Foram. Res., 24 (2): 45.

6. *Ammodiscus planorbis* Höglund, 1947 (pl. 1 fig. 4)
Ammodiscus planorbis Höglund, 1947, Zool. Bidrag Uppsala, 26: 125, figs. 91, 105, 109, pl. 8 figs. 4, 9, pl. 28 figs. 13, 14.

7. *Ammonia beccarii* (Linnaeus, 1758) (pl. 1 fig. 7a, b, c)
Nautilus beccarii Linnaeus, 1758, Syst. Nat. (ed. 10), 1: 710.
Rotalia beccarii, Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 58, pl. 12 figs. 1-7, pl. 13 figs. 1, 2.
Streblus beccarii, Hofker, 1960, Paläont. Z., 34 (3-4): 255, fig. 134.
Ammonia beccarii, Margerel, 1968, Foram. Redonien: 133, pl. 24 figs. 29-31, pl. 25 figs. 1-3.

8. *Ammonia inflata* (Sequenza, 1862) (pl. 1 fig. 9a, b, c)
Rosalina inflata Sequenza, 1862, Atti Accad. Gioenia Sci. Nat., (2) 18: 106, pl. 1 fig. 6.
Rotalia beccarii inflata, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 36, pl. 3 figs. 1-5.
Streblus inflatus, Hofker, 1960, Paläont. Z., 34 (3-4): 255, figs. 131, 133.

9. *Ammonia tepida* (Cushman, 1926) (pl. 1 fig. 8a, b, c)
Rotalia beccarii (Linnaeus) var. *tepida* Cushman, 1926, Publ. Carnegie Inst. Washington, 344: 79, pl. 1; Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 61, pl. 13 fig. 3.

10. *Amphicoryna perversa* (Schwager, 1866) (pl. 2 fig. 1)
Nodosaria perversa Schwager, 1866, Foss. Foram. Kar. Nikobar, Novarra Exp., Wien, Geol. Theil, 2 (2): 212, pl. 5 fig. 29.

11. *Anomalinoides aknerianus* (d'Orbigny, 1846) (pl. 2 fig. 2a, b)
Rotalina akneriana d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide et Comp., Paris: 156, pl. 8 figs. 13-15.

12. *Asterellina pulchella* (Parker, 1952) (pl. 2 fig. 5a, b)
Pninaella (?) *pulchella* Parker 1952, Bull. Mus. Comp. Zool., 106 (9): 420, pl. 6 figs. 18-20.
Asterellina pulchella, Anderson, 1963, Micropal., 9 (3): 313, pl. 1 figs. 5-7.

13. *Asterigerinata mamilla* (Williamson, 1858) (pl. 2 fig. 3a, b)
Rotalina mamilla Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 54, pl. 4 figs. 109-111.
Asterigerinata mamilla, Parker, 1958, Repts swedish Deep Sea Exp., 8 (4): 264, pl. 3 figs. 5-6; Hofker, 1960, Paläont. Z., 34 (3-4): 252, fig. 111.

14. *Astrononion stelligerum* (d'Orbigny, 1839) (pl. 2 fig. 4)
Nonionina stelligera d'Orbigny, 1839, in: P. Barker-Webb & Sabin Berthelot, Hist. Nat. Iles Canaries, 2 (2), Foraminifères: 128, pl. 3 figs. 1, 2.
Astrononion stelligerum, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 258, pl. 1 figs. 34, 35.

15. *Biloculinella depressa* (d'Orbigny, 1826) (pl. 2 fig. 7a, b)
Biloculina depressa d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 298, no. 7 Modèles no. 91.
Pyrgo depressa, Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 71, pl. 19 figs. 4, 5.
Biloculinella depressa, Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 26, pl.7 figs. 8-10.

16. *Bolivina pseudoplicata* Heron-Allen & Earland, 1930 (pl. 2 fig. 6)
Bolivina pseudoplicata Heron-Allen & Earland, 1930, J. Roy. Microsc. Soc., (3) 50: 81, pl. 3 figs. 36-40; Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., 9: 166, pl. 19 figs. 12-20; Margerel, 1968, Foram. Redonien: 93, pl. 15 figs. 26-27.

17. **Brizalina colomi** spec. nov. (pl. 2 figs. 8-9)
Test short and broad. periphery acute, serrate; chambers distinct, broader than high and increasing in relative breadth toward the apertural end, the periphery of each in the adult produced into a sharp angle with a distinct spine; sutures distinct, straight, forming an angle of about 35° with the horizontal; wall finely perforate with a row of distinct knots on both sides of the axis of the shell; aperture elongate, narrow. Length 0.33 mm; breadth 0.22 m; thickness 0.07 mm.

Holotype: F4474; Paratype: F4474A; type locality: Ria de Arosa (Spain); typical stratum: recent; derivation of the name: in honour of the Spanish micropalaeontologist Dr. G. Colom, Baleares.

Discussion: The new species possesses some affinities with *Bolivina difformis* (Williamson, 1858), but this species of the British Isles lacks the ornamentation. On the other hand our new species does not show the coarse perforation of *B. difformis*.

18. *Brizalina attica* (Parker, 1958) (pl. 2 fig. 10)
Bolivina attica Parker, 1958, Repts Swedish Deep Sea Exped., 8 (4): 259, pl. 2 figs. 12-14.

19. *Brizalina dilatata* (Reuss, 1850) (pl. 2 fig. 18)
Bolivina dilatata Reuss, 1850, Denkschr. Akad. Wiss. Wien, 1: 381, pl. 48 fig. 15; Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., 9: 78, pl. 9 figs. 17-20; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 31, pl. 2 figs. 10-14.

20. *Brizalina seminuda* (Cushman, 1911) (pl. 2 figs. 11, 12)
Bolivina seminuda Cushman, 1911, Bull. U.S. Nat. Mus., 71 (2): 34, fig. 55; Cushman, 1937, Cushm. Lab. For. Res., Spec. Publ., 9: 142, pl. 18 figs. 13-15.
According to Cushman his type material from the Bering Sea had a length of up to 1.00 mm. Our specimens are about one fourth of that size.

21. *Brizalina spathulata* (Williamson, 1858) (pl. 2 fig. 15)
Textularia variabilis Williamson var. *spathulata* Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 76, pl. 6 figs. 164-165.
Bolivina spathulata, Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., 9: 162, pl. 15 figs. 20-24; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 31, pl. 2 figs. 8, 9; Margerel, 1968, Foram. Redonien: 94, pl. 16 figs. 8-11, 15-17.

22. *Brizalina striatula* (Cushman, 1922) (pl. 2 fig. 16)
Bolivina striatula Cushman, 1922, Publ. Carnegie Inst. Washington, 311: 27, pl. 3 fig. 10; Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., 9: 154, pl. 18 figs. 30, 31; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 32, pl. 2 figs. 1-5; Hofker, 1960, Paläont. Z., 34 (3-4): 251, fig. 106.

23. *Brizalina variabilis* (Williamson, 1858) (pl. 2 fig. 17)
Textularia variabilis Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 76, pl. 6 figs. 162-163.
Bolivina variabilis, Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., 9: 158, pl. 16 figs. 6, 12-14.

24. *Brizalina* spec. 2 (pl. 2 fig. 14)

25. *Brizalina* spec. 3 (pl. 2 fig. 13)

26. *Bulimina costata* d'Orbigny, 1852 (pl. 2 fig. 19)

Bulimina costata d'Orbigny, 1852, Prodr. Pal. Strat., Paris, 3: 194; Fornasini, 1901, Boll. Soc. Geol. Ital., 20: 174, fig. 1; Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D: 115, pl. 27 figs. 2-3; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 24, pl. 1 figs. 7-11.

27. *Bulimina elongata* d'Orbigny, 1826 (pl. 2 fig. 21)

Bulimina elongata d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 269 no. 9 (nom. nud.); Fornasini, 1902, R. Accad. Sci. Inst. Bologna, Mem. Sci. Nat., (5) 9: 373, fig. 5; Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D: 108, pl. 25 figs. 14-17; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 25, pl. 1 fig. 19; Margerel, 1968, Foram. Redonien: 96, pl. 17 fig. 3.

28. *Bulimina elongata* d'Orbigny, 1826 var. *lappa* Cushman & Parker, 1937 (pl. 2 fig. 20)

Bulimina elongata d'Orbigny var. *lappa* Cushman & Parker, 1937, Cushm. Lab. Foram. Res., Contr., 13 (2): 51, pl. 7 fig. 8; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 25, pl. 1 figs. 13-18.

29. *Bulimina exilis* H. B. Brady, 1884 (pl. 2 figs. 22, 23)

Bulimina elegans d'Orbigny var. *exilis* H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 399, pl. 50 figs. 5-6.

Bulimina exilis, Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D: 123, pl. 28 figs. 27-28.

30. *Bulimina gibba* Fornasini, 1902 (pl. 2 fig. 24)

Bulimina gibba Fornasini, 1902, R. Accad. Sci. Inst. Bologna, Mem. Sci. Nat., (5) 9: 378, pl. O figs. 32, 34; Cushman & Parker, 1947, U.S. Geol. Surv. Prof. Pap., 210 - D: 125, pl. 28 figs. 37-38, pl. 29 figs. 1-5; Hofker, 1960, Paläont. Z., 34 (3-4): 248, figs. 91-95.

31. *Bulimina marginata* d'Orbigny, 1826 (pl. 2 fig. 25)

Bulimina marginata d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 269, pl. 12 figs. 10-12; Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D: 119, pl. 28 figs. 5-6; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 24, pl. 1 figs. 1-6.

32. **Buliminella arosaensis** spec. nov. (pl. 3 figs. 1a, b, 2a, b)

Test small, irregularly ovate in outline, composed of about 1½ whorls, initial end consisting of a round proloculus distinctly protruding; chambers mostly five in number, not inflated, rapidly increasing in size as added; sutures broad and hyaline; apertual face flat and semicircular with mostly seven fine radial striae and a depression on the inner side with the aperture most probably covered with shell material; length: 0.20 mm.

Holotype: F 4477; paratype F 4477A, type locality: Ria de Arosa (Spain), typical stratum: recent; derivation of the name: after the name of the Spanish Arosa Bay.

Discussion: The new species possesses close affinity with *B. minutissima* (J. Wright, 1875), but the latter does not show the flat apertural face with the fine radial striae.

33. *Buliminella elegantissima* (d'Orbigny, 1839) (pl. 3 fig. 3a, b)

Bulimina elegantissima d'Orbigny, 1839, Voyage Amérique Méridionale, 5 (5), Foram.: 51, pl. 7 figs. 13-14.

Buliminella elegantissima, Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D: 67, pl. 17 figs. 10-12; Hofker, 1960, Paläont. Z., 34 (3-4): 248, fig. 83; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 302, pl. 14 fig. 1; Margerel, 1968, Foram. Redonien: 91, pl. 16 figs. 23-24.

34. *Cancris auriculus* (Fichtel & Moll, 1798) (pl. 3 fig. 4a, b)

Nautilus auricula var., Fichtel & Moll, 1798 (1803 reprint), Test. Microsc., Wien: 108, pl. 20 figs. a-f.

Cancris auriculus, Cushman & Todd, 1942, Cushm. Lab. Foram. Res., Contr., 18 (4): 74, pl. 18 figs. 1-11, pl. 23 fig. 6; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 35, pl. 3 figs. 26-28; Margerel, 1968, Foram. Redonien: 117, pl. 21 figs. 20-22.

35. *Cassidulina neocarinata* Thalmann, 1950 (pl. 3 fig. 6)

Cassidulina laevigata d'Orbigny var. *carinata* Cushman, 1922, Bull. U.S. Nat. Mus., 104 (3): 124, pl. 25 figs. 6-7.

Cassidulina neocarinata Thalmann, 1950, Cushm. Found. Foram. Res., Contr., 1 (3-4): 44.

Cassidulina laevigata carinata, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 33, pl. 4 figs. 25-26.

Cassidulina laevigata d'Orbigny, 1826 var. *carinata* Silvestri, 1896, from the Lower Pliocene of Italy is a homonym of the recent *C. laevigata* d'Orbigny var. *carinata* Cushman, 1922, from the Atlantic. Thalmann renamed the Atlantic form as *Cassidulina neocarinata* Thalmann, 1950.

36. *Cassidulinoides bradyi* (Norman, 1881) (pl. 3 fig. 5)

Cassidulina bradyi, H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 431, pl. 54 figs. 6-10.

Cassidulina bradyi, Cushman, 1925, Cushm. Lab. Foram. Res., Contr., 1 (3): 52, pl. 8 figs. 3-5; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 325, pl. 16 figs. 18-19.

37. *Cibicides lobatulus* (Walker & Jacob, 1798) (pl. 3 fig. 7a, b, c)

Nautilus lobatulus Walker & Jacob, 1798, in: Adam's Essays, Kammacher's ed. 2: 642, pl. 14 fig. 36.

Cibicides lobatulus, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 39, pl. 3 figs. 23-25; Hofker, 1960, Paläont. Z., 34 (3-4): 256, figs. 139, 140, 142; Margerel, 1968, Foram. Redonien: 149, pl. 29 figs. 13-15.

38. *Cibicides refulgens* Denys de Montfort, 1808 (pl. 3 fig. 8a, b, c)

Cibicides refulgens Denys de Montfort, 1808, Conch. Syst., 1: 123, fig. (: 122); Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 116, pl. 21 fig. 2; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 38, pl. 7 figs. 24-25; Margerel, 1968, Foram. Redonien: 150, pl. 30 figs. 22-24.

39. *Cibicides* spp. div.

Many juvenile specimens in our fourth fraction (0.15-0.05 mm) could not be identified. We counted them as *Cibicides* spec. Moreover, there are some adults of which the identification would have been arbitrary; these specimens were also counted as *Cibicides* spec.

40. *Cibicidina boueana* (d'Orbigny, 1846) (pl. 3 fig. 18a, b, c)

Truncatulina boueana d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide et Comp., Paris: 169, pl. 9 figs. 21-26.

Cibicides boueana, Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): 21, pl. 7 fig. 79.

41. *Cibicidina rarescens* (H. B. Brady, 1884) (pl. 3 figs. 17a, b)

Discorbina rarescens H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 651, pl. 90 figs. 2-3.

Planodiscorbis rarescens, Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 196, pl. 1 fig. 17.

42. *Cribroelphidium poeyanum* (d'Orbigny, 1839) (pl. 3 fig. 9a, b)

Polystomella poeyana d'Orbigny, 1839, in: de la Sagra, Hist. Phys. Nat. Cuba: 55, pl. 6 figs. 25-26.

Elphidium poeyanum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 54, pl. 14 figs. 25-26.

43. *Cribrononion advenum* (Cushman, 1922) (pl. 3 fig. 10a, b)

Polystomella advena Cushman, 1922, Publ. Carnegie Inst. Washington, 311: 56, pl. 9 figs. 11-12.

Elphidium advenum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 60, pl. 16 figs. 31-35; Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 269, pl. 4 figs. 3-4.

Elphidiononion advenum, Hofker, 1960, Paläont. Z., 34 (3-4): 262, fig. 176A.

44. *Cribrononion excavatum* (Terquem, 1875) (pl. 3 fig. 12a, b)
Polystomella excavata, Terquem, 1875, Essai Class. Animaux Plage Dunkerque, (1): 20, pl. 2 fig. 2.
Elphidium excavatum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 58, pl. 16 figs. 7-12; Van Voorthuysen, 1957, Med. Geol. Sticht., n. ser., (11): 31, pl. 23 fig. 8.

45. *Cribrononion gerthi* (Van Voorthuysen, 1958) (pl. 3 fig. 13a, b)
Elphidium gerthi Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser. (11): 32, pl. 23 fig. 12; Haake, 1962, Meyniana, 12: 48, pl. 5 fig. 10.

46. *Cribrononion ibericum* (Cushman, 1936) (pl. 3 fig. 16a, b, c)
Nonion ibericum Cushman, 1936, Cushm. Lab. Foram. Res., Contr., 12 (3): 68, pl. 12 figs. 12-13; Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 191.
Nonion aff. *ibericum,* Margerel, 1968, Foram. Redonien: 156, pl. 33 figs. 14-17, 20-21, pl. 44 figs. 1-5.

47. *Cribrononion* spec. 1 Haake (pl. 3 fig. 15a, b)
Elphidium spec. 1 Haake, 1962, Meyniana, 12: 51, pl. 5 fig. 9.

48. *Cribrononion* spec. B (pl. 3 fig. 14a, b)

49. *Cribrononion* spec. C (pl. 3 fig. 11a, b)

50. *Cyclogyra planorbis* (Schultze, 1854) (pl. 4 fig. 1)
Cornuspira planorbis Schultze, 1854, Ueber den Organismus des Polythalamien (Foram.), Engelmann, Leipzig: 40, pl. 2 fig. 21; Phleger, Parker & Peirson, 1953, Repts Swedish Deep Sea Exp., 7 (1): 29, pl. 5 fig. 30.

51. ? *Cycloloculina* spec. (pl. 4 fig. 2a, b, c)
We found only one single specimen at Sta. 1.902 at a depth of 38 m. Hitherto this genus has only been found in the Palaeocene and Eocene. Our specimen is in any case a very peculiar form, but we are even uncertain about its generic identification, due to the fact that one side is damaged. Most probably it represents a juvenile stage.

52. *Dentalina communis* d'Orbigny, 1826 (pl. 4 fig. 10)
Nodosaria (Dentalina) communis d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 254; Parker, Jones & H. B. Brady, 1871, Ann. Mag. nat. Hist., (4) 8: 158, pl. 9 fig. 46.
Nodosaria communis, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 75, pl. 12 figs. 3, 4, 15-17; Hofker, 1960, Paläont. Z., 34 (3-4): 246, fig. 73.

53. *Dyocibicides perforatus* Cushman & Valentine, 1930 (pl. 4 fig. 4a, b)
Dyocibicides perforatus Cushman & Valentine, 1930, Contr. Dept.

Geol. Stanford Univ., Calif., 1 (1): 31, pl. 10 fig. 3; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 40, pl. 5 figs. 30-32.

54. *Discorbitura cushmanni* Margerel, 1968 (pl. 4 fig. 5a, b)

Discorbis parisiensis (?) Cushman, 1931, Bull. U.S. Nat. Mus., 104: 29, pl. 6 fig. 5

(?) *Discorbis parisiensis,* Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): 20, pl. 6 fig. 72.

Discorbitura cushmani, Margerel, 1968, Foram. Redonien: 102, fig. 23, pl. 17 figs. 11-13, 16-21.

55. *Eggerella scabra* (Williamson, 1858) (pl. 4 fig. 3)

Bulimina scabra Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 65, pl. 5 figs. 136-137.

Eggerella scabra, Höglund, 1947, Zool. Bidr. Uppsala, 26: 191, figs. 162-165, pl. 13 figs. 12-14; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 19, pl. 3 figs. 8-10; Hofker, 1960, Paläont. Z., 34 (3-4): 236, figs. 11, 12.

56. *Elphidium complanatum* (d'Orbigny, 1839) (pl. 4 fig. 8a, b)

Polystomella complanata d'Orbigny, 1839, in: P. Barker-Webb & Sabin Berthelot, Hist. Nat. Iles Canaries, 2 (2), Foram.: 129, pl. 2 figs. 35-36.

Elphidium complanatum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 56, pl. 15 fig. 20; Colom, 1950, Bol. Inst. Españ. Oceanogr., (28): 27, pl. 9 figs. 10-11; Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 270, pl. 4 fig. 5.

57. *Elphidium crispum* (Linnaeus, 1758) (pl. 4 fig. 9a, b)

Nautilus crispus Linnaeus, 1758, Systema Naturae (ed. 10), 1: 709.

Elphidium crispum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 61, pl. 13 figs. 17-21; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 34, pl. 3 figs. 32-35; Hofker, 1960, Paläont. Z., 34 (3-4): 262, fig. 184; Margerel, 1968, Foram. Redonien: 135, pl. 28 figs. 21-22.

58. *Elphidium macellum* (Fichtel & Moll, 1803) var. *aculeatum* (Silvestri, 1901) (pl. 4 fig. 6a, b)

Polystomella macella var. *aculeata* Silvestri, 1901, Atti Rend. Reale Accad. Sci. Lett. Arti Zelanti, Acireale, Cl. Sci., n. ser., 10 (7): 45.

Elphidium macellum var. *aculeatum,* Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 52, pl. 15 figs. 11-13.

59. *Elphidium margaritaceum* (Cushman, 1930) (pl. 4 fig. 7a, b)

Elphidium advenum (Cushman, 1922) var. *margaritaceum* Cushman, 1930, Bull. U.S. Nat. Mus., 104 (7): 25, pl. 10 fig. 3.

Elphidium margaritaceum, Van Voorthuysen, 1958, Med. Geol. Sticht.,

n. ser., (11): 32, pl. 23 fig. 13; Haake, 1962, Meyniana, 12: 49, pl. 5 fig. 11.

60. *Epistominella exigua* (H. B. Brady, 1884) (pl. 5 fig. 2a, b)
Pulvinulina exigua H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 696, pl. 103 figs. 13-14.
Epistominella exigua, Parker, 1954, Bull. Mus. Comp. Zool., 111 (10): 533, pl. 10 figs. 22-23.

61. *Epistominella* spec. (pl. 5 fig. 1a, b, c)
We found only a single specimen at Sta. 1.902 at a depth of 38 m.

62. *Eponides* (?) *wrightii* (H. B. Brady, 1881) (pl. 5 fig. 3a, b, c)
Discorbina wrightii H. B. Brady, 1881, Ann. Mag. Nat. Hist., (5) 8: 413, pl. 21 fig. 6.
Eponides wrightii, Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 56, pl. 11 figs. 7-8; Parker, 1952, Bull. Mus. Comp. Zool., 106 (8-9): 420, pl. 6 figs. 14-15.

63. *Faujasina* spec. (pl 5 fig. 4a, b, c)
We obtained only a single specimen, possibly a juvenile, at Sta. 1.772 at a depth of 82 m.

64. *Fissurina diaphana* (Buchner, 1940) (pl. 5 fig. 5a, b)
Lagena diaphana Buchner, 1940, Nova Acta K. Leop.-Carol. Deutsch. Akad. Naturf., Halle, n. ser., 9 (62): 480, pl. 14 figs. 266-271.

65. *Fissurina* cf. *formosa* (Schwager, 1866) (pl. 5 fig. 6)
Lagena formosa Schwager, 1866, Foss. Foram. Kar. Nikobar, Novara Exp., Wien, Geol. Theil, 2 (2): 207, pl. 4 fig. 19; H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 480, pl. 60 figs. 10, 18-20; Matthes, 1939, Palaeontogr., (3-6): 72, pl. 5 fig. 64.

66. *Fissurina lucida* (Williamson, 1848) (pl. 5 fig. 9a, b)
Entosolenia marginata Montagu var. *lucida,* Williamson, 1848, Ann. Mag. Nat. Hist., (2) 1: 17, pl. 2 fig. 17.
Fissurina lucida, Feyling-Hanssen, 1964, Norg. Geol. Undersök., 225: 315, pl. 15 fig. 21; Margerel, 1968, Foram. Redonien: 86, pl. 15 fig. 3-4.

67. *Fissurina marginata* (Montagu, 1803) (pl. 5 fig. 7)
Vermiculum marginata Montagu, 1803, Test. Brit.: 524.
Fissurina marginata, Loeblich & Tappan, 1953, Smiths. Misc. Coll., 121 (7): 77, pl. 14 figs. 6-9.
Fissurina marginata (Walker & Boys), Feyling-Hanssen, 1964, Norg. Geol. Undersök., 225: 315, pl. 15 fig. 22.

68. *Fissurina* cf. *obscurocostata* Galloway & Wissler, 1927 (pl. 5 fig. 10a, b)

Fissurina obscurocostata Galloway & Wissler, 1927, Journ. Pal., 1: 52, pl. 9 fig. 1.

One specimen has been obtained from the Pleistocene of California. It was ornamented with twelve rounded costae extending from the base two-thirds of the way toward the aperture. Our single specimen possesses few costae, which moreover are not regularly distributed.

69. *Fissurina orbignyana* Seguenza, 1862 (pl. 5 fig. 8)

Fissurina orbignyana Seguenza, 1862, Foram. Monotal. Mioc., T. Capra, Messina: 66, pl. 2 figs. 25-26.

Lagena orbignyana, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 39.

70. *Fissurina quadrata* (Williamson, 1858) (pl. 5 fig. 11)

Entosolenia marginata Montagu var. *quadrata* Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 11, pl. 1 figs. 27-28.

Lagena quadrata, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 47, pl. 9 figs. 5-6; Van Voorthuysen, 1951, Med. Geol. Sticht., n. ser., 5: 24 (no. 18), pl. 1 fig. 17.

71. *Fissurina trigonomarginata* (Parker & Jones, 1865) (pl. 5 fig. 12a, b)

Lagena trigonomarginata Parker & Jones, 1865, Philos. Trans., 155: 348, pl. 18 fig. 1; Margerel, 1968, Foram. Redonien: 61, pl. 10 figs. 4-5.

Fissurina trigonomarginata, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 59, pl. 11 figs. 3-4.

72. *Florilus boueanum* (d'Orbigny, 1846) (pl. 5 fig. 13a, b)

Nonionina boueana d'Orbigny, 1846, Foram. Foss. Bass. Tert., Vienne, Gide et Comp, Paris: 108, pl. 5 figs. 11, 12.

Florilus boueanum, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 12, pl. 3 figs. 7-8; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 34, pl. 3 fig. 36.

73. *Florilus grateloupi* (d'Orbigny, 1826) (pl. 5 fig. 14a, b)

Nonionina grateloupi d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 294, no. 19.

Nonion grateloupi Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 21, pl. 6 figs. 1-7.

74. *Florilus pauperatum* (Balkwill & Wright, 1885) (pl. 5 fig. 15a, b)

Nonionina pauperata Balkwill & Wright, 1885, Trans. Roy. Irish Acad., 28 (Science) (18): 353, pl. 23 figs. 25-26.

Nonion pauperatum, Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser., (11): 30, pl. 23 fig. 6; Haake, 1962, Meyniana, 12: 42, pl. 3 figs. 6-7; Margerel, 1968, Foram. Redonien: 157, pl. 33 figs. 10, 11.

75. *Gavelinopsis praegeri* (Heron-Allen & Earland, 1913) (pl. 6 fig. 1a, b, c)

Discorbina praegeri Heron-Allen & Earland, 1913, Proc. R. Irish Acad., 31 (64): 122, pl. 10 figs. 8-10.

Gavelinopsis praegeri, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 264, pl. 3 figs. 24-25; Hofker, 1960, Paläont. Z., 34 (3-4): 252, fig. 114.

76. **Glabratella minima** spec.. nov. (pl. 6 figs. 2a, b, 3a, b)

Test very small, consisting of one whorl with five or six chambers, arranged in a depressed spiral, spiral side convex, umbilical side concave, periphery rounded, distinctly lobulate; chambers more or less inflated; increasing in size as added; sutures depressed, straight on the umbilical side, curved on the spiral side; wall in some specimens granular on the spiral side; smooth and with a few radial striae on the umbilical side; aperture a depressed round opening in the middle of the umbilical side. Diameter 0.1 mm; length 0.06 mm.

Holotype: F 4089; paratype F 4089A, type locality: Ria de Arosa (Spain); typical stratum: recent.

Discussion: This new species shows a certain resemblance with *G. browningi* Redmond, 1953, from the Upper Miocene of Columbia. Our recent form, however, is twice as small and contains fewer chambers. We could not study the aperture in detail; it may be that the aperture is more complicated than we mentioned in the diagnosis of the species.

77. *Globigerina bulloides* d'Orbigny, 1826 (pl. 6 fig. 5a, b)

Globigerina bulloides d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 227, modèles, nos. 17, 76; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 41, pl. 8 figs. 8-16; Hofker, 1960, Paläont. Z., 34 (3-4): 257, figs. 153-156; Margerel, 1968, Foram. Redonien: 145, pl. 28 figs. 18-20.

78. *Globigerina eggeri* Rhumbler, 1900 (pl. 6 fig. 6a, b)

Globigerina eggeri Rhumbler, 1900, Nord. Plankton, (14), Foram.: 19, fig. 20; Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 277, pl. 5 figs. 5-7.

Globigerina concinna Reuss, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 42, pl. 8 figs. 6-7.

79. *Globorotalia inflata* (d'Orbigny, 1839) (pl. 6 fig. 7a, b)

Globigerina inflata d'Orbigny, 1839, in: P. Barker-Webb & Sabin Berthelot, Hist. Nat. Iles Canaries, 2 (2), Foram.: 134, pl. 2 figs. 7-9; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 42, pl. 8 figs. 37-41.

Globorotalia inflata, Hofker, 1960, Paläont. Z., 34 (3-4): 259, figs. 163-166.

80. *Globigerinella aequilateralis* (H. B. Brady, 1879) (pl. 6 fig. 8a, b, c)

Globigerina aequilateralis H. B. Brady, 1879, Quart. J. Microsc. Sci., n. ser., 19: 285; H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 605, pl. 80 figs. 18-21.

Globigerinella aequilateralis, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 42, pl. 8 figs. 6-7; Phleger, Parker & Peirson, 1953, Repts Swedish Deep Sea Exp., 7 (1): 16, pl. 2 figs. 9-11.

81. *Globobulimina auriculata* (Bailey, 1851) (pl. 6 fig. 12)

Bulimina auriculata Bailey, 1851, Smiths. Inst. Knowledge, (3): 12, pl. 1 figs. 25-27.

Bulimina (Desinobulimina) auriculata, Cushman & Parker, 1947, U.S. Geol. Surv., Prof. Pap., 210 — D; 129, pl. 29 figs. 22-24.

82. *Globocassidulina subglobosa* (H. B. Brady, 1881) (pl. 6 fig. 4a, b)

Cassidulina subglobosa H. B. Brady, 1881, Quart. J. Microsc. Sci., n. ser., 21: 60; H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 430, pl. 54 fig. 17; Phleger, Parker & Peirson, 1953, Repts Swedish Deep Sea Exped., 8 (1): 45, pl. 10 figs. 4; Margerel, 1968, Foram. Redonien: 155, pl. 32 figs. 4-6.

83. *Globulina gibba* d'Orbigny, 1826 (pl. 6 fig. 10)

Polymorphina (Globulina) gibba d'Orbigny, 1826, Ann. Sci. nat., (1) 7: 266 no. 10, modèles no. 63.

Globulina gibba, Cushman & Ozawa, 1930, Proc. U.S. Nat. Mus., 77 (6): 60, pl. 16 figs. 1-4; Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnbk. Gen., Geol. serie, 19: 249, pl. 11 fig. 4; Hofker, 1960, Paläont. Z., 34 (3-4): 247, figs. 79, 81.

84. *Globulina gibba* d'Orbigny, 1826 var. *myristiformis* (Williamson, 1858) (pl. 6 fig. 11)

Polymorphina myristiformis Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 73, pl. 6 figs. 156-157.

Globulina gibba d'Orbigny var. *myristiformis*, Cushman & Ozawa, 1930, Proc. U.S. Nat. Mus., 77 (6): 66, pl. 16 fig. 8, pl. 20 fig. 6.

85. *Globulina inaequalis* Reuss, 1850 (pl. 6 fig. 9)

Globulina inaequalis Reuss, 1850, Denkschr. K. Akad. Wiss. Wien, 1: 377, pl. 48 fig. 9; Cushman & Ozawa, 1930, Proc. U.S. Nat. Mus., 77 (6): 73, pl. 18 figs. 2-4; Hofker, 1960, Paläont. Z., 34 (3-4): 247, fig. 80; Margerel, 1968, Foram. Redonien: 69, pl. 10 figs. 24-25.

86. *Glomospira glomerata* Höglund, 1947 (pl. 6 fig. 16a, b)

Glomospira glomerata Höglund, 1947, Zool. Bidr. Uppsala, 26: 130, pl. 3 figs. 8-10.

87. *Guttulina lactea* (Walker & Jacob, 1798) (pl. 6 fig. 13)

Serpula lactea Walker & Jacob, 1798 in: Adam's Essays, Kammacher's ed. 2: 634, pl. 14 fig. 4.
Guttulina lactea, Cushman & Ozawa, 1930, Proc. U.S. Nat. Mus., 77 (6): 43, pl. 10 figs. 1-4; Hofker, 1960, Paläont. Z., 34 (3-4): 247, fig. 77.

88. *Haplophragmoides canariensis* (d'Orbigny, 1839) (pl. 6 fig. 14a, b, c)
Nonionina canariensis d'Orbigny, 1839, in: P. Barker-Webb & Sabin Berthelot, Hist. Nat. Isles Canaries, 2 (2), Foram.: 128: pl. 2 figs. 33, 34.
Haplophragmoides canariensis, Van Voorthuysen, 1951, Proc. III Int. Congr. Sedim., Groningen-Wageningen: 271, fig. 3.

89. *Haplophragmoides emaciatum* (H. B. Brady, 1884) (pl. 6 fig. 15a, b)
Haplophragmium emaciatum H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 305, pl. 33 figs. 26-28.
Haplophragmoides emaciatum, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 16, pl. 6 fig. 10.

90. *Heterolepa pseudoungeriana* (Cushman, 1922) (pl. 7 fig. 1a, b, c)
Truncatulina pseudoungeriana Cushman, 1922, U.S. Geol. Surv., Prof. Pap., 129 — E: 97, pl. 20 fig. 9.
Cibicides pseudoungeriana, Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): 22, pl. 7 fig. 81.

91. *Heterolepa rugosa* (Phleger & Parker, 1951) (pl. 7 fig. 2a, b, c)
Cibicides rugosa Phleger & Parker, 1951, Mem. Geol. Soc. America, 46 (2): 31, pl. 17 figs. 5-6; Parker, 1954, Bull. Mus. Comp. Zool., 3 (10): 543, pl. 13 figs. 1, 4.

92. *Hopkinsina pacifica* Cushman, 1933 var. *atlantica* Cushman, 1944 (pl. 7 fig. 4)
Hopkinsina pacifica var. *atlantica* Cushman, 1944, Cushm. Lab. Foram. Res., Spec. Publ., 12: 30, pl. 4 fig. 1; Parker, 1952, Bull. Mus. Comp. Zool., 106 (10): 451, pl. 4 figs. 14-16.

93. *Hyalinea balthica* (Schroeter, 1783) (pl. 7 fig. 3a, b)
Nautilus balthicus Schroeter, 1783, Einl. Conch. Kenntn., 1: 20, pl. 1 fig. 2.
Anomalina balthica, Colom, 1950, Bol. Inst. Españ. Oceanogr., (28): 36, pl. 4; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 38, pl. 4 fig. 41.
Hyalinea balthica, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 275, pl. 4 fig. 39; Margerel, 1968, Foram. Redonien: 148.
Hofkerinella balthica, Hofker, 1960, Paläont. Z., 34 (3-4): 255, fig. 137.

94 *Lagena globosa* (Montagu, 1803) (pl. 7 fig. 5)
Vermiculum globosum Montagu, 1803, Test. Brit.: 523.
Lagena globosa, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 20, pl. 4 figs. 1-2.
Our forms possess very fine striae on the test, while *L. globosa* seems to be completely without ornamentation.

95. *Lagena laevis* (Montagu, 1803) (pl. 7 fig. 6)
Vermiculum laeve Montagu, 1803, Test. Brit.: 524.
Lagena laevis, Loeblich & Tappan, 1953, Smiths. Misc. Coll., 121 (7): 61, pl. 11 figs. 5-8; Margerel, 1968, Foram. Redonien: 59, pl. 9 fig. 11.

96. *Lagena meridionalis* Wiessner, 1931 (pl. 7 fig. 9)
Lagena gracilis var. *meridionalis* Wiessner, 1931, Deutsch. Südpolar Exp., 20 (= Zool., 12): 117, pl. 18 fig. 211.
Lagena meridionalis, Loeblich & Tappan, 1953, Smiths. Misc. Coll., 121 (7): 62, pl. 12 fig. 1.

97. *Lagena semilineata* J. Wright, 1885 (pl. 7 figs. 10-11)
Lagena semilineata J. Wright, 1885, Proc. Belfast Nat. Field Cl., n. ser. 1 app. 9: 320, pl. 26 fig. 7; Cushman & McCulloch, 1950, Allan Hannock Pac. Exp., 6 (6): 345, pl. 46 fig. 11.

98. *Lagena sulcata* (Walker & Jacob, 1798) (pl. 7 fig. 8)
Serpula (*Lagena*) *sulcata* Walker & Jacob, in: Adam's Essays, Kammacher's ed. 2: 642, pl. 14 fig. 36.
Lagena sulcata, Cushman, 1923, Bull. U.S. Nat. Mus., 104: 57, pl. 11 fig. 1; Margerel, 1968, Foram. Redonien: 61, pl. 9 fig. 15.

99. *Lagena* spec. 1. (pl. 7 fig. 7)
We found only one single specimen at Sta. 1.836 at a depth of 45 m.

100. *Lamarckina haliotidea* (Heron-Allen & Earland, 1911) (pl. 7 fig. 12a, b, c).
Pulvinulina haliotidea Heron-Allen & Earland, 1911, J. Roy. Microsc. Soc., 1911: 338, pl. 11 figs. 6-11.
Lamarckina haliotidea, Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 36, pl. 7 figs. 8-9.

101. *Lenticulina* (*Astacolus*) *crepidulus* (Fichtel & Moll, 1798) (pl. 7 fig. 13)
Nautilus crepidulus Fichtel & Moll, 1798, Test. Microsc.: 107, pl. 19 figs. 9, h, .i
Lenticulina crepidulus, Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 189, pl. 1 fig. 5; Hofker, 1960, Paläont. Z., 34 (3-4): 248, fig. 82.

102. *Lenticulina* (*Robulus*) *cultratus* (De Montfort, 1808) (pl. 8 fig. 1a, b)

Robulus cultratus De Montfort, 1808, Conch. Syst., 1: 215, fig. (214); Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 188.

103. *Lenticulina* (*Marginulopsis*) *linearis* (Montagu, 1808) (pl. 7 figs. 14, 15)

Nautilus linearis Montagu, 1808, Suppl. Test. Brit.: 87, pl. 30 fig. 9.

Lenticulina linearis, Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 281, pl. 10 figs. 4-9.

We found 6 specimens, four of which are broken, two are complete. There is one juvenile with striation and a very slender one without striae; both are figured.

104. *Lenticulina* (*Lenticulina*) *peregrina* (Schwager, 1866) (pl. 8 fig. 2)

Cristellaria peregrina Schwager, 1866, Foss. Foram. Kar. Nikobar, Novara-Exp., Wien, Geol. Theil, 2 (2): 245, pl. 7 fig. 89.

Lenticulina peregrina, Cushman & McCullogh, 1950, Allan Hancock Pac. Exp., 6 (6); 302, pl. 39 fig. 5; Hofker, 1960, Paläont. Z., 34 (3-4): fig. 71.

105. *Lenticulina* spp. juv. (pl. 8 figs. 3-4)

Juvenile specimens, of which in most cases we were unable to give a specific identification.

106. *Lingulina bicarinata* Sidebottom, 1907 (pl. 8 fig. 6a, b)

Lingulina carinata d'Orbigny var. *bicarinata* Sidebottom, 1907, Mem. Proc. Lit. phil. Soc. Manchester, 51 (9): 3, pl. 1 fig. 20.

Lingulina bicarinata, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 97, pl. 17 figs. 5-7, pl. 18 figs. 6-7.

107. *Lingulina falcata* Heron-Allen & Earland, 1932 (pl. 8 fig. 5a, b)

Lingulina falcata Heron-Allen & Earland, 1932, Discovery Repts, 4: 386, pl. 12 figs. 6-8.

108. *Marginulina glabra* d'Orbigny, 1826 (pl. 8 fig. 10)

Marginulina glabra d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 259, modèles no. 55; H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 527, pl. 65 figs. 5-6; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 22, pl. 7 fig. 16.

109. *Melonis barleeanum* (Williamson, 1858) (pl. 8 fig. 7a, b)

Nonionina barleeana Willamson, 1858, Rec. Foram. Gr. Britain, Roy. Soc. London: 32, pl. 3 figs. 68-69; Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 23, pl. 6 fig. 11; Feyling-Hanssen, 1964, Norg. Geol. Undersök., 225: 329, pl. 17 figs. 7-12.

Anomalinoides barleeanum, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 38, pl. 4 figs. 38-39.

110. *Melonis pompilioides* (Fichtel & Moll, 1798) (pl. 8 fig. 9a, b)

Nautilus pompilioides Fichtel & Moll, 1798, Test. Microsc., Wien: 31, pl. 2 figs. a-c.

Nonion pompilioides, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 19, pl. 5 figs. 9-12; Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 190, pl. 1 fig. 11.

Gavelinonion pompilioides, Hofker, 1960, Paläont. Z., 34 (3-4): 261, figs. 177-178.

111. *Miliammina fusca* (H. B. Brady, 1870) (pl. 8 fig. 8)

Quinqueloculina fusca H. B. Brady, 1870, Ann. Mag. nat. Hist., (4) 6: 286, pl. 11 figs. 2-3.

Miliammina fusca, Todd & Brönnimann, 1957, Cushm. Found. Foram. Res., Spec. Publ., 3: 26, pl. 3 fig. 1; Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnbk. Gen., Geol. ser., 19: 245.

112. *Miliolinella circularis* (Bornemann, 1855) (pl. 8 fig. 11a, b)

Triloculina circularis Bornemann, 1855, Z. Deutsch. Geol. Ges., 7: 349, pl. 19 fig. 4; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 11-12.

Miliolinella circularis, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 255, pl. 1 figs. 16, 17.

113. *Miliolinella insignis* (H. B. Brady, 1884) (pl. 8 fig. 12a, b, c)

Miliolina insignis H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 165, pl. 4 figs. 8, 10.

Triloculina insignis, Cushman, 1929, Bull. U.S. Nat. Mus., 104 (6): 64, pl. 17 fig. 2.

114. *Miniacina miniacea* (Pallas, 1766) (pl. 8 figs. 13, 14)

Millipora miniacea Pallas, 1766, Elenchus Zoophytorum, P. van Cleef, the Hague: 251.

Miniacina miniacea, Galloway, 1933, Man. of Foram.: 305, pl. 28 fig. 8; Colom, 1950, Bol. Inst. Españ. Oceanogr., (28): 41; Loeblich & Tappan, 1964, Treat. Invert. Pal., C 2: 705, pl. 577 figs. 4-7.

Many specimens were attached to mollusc shells at Sta. 1.759 at a depth of 65 m. This was not a foraminiferal sample.

115. *Neoconorbina millettii* (J. Wright, 1911) (pl. 9 fig. 1a, b)

Discorbina millettii J. Wright, 1911, Rep. Belfast Nat. Field Cl., (2) 3 (6), app. 2: 13, pl. 2 figs. 14-17; Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 24, pl. 5 figs. 3-4.

Rosalina millettii, Van Voorthuysen, 1957, Med. Geol. Sticht., n. ser. (11): 33, pl. 24 fig. 17.

Neoconorbina millettii, Margerel, 1968, Foram. Redonien: 108, pl. 19 figs. 10-12.

116. *Neoconorbina obtusa* (d'Orbigny, 1846) (pl. 9 fig. 2a, b)
Rosalina obtusa d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide & Comp., Paris: 179, pl. 11 figs. 4-6.
Discorbis obtusa, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 35, pl. 5 figs. 27, 28.
117. *Neoconorbina terquemi* (Rzehak, 1888) (pl. 9 fig. 3a, b)
Discorbina terquemi Rzehak, 1888, Verh. Geol. Reichsanst., 1888: 228.
Neoconorbina terquemi, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 267, pl. 3 figs. 26, 27.
118. *Neoconorbina williamsoni* (Chapman & Parr, 1932) (pl. 9 fig. 4a, b)
Rotalina nitida Williamson, 1858, Rec. Foram. Gr. Britain: 54, pl. 4 figs. 106-108.
Discorbis williamsoni Chapman & Parr, 1932, Proc. R. Soc. Victoria, n. ser., 44 (2): 266, pl. 21 fig. 25.
Neoconorbina williamsoni, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 267, pl. 3 figs. 28-29.
Rosalina nitida (Williamson), Margerel, 1968, Foram. Redonien: 115, pl. 19 figs. 16-18, pl. 20 figs. 14-16.
119. *Neoconorbina* spec. 1 (pl. 9 fig. 5a, b)
120. *Neoconorbina* spec. 2 (pl. 9 fig. 7a, b)
121. *Neoconorbina* spec. 3 (pl. 9 fig. 6a, b)
122. *Nonion depressulum* (Walker & Jacob, 1798) (pl. 9 fig. 8a, b)
Nautilus depressulus Walker & Jacob, 1798, in: Adam's Essays, Kammacher's ed. 2: 641, pl. 14 fig. 33.
Nonion depressulum, Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser., (11): 28, pl. 23 fig. 2; Haake, 1962, Meyniana, 12: 40, pl. 3 figs. 1, 2.
123. *Nonion depressulum* (Walker & Jacob, 1798) *asterotuberculatum* Van Voorthuysen, 1958 (pl. 9 fig. 9a, b)
Nonion depressulus forma *asterotuberculatus* Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser., (11): 28, pl. 23 fig. 3; Haake, 1962, Meyniana, 12: 41, pl. 3 fig. 5.
124. *Nonion umbilicatulum* (Walker & Jacob, 1798) (pl. 10 fig. 1a, b)
Nautilus umbilicatulus Walker & Jacob, 1798, in: Adam's Essays, Kammacher's ed. 2: 641, pl. 14 fig. 34.
Nonion umbilicatulus, Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser., (11): 29, pl. 23 fig. 4; Haake, 1962, Meyniana, 12: 41, pl. 3 figs. 3-4.
125. *Nonion* (?) spec. 3 (pl. 10 fig. 3a, b)
126. *Nonionella turgida* (Williamson, 1858) (pl. 10 fig. 2a, b)

Rotalina turgida Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 50, pl. 4 figs. 95-97.
Nonionella turgida, Cushman, 1939, U.S. Geol. Surv., Prof. Pap., 191: 32, pl. 9 figs. 2-3; Hofker, 1960, Paläont. Z., 34 (3-4): 262, figs. 181-182; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 328, pl. 17 figs. 2-6.

127. *Nonionella* spec. 1 (pl. 10 fig. 4a, b, c).

128. *Oolina hexagona* (Williamson, 1848) (pl. 10 fig. 8)
Entosolenia squamosa Montagu var. *hexagona* Williamson, 1848, Ann. Mag. Nat. Hist., (2) 1: 20, pl. 2 fig. 23.
Oolina hexagona, Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 24, pl. 4 fig. 6; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 311, pl. 15 fig. 4; Margerel, 1968, Foram. Redonien: 81, pl. 14 fig. 2.

129. *Oolina melo* d'Orbigny, 1839 (pl. 10 fig. 5)
Oolina melo d'Orbigny, 1839, Voy. Amér. Mérid., 5 (5), Foram.: 20, pl. 5 fig. 9; Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnbk. Gen., Geol. ser., 19: 247, pl. 10 fig. 16; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 311, pl. 15 fig. 4.

130. *Oolina squamosa* (Montagu, 1803) (pl. 10 fig. 6)
Vermiculum squamosum Montagu, 1803, Test. Brit.: 526, pl. 14 fig. 2.
Oolina squamosa, Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnbk. Gen., Geol. Ser., 19: 247, pl. 10 fig. 17.

131. *Oolina williamsoni* (Alcock, 1865) (pl. 10 fig. 7)
Entosolenia williamsoni Alcock, 1865, Proc. Lit. Philos. Soc., 4: 193.
Oolina williamsoni, Van Voorthuysen, 1958, Med. Geol. Sticht., n. ser., (11): 37, pl. 26 fig. 41.
Lagena williamsoni, Hofker, 1960, Paläont. Z., 34 (3-4): 245, fig. 68.

132. *Orbulina suturalis* Brönnimann, 1951 (pl. 10 fig. 11)
Orbulina suturalis Brönnimann, 1951, Cushm. Found. Foram. Res., Contr., 2 (4): 135, text-fig. 2, figs. 1-15; Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 183, pl. 1 figs. 21-22.
According to Brönnimann (l.c.) this species became extinct during the Miocene, but Todd found it to be present in Pleistocene cores from the Mediterranean. Whether our specimens are recent or from Pleistocene or Miocene origin remains an open question.

133. *Orbulina universa* d'Orbigny, 1839 (pl. 10 fig. 10)
Orbulina universa d'Orbigny, 1839, in: de la Sagra, Hist. Phys. Nat. Cuba, 8: 3, pl. 1 fig. 1; Phleger, Parker & Peirson, 1953, Repts

Swedish Deep Sea Exp., 7 (1): 17, pl. 2 fig. 8; Hofker, 1960, Paläont. Z., 34 (3-4): 261, figs. 173-176; Margerel, 1968, Foram. Redonien: 146, pl. 28 fig. 21.

134. *Parafissurina inaequilateralis* (J. Wright, 1886) (pl. 10 fig. 9)
Lagena marginata (Montagu) var. *inaequilateralis* J. Wright, 1886, Proc. Belfast Nat. Field Club, n. ser., 1, app. 9: 321, pl. 26 fig. 10.
Parafissurina inaequilateralis, Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnb. Gen., Geol. Serie, 19: 248, pl. 11 fig. 1.

135. *Patellina corrugata* Williamson, 1858 (pl. 10 fig. 12a, b)
Patellina corrugata Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 46, pl. 3 figs. 86-89; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 335, pl. 18 fig. 9; Margerel, 1968, Foram. Redonien; 128, pl. 25 figs. 4-6.

136. *Patellinoides conica* Heron-Allen & Earland, 1932 (pl. 10 fig. 13a, b, c)
Patellinoides conica Heron-Allen & Earland, 1932, Discovery Repts, 4: 408, pl. 13 figs. 26-29; Loeblich & Tappan, 1964, Treat. Invert. Pal., C2: 604, pl. 477 figs. 2-3; Margerel, 1968, Foram. Redonien: 128, pl. 24 figs. 23-25.

137. *Planispirillina wrightii* Heron-Allen & Earland, 1930 (pl. 10 fig. 14a, b, c)
Planispirillina wrightii Heron-Allen & Earland, 1930, J. Roy Microsc. Soc., 50: 181, pl. 4 figs. 54-58.
Spirillina wrightii, Parker, 1958, Repts Swedish Deep Eea Exp., 8 (4): 264, pl. 3 figs. 1-3.

138. *Planorbulina mediterranensis* d'Orbigny, 1826 (pl. 11 fig. 1a, b)
Planorbulina mediterranensis d'Orbigny, 1826, Ann. Sci. Nat., (1) vol. 7: 280, pl. 14 figs. 4-6; Colom, 1952, Bol. Inst. Españ. Oceanogr., (50): 40, pl. 5 fig. 43; Parker, 1958, Repts Swedish Deep Sea Exped., 8 (4): 276, pl. 4 fig. 44; Hofker, 1960, Paläont. Z., 34 (3-4): 254, figs. 128-129; Margerel, 1968, Foram. Redonien: 150, figs. 5-9.

139. *Psammosphaera bowmanni* Heron-Allen & Earland, 1912, (pl. 11 fig. 2)
Psammosphaera bowmanni Heron-Allen & Earland, 1912, J. Roy. Microsc. Soc., 1912: 385, pl. 5 figs. 5, 6; Höglund, 1947, Zool. Bidrag Uppsala, 26: 49, pl. 4 figs. 1-8; Hofker, 1960, Paläont. Z., 34 (3-4): 234, fig. 5.

140. *Pyrgo elongata* (d'Orbigny, 1826) (pl. 11 fig. 3)
Biloculina elongata d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 298.
Pyrgo elongata, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 21, pl. 5 figs. 19-21; Hofker, 1960, Paläont. Z., 34 (3-4): 244, fig. 58; Margerel, 1968, Foram. Redonien: 49, pl. 7 figs. 4-6.

(?) *Pyrgo williamsoni* Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 264, pl. 7 figs. 5-6, pl. 8 figs. 3-5.

141. *Quinqueloculina agglutinata* Cushman, 1917 (pl. 11 fig. 8).

Quinqueloculina agglutina Cushman, 1917, Bull. U.S. Nat. Mus., 71 (6): 43, pl. 9 fig. 2; Loeblich & Tappan, 1953, Smiths. Misc. Coll., 121 (7): 39, pl. 5 figs. 1-4; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 247, pl. 4 fig. 11.

142. *Quinqueloculina bicornis* (Walker & Jacob, 1798) (pl. 11 fig. 7)

Serpula bicornis Walker & Jacob, 1798, in: Adam's Essays, Kammacher's ed. 2: 633, pl. 14 fig. 2.

Quinqueloculina bicornis, Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 32, pl. 5 figs. 5-7, pl. 6 figs. 1-2; Margerel, 1968, Foram. Redonien: 38, pl. 3 figs. 13-15.

? *Quinqueloculina poeyana* d'Orbigny, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 5, 6, 44.

143. *Quinqueloculina* cf. *candeiana* d'Orbigny, 1839 (pl. 11 fig. 10)

Quinqueloculina candeiana d'Orbigny, 1839, in: de la Sagra, Hist. Phys. Nat. Cuba: 170, pl. 12 figs. 24-26; Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 27, pl. 3 fig. 1.

The specimens from the Spanish coast are slightly flatter than is usually the case in this species; for the rest there is much resemblance.

144. *Quinqueloculina duthiersi* (Schlumberger, 1886) (pl. 11 fig. 11)

Adelosina duthiersi Schlumberger, 1886, Bull. Soc. Zool. Fr., 11: 553, fig. 9, pl. 16 figs. 16-18.

Quinqueloculina duthiersi, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 1-4; Hofker, 1960, Paläont. Z., 34 (3-4): 243, fig. 50.

145. *Quinqueloculina lamarckiana* d'Orbigny, 1839 (pl. 11 fig. 13)

Quinqueloculina lamarckiana d'Orbigny, 1839, in: de la Sagra, Hist. Phys. Nat. Cuba: 189, pl. 11 figs. 14-15; Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 26, pl. 2 fig. 6; Colom, 1950, Bol. Inst. Españ. Oceanogr., 28: 39.

Quinqueloculina aff. *lamarckiana,* Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 256, pl. 1 figs. 20, 21.

Our specimens have a blunter angled periphery than d'Orbigny's species usually possesses.

146. *Quinqueloculina* cf. *lyra* d'Orbigny, 1826 (pl. 11 fig. 12)

Quinqueloculina lyra d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 303, Modèles no. 8.

We are not certain about the correctness of our identification, our specimens also having some affinity to *Q. elegans* d'Orbigny, 1826.

147. *Quinqueloculina peregrina* d'Orbigny, 1846 (pl. 11 fig. 14)
Quinqueloculina peregrina d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide et Comp., Paris: 292, pl. 19 figs. 1-3.

148. *Quinqueloculina sclerotica* Karrer, 1868 (pl. 11 fig. 4)
Quinqueloculina sclerotica Karrer, 1868, S.B. Akad. Wiss. Wien, 58 (1): 152, pl. 3 fig. 5; Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 24, pl. 1 fig. 5.

149. *Quinqueloculina seminulum* (Linnaeus, 1758) (pl. 11 fig. 5)
Serpula seminulum Linnaeus, 1758, Syst. Nat. (ed. 10), 1: 786.
Quinqueloculina seminulum, Cushman, 1924, Bull. U.S. Nat Mus., 104 (6): 24, pl. 2 figs. 1-2; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 22-26; Hofker, 1960, Paläont. Z., 34 (3-4): 241, fig. 41.

150. *Quinqueloculina venusta* Karrer, 1868 (pl. 11 fig. 9)
Quinqueloculina venusta Karrer, 1868, S.B. Akad. Wiss. Wien, 58 (1): 147, pl. 2 fig. 6; Phleger, Parker & Peirson, 1953, Repts Swedish Deep Sea Exp., 7 (1): 27, pl. 5 figs. 11-12; Parker, 1954, Bull. Mus. Comp. Zool., 3 (10): 498, pl. 4 figs. 13-14.

151. *Quinqueloculina vulgaris* d'Orbigny, 1826 (pl. 11 fig. 6)
Quinqueloculina vulgaris d'Orbigny, 1826, Ann. Sci. Nat., (1) vol. 7: 302; Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 25, pl. 2 fig. 3; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 13-15; Hofker, 1960, Paläont. Z., 34 (3-4): 241, fig. 43.

152. *Remaneica helgolandica* Rhumbler, 1938 (pl. 11 fig. 15a, b)
Remaneica helgolandica Rhumbler, 1938, Kieler Meeresforsch., 2: 195, figs. 38-45.
Trochammina (Remaneica) helgolandica, Höglund, 1947, Zool. Bidr. Uppsala, 26: 212, figs. 191-192, pl. 16 fig. 3.

153. *Remaneica* spec. 1. (pl. 11 fig. 16a, b)
One specimen was found at Sta. 1.56 and one at Sta. 1.1195, at 5 and 44 m depth, respectively.

154. *Reophax fusiformis* (Williamson, 1858) (pl. 12 fig. 1)
Proteonina fusiformis Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 1, pl. 1 fig. 1; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 219, pl. 1 fig. 12.

155. *Reophax nana* Rhumbler, 1911 (pl. 12 fig. 2)
Reophax nana Rhumbler, 1911, Plankton Exped., Foram., 1 (3): 182, pl. 8 figs. 6-12 (plate explanation published in 1949, Micro-

palaeontologist, 3 (2); Todd & Brönnemann, 1957, Cushm. Found. Foram. Res., Spec. Publ., 3: 22, pl. 1 fig. 17.

156. *Rosalina globularis* d'Orbigny, 1826 (pl. 12 fig. 5a, b)

Rosalina globularis d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 271, pl. 13 figs. 1-4; Margerel, 1968, Foram. Redonien: 112, pl. 20 figs. 8-10.

Discorbis globularis, Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 22, pl. 4 fig. 9.

Discopulvinulina globularis, Hofker, 1960, Paläont. Z., 34 (3-4): 253, fig. 123.

157. *Sigmoilopsis distorta* (Phleger & Parker, 1951) (pl. 12 fig. 6)

Sigmoilina distorta Phleger & Parker, 1951, Mem. Geol. Soc. Amer., 46 (2): 8, pl. 4 figs. 3-5; Parker, 1958, Repts Swedish Deep Sea Exp., 7 (4): 256, pl. 1 fig. 25.

158. *Sigmoilopsis flintii* (Cushman, 1946) (pl. 12 fig. 7)

Sigmoilina flintii Cushman, 1946, Contr. Cushm. Lab. Foram. Res., 22 (2): 44, pl. 6 figs. 35-39; Colom, 1950, Bol. Inst. Españ. Oceanogr., (28): 41, pl. 8 figs. 10-12.

159. *Siliconodosaria delicatula* Colom, 1963 (pl. 12 figs. 3-4)

Siliconodosaria delicatula Colom, 1963, Inv. Pesq., (23): 79, fig. 4, pl. 1 figs. 2-3.

160. *Siphotextularia foliacea* (Heron-Allen & Earland, 1915) var. *occidentalis* (Cushman, 1922) (pl. 12 figs. 11a, b, 12)

Textularia foliacea var. *occidentalis* Cushman, 1922, Bull. U.S. Nat. Mus., 104 (3): 16, pl. 2 fig. 13.

161. *Spirillina lateseptata* Terquem, 1875 (pl. 12 fig. 8)

Spirillina lateseptata Terquem, 1875, Ess. Amm. Dunkerque: 21, pl. 1 fig. 6; Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 6, pl. 1 figs. 12, 13, pl. 2 fig. 1.

162. *Spirillina obconica* H. B. Brady, 1879 (pl. 12 fig. 10a, b)

Spirillina obconica H. B. Brady, 1879, Quart. J. Microsc. Sci., n. ser., 19: 279, pl. 8 fig. 27.

163. *Spirillina vivipara* Ehrenberg, 1843 (pl. 12 fig. 9)

Spirillina vivipara Ehrenberg, 1843, Abh. K. Akad. Wiss. Berlin, 1843 (1): 323, 422, pl. 3 fig. 41; Cushman, 1931, Bull. U.S. Nat. Mus., 104 (8): 3, pl. 1 figs. 1-4; Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 264, pl. 3 fig. 4; Hofker, 1960, Paläont. Z., 34 (3-4): 252, fig. 109; Margerel, 1968, Foram. Redonien: 126, pl. 25 figs. 4-6.

164. *Spiroloculina depressa* d'Orbigny, 1826 (pl. 12 fig. 16a, b, c)

Spiroloculina depressa d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 298;

Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 21, pl. 5 figs. 16, 17; Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): pl. 1 fig. 11; Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 187; Hofker, 1960, Paläont. Z., 34 (3-4): 239, figs. 29, 40; Margerel, 1968, Foram. Redonien, 37, pl. 4 figs. 3-4.

165. *Spiroloculina excavata* d'Orbigny, 1846 (pl. 12 fig. 14a, b)
Spiroloculina excavata d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide et Comp., Paris: 271, pl. 16 figs. 19-21; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51) 21, pl. 5 fig. 18; Hofker, 1960, Paläont. Z., 34 (3-4): 239, fig. 30.

166. *Spiroloculina grata* Terquem, 1878 (pl. 12 fig. 15a, b, c)
Spiroloculina grata Terquem, 1878, Mém. Soc. Geol. France, (3) 1: 55, pl. 5 figs. 14-15; Todd, 1958, Repts Swedish Deep Sea Exp., 8 (3): 187.
(?) *Spiroloculina* cf. *grata,* Parker, 1954, Bull. Mus. Comp. Zool., 111 (10): 498, pl. 4 fig. 15.

167. *Spirophthalmidium acutimargo* (H. B. Brady, 1884) (pl. 12 fig. 13)
Spiroloculina acutimargo H. B. Brady, 1884, Rep. Voy. Challenger, Zool., 9: 154, pl. 10 fig. 13 (not figs. 12, 14, 15); Cushman, 1924, Bull. U.S. Nat. Mus., 104 (6): 90, pl. 22 fig. 1.

168. *Stainforthia fusiformis* (Williamson, 1958) (pl. 13 fig. 2)
Bulimina pupoides d'Orbigny var. *fusiformis* Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 63, pl. 5 figs. 129-130.
Virgulina fusiformis, Parker, 1952, Bull. Mus. Comp. Zool., 106 (8-9): 417, pl. 6 figs. 3-6.

169. *Stainforthia schreibersiana* (Czjzek, 1848) (pl. 13 fig. 1)
Virgulina schreibersiana Czjzek, 1848, Haidinger's Nat. Abh., 2: 11, pl 13 figs. 18-21; Cushman, 1937, Cushm. Lab. Foram. Res., Spec. Publ., (9): 13, pl. 2 figs. 11-20; Feyling-Hanssen, 1964, Norg. Geol. Undersök., (225): 309, pl. 14 figs. 19-21; Margerel, 1968, Foram. Redonien: 152, pl. 31 fig. 4.

170. *Svratkina tuberculata* (Balkwill & J. Wright, 1885) (pl. 13 fig. 3a, b)
Discorbina tuberculata Balkwill & J. Wright, 1885, Trans. Roy. Irish Acad., 28: 350, pl. 23 figs. 28-30.
Eponides (?) *tuberculata,* Cushman, 1949, Verh. Kon. Belg. Inst. Natuurw., (111): 47, pl. 9 fig. 2.
Eponides tuberculata, Van Voorthuysen, 1960, Verh. Kon. Ned. Geol. Mijnbk. Gen., Geol. Serie, 19: 252, pl. 11 fig. 20.
Alabamina (*Svratkina*) *tuberculata,* Margerel, 1968, Foram. Redonien: 157, pl. 33 figs. 7-9.

171. *Textularia bocki* Höglund, 1947 (pl. 13 fig. 7a, b)
Textularia bocki Höglund, 1947, Zool. Bidr. Uppsala, 26: 171, figs. 152, 153, pl. 12 figs. 5-7.
(?) *Textularia articulata* d'Orbigny, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 18.

172. *Textularia earlandi* Parker, 1952 (pl. 13 fig. 9)
Textularia tenuissima Earland, 1933, Discovery Repts, 7: 95, pl. 3 figs. 21-30 (not *T. tenuissima* Häuster, 1881).
Textularia tenuissima, Höglund, 1947, Zool. Bidr. Uppsala, 26: 176, figs. 154, 155, 161, pl. 13 fig. 1.
Textularia cf. *tenuissima* Parker, 1952, Bull. Mus. Comp. Zool., 106 (10): 458, pl. 2 figs. 4-5 (see footnote on page 458).

173. *Textularia pseudotrochus* Cushman, 1922 (pl. 13 fig. 15a, b)
Textularia pseudotrochus Cushman, 1922, Bull. U.S. Nat. Mus., 104 (3): 21, pl. 5 figs. 1-3; Parker, 1948, Bull. Mus. Comp. Zool., 100 (2): 240, pl. 2 fig. 2; Colom, 1950, Bol. Inst. Españ. Oceanogr., (28): 15, pl. 2; Hofker, 1960, Paläont. Z., 34 (3-4): 239, figs. 21-23.

174. *Textularia sagittula* Defrance, 1824 (pl. 13 fig. 6a, b)
Textularia sagittula Defrance, 1824, Diction. Sci. Nat., 23: 177; Atlas Conch., pl. 13 fig. 5; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 18, pl. 5 figs. 41-42.

175. *Textularia truncata* Höglund, 1947 (pl. 13 fig. 8a, b)
Textularia truncata Höglund, 1947, Zool. Bidr. Uppsala, 26: 175, figs. 147-149, pl. 12 figs. 8-9; Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw. (142): 6, pl. 1 fig. 3.

176. *Textularia* spec. 1. (pl. 13 fig. 4)

177. *Trifarina angulosa* (Williamson, 1858) (pl. 13 fig. 14)
Uvigerina angulosa Williamson, 1858, Rec. Foram. Gr. Britain, Ray Soc., London: 67, pl. 5 fig. 140.
Angulogerina angulosa, Parker, 1958, Repts Swedish Deep Sea Exp., 8 (4): 259, pl. 2 figs. 1-2; Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): 16, pl. 4 fig. 54; Margerel, 1968, Foram. Redonien: 98, fig. 30.

178. *Triloculina inflata* d'Orbigny, 1826 (pl. 13 fig. 13)
Triloculina inflata d'Orbigny, 1826, Ann. Sci. Nat., (1) 7: 300; Van Voorthuysen, 1958, Verh. Kon. Belg. Inst. Natuurw., (142): 8, pl. 1 fig. 13.

179. *Triloculina oblonga* (Montagu, 1803) (pl. 13 fig. 10)
Vermiculum oblongum Montagu, 1803, Test. Brit.: 522, pl. 14 fig. 9.
Triloculina oblongum, Cushman, 1929, Bull. U.S. nat. Mus., 104 (6):

57, pl. 13 figs. 4-5; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 20, pl. 5 figs. 8-10.

180. *Triloculina* cf. *tubiformis* Jabe & Asano, 1937 (pl. 13 fig. 12)
Triloculina tubiformis Jabe & Asano, 1937, Sci. Repts Tokohu Imp. Univ., (2) (Geol.), 19 (1): 116, pl. 17 fig. 9.

181. *Triloculina* spec. 2. (pl. 13 fig. 11)
We found one specimen at Sta. 1.66 at a depth of 12 m.

182. *Trochammina globigeriniformis* Parker & Jones, 1865 var. *pygmaea* Höglund, 1947 (pl. 14 fig. 2a, b, c)
Trochammina globigeriniformis, Parker & Jones var. *pygmaea* Höglund, 1947, Zool. Bidr. Uppsala, 26: 200, pl. 17 fig. 3, fig. 182.

183. *Trochammina inflata* (Montagu, 1808) (pl. 14 fig. 7a, b, c)
Nautilus inflatus Montagu, 1808, Test. Brit., Suppl.: 81, pl. 18 fig. 3.
Trochammina inflata, Phleger & Parker, 1952, Bull. Mus. Comp. Zool., 106 (8-9): 407, pl. 4 figs. 6, 10.

184. *Trochammina intermedia* Rhumbler, 1938 (pl. 14 fig. 5a, b)
Trochammina squamata Jones & Parker forma *intermedia* Rhumbler, 1938, Kieler Meeresforsch., 2 (2): 186, fig. 27.
Trochammina intermedia, Höglund, 1947, Zool. Bidr. Uppsala, 26: 206, fig. 188, pl. 16 fig. 1.

185. *Trochammina* cf. *ochracea* (Williamson, 1858) (pl. 14 fig. 4a, b)
Rotalina ochracea Williamson, 1858, Rec. Foram. Gr. Britain: 55, pl. 4 fig. 112, pl. 5 fig. 113.
Trochammina ochracea, Höglund, 1947, Zool. Bidr. Uppsala, 26: 211, fig. 190, pl. 16 fig. 2.

186. *Trochammina rotaliformis* J. Wright, 1911 (pl. 14 fig. 3a, b, c)
Trochammina rotaliformis J. Wright, 1911, J. Roy. Microsc. Soc., 1911: 309.
Trochammina cf. *rotaliformis,* Höglund, 1947, Zool. Bidr. Uppsala: 26, figs. 180, 181, 198, pl. 17 figs. 1, 2.

187 *Trochammina stellata* Höglund, 1947 (pl. 14 fig. 6a, b, c)
Trochammina stellata Höglund, 1947, Zool. Bidr. Uppsala, 26: 210, fig. 187, pl. 15 figs. 3, 4.

188. *Trochammina* spec. 1. (pl. 14 fig. 1a, b)

189. *Uvigerina angustiformis* Vella, 1957 (pl. 13 fig. 16)
Uvigerina peregrina Cushman var. *bradyana* Cushman, 1923, Bull. U.S. Nat. Mus., 104 (4): 168, pl. 42 fig. 12.
Uvigerina peregrina bradyana, Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 27, pl. 4 figs. 10-12.

Uvigerina angustiformis Vella, 1957, New Zealand Geol. Surv., Pal. Bull., (28): 34.

190. *Uvigerina compressa* Cushman, 1925 (pl. 13 fig. 15)

Uvigerina compressa Cushman, 1925, Contr. Cushm. Lab. Foram. Res., 1: 10, pl. 4 fig. 2; Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 27, pl. 2 fig. 25.

(?) *Rectuvigerina* spec., Phleger, Parker & Peirson, 1953, Repts Swedish Deep Sea Exp., 7 (1): 38, pl. 8 fig. 8.

191. *Valvulineria complanata* (d'Orbigny, 1846) (pl. 14 fig. 8a, b)

Rosalina complanata d'Orbigny, 1846, Foram. Foss. Bass. Tert. Vienne, Gide et Comp., Paris: 175, pl. 10 figs. 13-15.

(?) *Valvulineria bradyana* (Fornasini), Colom, 1952, Bol. Inst. Españ. Oceanogr., (51): 35, pl. 3 figs. 19-23.

Valvulineria complanata, Parker, 1958, Repts Swedish Deep Sea Exped., 8 (4): 268, pl. 3 fig. 42-44.

192. *Verneuillinoides media* (Höglund, 1947) (pl. 13 fig. 17)

Verneuillina media Höglund, 1947, Zool. Bidr. Uppsala, 26: 184, pl. 13 figs. 7-10, pl. 30 fig. 21.

193. *Virgulinella pertusa* (Reuss, 1861) (pl. 13 fig. 18)

Virgulina pertusa Reuss, 1861, S.B. Akad. Wiss. Wien, 42: 362, pl. 2 fig. 16.

Virgulina (*Virgulinella*) *pertusa,* Todd & Brönnimann, 1957, Cushm. Found. Foram. Res., Spec. Publ., 3: 33, pl. 8 fig. 7.

This is the second record of recent specimens of this *Virgulinella* species, the first record being from the Gulf of Paria, Trinidad. We found four transparent and very fragile specimens, one of which was living at a depth of 11.5 m (Sta. 1.59).

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Plate 1

1. *Ammodiscus gullmarensis* Höglund. 2. *Acervulina globosa* Schultze. 3. *Ammodiscus catinus* Höglund. 4. *Ammodiscus planorbis* Höglund. 5a, b. *Acervulina inhaerens* Schultze. 6. *Ammobaculites foliaceus* (H. B. Brady). 7a-c. *Ammonia beccarii* (Linnaeus). 8a-c. *Ammonia tepida* (Cushman). 9a-c. *Ammonia inflata* (Sequenza). 1, 3, 4, × 100; 2, 5-9, × 50.

Plate 2

1. *Amphicorina perversa* (Schwager). 2a, b. *Anomalinoides aknerianus* (d'Orbigny). 3a, b. *Asterigerinata mamilla* (Williamson). 4. *Astrononion stelligerum* (d'Orbigny). 5a, b. *Asterellina pulchella* (Parker). 6. *Bolivina pseudoplicata* Heron-Allen & Earland. 7a, b. *Biloculinella depressa* (d'Orbigny). 8. *Brizalina colomi* spec. nov., holotype. 9. do., paratype. 10. *B. attica* (Parker). 11. *B. seminuda* (Cushman). 12. *B. seminuda* (Cushman). 13. *Brizalina* spec. 3. 14. *Brizalina* spec. 2. 15. *B. spathulata* (Williamson). 16. *B. striatula* (Cushman). 17. *B. variabilis* (Williamson). 18. *B. dilatata* (Reuss). 19. *Bulimina costata* d'Orbigny. 20. *B. elongata* d'Orbigny var. *lappa* Cushman & Parker. 21. *B. elongata* d'Orbigny. 22. *B. exilis* H. B. Brady. 23. *B. exilis* H. B. Brady. 24. *B. gibba* Fornasini. 25. *B. marginata* d'Orbigny. 7, × 34; 1-4, 19, 20, 24, × 50; 5, 6, 8-18, 21-23, × 100.

Plate 3

1a, b. *Buliminella arosaensis* spec. nov., holotype. 2a, b. do., paratype. 3a, b. *B. elegantissima* Cushman & Parker. 4a, b. *Cancros auriculus* (Fichtel & Moll). 5. *Cassidulinoides bradyi* (Norman). 6. *Cassidulina neocarinata* Thalmann. 7a-c. *Cibicides lobatulus* (Walker & Jacob). 8a-c. *C. refulgens* Denys de Montford. 9a, b. *Cribroelphidium poeyanum* (d'Orbigny). 10a, b. *Cribrononion advenum* (Cushman). 11a, b. *Cribrononion* spec. C. 12a, b. *C. excavatum* Terquem. 13a, b. *C. gerthi* (Van Voorthuysen). 14a, b. *Cribrononion* spec. B. 15a, b. *Cribrononion* spec. 1. 16a-c. *C. ibericum* (Cushman). 17a, b. *Cibicidina rarescens* (H. B. Brady). 18a-c. *C. bouenana* (d'Orbigny). 1-3, × 150; 4-7, 9-18, × 50; 8, × 34.

Plate 4

1. *Cyclogyra planorbis* (Schultze). 2a-c.? *Cycloloculina* spec. 3. *Eggerella scabra* (Williamson). 4a, b. *Dyocibicides perforatus* Cushman & Valentine.

5a, b. *Discorbitura cushmani* Margerel. 6a, b. *Elphidium macellum* (Fichtel & Moll) var. *aculeatum* (Silvestri). 7a, b. *E. margaritaceum* (Cushman). 8a, b. *E. complanatum* (d'Orbigny). 9a, b. *E. crispum* (Linnaeus). 10. *Dentalina communis* d'Orbigny. 1, 2, 5, × 100; 3, 4, 6-10, × 50.

Plate 5

1a-c. *Epistominella* spec. 2a, b.*E. exigua* (H. B. Brady). 3a-c. *Eponides* (?) *wrightii* (H. B. Brady). 4a-c. *Faujasina* spec. 5a, b. *Fissurina diaphana* (Buchner). 6. *F.* cf. *formosa* (Schwager). 7. *F. marginata* (Montagu). 8. *F. orbignyana* Seguenza. 9a, b. *F. lucida* (Williamson). 10a, b. *F.* cf. *obscurocostata* Galloway & Wissler. 11. *F. quadrata* (Williamson). 12a, b, c. *F. trigonomarginata* (Parker & Jones). 13a, b. *Florilus boueanum* (d'Orbigny). 14a, b. *F. grateloupi* (d'Orbigny). 15a, b. *F. pauperatum* (Balkwill & Wright), 1-4, 6-9, 11, 12, 14, 15, × 100; 5, 10, × 134; 13, × 50.

Plate 6

1a-c. *Gavelinopsis praegeri* (Heron-Allen & Earland). 2a, b. *Glabratella minima* spec. nov., paratype. 3a, b. do., holotype. 4a, b. *Globocassidulina subglobosa* (H. B. Brady). 5a, b. *Globigerina bulloides* d'Orbigny. 6a, b. *G. eggeri* Rhumbler. 7a, b. *Globorotalia inflata* (d'Orbigny). 8a-c. *Globigerinella aequilateralis* (H. B. Brady). 9. *Globulina inaequalis* Reuss. 10. *G. gibba* d'Orbigny. 11. *G. gibba* d'Orbigny var. *myristiformis* (Williamson). 12. *Globulimina auriculata* (Bailey). 13. *Guttulina lactea* (Walker & Jacob). 14a-c. *Haplophragmoides canariensis* (d'Orbigny). 15a, b. *H. emaciatum* (H. B. Brady). 16a, b. *Glomospira glomerata* Höglund, 1, 10, 16, × 100; 2, 3, × 134; 4-9, 11-15, × 50.

Plate 7

1a-c. *Heterolepa pseudoungeriana* (Cushman). 2a-c. *H. rugosa* (Phleger & Parker). 3a, b. *Hyalinea balthica* (Schroeter). 4. *Hopkinsina pacifica* Cushman var. *atlantica* Cushman. 5. *Lagena globosa* (Montagu). 6. *L. laevis* (Montagu). 7. *Lagena* spec. 1. 8. *L. sulcata* (Walker & Jacob). 9. *L. meridionalis* Wiessner. 10. *L. semilineata* J. Wright. 11. *L. semilineata* J. Wright. 12a-c. *Lamarckina haliotidea* (Heron-Allen & Earland). 13. *Lenticulina (Astacolus) crepidulus* (Fichtel & Moll). 14. *L. (Marginulopsis) linearis* (Montagu). 15. *L. (Marginulopsis) linearis* (Montagu). 1-3, 8, 10, 11, 13-15, × 50; 4-7, 9, 12, × 100.

Plate 8

1a, b. *Lenticulina (Robulus) cultratus* (De Montfort). 2. *L. (Lenticulina) peregrina* (Schwager). 3. *Lenticulina* spec. juv. 4. *Lenticulina* spec. juv. 5a, b. *Lingulina falcata* Heron-Allen & Earland. 6a, b. *L. bicarinata* Sidebottom. 7a, b. *Melonis barleeanum* (Williamson). 8. *Miliammina fusca* (H. B. Brady). 9a, b. *Melonis pompilioides* (Fichtel & Moll). 10. *Marginulina glabra* d'Orbigny. 11a, b. *Miliolinella circularis* (Bornemann). 12a-c. *M. insignis* (H. B. Brady). 13, 14. *Miniacina miniacea* (Pallas), 1, 3-5, 8, × 100; 2, 7, 9-12, × 50; 6, × 134; 13, 6.7 ×; 14, × 13.5.

Plate 9

1a, b. *Neoconorbina millettii* (J. Wright). 2a, b. *N. obtusa* (d'Orbigny). 3a, b. *N. terquemi* (Rzehak). 4a, b. *N. williamsoni* (Chapman & Parr). 5a, b. *Neoconorbina* spec. 1. 6a, b. *Neoconorbina* spec. 3. 7a, b, *Neoconorbina* spec. 2. 8a, b, *Nonion depressulum* (Walker & Jacob). 9a, b. *N. depressulum* (Walker & Jacob) var. *asterotuberculatum* Van Voorthuysen, 1, 4-9, × 100; 2, 3, × 50.

Plate 10

1a, b. *Nonion umbilicatulum* (Walker & Jacob). 2a, b. *Nonionella turgida* (Williamson). 3a, b. *Nonion* (?) spec. 3. 4a-c. *Nonionella* spec. 1. 5. *Oolina melo* d'Orbigny. 6. *O. squamosa* (Montagu). 7. *O. williamsoni* (Alcock). 8. *O. hexagona* (Williamson). 9. *Parafissurina inaequilateralis* (J. Wright). 10. *Orbulina universa* d'Orbigny. 11. *O. suturalis* Brönnimann. 12a, b. *Patellina corrugata* Williamson. 13a-c. *Patellinoides conica* Heron-Allen & Earland. 14a-c. *Planispirillina wrightii* Heron-Allen & Earland, 1-8, 11-13, × 100; 9, × 134; 10, × 50; 14, × 67.

Plate 11

1a, b. *Planorbulina mediterranensis* d'Orbigny. 2. *Psammosphaera bowmanni* Heron-Allen & Earland. 3. *Pyrgo elongata* (d'Orbigny). 4. *Quinqueloculina sclerotica* Karrer. 5. *Q. seminulum* (Linnaeus). 6. *Q. vulgaris* d'Orbigny, 7. *Q. bicornis* (Walker & Jacob). 8. *Q. agglutinata* Cushman. 9. *Q. venusta* Karrer. 10. Q. cf. *candeiana* d'Orbigny. 11. *Q. duthiersi* (Schlumberger). 12. *Q.* cf. *lyra* d'Orbigny. 13. *Q. lamarckiana* d'Orbigny. 14. *Q. peregrina* d'Orbigny. 15a, b. *Remaneica helgolandica* Rhumbler. 16a, b. *Remaneica* spec. 1. 1-4, 15, 16, × 50; 5-14, × 34.

Plate 12

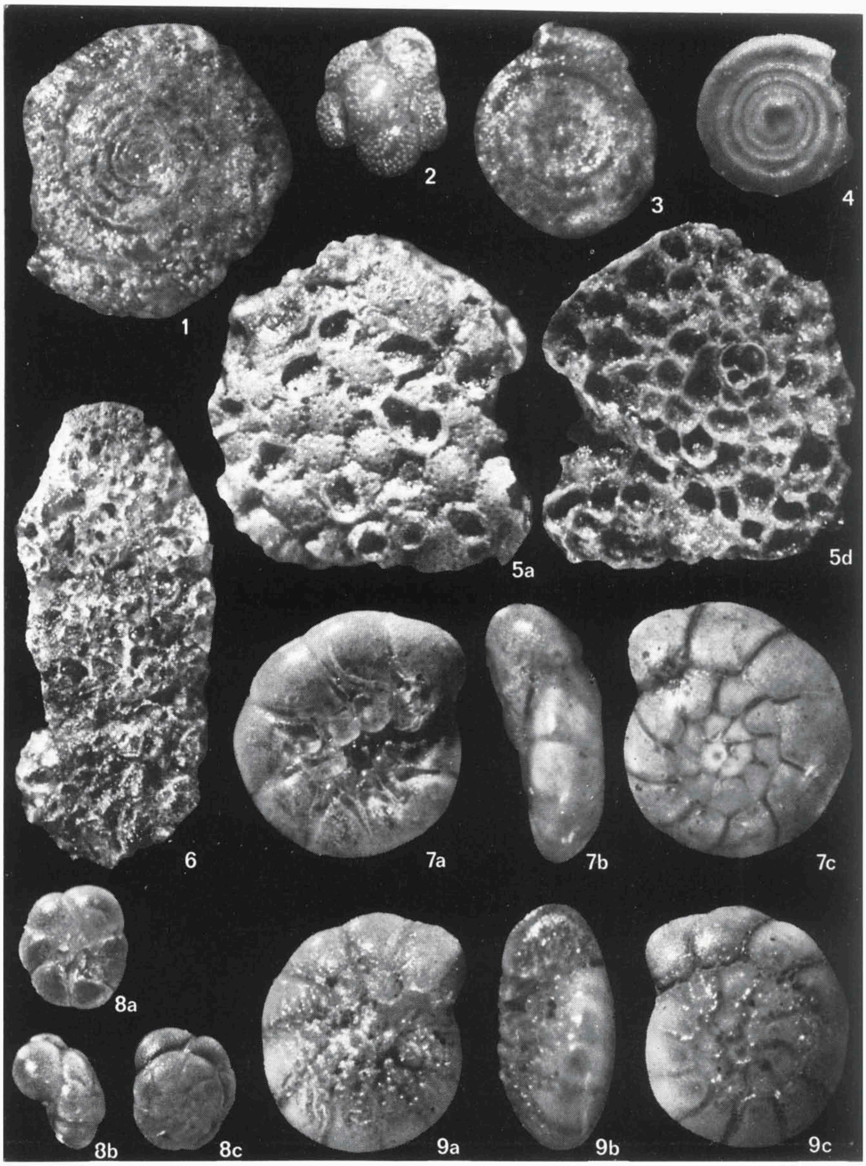
1. *Reophax fusiformis* (Williamson). 2. *R. nana* Rhumbler. 3, 4. *Siliconodosaria delicaluta* Colom. 5a, b. *Rosalina globularis* d'Orbigny. 6. *Sigmoilopsis distorta* (Phleger & Parker). 7. *S. flintii* (Cushman). 8. *Spirillina lateseptata* Terquem. 9. *S. vivipara* Ehrenberg. 10a, b. *S. obconica* H. B. Brady. 11a, b, 12. *Siphonotextularia foliacea* (Heron-Allen & Earland) var. *occidentalis* (Cushman). 13a, b. *Spirophtalmidium acutimargo* (H. B. Brady). 14a, b. *Spiroloculina excavata* d'Orbigny. 15a-c. *S. grata* Terquem. 16a-c. *S. depressa* d'Orbigny. 1, 5-7, 13, × 50; 2-4, 8-12, × 100; 14-16, × 34.

Plate 13

1. *Stainforthia schreibersiana* (Czjzek). 2. *S. fusiformis* (Williamson). 3a, b. *Svratkina tuberculata* (Balkwill & J. Wright). 4. *Textularia* spec. 1. 5a, b. *T. pseudotrochus* Cushman. 6a, b. *T. sagittula* Defrance. 7a, b. *T. bocki* Höglund. 8a, b. *T. truncata* Höglund. 9. *T. earlandi* Parker. 10. *Triloculina oblonga* (Montagu). 11. *Triloculina* spec. 2. 12. *Triloculina* cf. *tubiformis* Jabe & Asano. 13. *T. inflata* d'Orbigny. 14. *Trifarina angulosa* (Williamson). 15. *Uvigerina compressa* Cushman. 16. *U. angustiformis* Vella. 17. *Verneuillinoides media* (Höglund). 18. *Virgulinella pertusa* (Reuss). 1, 2, 4, 9, 15, × 100; 3, × 134; 5, 7, 8, 10, 11, 13, × 34; 6, 12, 14, 16, × 50; 17, 18, × 67.

Plate 14

1a, b. *Trochammina* spec. 1. 2a-c. *T. globigeriniformis* (Parker & Jones) var. *pygmaea* Höglund. 3a-c. *T. rotaliformis* J. Wright. 4a, b. *Trochammina* cf. *ochracea* (Williamson). 5a, b. *T. intermedia* Rhumbler. 6a-c. *T. stellata* Höglund. 7a-c. *T. inflata* (Montagu). 8a, b. *Valvulineria complanata* (d'Orbigny). 1, 2, 4-7, × 100; 3, × 50; 8, × 67.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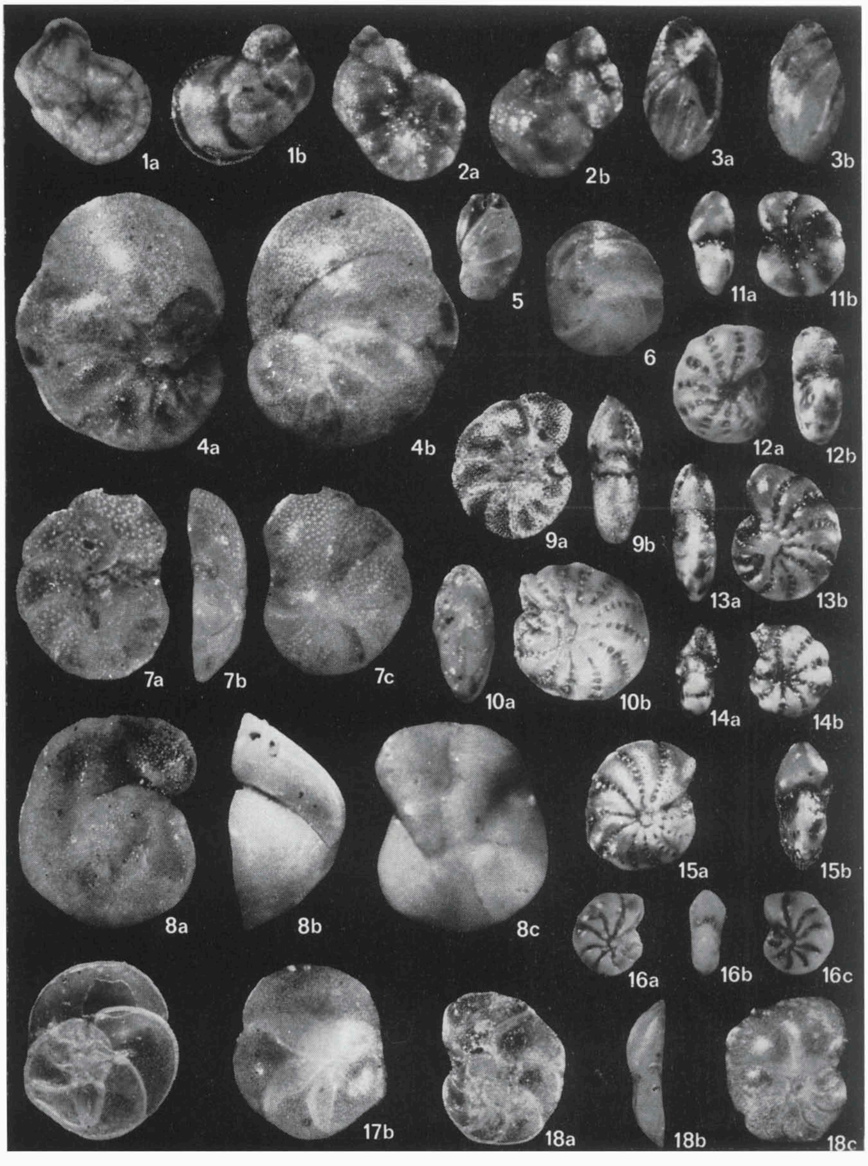
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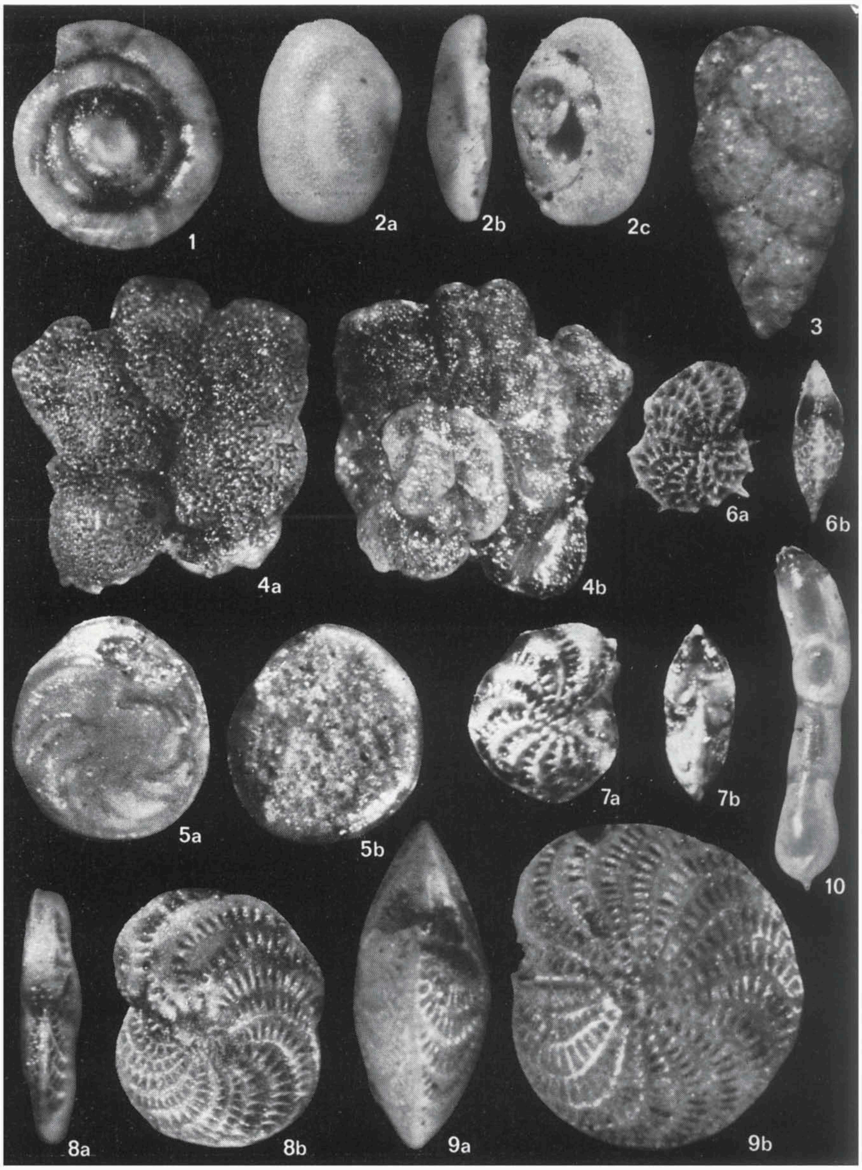
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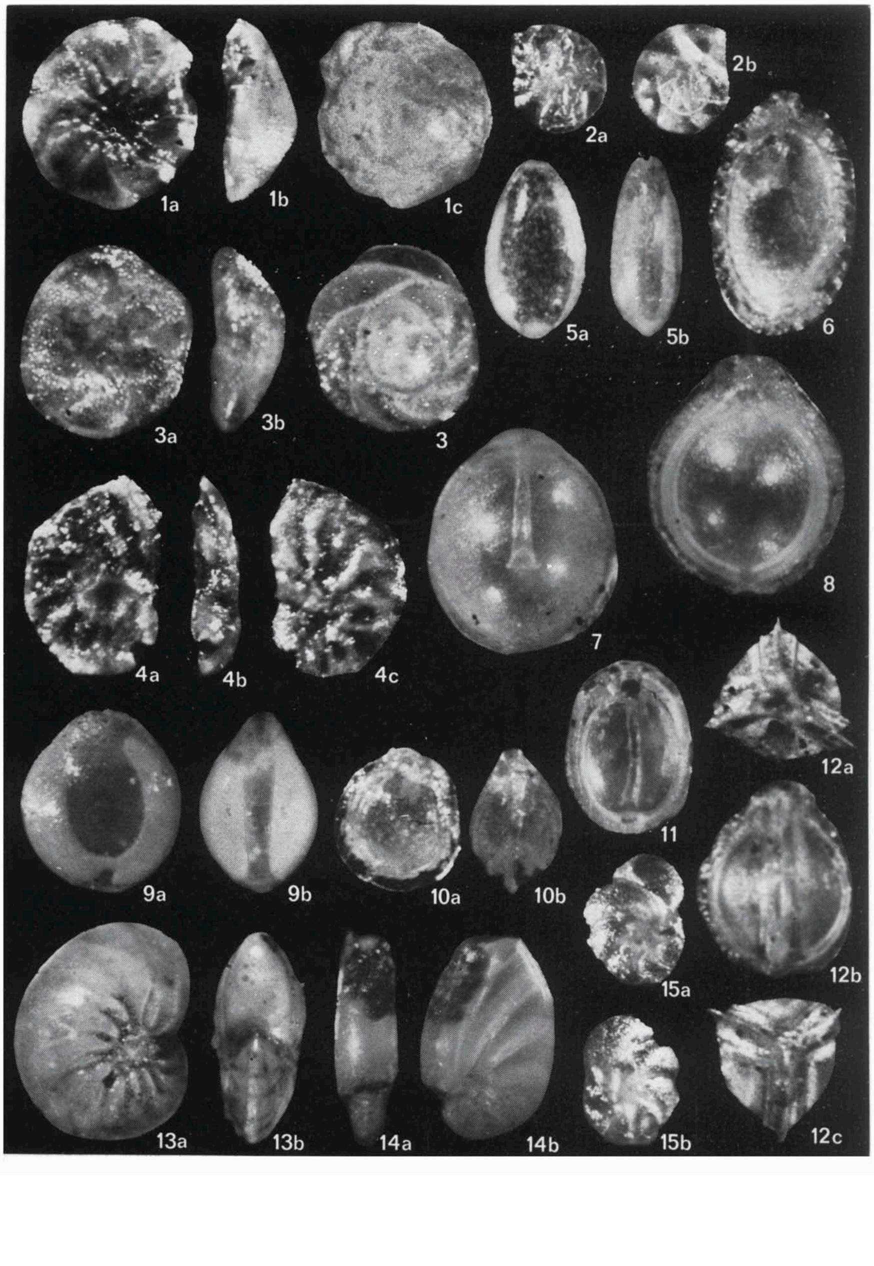
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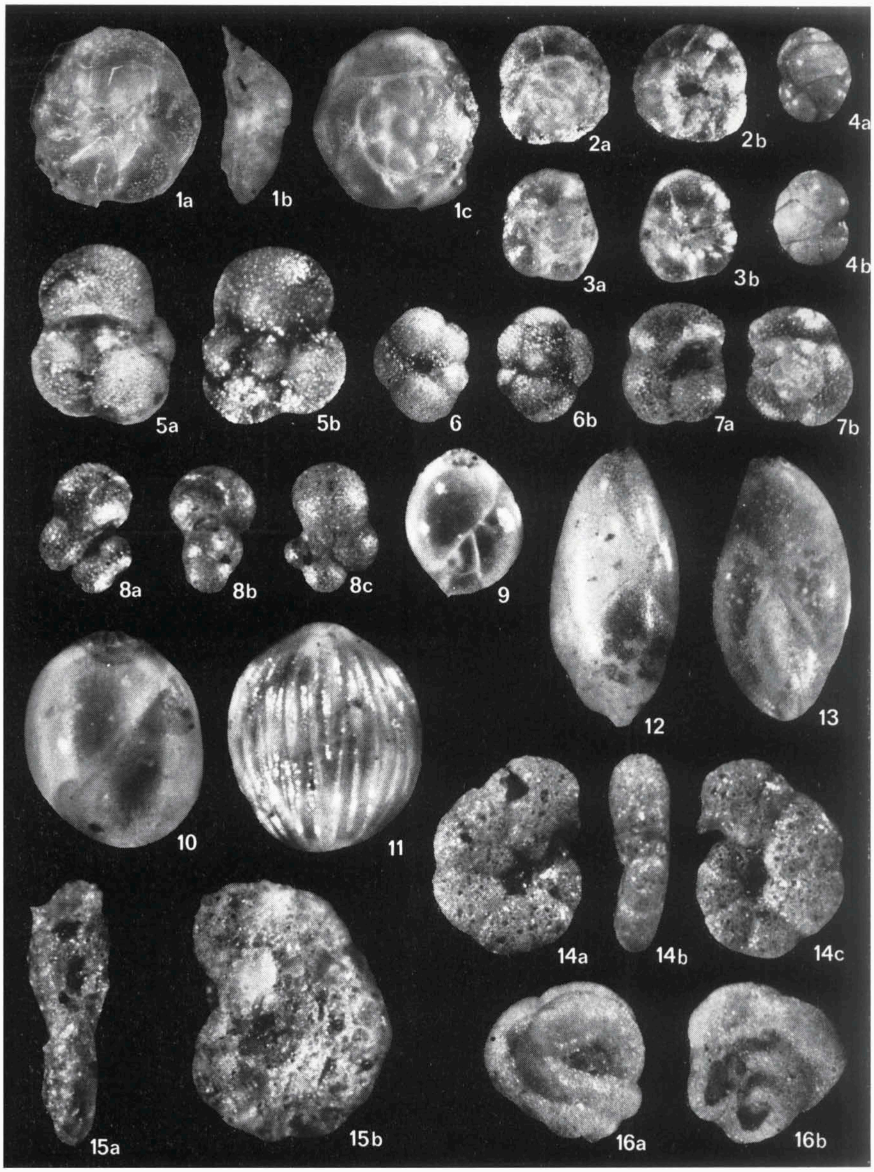
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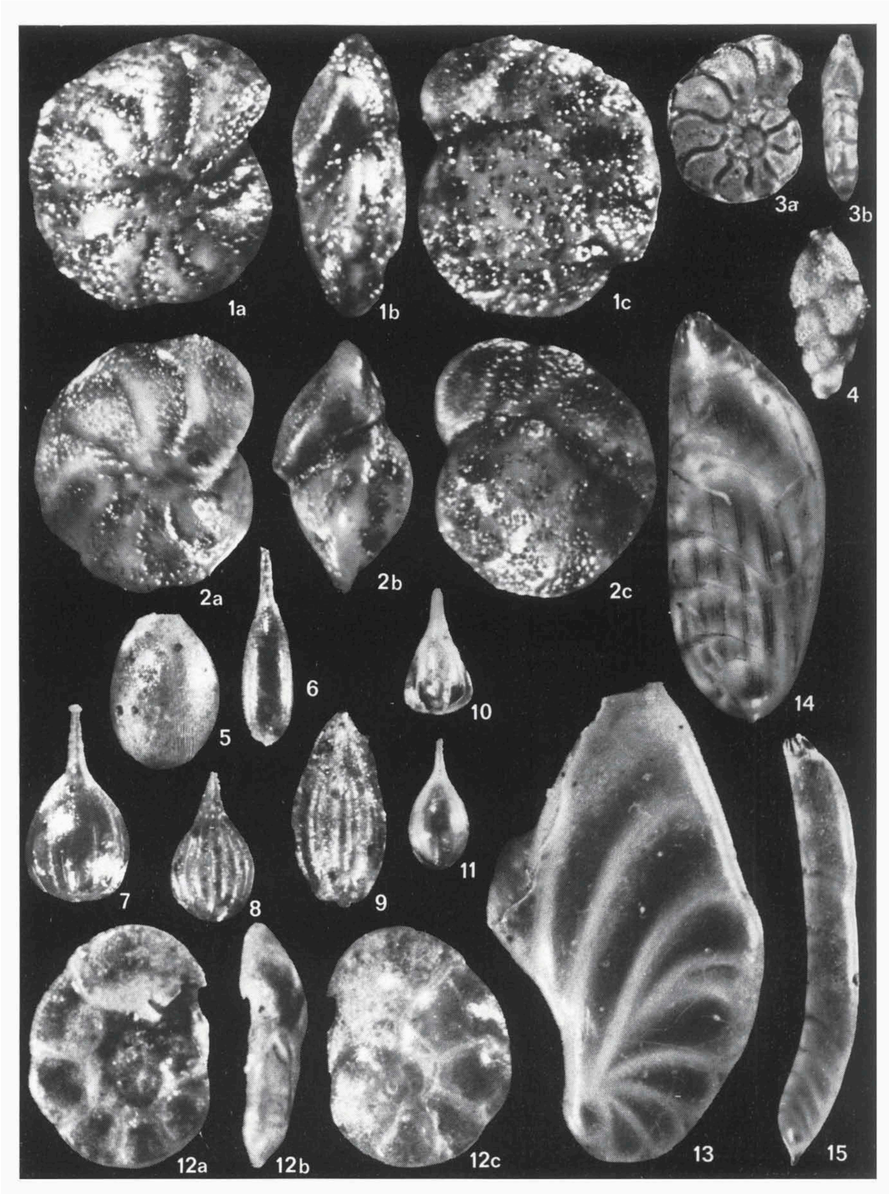
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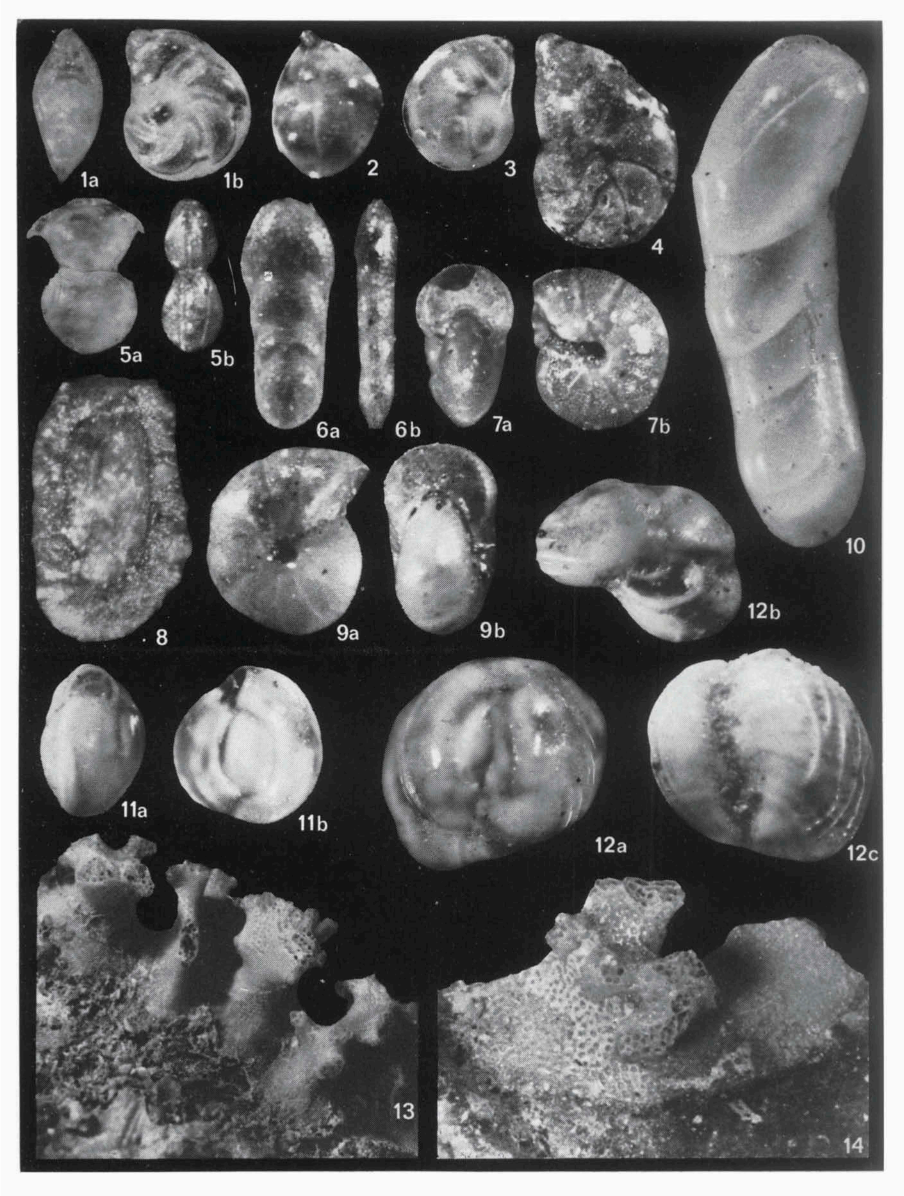
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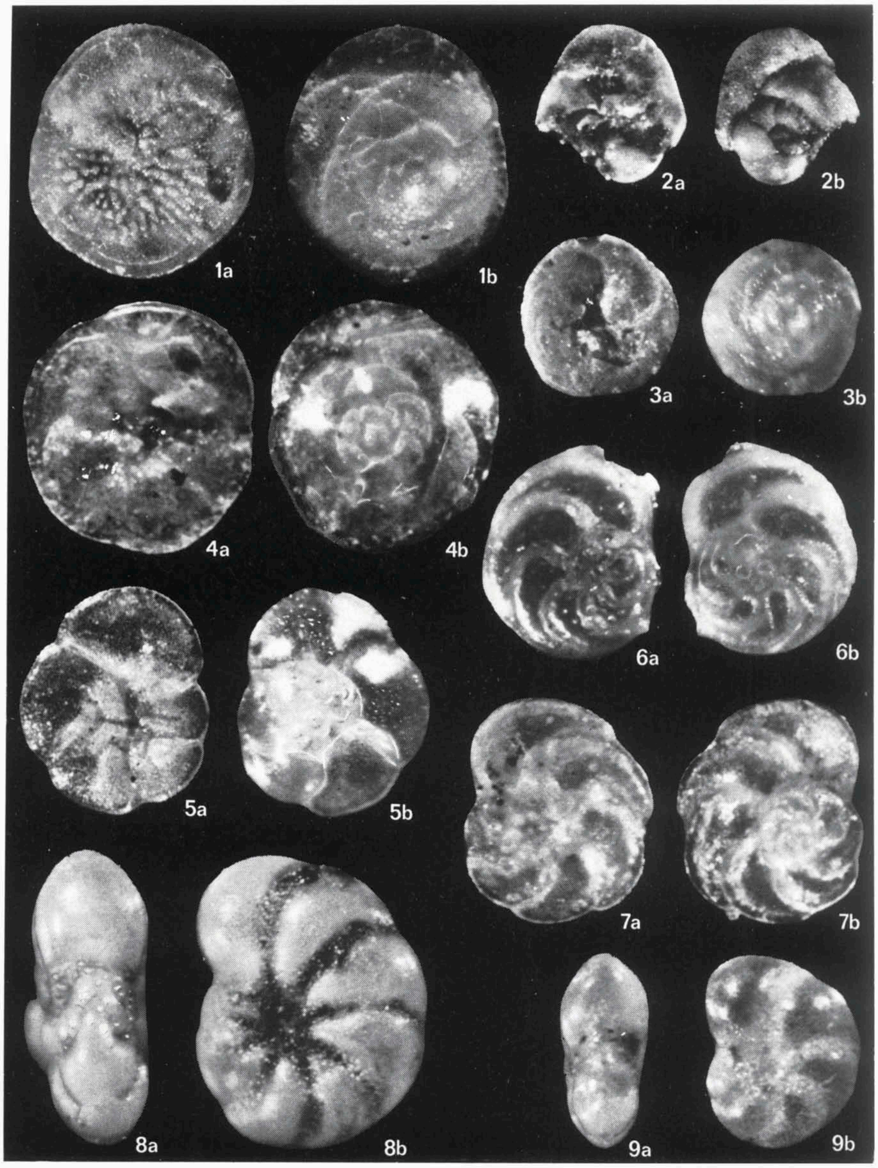
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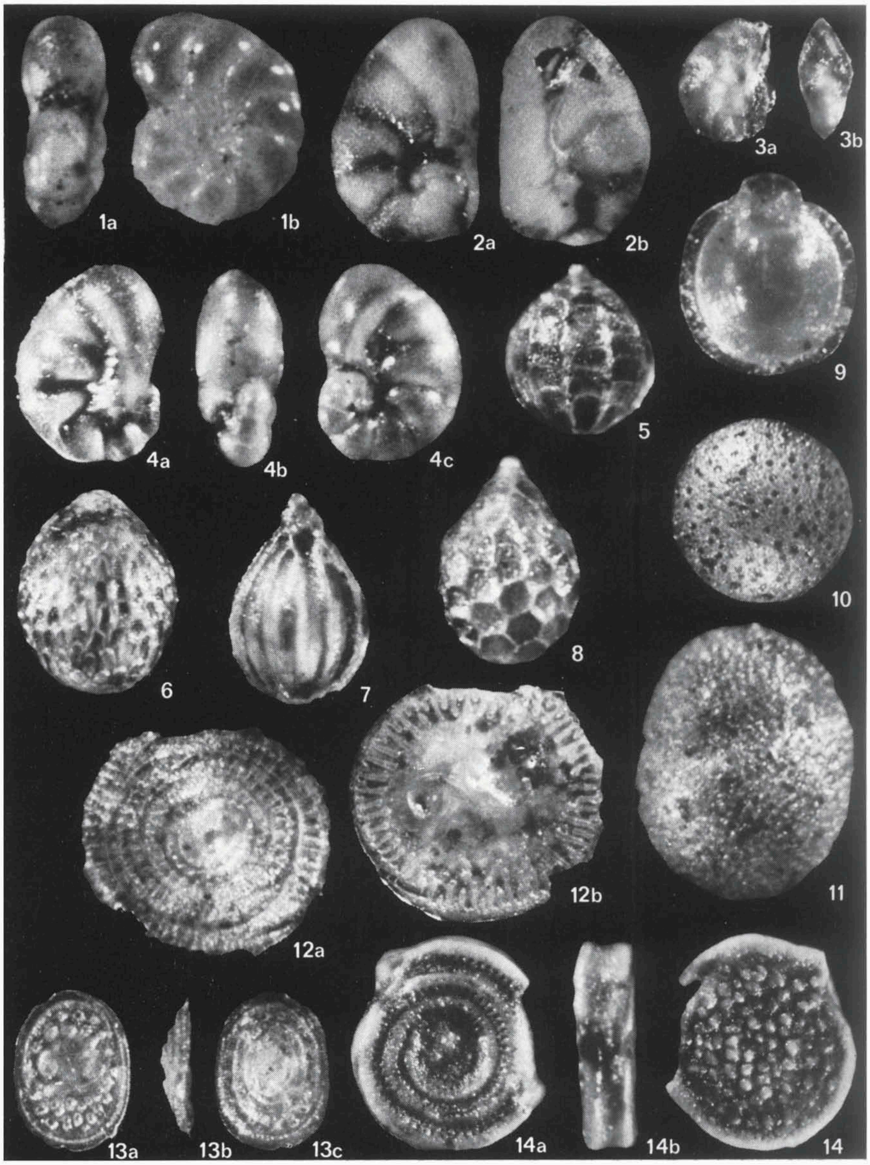
9a
9b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2b
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3b
4a
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11
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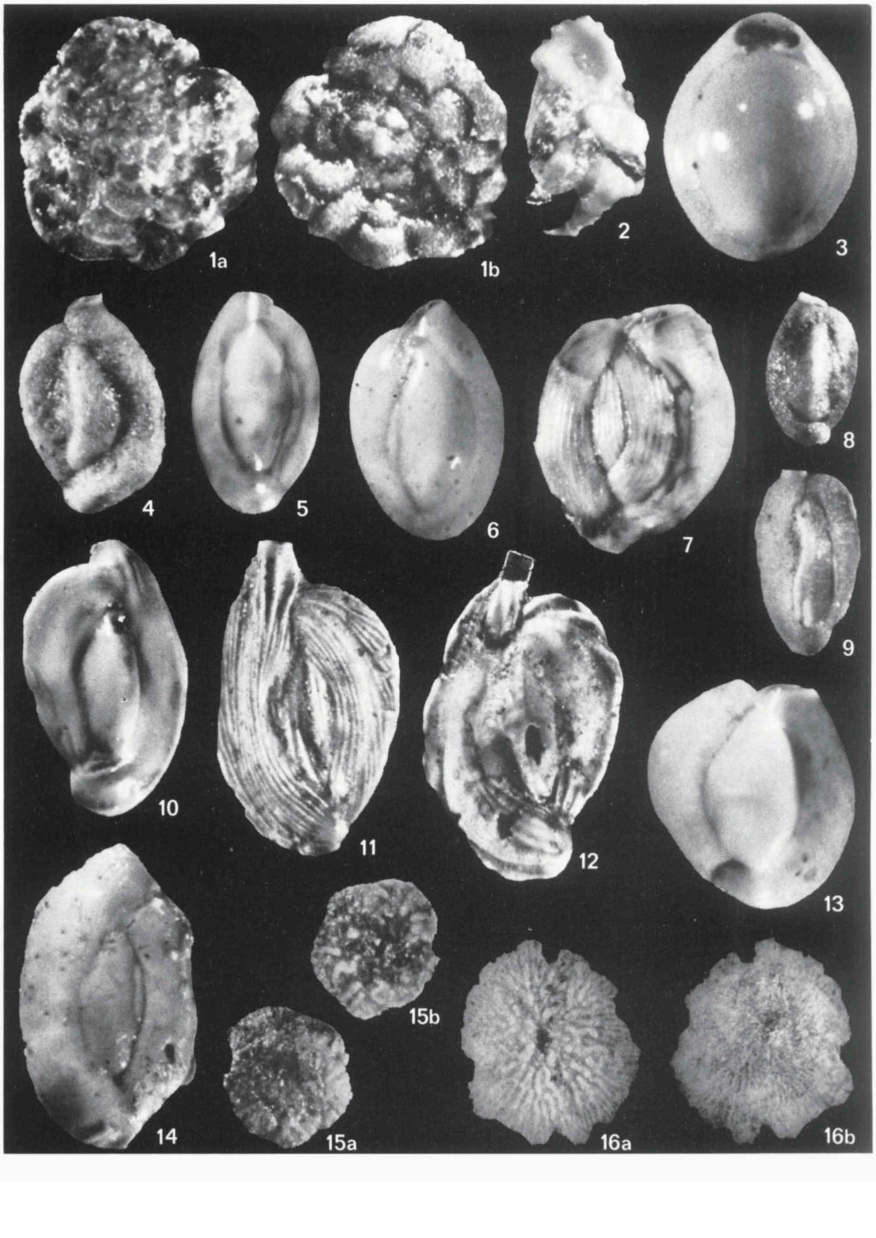
12b
13a
13b
13c
14a
14b
14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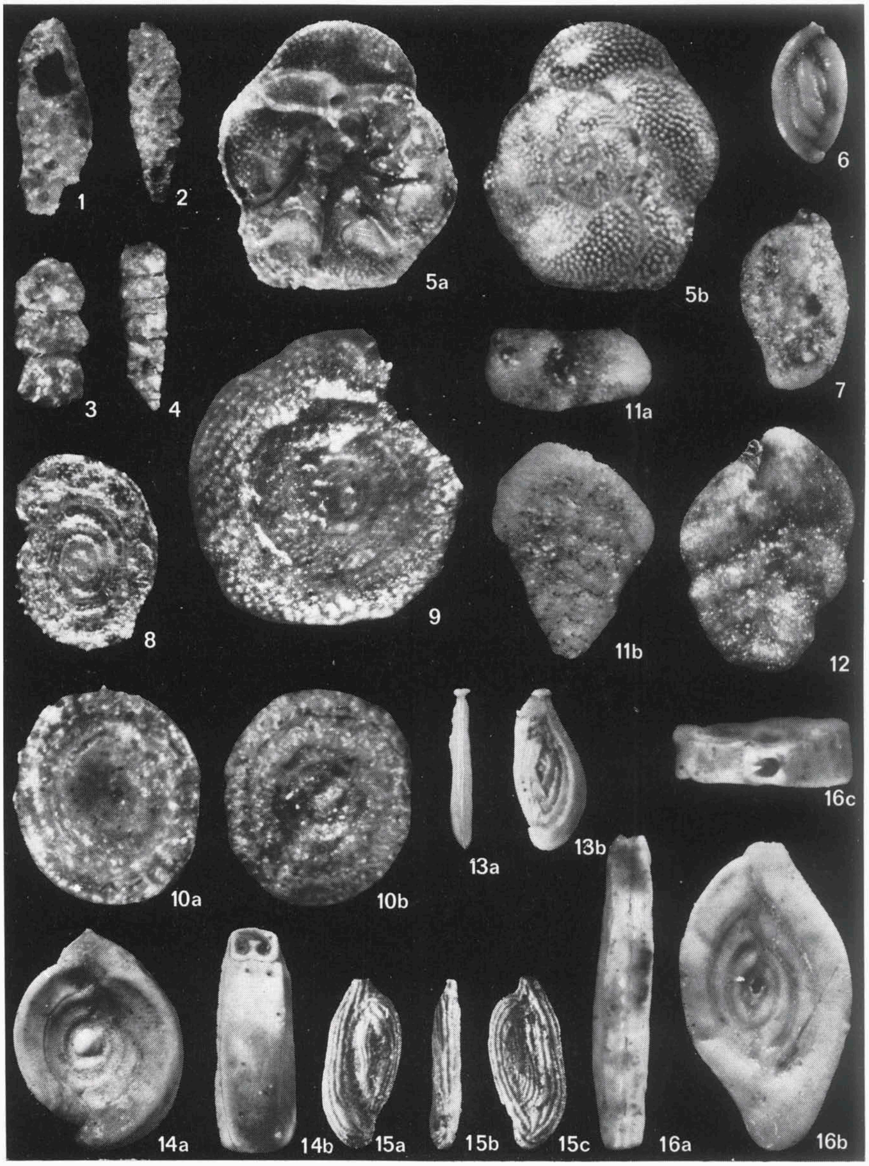
16b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11a
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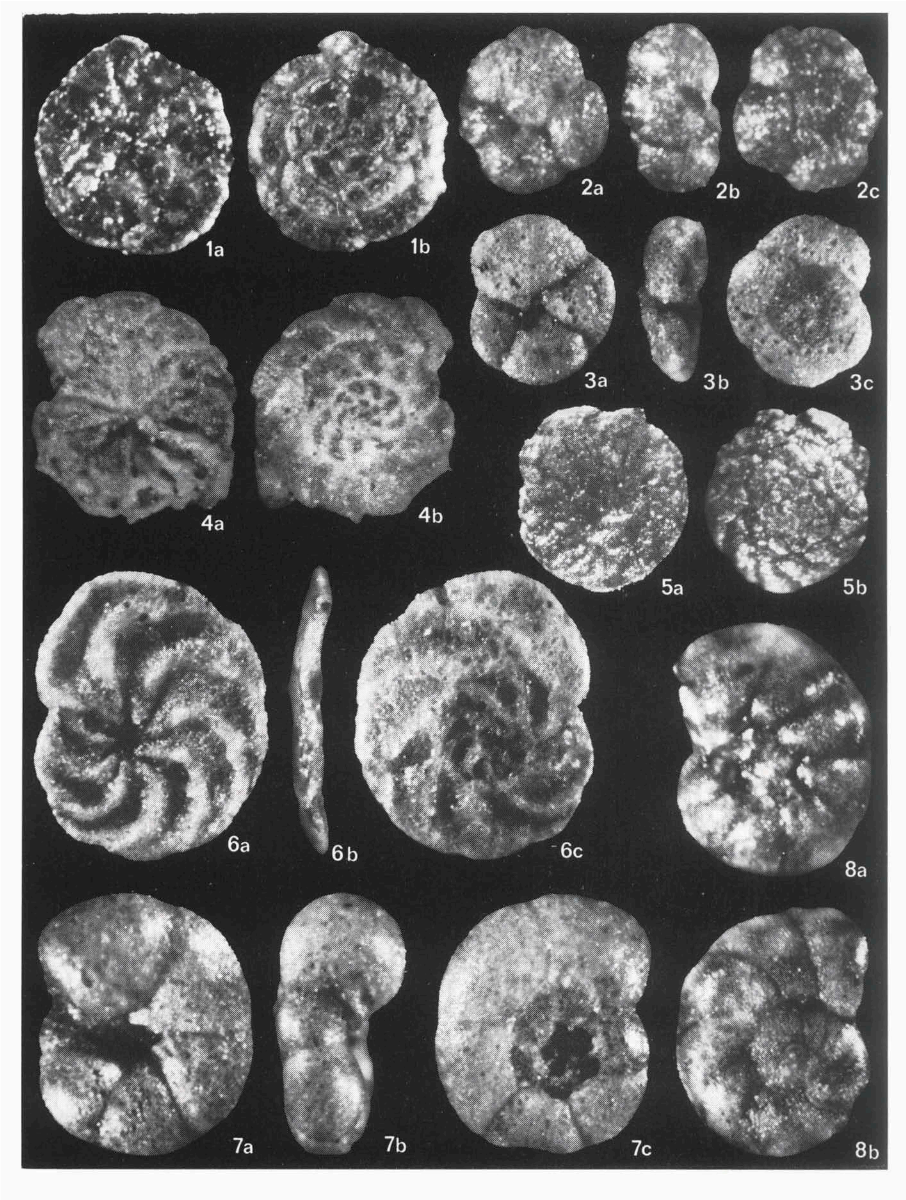
10b
14a
14b
15a
15b
15c
16a
16b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2b
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3b
3c
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6a
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6c
8a
7a
7b
7c
8b


1
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3a
3b
4
5a
5b
6a
6b
7a
7b
8a
8b
9
10
11
12
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18