# REGIONAL FORAMINIFERAL ASSEMBLAGES IN TANABE BAY, KII PENINSULA, CENTRAL JAPAN[1)]

MANZO CHIJI
Ôsaka Museum of Natural History

and

SILVIO M. LOPEZ
Geological Institute, Kyôto University

*With Plates VI-XV and 8 Text-figures*

## Introduction

The fauna of Tanabe Bay is as well known as its oceanography and submarine geology, for Tanabe Bay has long been the home of the Seto Marine Biological Laboratory of the University of Kyôto. Foraminiferal assemblages and their distribution in the bay, however, have not been studied extensively until this time.

Knowledge of foraminiferal assemblages in various environments and the distribution of the living and non-living faunas with known oceanographic factors should prove invaluable to the study of the marine ecology of the Bay. Furthermore, this knowledge is expected to contribute some new information to the paleontological or paleophysical condition of sedimentation of the Pleistocene marine terrace deposits and also of the alluvium distributed along the coast of the Japanese Islands.

In this work, 14 sediment samples selected from the material collected at 33 stations in Tanabe Bay by the present writers in April, 1966 were studied to describe the foraminiferal assemblages and their distribution in Tanabe Bay and to discuss some of its ecological implications (Fig. 1). Field work was done on board a surveying boat of the Laboratory. This work was supported in part by a research grant from the Kôyosha Foundation and the Hôkoku-sekizenkai Foundation of Ôsaka.

## Acknowledgements

The writers wish to thank the Seto Marine Biological Laboratory of the University of Kyôto and the Ôsaka Museum of Natural History for the use of their facilities during

1) Contributions from the Seto Marine Biological Laboratory, No. 489 and Contributions from the Ôsaka Museum of Natural History, No. 119.

Publ. Seto Mar. Biol. Lab., XVI (2), 85-125, 1968. (Article 10)

various aspects of this study. Dr. Shin-ichiro FUSE of the Seto Marine Biological Laboratory performed the dissolved oxygen analysis and gave valuable help in the field work. Dr. Takasi TOKIOKA of the same laboratory kindly read the manuscript of this paper and gave much valuable suggestions to the writers. The junior writer

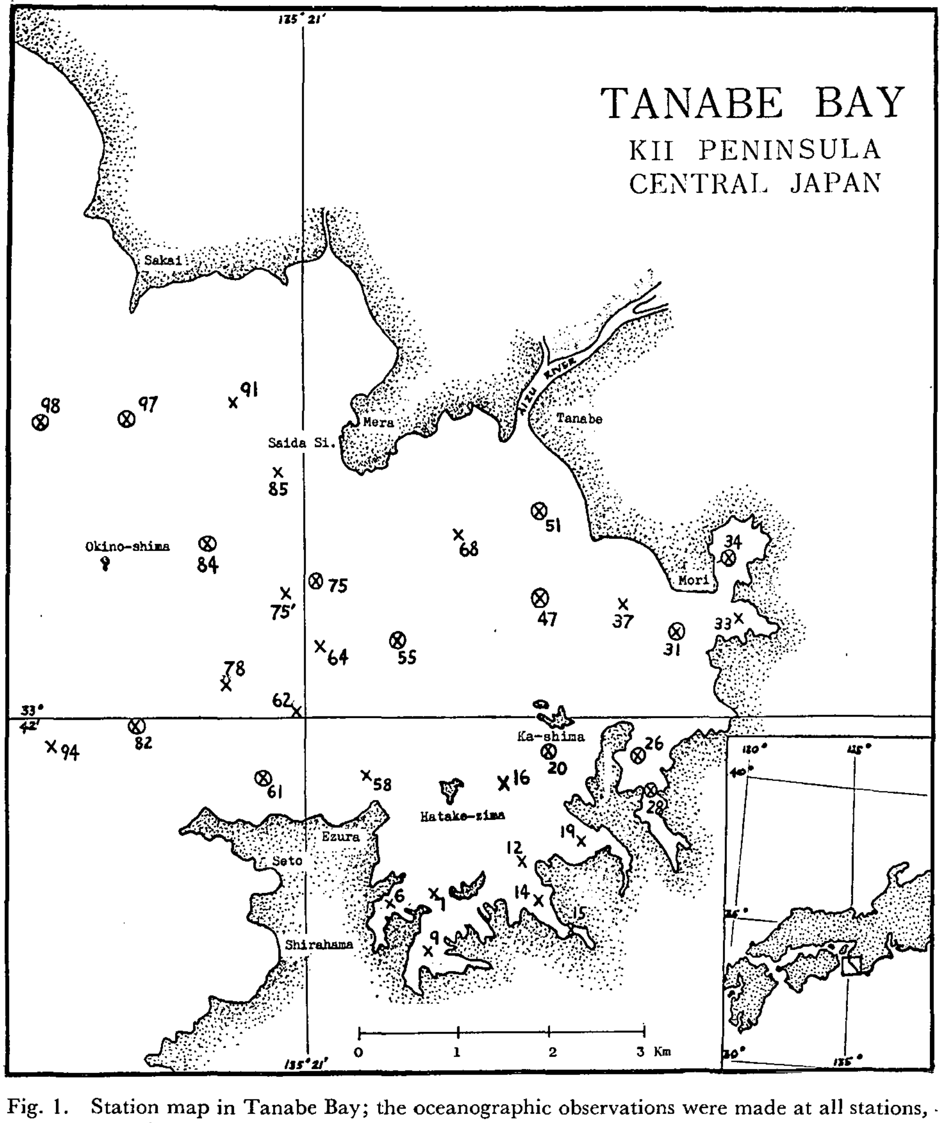



Fig. 1. Station map in Tanabe Bay; the oceanographic observations were made at all stations, while the faunal examinations were limited to those in circle.

wishes also to express his sincere gratitude to Prof. Emeritus Susumu MATSUSHITA, Prof. Keiji NAKAZAWA and Dr. Yasuo NOGAMI of the Institute of Geology and Mineralogy of the University of Kyôto.

## Method of study

The samples were collected with an EKMAN-LENZ's Bottom Sampler. Formaldehyde of 3.5–4.0% was added to these to preserve living foraminifers. In addition to sediment and bottom water sampling, the bottom water temparature, chlorinity, dissolved oxygen content, and hydrogen ion concentration of the bottom water were measured at each collecting station.

For the present study 20 g of each wet sample was examined. Aliquots for examination were respectively washed through a sieve of 0.074 mm meshes and stained with rose of Bengal (WALTON, 1952; KUWANO, 1956) to determine living populations. They were rewashed using the water-bath and sieve, oven-dried, and then weighed for records. To obtain a manageable population, the aliquots thus prepared were mechanically split into some fractions. Each fraction to be studied was weighed and its size was adjusted to include 250 or so foraminiferal specimens in it. The total population in 20 g aliquot was approximated by comparing the weight of the whole fraction coarser than 0.074 mm in diameter with that of the fraction used for the actual counting.

Percentages of respective species were calculated in each sample to define the foraminiferal assemblages in various environments.

The carbon-tetrachloride separation method was not adopted in this study, because it was found that in some cases, some of the forms could not be afloat for their thick wall or breakage, or for other reasons.

## Depository of materials

All the figured specimens are deposited in the Ôsaka Museum of Natural History under the registered numbers F10607F to F10755F inclusive.

## Previous works in the area

MORISHIMA (1948, 1950) analyzed 49 samples from Ago Bay in southeastern Kii. He reported 183 species; 6 of them were planktonic and 24 were arenaceous foraminifers. He noted the gradual decrease of the number of foraminiferal tests towards the innermost section of the bay contrary to the distributions in Obama and Maizuru Bays on the Japan Sea side of Japan (MORISHIMA, 1947). He recognized the following five types of foraminiferal assemblages in that bay.

A) *Globigerina* assemblage: at the entrance of the bay,

B) *Amphistegina—Elphidium crispum* assemblage: distributed near the mouth of the bay,

C) *Rotalia papillosa—Quinqueloculina lamarckiana* assemblage: occupying the central part of the bay proper,

D) *Elphidium craticulatum—Textularia hauerii* assemblage: in certain sections of some coves,

E) *Trochammina* assemblage: limited to the innermost part of the bay.

UCHIO (1962) made a quantitative analysis of the foraminiferal faunas from the beach and nearshore sediments along the west coast of Kii Peninsula. He noted the predominance of *Elphidium*, Miliolidae and *Amphistegina* in the beach sand of the area and *Ammonia* in the wharf-area samples. In Tanabe Bay, he analyzed foraminiferal faunas from 4 stations, 3 of which were set in Mori Harbor. At one station in the harbor, the fauna consisted mainly of *Ammonia beccarii asanoi*, with *Elphidium* (mainly *E. subincertum*) and some arenaceous species such as *Trochammina* cf. *globigeriniformis*, *Textularia earlandi*, etc. Off the harbor, the percentage of *Ammonia* in population dropped significantly, while some species of Elphidiidae and Miliolidae, such as *E. incertum*, *E. advena*, *Miliolinella circularis*, etc., increased in percentage.

FUSE, YAMAZI and HARADA (1958), FUSE (1959), and FUSE and HARADA (1960) published several papers on the oceanographic conditions of Tanabe Bay; MII(1962) studied its submarine geology.

## Submarine geology

The average declivity of the sea bottom off the southwestern coast of Kii Peninsula is 12 m/km. Three submarine canyons, interpreted by TOYAMA as drowned land rivers, traverse the continental slope and the outer margin of the shelf, each starting as a narrow gorge and running south straight down to the depth of about 1,500 m and branching in a dendroid pattern.

MII (1962) divided the submarine area of Tanabe Bay topographically into four submarine terraces. The first terrace or the offshore platform, ranging from 0 to 10 m below the lowest water level, occurs on the sea bottom adjacent to the promontories, islands or reefs. Its landward margin is usually backed by a steep or nearly vertical cliff which is often incised with notches, while the seaward edge to the second terrace, at the depth of 15 m, is bordered by about 5 m high steep slope often covered with sand and silt. The second terrace is distributed throughout the sea adjacent to the coast. In the open sea area, the bedrocks are usually exposed at the landward margin of this terrace. Because of such sporadic exposure of the rocks, the terrace is covered with only thin sediments. The third submarine terrace, at the depth of 25 to 35 m is also furnished with sporadic exposure of bedrocks and generally bordered with about 10 m high relatively distinct slope between it and the fourth terrace which is extending at the depth of 50 to 100 m and covered uniformly with sand and silt.

Some shelf channels, attributed by MII to drowned land valleys, are found on the floor of Tanabe Bay. They are extending in a dendroid pattern in the direction E-W or NEE-SWW. Majority of their branching channels start respectively from deep coves of the bay or from channels between islands or reefs but never extend to the deep submarine canyons starting from the shelf break. The bay sediment in most part is the fine-grained mud falling into the silt and clay size range, though in some areas, especially around the entrance to the bay where the tidal current to the northwest is rather significant, the floor is sandy with numerous patches of gravels. In the cove of Mori, the bottom sediment is muddy with a considerable amount of organic debris. Such a distribution pattern of bottom sediments agrees with that already shown by Mii (1962), (Fig. 2).

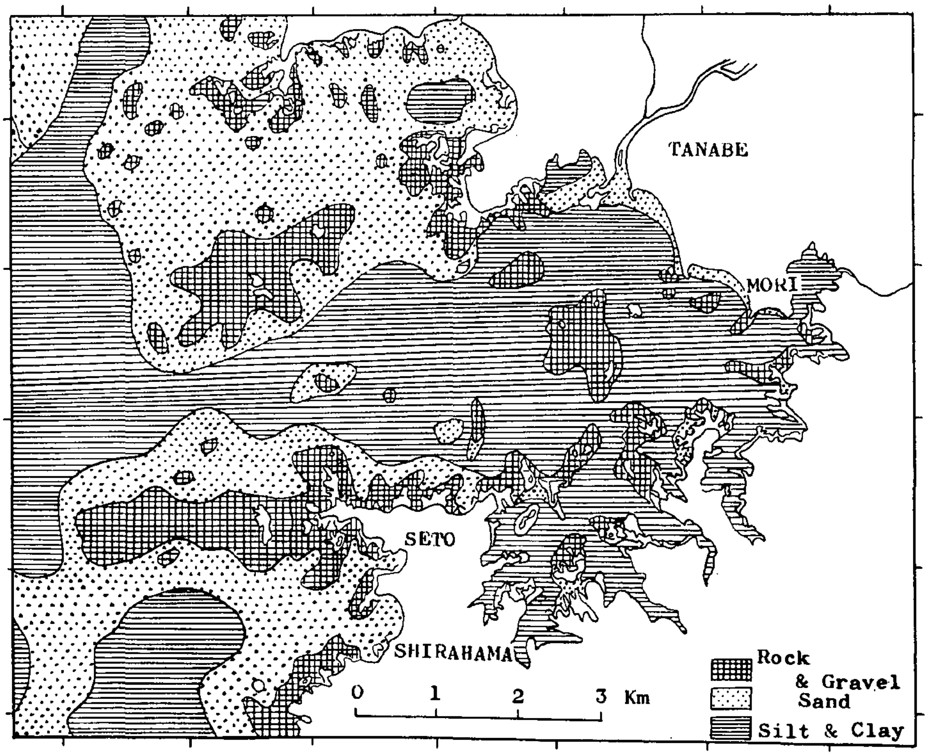



Fig. 2. Bottom sediments of Tanabe Bay (after Mii, 1962).

## Hydrographical outline of the Bay

The warm current, Kuroshio, flows northeast off the southern tip of Kii Peninsula with an averrage speed of about 7 km/hr at surface. The current off Tanabe Bay is not maintained uniformly, but most frequently affected by a minor branch of the Kuroshio flowing northwest. And in Tanabe Bay the influx of the oceanic water reaches usually southeast the area between the two islets, Kashima and Hatakezima. Waves and surf are prominent along the coast in the western half of the Bay and swells which are most remarkable during the stormy season from July to September approach the Bay from the south. The water is much agitated by the monsoon from the northwest from late autumn to early spring.

The mean high water level is 0.6 m and the highest water level is 1.2 m above and the mean low water level is 0.5 m and the lowest water level is 1.3 m below the mean sea level (MII, 1962).

The distribution of the bottom water temperature (Table 1) showed a tendency to the increase in the northeastern part of the bay exclusive of the cove of Mori,

Table 1. Hydrological data at sampling stations in Tanabe Bay, April 26–27, 1966.

| Station No. | Depth in m | Bottom Water | | | | Mud Temp. in °C |
|---|---|---|---|---|---|---|
| | | Temp. in °C | $O_2$ in % | pH | Chlorinity in ‰ | |
| 6 | 9 | 20.5 | 100 | 8.3 | 19.00 | — |
| 7 | 15 | 20.1 | 115 | 8.3 | 18.89 | 18.7 |
| 9 | 10 | 21.1 | 115 | 8.3 | 19.09 | 20.0 |
| 12 | 15 | 20.1 | 115 | 8.3 | 19.00 | 18.7 |
| 14 | 8 | 20.4 | 100 | 8.3 | 19.00 | 19.6 |
| 15 | 4 | 20.4 | 115 | 8.3 | 19.00 | 19.5 |
| 16 | 19 | 19.2 | 150 | 8.3 | 19.12 | 18.1 |
| 19 | 10 | 20.4 | 100 | 8.3 | 19.01 | 20.0 |
| 20 | 15 | 19.8 | 105 | 8.3 | 19.03 | 19.3 |
| 26 | 12 | 20.2 | 104 | 8.3 | 19.02 | 19.0 |
| 28 | 9 | 20.4 | 100 | 8.3 | 18.95 | 19.8 |
| 31 | 9 | 21.2 | 100 | 8.3 | 19.07 | 20.0 |
| 33 | 2.5 | 21.4 | 112 | 8.3 | 19.08 | 20.5 |
| 34 | 7 | 19.5 | 100 | 8.3 | 18.78 | 19.0 |
| 37 | 7 | 21.4 | 105 | 8.3 | 19.23 | 20.0 |
| 47 | 9 | 21.5 | 104 | 8.3 | 19.21 | 20.5 |
| 51 | 7 | 21.4 | 100 | 8.3 | 19.12 | 20.8 |
| 55 | 24 | 19.3 | 100 | 8.3 | 19.23 | — |
| 58 | 15 | 21.1 | 115 | 8.3 | 19.27 | — |
| 61 | 21 | 21.0 | 100 | 8.3 | 19.27 | 21.0 |
| 62 | 26 | 20.5 | 107 | 8.3 | 19.08 | 19.5 |
| 64 | 27 | 20.4 | 100 | 8.3 | 19.14 | 19.5 |
| 68 | 12 | 21.3 | 100 | 8.3 | 19.20 | 20.5 |
| 75 | 25 | 19.3 | 100 | 8.3 | 18.95 | 18.5 |
| 75′ | 31 | 19.2 | 102 | 8.2 | 19.04 | 20.0 |
| 78 | 31 | 19.2 | 110 | 8.3 | 19.25 | 19.0 |
| 82 | 38 | 19.9 | ? 78 | 8.2 | 19.33 | 20.8 |
| 84 | 31 | 19.8 | 106 | 8.2 | 19.08 | 19.4 |
| 85 | 23 | 19.8 | 110 | 8.3 | 19.02 | — |
| 91 | 18 | 20.8 | 100 | 8.3 | 19.09 | — |
| 94 | 40 | 19.8 | 94.2 | 8.2 | 19.26 | — |
| 97 | 24 | 20.0 | 100 | 8.3 | 19.30 | — |
| 98 | 33 | 20.8 | 110 | 8.3 | 19.25 | 22.0 |

21.37°C on an average, whereas the mean temperature was 19.85°C near and outside the mouth of the bay. The temperature was generally a little lower in coves.

The bottom sediment temperature ranged from 18.5 to 21.0°C throughout 33 stations. It was nearly equal to or slightly higher than the bottom water temperature outside the bay, the difference being 0.25°C on an average. In the bay, however, the former was a little lower than the latter, the difference being 0.89°C on an average.

The chlorinity of the bottom water ranged from 18.78 to 19.33‰ throughout 33 stations, with the mean chlorinity 19.10‰. Naturally it was higher outside the bay, 19.25 to 19.33‰ and 19.29‰ on an average, and lower in the coves of the bay, 18.78 to 19.09‰ and 18.97‰ on an average. It was noteworthy that an area of comparatively low chlorinity, 19.09‰ on an average against 19.17‰ for other parts of the bay proper, was found in the northern part near the mouth of the bay. This might be a temporary phenomenon attributable to a special hydrological condition caused by the existence of the reef extending from Saida-saki to Okinoshima and inhibiting the bottom water flowing and some tidal phase. When the salinity temperature relation is taken in consideration, it is noted that the lower temperature can be combined with both the high and low extremities of the chlorinity range: the former indicates the oceanic water mass and the latter seems to show the stagnant water mass in the inner part of the bay.

The dissolved oxygen content of the bottom water was measured by using the "JARREL-ASH Model 26–601 Dissolved Oxygen Analyser". As seen in Table 1, the dissolved oxygen seemed to be saturated all over the bay except for Stations 82 (?78%) and 94 (94.2%) outside the bay. The content was especially prominent (115%) at some stations (Sts. 7, 9, 12 and 15) near the south-east coner of the bay, which is highly sheltered, and at Station 58 which seems to be located in the course of the outflow of the stagnant water of the inner part of the bay.

The pH was uniformly 8.3 throughout the bay, except for several stations (Sts. 75′, 82, 84 and 94) near and outside the bay mouth, where the pH was 8.2.

In the summer season, the water temperature attained 28.59–30.30°C at surface and 29.56°C on the bottom; and it was lower at the southwestern ocean-side stations and higher at the northeastern land-side stations (in August 1958, FUSE and HARADA, 1960). The chlorinity was 18.44–18.93‰ at surface and higher at the lower temperature stations and lower at the higher temperature stations.

In late autumn, the water temperature was 20.28–23.14°C at surface and lower near the entrance to the bay and became higher toward the southeast. The chlorinity was 14.35–18.96‰ at surface and higher by up to 0.3‰ near the bottom in the bay proper. In the cove of Mori, the surface water chlorinity was lower by 4.42 ‰ than the bottom water (in November 1956; FUSE, YAMAZI and HARADA, 1958).

The hydrographical condition of the spring season observed by the present writers shows some resemblance to that of the summer season when the southerly wind is dominant. On the contrary, the condition in November 1956 is evidently affected by the influx from the northwest.

Both inorganic phosphate and silicate decreased toward the ocean side of the bay, and from the surface to bottom in November 1956 (FUSE, YAMAZI and HARADA, 1958), while they increased from the surface toward the bottom in August 1958 (FUSE and HARADA, 1960).

## Thanatocoenoses

The foraminiferal fauna in Tanabe Bay shares characteristics common to other faunas in the inlets on the coast of Southwestern Japan influenced by the warm current Kuroshio; the most striking is a high population of very numerous species, especially tropical and subtropical.

In Tanabe Bay, 239 benthonic foraminifers were recognized in this work. The calcareous Miliolidae is represented most abundantly, with 13 genera of which *Quinqueloculina* is the most abundant genus with 28 species and followed by *Triloculina* with 10 species.

The Discorbidae is also rich with 10 genera; *Rosalina* is the most significant genus with 9 species.

Among the arenaceous forms, the Textulariidae is the most significant with the prominent genus *Textularia* represented by more than 13 species, and followed by the genus *Trochammina* with more than 4 species.

The larger numbers of species were found at Station 82 (114 spp.), 84 (110 spp.) and 61 (96 spp.) in the southern part of the bay mouth; while the smaller numbers of species, at Stations 34 (21 spp.), 31 (31 spp.) and 28 (39 spp.) in the innermost part or coves of the bay. In general, the number of species decreases toward the inner part of the bay exclusive of Station 20 where an exceptionally large number of species (111 spp.) was found. Probably this indicates that the station is greatly affected by the oceanic water. In the open sea area near the bay mouth, the number of species in the northern part was less than in the southern part (Table 2).

BANDY (1954) in his study of the shallow water Foraminifera in the Gulf of Mexico, and UCHIO (1960) in his ecological study of the living benthonic Foraminifera from San Diego, California arrived at the same conclusion that the number of species increases with the distance from the shore due to the more rapid sedimentation in the nearshore waters and to the fairly stable chlorinity in the offshore waters. The same tendency is suggested in Tanabe Bay, too.

The size of population of the original samples (20 g aliquot of respective wet samples) was large in the bay mouth region, especially in its southern part as in the distribution of the number of species.. The least population was found at Stations 51 and 34. St. 51 is situated near the estuary of the Aizu River and St. 34 in Mori Harbor, both affected by the fresh water inflow. At these stations, some change was

Table 2. Distribution of Foraminiferal populations and species in Tanabe Bay (in 20 g aliquot).

| St. No. | 98 | 97 | 82 | 84 | 75 | 61 | 55 |
|---|---|---|---|---|---|---|---|
| Total population | 6,474 | 679 | 14,259 | 14,723 | 3,146 | 31,086 | 4,608 |
| Living population | 66 | 2 | 33 | 140 | 180 | 190 | 42 |
| Living/Total Ratio (%) | 1.02 | 0.29 | 0.23 | 0.95 | 5.72 | 0.61 | 0.91 |
| Total species | 83 | 42 | 114 | 110 | 57 | 96 | 54 |
| Living species | 3 | 1 | 1 | 4 | 6 | 2 | 2 |
| Living/Total Ratio (%) | 3.6 | 2.4 | 0.9 | 3.6 | 10.5 | 2.1 | 3.7 |

| St. No. | 51 | 47 | 20 | 31 | 28 | 26 | 34 |
|---|---|---|---|---|---|---|---|
| Total population | 584 | 6,902 | 7.261 | 911 | 1,190 | 1,799 | 557 |
| Living population | 57 | 110 | 104 | 60 | 190 | 270 | 138 |
| Living/Total Ratio (%) | 9.76 | 1.59 | 1.43 | 6.59 | 19.67 | 14.91 | 24.72 |
| Total species | 54 | 81 | 111 | 31 | 39 | 47 | 21 |
| Living species | 9 | 4 | 7 | 8 | 11 | 9 | 7 |
| Living/Total Ratio (%) | 16.7 | 6.2 | 6.3 | 25.8 | 28.2 | 19.1 | 33.3 |

recognized in composition of the foraminiferal population.

The poor population at Station 97 in the northwest part of the bay near the mouth (less than 1000 per 20 g aliquot) may be due to the special sediment composition consisting of clean, coarse shell-sand but scarcely containing organic materials available as food for bethonic organisms (Sverdrup and others, 1942).

Said (1951), in his study of the Foraminifera of Narragansett Bay, noted the general increase of individual number away from the open ocean. He further referred to the possibility that Morishima's finding in Ago Bay (*op. cit.*) which is contrary to his, would be substantially altered if the planktonic foraminifers were not counted. In Tanabe Bay, as mentioned above, the population size of both live and dead benthonic foraminifers decreases with the distance from the open sea and the bay mouth toward the inner part of the bay, as shown in Morishima's finding.

*Distribution of species*: Each foraminiferal species was found to have its own characteristic distributional area in the bay. Some were restricted within narrow protected area, while others were found having wider distributions. To get more detailed distributional pattern of respective species, it is necessary to do with much more sediment samples from further additional stations. However, the outline of the distribution of each studied species may be presented safely as follows (Table 3, Fig. 3).

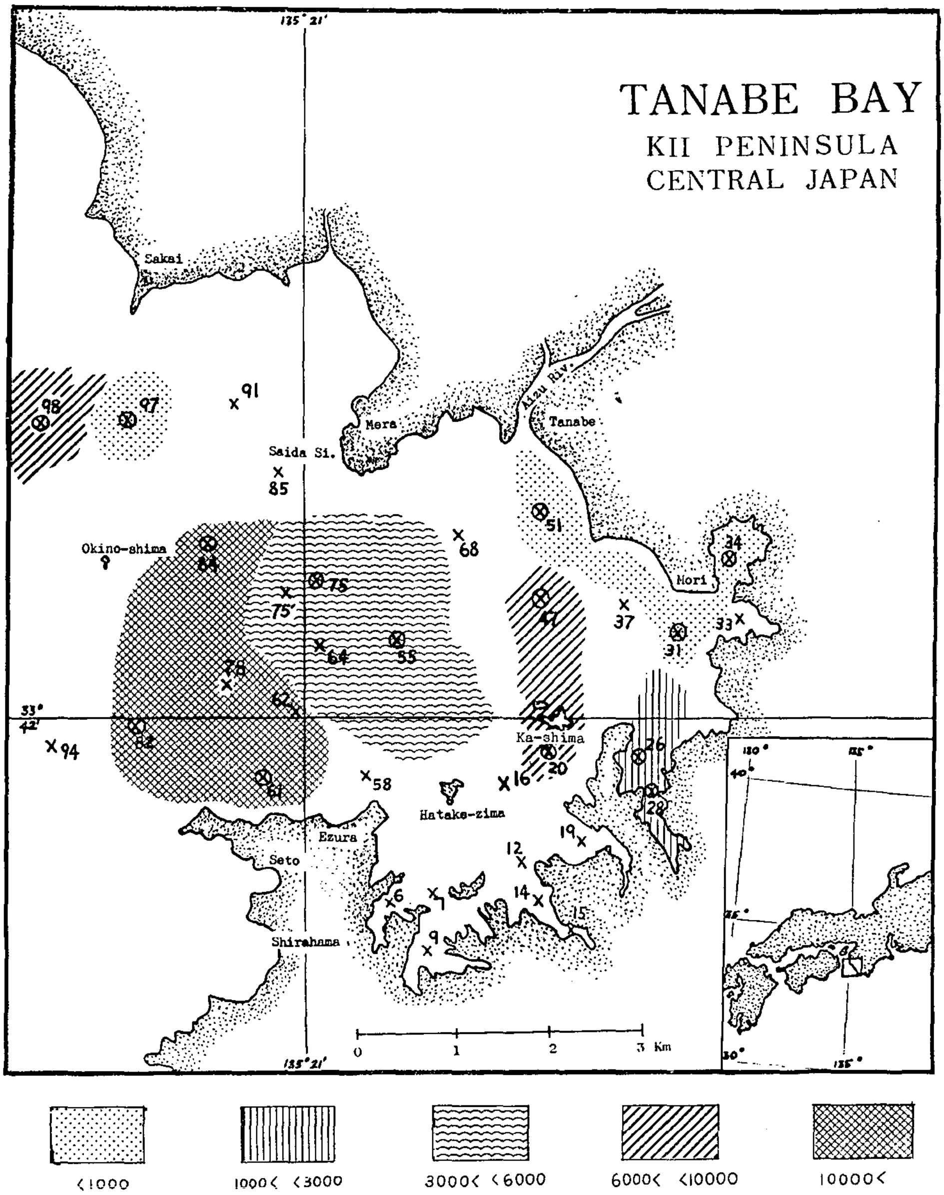



Fig. 3. Distribution of the total population of benthonic Foraminifera in Tanabe Bay (in 20 g aliquat).

1) The species found most widely throughout the studied area are:—*Ammonia beccarii* "forma A", *Elphidium advena, E. crispum, E. hispidulum, E. jenseni, E. matagordanum, Florilus grateloupi, Gavelinopsis* cf. *praegeri, Glabratella patelliformis, Globocassidulina subglobosa, Lagena striata, Miliolinella oblonga, Quinqueloculina laevigata, Q. seminulum, Rosalina floridana, R. globularis,* and *Trochammina globigeriniformis.* Of these species, *A. beccarii* "from A" is dominant in the coves. *T. globigeriniformis* and *Q. seminulum* are distributed uniformly all over the area. Other species are abundantly distributed near the mouth of the bay, but decreasing in number toward the inner part of the bay.

2) The species found widely in the bay but absent in the coves, are:—*Anomalina globulosa, Bolivina glutinata, B. robusta, Brizalina striatula, Bulimina marginata, Cibicides pseudoungerianus, Discorbis mira, Hanzawaia nipponica, Hauerina bradyi, H. pacifica, Miliolinella circularis, Neoconorbina terquemi, Planorbulina* cf. *mediterranensis, Quinqueloculina bradyana, Q. candeiana, Q. granulosa, Q. vulgaris, Rosalina concinna, R. vilardeboana, Spiroloculina corrugata, Triloculina affinis,* etc. Most of these species are abundant in the open sea area.

3) The following species are found in the open sea to central part of the bay, but absent in the inner part of the bay:—*Amphistegina radiata, Brizalina seminuda, Cibicides lobatulus, C. refulgens, C. subhaidingerii, Glabratella australensis, G. opercularis, G. opercularis nakamurai, Nonionellina labradorica, Pyrgo denticulata, Quinqueloculina bicornis, Q. contorta, Q. parkeri, Reussella aculeata, Textularia candeiana, T. conica, T. secasensis, Uvigerina proboscidea, Vertebralina striata.* Among these species, *C. subhaidingerii* and *A. radiata* are dominant in the open sea, while others are rich in the bay mouth area.

4) The following species are restricted in the open sea to the bay mouth area:—*Amphistegina madagascariensis, Bolivina subangularis, Calcarina hispida, Gaudryina robusta, Gyroidina soldanii, Heterostegina glutinata, Operculina ammonoides, Poroeponides cribrorepandus, Quinquiloculina agglutinata, Q. bicarinata, Q. crassa, Textularia articulata, T. pseudogramen, Triloculina sabangularis,* etc.

5) The species widely distributed in the bay but absent in the open sea area:—*Ammomarginulina folicaeus, Ammonia beccarii tepida, Cyclogyra involvens, Elphidium translucens, Florilus japonicus, Fursenkoina pauciloculata, Loxostomoides durrandii, L. limbatum, Massilina inaequalis, Milonis nikobarensis, Nonionella miocenica, Pararotalia* cf. *imperatoria globosa, P. murrayi, Quinqueloculina agglutinnans, Q. bociana, Sigmoilopsis schlumbergeri, Textularia foliacea, Triloculina planciana, T. tricarinata,* etc. Among these species, *C. involvens, L. durrandii, L. limbatum, M. nikobarensis, Q.* cf. *agglutinans, Q. bosciana, T. foliacea, T. planciana* and *T. tricarinata* are absent in the coves. *A. foliaceus* and *F. pauciloculata* are particularly abundant in the bay mouth area, and *M. inaequalis* in the central part of the bay.

6) The following species are limited to the bay mouth area to the central part of the bay:—*Astrononion stelligerium, Bolivinella folium, Cassidulina laevigata, C.* cf. *minuta, Cibicides aknerianus, Cymbaloporetta bradyi, Epistominella tamana, Fissurina marginata,*

*Glabratella* cf. *pulvinata, Hauerina frigilissima, H. orientalis, Pseudorotalia gaimardii, Quinqueloculina elongata, Q. lamarckiana, Q. sulcata, Triloculina oblonga, Wiesnerella auriculata,* etc.

7) The flowing species are found only in the bay mouth area:—*Discorbinella auraucana, Gaudryina subglabrata, Pattelina corrugata, Quinqueloculina poeyana,* etc.

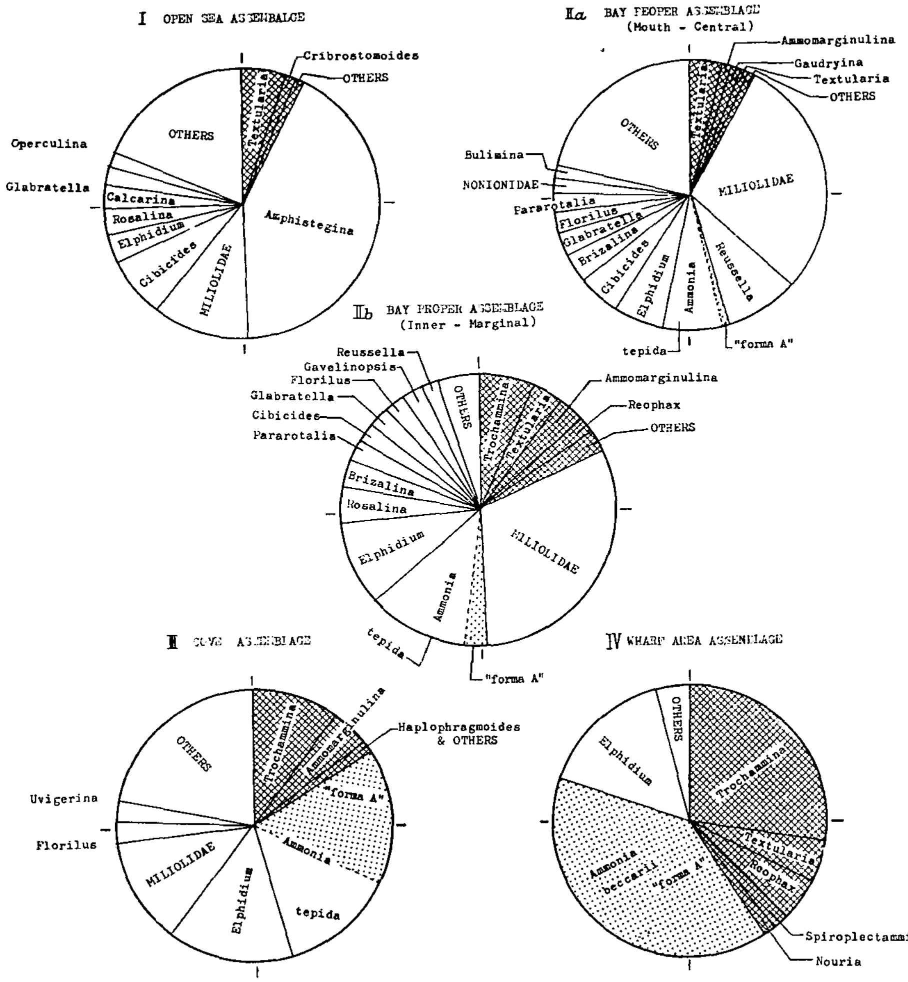



Fig. 4. Foraminiferal assemblages in Tanabe Bay.

8) The species found in the bay but absent in the open sea and the bay mouth area, are:—*Bulimina aculeata, Martinottiella bradyana, Massilina planata, Nourina polymorphinoides, Textularia crecentiformis, Uvigerina* cf. *carinata,* etc. Of these species, *N. polymorphinoides* and *M. bradyana* are restricted within the coves.

*Assemblages*: Four regional assemblages may be defined in Tanabe Bay on the distribution and abundance of the above mentioned species. They are given in Text-fig. 4 which shows the composition of each of these four assemblages.

I. Open sea assemblage (Text-fig. 4, I)

This assemblage found at Stations 97 and 98, is characterized by the abundance of *Amphistegina* (mainly *A. madagascariensis* or *A. radiata*), accompanied by *Cibicides* (dominant species: *C. pseudoungerianus, C. refulgens, C. subhaidingerii*), *Calcarina hispida, Elphidium* (manily *E. crispum*), *Glabratella* (mainly *G. opercularis* or *G. opercularis nakamurai*), *Operculina ammonoides,* and *Rosalina.*

*Heterostegina glutinata, Quinqueloculina agglutinans, Q. bicarinata, Sorites marginalis, Textularia articulata* are also comprised in this assemblage. The arenaceous form found in this assemblage is mainly *Textularia.*

This assemblage is seemingly comparable with the *Amphistegina lessonii* assemblage defined by Uchio (1962) on the beach sand sample collected at Seto of this vicinity. As he did not give any taxonomic discussion of his species, *A. lessonii,* nor its illustration, it is very unfortunately impossible at present to check our *Amphistegina* with his *A. lessonii.* We identified our forms with *A. madagascariensis* and *A. radiata* described by Todd (1965).

II. Bay proper assemblage (Text-fig. 4, IIa & IIb)

The assemblage found in the main part of the bay is characterized by the abundance of Miliolidae and a considerably high percentage of *Ammonia beccarii tepida. Elphidium* (dominant species: *E. matagordanum, E. hispidulum, E. advena*), *Brizalina* (dominant species: *B. seminuda, B. striatula*), *Cibicides* (dominant species: *C. lobatulus, C. pseudoungerianus, C. refulgens*), *Gavelinopsis* cf. *praegeri, Glabratella* (dominant species: *G. opercularis, G. opercularis nakamurai, G. patteliformis*), *Florilus* (mainly *F. japonicus*), *Pararotalia murrayi, Quinqueloculina* (dominant species: *Q. bradyana, Q. laevigata, Q. granulosum, Q. vulgaris*), *Reussella aculeata,* and *Rosalina* (mainly *R. floridana* and *R. globularis*) are important calcareous members of this assemblage. Significant arenaceous forms are *Ammomarginulina foliaceus, Gaudryina, Textularia* and *Trochammina.*

This assemblage can be subdivided into two facies, the mouth-central facies and the inner-marginal facies.

The mouth-central facies seems to be extending through Stations 85, 82, 75, 61, 55, etc. situated in the area from the mouth to the central part of the bay. It is characterized by rich species, by the low percentage of *Trochammina* and *Ammonia,* and also by the very low ratio *Ammonia beccarii* "forma A" to *A. beccarii tepida* (1:9 on an average). *Astrononion stelligerum, Bolivinella folium, Cymbaloporetta bradyi, Quinqueloculina lamarckiana,* etc. are restricted in this facies.

The other facies is distributed in the inner-marginal part of the bay including Stations 51, 47, 31, 20, etc., and characterized by a little increase of arenaceous forms, especially of *Trochammina* (mainly *T. globigeriniformis*). The frequency of

*Ammonia* increases remarkably in this facies and the ratio *Ammonia beccarii* "forma A" to *A. beccarii tepida* shows here a little increase, too (1:6 on an average).

III. Cove assemblage (Text-fig. 4, III)

This assemblage seems to be distributed in the coves of the bay, as seen actually at Stations 26 and 28. It consists of *Ammonia* (mainly *A. beccarii tepida* and *A. beccarii* "forma A"), *Elphidium* (dominant species: *E. advena, E. hispidulum, E. incertum, E. translucens,* etc.) and arenaceous forms (mainly *Trochammina globigeriniformis* and *Ammomarginulina foliaceus*) and is characterized by the sharp decrease of Miliolidae and increase of *Ammonia.* The frequency of *Ammonia beccarii* "forma A" shows here a value nearly equal to that of *A. beccarii tepida.*

IV. Wharf-area assemblage (Text-fig. 4, IV)

The assemblage found at Station 34 is particular in its composition. It is dominated by *Ammonia beccarii* "forma A" and arenaceous foraminifers, mainly *Trochammina globigeriniformis.* Other arenaceous species found commonly in the assemblage are: *Nouria polymorphinoides, Haplophragmoides canariensis, Reophax gracilis, Spiroplectammina biformis, Textularia* cf. *earlandi, Trochammina inflata. Elphidium advena* and *E. incertum* also occur in significant frequencies. The almost complete absence of *Ammonia beccarii tepida* in this assemblage is of particular interest, because the number of this subspecies increases steadily with the distance from the coves.

## Living Foraminifera

The distributional pattern of living specimens is referred here only to some species (Fig. 5). In general, the population distribution of living (stained) benthonic foraminifers in 20 g aliquot shows a pattern or tendency similar to those of the total foraminiferal population all over the bay, except in the inner-marginal area and coves where the total population is very small.

Text-figure 6 shows the size of total and living populations and the ratios living population to total population and living species to total species at each station.

At Stations 34, 26, 28, 31, and 51 situated in the inner-marginal area and the coves, the total population of foraminifers was very small as mentioned already, but it contained a considerable number of living individuals, though the number of living species included is relatively small as compared with populations in other parts of the bay. Here, a high ratio the living species to the total species is maintained. Such a poor population and a few species number in the inner-marginal area and coves may be due to the particular ecological condition of these areas, especially lower chlorinity and excess organic debris which will consume oxygen on one side and produce some harmfull substances such as methane or $H_2S$ on the other side. Consequently, these areas are occupied by the assemblage of particular foraminifers, predominated by *Ammonia beccarii tepida* and *A, beccarii* "forma A", accompanied

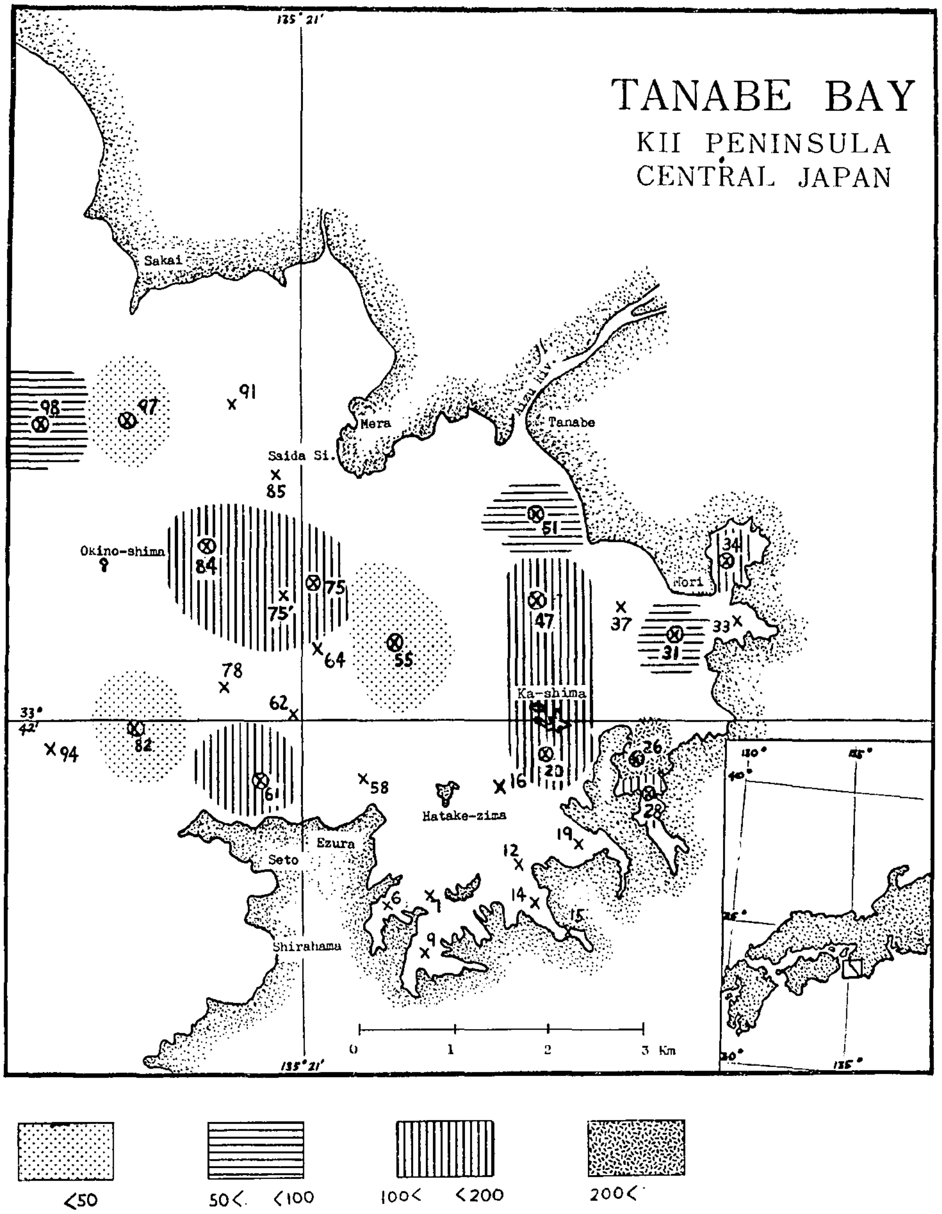



Fig. 5. Distribution of the living population of benthonic Foraminifera in Tanabe Bay (in 20 g aliquat).

with *Ammomarginulina foliaceus, Haplophragmoides* sp., *Textularia* cf. *earlandi, Trochammina globigeriniformis,* etc. Especially, it is remarkable that nearly 80% of the living foraminifers at Station 34 in the cove of Mori consisted of *Ammonia beccarii* "forma A".

The large living population found in these areas may be due to much less activity of the current and wave which otherwise may carry off the bottom sediments including living foraminifers and thus alter their distribution. Nevertheless, the dead population is relatively small there, this means less accumulation of dead tests in this area than in other areas. Such a phenomenon was recognized by PARKER and ATHEARN (1959) in the marsh in Poponesset Bay, Massachusetts. In that marsh,

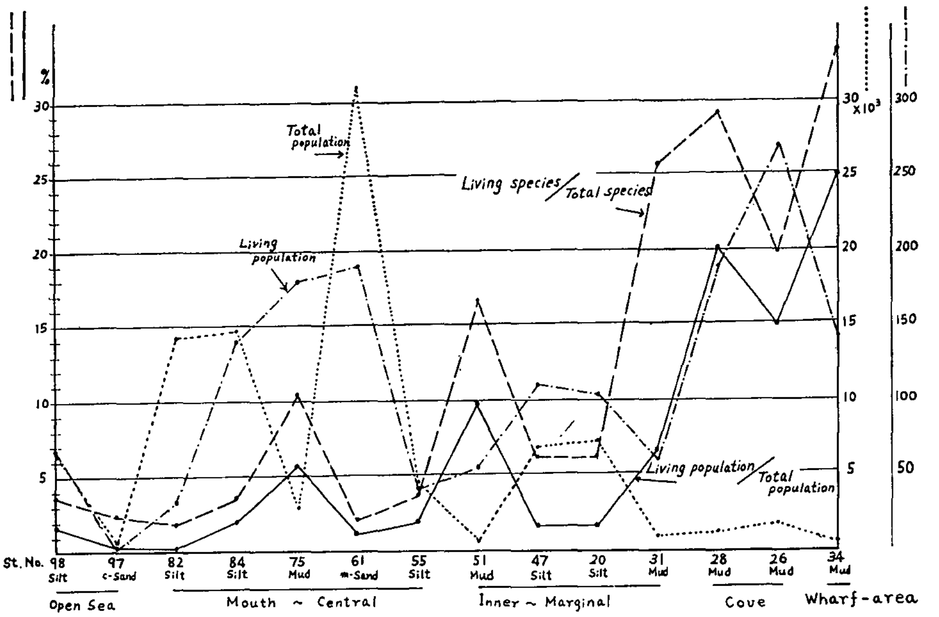



Fig. 6. Regional succession of the total (············) and living (—·—·—) foraminiferal populations, and of ratios-number of living species to total species (— — —) and living population to total population (———).

the calcareous foraminifers were represented for the most part by living specimens and very few dead ones were observed. They concluded that calcareous specimens were rapidly destroyed after death presumably due either to the ability of the living form to resist acidity or to a postulated increase in acidity immediately below the sediment surface, more probably the latter. The uniform value of pH of the bottom water measured by the writers in Tanabe Bay may supports the latter probability.

At Stations 84, 82, and 61, the total population was very large as shown in Fig. 6 and this resulted in the decline of the ratio the living population to total population and of the ratio the number of living species to that of the total species. The populations at Stations 98, 55, 47 and 20 were similarly found on the rather coarse sediment against the populations at Stations 84, 82 and 61 which were thriving in sands of fine to medium size. The large total populations including the small living populations may be due to a rapid accumulation of foraminiferal tests.

As in the case of thanatocoenoses, the areal distributions of some living foraminifers in Tanabe Bay are suggested as follows;

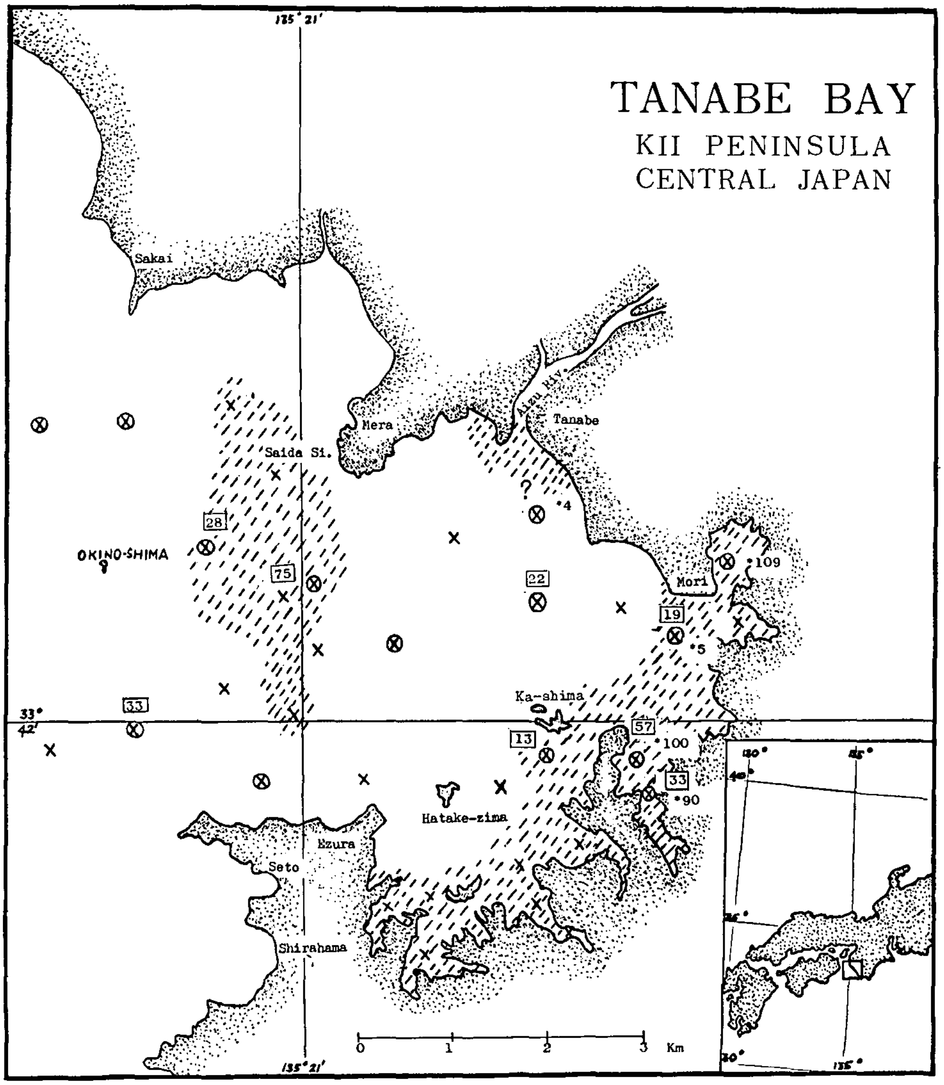



Fig. 7. Distribution of living *Ammonia beccarii tepida* and *Ammonia beccarii* "forma A". The numbers of specimens in 20 g aliquat. The numbers in square for *A. beccarii tepida* and those with asterisk for *A. beccarii* "forma A." In the region covered by broken lines the chlorinity of the bottom water was less than 19.11% in April, 1966, whereas in other parts of the bay it was higher than 19.11%.

*Amphistegina radiata* and *A. madagascariensis* are distributed in the open sea and the bay mouth area, together with *Operculina ammonoides, Textularia articulata*, etc.

*Ammomarginulina foliaceus* and *Ammonia beccarii tepida* are widely distributed all over the bay.

*Florilus japonicus* and *Trochammina globigeriniformis* are distributed in the central part to the coves, though their empty tests are found in the bay mouth area.

*Ammonia beccarii* "forma A", *Haplophragmoides canariensis,* and *Nonionella miocenica* are distributed in the innermost part of the bay, including coves.

*Ammonia beccarii tepida* and *A. beccarii* "forma A" have been very frequently found in the clay or mud beds intercalated in the Alluvium and the Pleistocene marine terrace deposits on the Pacific coast of Southwest Japan (CHIJI, 1963, 1964; Ariake Bay Res. Group, 1965; KONDA, 1967, etc.). The frequency of *Ammonia beccarii* and the distributions of the two varieties or subspecies and the ratio between the two in Tanabe Bay (Fig. 7) may be regarded as useful informations on the paleoecological or paleophysical conditions of the sedimentary environment in the Quaternary.

## Planktonic Foraminifera

Planktonic foraminifers were found in all samples examined, except the one from Station 34 in the cove of Mori. The distributions of planktonic foraminifers in the bay are shown in Fig. 8, the largest population (1515 specimens per 20 g aliquot) was found at Station 82 in the southern part of the bay mouth area. In general, the number of planktonic foraminifers in bottom sediments decreases towards the inner part of the bay. The complete absence of planktonic foraminifers in the cove of Mori may be due to the breakwater at the entrance to the cove, which will inhibit the inflow of the oceanic water.

This distribution pattern of extant planktonic foraminifers agrees with that of the open sea water influx in the bay in the summer season traced by FUSE and HARADA (1960) on the distributions of the water colour and transparency.

## Foraminiferal referrence list

The following is an alphabetical list of the Foraminifera species which are shown in systematically arranged plates of this paper. Any detailed taxonomic discussions or complete synonymy of respective species are not given, but a brief note on some questionable species.

### Benthonic Foraminifera

*Ammobaculites agglutinans* (D'ORBIGNY).–Pl. VI, fig. 3.

*Ammobaculites agglutinans*, BARKER, 1960; Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 66, pl. 33, figs. 19–21, 24–26,

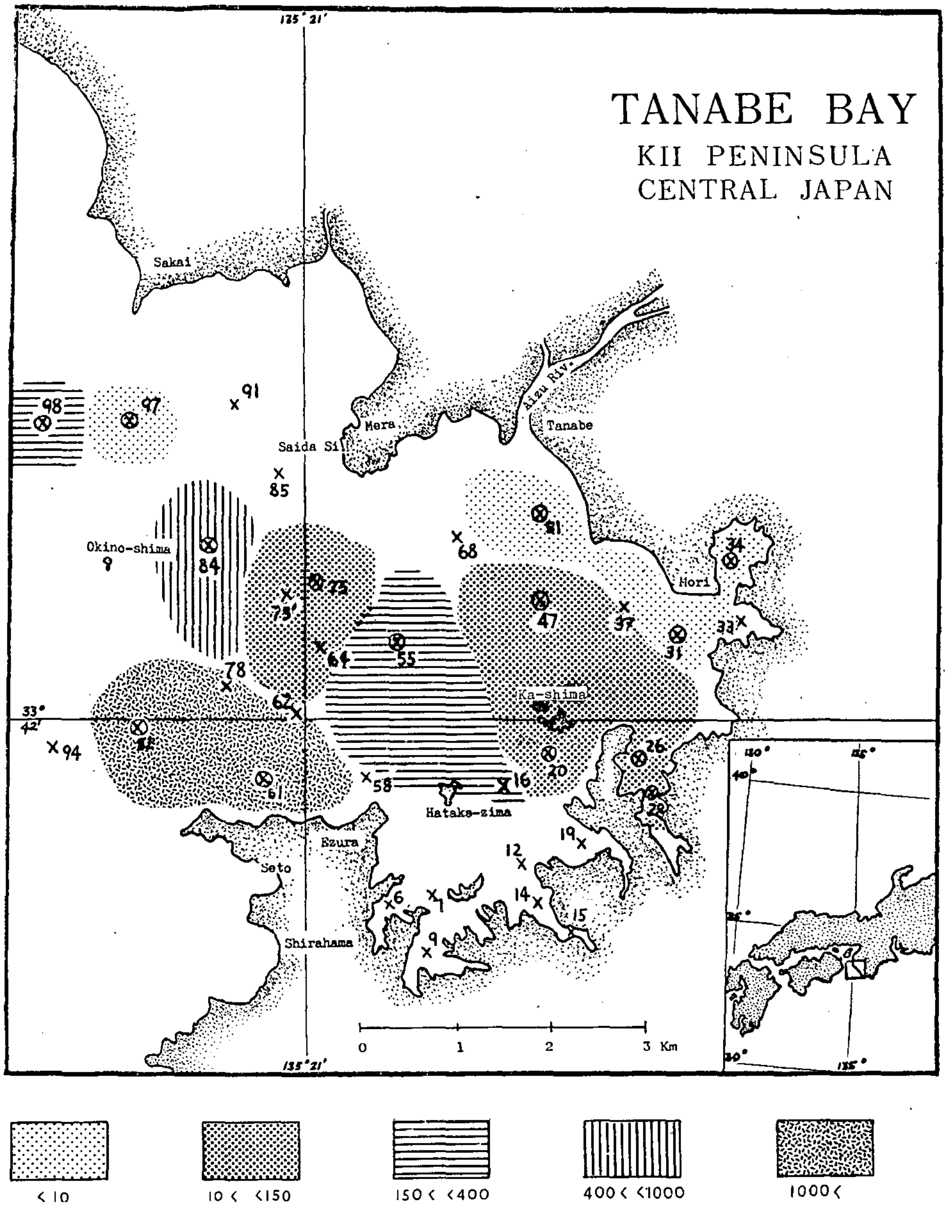



Fig. 8. Distribution of the total population of planktonic Foraminifera in Tanabe Bay (in 20 g aliquat).

*Ammomarginulina foliaceus* (BRADY).–Pl. VI, fig. 4.

*Ammobaculites* cf. *foliaceus*, CUSHMAN & STONE, 1949, Contr. Cush. Found. Foram. Res., vol. 25, pt. 4, p. 76, pl. 13, fig. 14.

*Ammomarginulina foliaceus*, BARKER, 1960, Taxonomic Note, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 68, pl. 33, figs. 20–25.

*Ammonia beccarii* (LINNÉ) var. *tepida* (CUSHMAN).—Pl. XII, figs. 3a, b, 4a, b.

*Rotalia beccarii* (LINNÉ) var. *tepida*, CUSHMAN, 1931, U.S. Nat. Mus. Bull. 104, pt. 8, p. 61, pl. 13, figs. 3a-c.

*Strebulus beccarii* (LINNÉ) var. *tepida*, TODD & BRONNIMANN, 1957, Cush. Found. Foram. Res., Spec. Publ. 3, p. 38, pl. 10, figs. 5–11.

*Strebulus beccarii* (LINNÉ) var. *tepida*, ANDERSEN, 1961, Geol. Bull., La. Geol. Surv., no. 35, pt. 2, p. 99, pl. 22, figs. 2a, b.

*Ammonia beccarii* (LINNÉ) "forma A"—Pl. XII, figs. 2a, b.

*Rotalia beccarii* (LINNÉ) var. A, ISHIWADA, 1958, Rept. Geol. Surv. Japan, no. 180, pl. 2, figs. 1–8.

*Strebulus beccarii*, CHIJI, 1963, Bull. Osaka Mus. Nat. Hist., no. 16, p. 65, pl. 7, figs. 4a, b.

*Strebulus beccarii* (LINNÉ) "forma A", CHIJI, 1964, Rept. Geol. Surv. Hamamatsu City (Hamamatsu City Government), pl. 1, figs. 9a–c, 11a, b.

The present form has no umbilical boss, the sutures are rather straight and radial, and limbate, slightly raised towards the peripheral margine on the ventral side. On the dosal side, the sutures are limbated and usually not raised. The periphery rounded and sometimes slightly lobulate in later stages of coiling. HOFKER (1951) separated *A. batavus* from *A. beccarii* i. a., as a smaller and less compressed form. The present form somewhat resembles *A. batavus* figured by FEYLING-HANSSEN (1964), which came from the Post Glacial deposits in the Oslofjord area.

*Amphistegina madagascariensis* D'ORBIGNY.—Pl. XIV, figs. 3a, b.

*Amphistegina madagascariensis*, TODD, 1965, U.S. Nat. Mus. Bull. 161, pt. 4, p. 34, pl. 11, fig. 3, pl. 12, figs. 1, 2.

*Amphistegina radiata* (FICHTEL & MOLL).—Pl. XIV, figs. 2a, b.

*Amphistegina radiata*, Todd, 1965, ibid., pt. 4, p. 34, pl. 13, figs. 1–3, pl. 14, figs. 1–3.

*Anomalina globulosa* CHAPMAN & PARR.–Pl. XV, figs. 15a, b.

*Anomalina globulosa*, BARKER, 1960, Taxonomic Note, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 194, pl. 94, figs. 4–5.

*Articulina conico-articulata* BATCH.—Pl. X, fig. 10.

*Articulina conico-articulata*, MILLETT, 1898, Jour. Roy. Micro. Soc., pt. 2, p. 511, pl. 12, figs. 9, 10.

*Astrononion stelligerium* (D'ORBIGNY).—Pl. XV, fig. 11.

*Astrononion stelligerium*, BARKER, 1960, Taxonomic Note, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 224, pl. 109, figs. 3, 4.

*Bolivina glutinata* EGGER.—Pl. X, fig. 13.

*Bolivina glutinata*, CUSHMAN, 1937, Cush. Lab. Foram. Res., Spec. Publ. 9, p. 137, pl. 16, fig. 25.

*Bolivina robusta* BRADY.—Pl. X, fig. 15.

*Bolivina robusta*, CUSHMAN, 1942, U.S. Nat. Mus. Bull. 161, pt. 3, p. 17, pl. 6, fig. 2.

*Bolivina subangularis* BARDY.—Pl. X, fig. 14.

*Bolivina subangularis*, CUSHMAN, 1937, Cush. Lab. Foram. Res., Spec. Publ. 9, p. 133, pl. 17, figs. 5–10.

*Brizalina seminuda* (CUSHMAN).—Pl. X, fig. 16.

*Bolivina seminuda*, CUSHMAN, 1937, Cush. Lab. Foram. Res. Spec. Publ. 9, p. 142, pl. 18, figs. 13–15.

*Brizalina striatula* (CUSHMAN).—Pl. X, figs. 17, 18.

*Bolivina striatula*, CUSHMAN, 1937, ibid, p. 154, pl. 18, figs. 30, 31.

*Buliminella elegantissima* D'ORBIGNY.—Pl. X, fig. 12.

*Buliminella elegantissima*, BARKER 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 104, pl. 50, figs. 20, 21.

*Calcarina hispida* BRADY.—Pl. XII, figs. 8a, b.

*Calcarina hispida*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ. Geol. Sci., vol. 6, no. 2, p. 106, pl. 17, figs. 5–7.

*Cellanthus craticulatus* (FICHTEL & MOLL).—Pl. XIII, fig. 9.

*Polystomella craticulata*, CUSHMAN, 1914, U.S. Nat. Mus. Bull. 71, pt. 4, p. 34, pl. 19, figs. 4a–b.

*Elphidium craticulatum*, CUSHMAN, 1939, U.S. Geol. Surv., Prof. Paper 191, p. 56, pl. 15, figs. 14–17.

*Cibicides lobatulus* (WALKER & JACOB).—Pl. XIV, figs. 7a–b.

*Cibicides lobatula*, CUSHMAN, 1931, U.S. Nat. Mus. Bull. 104, pt. 8, p. 118, pl. 21, figs. 3a–c.

*Cibicides pseudoungerianus* (CUSHMAN).—Pl. XIV. figs. 5a, b.

*Cibicides pseudoungeriana*, CUSHMAN, 1931, ibid., p. 123, pl. 22, figs. 3–7.

*Cibicides refulgens* MONTFORT.—Pl. XIV, figs. 6a, b.

*Cibicides refulgens*, CUSHMAN, 1931, ibid., p. 116, pl. 21, figs. 2a–c.

*Cibicides subhaidingerii* PARR.—Pl. XIV, figs. 4a–c.

*Cibicides subhaidingerii*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 196, pl. 95, fig. 7.

*Cribrostomoides columbiense* (CUSHMAN).—Pl. VI, figs. 2a, b.

*Haplophragmoides columbiense*, CUSHMAN & MCCULLOCH, 1939, Allan Hancock Pacific Exped., vol. 6, no. 1, p. 72 pl. 5, figs. 8–10.

*Cyclogyra involvens* (REUSS).—Pl. VII, fig. 5,

*Cornuspira involvens*, CUSHMAN, 1921, U.S. Nat. Mus. Bull. 100, p. 389, pl. 77, figs. 3, 4.

*Cymbaloporetta bradyi* (CUSHMAN).—Pl. XIV, figs. 9a, b.

*Cymaloporetta bradyi*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 210, pl. 102, fig. 14.

*Elphidium advena* (CUSHMAN).—Pl. XIII, fig. 1.

*Elphidium advenum*, CUSHMAN, 1939, U.S. Geol. Surv. Prof. Paper 191, p. 60, pl. 16, figs. 31–35.

*Elphidium crispum* (LINNÉ).—Pl. XIII, fig. 2.

*Elphidium crispum*, CUSHMAN 1939, ibid., p. 50, pl. 13, figs. 17–21.

*Elphidium hispidulum* CUSHMAN.—Pl. XIII, fig. 3.

*Elphidium hispidulum* CUSHMAN, 1936, Contr. Cush. Lab. Foram. Res., vol. 12, p. 83, pl. 14, figs. 13a, b.

*Elphidium incertum* (WILLIAMSON).—Pl. XIII, fig. 7.

*Elphidium subincertum* ASANO, 1950, Ill. Cat. Japan. Tert. Smaller Foram., pt. 1, p. 10, figs. 56, 57.

*Elphidium incertum*, PHLEGER, 1952, Contr. Cush. Found. Foram. Res., vol. 3, p. 83, pl. 14, fig. 7.

*Elphidium incerutm*, LOEBLICH & TAPPAN, 1953, Smith. Misce. Coll., vol. 3, no. 7, p. 100.

LOEBLICH and TAPPAN (1953) gave a full discussion of *E. incertum* to make the confusion cease concerning its identification. Unfortunately they did not give any figure of the species, but indicated that the only American Arctic reference to *E. incertum* which possibly may be correctly identified is that of PHLEGER (1952), as it has the sutural slits converging at the umbilical depression. *E. subincertum* decribed by ASANO (1950) having several slit-like openings along the sutural depression is considered to be a synonym of the above-mentioned species figured by PHLEGER.

*Elphidium jenseni* (CUSHMAN),—Pl. XIII, fig. 5.

*Elphidium jenseni*, CUSHMAN, 1933, U.S. Nat. Mus. Bull. 161, pt. 2, p. 48, pl. 11, figs. 6, 7.

*Elphidium matagordanum* (KORNFELD).—Pl. XIII, fig. 6.

*Elphidium matagordanum*, PAKER, PHLEGER & PEIRSON, 1953, Cush. Lab. Foram. Res., Spec. Publ. 2, p. 8, pl. 3, figs. 24, 25.

*Elphidium striatopunctatum* (FICHTEL & MOLL) ?.—Pl. XIII, fig. 4.

*Polystomella striatopunctatus*, BRADY, 1884, Challenger Report, vol. 9, pl. 109, fig. 23.

BARKER (1960) tentatively referred this species to *E. incertum* for the reason that BRADY's specimen resembles *E. incertum* figured by MACFADYEN (1932) and PHLEGER (1952). However, the openings along the sutural depression are not slit-like in BRADY's specimen in later stages of coiling, but distinctly arched. Thus, BRADY's specimen is not likely identical with PHLEGER's specimen.

*Elphidium translucens* NATLAND.—Pl. XIII, fig. 8.

*Elphidium translucens*, CUSHMAN 1939, U.S. Geol. Surv. Prof. Paper 191, p. 65, pl. 20, figs. 7a, b.

*Florilus grateloupi* (D'ORBIGNY).—Pl. XV, figs. 9a, b.

*Nonion grateloupi*, CUSHMAN, 1939, ibid., p. 21, pl. 6, figs. 1–7.

*Florilus japonicus* (ASANO).—Pl. XV, figs. 10a, b.

*Pseudononion japonicum*, ASANO, 1950, Ill. Cat. Japan. Tert. Smaller Foram., pt.

1, p. 5, figs. 19–21.

*Fursenkoina pauciloculata* (BRADY).—Pl. XV, figs. 2a, b.

*Virgulina pauciloculata*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 106, pl. 52, figs. 4, 5.

*Gaudryina robusta* CUSHMAN.—Pl. VII, fig. 4.

*Gaudryina robusta*, CUSHMAN, 1921, U.S. Nat. Mus. Bull. 100, p. 152, pl. 30, figs. 1a–c.

*Gavelinopsis* cf. *preageri* (HERON-ALLEN & EARLAND).—Pl. XI, figs. 8a, b., 9a, b.

*Discorbis* (?) *preageri*, CUSHMAN, 1931, U.S. Nat. Mus. Bull. 104, p. 30, pl. 6, figs. 4a–c.

*Gavelinopsis praegeri*, HOFKER, 1951, Foram. Siboga Exped., pt. 3, p. 486, figs. 332–334.

*Glabratella australensis* (HERON-ALLEN & EARLAND).—Pl. XI, figs. 11a–c.

*Discorbis australensis*, ASANO, 1951, Ill. Cat. Japan. Tert. Smaller Foram. pt. 14, p. 2, figs. 6, 7.

*Pileolina* (?) *australensis*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 184, pl. 89, figs. 2–4.

*Glabratella opercularis* (D'ORBIGNY).—Pl. XI, figs. 12a b.

*Discorbis opercularis*, ASANO, 1951, Ill. Cat. Japan. Tert. Smaller Foram. pt. 14, p. 2, figs. 11–13.

*Pileolina* (?) *opercularis*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 184, pl. 89, figs. 8, 9.

*Glabratella opercularis* (D'ORBIGNY) *nakamurai* (ASANO).—Pl. XI, figs. 13a b.

*Discorbis nakamurai* ASANO, 1951, Ill. Cat. Japan. Tert. Smaller Foram. pt. 14, p. 2, figs. 8–10.

*Pileolina* (?) *opercularis nakamurai*, UCHIO, 1962, Publ. Seto Mar. Biol. Lab. vol. X, no. 1, p. 139.

*Glabratella patelliformis* (BRADY).—Pl. XI, figs. 10a, b.

*Discorbis patelliformis*, CUSHMAN, 1931, U.S. Nat. Mus. Bull. 104, pt. 8, p. 29.

*Pileolina* (?) *patelliformis*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Palenot. & Min. Spec. Publ. 9, p. 184, pl. 89, fig. 1.

*Globocassidulina subglobosa* (BRADY).—Pl. XV, figs. 5a, b.

*Cassidulina subgloboosa*, BARKER, 1960, ibid., p. 112, pl. 54, fig. 17.

*Hanzawaia nipponica* ASANO.—Pl. XV, figs. 14a, b.

*Hanzawaia nipponica* ASANO, 1944, Jour. Geol. Soc. Japan, vol. 51, no. 606, p. 99, pl. 4, figs. la, b, 2a, b.

*Hauerina fragilissima* (BRADY).—Pl. X, fig. 9.

*Hauerina fragilissima*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ. Geol. Sci., vol. 6, no. 2, p. 35, pl. 3, fig. 9.

*Hauerina pacifica* CUSHMAN.—Pl. X, fig. 8.

*Hauerina pacifica* CUSHMAN, 1917, U.S. Nat. Mus. Bull. 71, pt. 6, p. 64, pl. 21, fig. 2.

*Lagena striata* (D'ORBIGNY).—Pl. X, fig. 11.

*Lagena striata,* BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 118, pl. 57, figs. 19, 28.

*Loxostomoides durrandii* (MILLETT).—Pl. XV, fig. 3.

*Bolivina durrandii* MILLETT, 1900, Jour. Roy. Micro. Soc., pt. 9, p. 544, pl. 6, fig. 7.

*Loxostoma durrandii,* CUSHMAN, 1937, Cush. Lab. Foram. Res., Spec. Publ. 9, p. 191, pl. 22, fig. 6.

*Loxostomoides limbatum* (BRADY).—Pl. XV, fig. 4.

*Bolivina limbata,* MILLETT, 1900, Jour. Roy. Micro. Soc., pt. 9, p. 543,

*Loxostoma limbatum,* CUSHMAN, 1939, Cush. Lab. Foram. Res., Spec. Publ. 9, p. 186, pl. 21, figs. 26–29.

*Massilina inaequalis* CUSHMAN.—Pl. X, figs. la, b.

*Massilina inaequalis,* CUSHMAN, 1929, U.S. Nat. Mus. Bull. 104, pt. 6, p. 38, pl. 7, figs. 1, 2.

*Massilina planata* CUSHMAN.—Pl. X, fig. 2.

*Massilina planata* CUSHMAN, 1932, U.S. Nat. Mus. Bull. 161, p. 31, pl. 8, figs. 8a, b.

*Melonis nicobarense* (CUSHMAN).—Pl. XV, fig. 13.

*Nonion nicobarensis* CUSHMAN, 1936, Contr. Cush. Lab. Foram. Res., vol. 12, p. 67 pl. 12, figs. 9a, b.

*Miliolinella circularis* (BORENEMANN).—Pl. X, figs. 3a, b, 4.

*Miliolina circularis,* MILLETT, 1898, Jour. Roy. Micro. Soc., pt. 14, p. 499, pl. 11, figs. 1a–c, 3a–c.

*Triloculina circularis,* CUSHMAN, 1917, U.S. Nat. Mus. Bull. 71, pt. 6, p. 67, text fig. 33; pl. 25, figs. 4a–c; pl. 26, figs. 1a–c.

*Miliolinella circularis,* ASANO, 1951, Ill. Cat. Japan. Tert. Smaller Foram. pt. 6, p. 9, figs. 65–67.

*Miliolinella oblonga* (MONTAGU).—Pl. X, fig. 5.

*Miliolinella oblonga,* ASANO, 1951,ibid., pt. 6, p. 10, figs. 68, 69.

*Neoconorbina terquemi* (RZEHAK).—Pl. XI, figs. la, b.

*Neoconorbina terquemi,* ANDERSEN, 1961, Geol. Bull., La. Geol. Surv., no. 35, pt. 2, p. 102, pl. 21, figs. 5a, b.

*Nonion japonicum* ASANO.—Pl. XV, fig. 6.

*Nonion japonicum* ASANO, 1938, Jour. Geol. Soc. Japan, vol. 45, no. 538, p. 593, pl. 15, figs. la, b, 2a, b.

*Nonionella miocenica* CUSHMAN,—Pl. XV, fig. 7.

*Nonionella miocenica* CUSHMAN, 1962, Contr. Cush. Lab. Foram. Res., vol. 2, pt. 3, p. 64.

*Nonionella pulchella* HADA.—Pl. XV, fig. 8.

*Nonionella pulchella* HADA, 1931, Tohoku Imp. Univ. Sci. Rept., ser. 4, vol. 6, p. 120, fig. 79.

*Nonionellina labradorica* (DAWSON).—Pl. XV, fig. 12.
*Nonion labradorica*, CUSHMAN, 1930, U.S. Nat. Mus. Bull. 104, pt. 7, p. 11, pl. 4, figs. 6–12.
*Nonion labradoricum*, CUSHMAN, 1939, U.S. Geol. Surv. Prof. Paper 191, p. 23, pl. 6, figs. 13–16.

*Operculina ammonoides* (GRONOVIUS).—Pl. XIII, fig. 10.
*Operculina gaimardi*, CUSHMAN, 1933, U.S. Nat. Mus. Bull. 161, pt. 2, p. 55, pl. 13, figs. 1–5.
*Operculina ammonoides*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 76, pl. 12, figs. 1, 2a, b.

*Pararotalia* cf. *imperatoria* (D'ORBIGNY) var. *globosa* (MILLETT).—Pl. XII, figs. 5a–c.
*Discorbina imperatoria* D'ORBIGNY var. *globosa* MILLETT, 1903, Jour. Roy. Micro. Soc., pt. 12, p. 701, pl. 7, fig. 6a–c.

*Pararotalia murrayi* (HERON-ALLEN & EARLAND).—Pl. XII, figs. 6a, b.
"*Rotalia*" *murrayi*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 100, pl. 15, figs. 5a–c.

*Patellina corrugata* WILLIAMSON.—Pl. XII, figs. 1a, b.
*Patellina corrugata*, BRADY, 1884, Challrenger Rept., vol. 9, p. 634, pl. 86, figs. 1–7.

*Planorbulina* cf. *mediterranensis* D'ORBIGNY.—Pl. XIV, figs. 8a, b.
*Planorbulina mediterranensis*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 109, pl. 92, figs. 1–3.

*Pseudorotalia gaimardii* (D'ORBIGNY).—Pl. XII, figs. 7a–c.
*Sterbulus gaimardii*, BARKER, 1960, ibid., p. 218, pl. 106, figs. 9a–c.

*Pyrgo denticulata* (BRADY).—Pl. VIII, fig. 2.
*Pyrgo denticulata*, CUSHMAN 1929, U.S. Nat. Mus. Bull 104, pt. 6, p. 69, pl. 18, figs. 3, 4.

*Quinqueloculina agglutinans* D'ORBIGNY.—Pl. VIII, figs. 3a, b.
*Quinqueloculina agglutinans*, CUSHMAN, 1917, ibid., Bull. 71, pt. 6, p. 42, pl. 9, figs. 1a–c.

*Quinoqueloculina bicarinata* D'ORBIGNY.—Pl. VIII, figs. 4a–c.
*Quinqueloculina bicarinata*, CUSHMAN, 1921, ibid., Bull. 100, p. 428, pl. 86, figs. 2, 3; pl. 100, fig. 7.

*Quinqueloculina bicornis* (WALKER & JACOB).—Pl. VIII, figs. 5a, b.
*Quinqueloculina bicornis*, CUSHMAN, 1921, ibid., Bull. 104, p. 32, pl. 5, figs. 5–7; pl. 6, figs. 1, 2.

*Quinqueloculina bosciana* D'ORBIGNY.—Pl. VIII, figs. 6a, b.
*Miliolina bosciana*, MILLETT, 1889, Jour. Roy. Micro. Soc., pt. 6, p. 267, pl. 6, figs. 1a, b.
*Quinqueloculina bosciana*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 43, pl. 5, figs. 3a–c.

*Quinqueloculina bradyana* CUSHMAN.—Pl. VIII, figs. 7a, b.

*Quinqueloculina bradyana*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 12, pl. 6, figs. 6–8.

*Quinqueloculina candeiana* D'ORBIGNY.—Pl. VIII, figs. 8a, b.

*Quinqueloculina candeiana*, CUSHMAN, 1929, U.S. Nat. Mus. Bull. 104, pt. 6, p. 27, pl. 3, figs. 1a–c.

*Quinqueloculina contorta* D'ORBIGNY.—Pl. VIII, figs. 9a–c.

*Quinqueloculina contorta*, ASANO, 1951, Ill. Cat. Japan. Tert. Small. Foram., pt. 6, p. 3, figs. 11–13.

*Quinqueloculina elongata* NATLAND,—Pl. VIII, fig. 10.

*Quinqueloculina elongata*, ASANO, 1959, ibid., pt. 6, p. 4, figs. 20–22.

*Quinqueloculina granulosa* NATLAND.—Pl. VIII, figs. 11a, b.

*Quinqueloculina granulosa* NATLAND, 1938, Scripps Inst. Oceanogr., Bull., vol. 4, no. 5, p. 141. (Ellis & Messina; Catalogue of Foraminifera)

*Quinqueloculina laevigata* D'ORBIGNY.—Pl. VIII, figs 12a, b, 13a, b.

*Quinqueloculina laevigata*, CUSHMAN, 1929, U.S. Nat. Mus. Bull. 104. pt. 6, p. 30, pl. 4, figs. 3a–c.

*Quinqueloculina lamarckiana* D'ORBIGNY.—Pl. VIII, figs. 14a, b.

*Quinqueloculina lamarckiana*, CUSHMAN, 1929, ibid., Bull. 104, pt. 6, p. 26, pl. 2, figs. 6a–c.

*Quinqueloculina* cf. *lata* TERQUEM.—Pl. IX, figs. 1a, b.

*Quinqueloculina lata*, CUSHMAN, 1944, Cush. Lab. Foram. Res., Spec. Publ. 12, p. 14, pl. 2, fig. 16.

*Quinqueloculina limbata* D'ORBIGNY.—Pl. IX, figs. 2a, b.

*Quinqueloculina limbata*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 45, pl. 5, figs. 14a–c.

*Quinqueloculina parkeri* (BRADY).—Pl. IX, figs. 4a, b.

*Quinqueloculina parkeri*, CUSHMAN, 1921, U.S. Nat. Mus. Bull 100, vol. 4, p. 440, pl. 86, figs. 4a–c.

*Quinqueloculina poeyana* D'ORBIGNY.—Pl. IX, figs. 3a, b.

*Quinqueloculina poeyana*, GRAHAM & MILITANTE, 1959, Stanford Univ. Pbul., Geol. Sci., vol. 6, no. 2, p. 46, pl. 5, figs. 16a–c.

*Quinqueloculina reticulata* (D'ORBIGNY).—Pl. IX, figs. 5a–c.

*Quinqueloculina reticulata*, ASANO, Ill. Cat. Japan. Tert. Small. Foram., pt. 6, p. 6, figs. 35, 36.

*Quinqueloculina seminulum* (LINNÉ).—Pl. IX, figs. 6a, b.

*Quinqueloculina seminulum*, ASANO, 1951, ibid., pt. 6, p. 7, figs. 43–45.

*Quinqueloculina subagglutinata* ASANO.—Pl. IX, figs. 8a–c.

*Quinqueloculina subagglutinata* ASANO, 1956, Sci. Rept., Tohoku Univ., ser. 2, vol. 27, p. 62, pl. 8, fig. 12.

*Quinqueloculina sulcata* D'ORBIGNY.—Pl. IX, figs. 7a, b.

*Quinqueloculina sulcata*, CUSHMAN, 1932, U.S. Nat. Mus Bull. 161, pt. 1, p. 28, pl. 7, figs. 5–8.

*Quinqueloculina vulgaris* D'ORBIGNY.—Pl. IX, figs. 9a–c.

*Quinqueloculina vulgaris*, CUSHMAN, 1929 ibid., Bull. 104, pt. 6, p. 25, pl 2, figs 3a–c.

*Reophax gracilis* (KIAER).—Pl. VI, fig. 1.

*Reophax grasilis*, HADA, 1931, Sci. Rept., Tohoku Imp. Univ., ser. 4, vol. 6, no. 1, p. 61, fig. 13.

*Reussella aculeata* CUSHMAN.—Pl. X, fig. 19.

*Reussella aculeata* CUSHMAN, 1945, Contr. Cush. Lab. Foram. Res., vol. 21, pt. 2, p. 41, pl 7, figs. 10, 11.

*Rosalina concinna* (BRADY).—Pl. XI, figs. 3a, b.

*Rosalina concinna*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 186, pl. 90, figs. 7, 8.

*Rosalina floridana* (CUSHMAN).—Pl. XI, figs. 5a, b.

*Discorbis floridana*, CUSHMAN, 1931, U.S. Nat. Mus. Bull. 104, pt. 8, p. 21, pl. 4, figs. 7, 8.

*Discorbis candeiana*, GRAHAM & MILETANTE, 1959, Stanford Univ Pabl., Geol. Sci., vol. 6, no. 2, p. 93, pl. 13, fig. 22.

*Rosalina floridana*, TODD, 1965, U.S. Nat. Mus. Bull. 161, pt. 4 p. 10, pl. 3, figs. 1, 3; pl. 4, fig. 5.

*Rosalina globularis* D'ORBIGNY.—Pl. XI, figs. 2a, b.

*Discorbis globularis*, CUSHMAN, 1915, U.S. Nat. Mus. Bull. 71, pt. 5, p. 11, pl. 9, figs. 4a–c.

*Rosalina gobularis*, TODD, 1965, ibid., Bull. 161, pt. 4, p. 11, pl. 13, fig. 4.

*Rosalina rugosa* D'ORBIGNY.—Pl. XI, figs. 4a, b.

*Discorbis rugosa*, GRAHAM & MILETANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 94, pl. 14, figs. 1, 2.

*Rosalina rugosa*, TODD, 1965, U.S. Nat. Mus. Bull. 161, pt. 4, p. 12, pl. 4, fig. 1.

*Rosalina subbertheloti* (CUSHMAN).—Pl. XI, fig. 7.

*Rosaliua subbertheloti*, TODD, 1965, ibid., Bull 161, pt. 4, p. 13, pl. 4, fig. 4.

*Rosalina vilardeboana* D'ORBIGNY.—Pl. XI, figs. 6a, b.

*Rosalina vilardeboana*, TODD, 1965, ibid., Bull. 161, pt. 4, p. 13, pl. 3, figs. 2, 5.

*Scutuloris* sp. A.—Pl. X, figs. 6a–c, 7a–c.

*Sigmavirgulina tortuosa* (BRADY).—Pl. XV, fig. 1.

*Bolivina tortuosa*, CUSHMAN, & MCCULLOCH, 1942, Allan Hancock Pacific Expd. vol. 6, no. 4, p. 220, pl. 27, fig. 12.

*Sigmavirgulina tortuosa*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 87, pl. 13, figs. 6, 7a, b.

*Sigmoilopsis schlumbergeri* (SILVESTRI).—Pl. VII, fig. 9.

*Sigmoilopsis schlumbergeri*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 16, pl. 8, figs. 1–4.

*Spiroloculina corrugata* CUSHMAN & TODD.—Pl. VII, fig. 7.
*Sprioloculina corrugata* CUSHMAN & TODD, 1944, Cush. Lab. Foram. Res., Spec. Publ. 11, p. 61, pl. 8, figs. 22–25.

*Spiroplectammina biformis* (PARKER & JONES).—Pl. VI, fig. 5.
*Spiroplectammina biformis*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 92, pl. 45, figs. 25, 27.

*Textularia articulata* D'ORBIGNY.—Pl. VI, figs. 12a, b.
*Textularia articulata*, ASANO, Ill. Cat. Japan. Tert. Small. Foram., pt. 3, p. 3, figs. 9, 10.

*Textularia calva* LALICKER.—Pl. VI, figs. 13a, b.
*Textularia calva*, LALICKER & MCCULLOCH, 1940, Allan Hancock Pacific Exped., vol. 6, no. 2, p. 120, pl. 13, figs. 6a–d.

*Textularia candeiana* D'ORBIGNY.—Pl. VI, figs. lla, b.
*Textularia candeiana*, CUSHMAN, 1930, U.S. Nat. Mus. Bull. 161, pt. 1, p. 9, pl. 2, figs. 4a, b.

*Textularia conica* D'ORBIGNY.—Pl. VI, figs. 8a, b.
*Textularia conica*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 88, pl. 43, figs. 13, 14.

*Textularia* cf. *earlandi* PARKER.—Pl. VI, fig. 10.
*Textularia earlandi*, ARNAL, 1958, Contr. Cush. Found. Foram. Res., vol. 9, pt. 2, p. 42, pl. 9, figs. 1–3.

*Textularia kerimbaensis* SAID.—Pl. VI, figs. 9a, b.
*Textularia corrugata*, CUSHMAN, 1932, U.S. Nat. Mus. Bull. 161, pt. 1, p. 12, pl. 3, figs. 2, 4.
*Textularia kerimbaensis* SAID, 1949, Cush. Lab. Foram. Res., Spec. Publ. 26, p. 6, pl. 1, fig. 8.

*Textularia pseudogramen* CHAPMAN & PARR.—Pl. VI, fig. 7.
*Textularia pseudogramen*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 88, pl. 43, figs. 9, 10.

*Textularia secasensis* LALICKER & MCCULLOCH.—Pl. VI, figs. 6a, b.
*Textularia secasensis* LALICKER & MCCULLOCH, 1940, Allan Hancock Pacific Exped. vol. 6, no. 2, p. 141, pl. 16, figs. 24a–c.

*Triloculina affinis* D'ORBIGNY.—Pl. VII, figs. 10a, b.
*Triloculina affinis*, CUSHMAN, 1932, U.S. Nat. Mus. Bull. 161, pt. 1, p. 58, pl. 13, figs. 2a, b.

*Triloculina oblonga* (MONTAGU).—Pl. VIII, figs. la, b.
*Miliolina oblonga*, MILLETT, 1898, Jour. Roy. Micro. Soc., pt. 6, p. 267, pl. 5, figs. 14a, b.
*Triloculina oblonga*, CUSHMAN, 1929, U.S. Nat. Mus. Bull. 104, pt. 6, p. 57, pl. 13, figs. 4, 5.

*Triloculina planciana* D'ORBIGNY.—Pl. VII, figs. 13a, b.

*Triloculina planciana*, CUSHMAN, 1929, ibid., Bull. 104, pt. 6, p. 62, pl. 15, figs. 5, 6.

*Triloculina tricarinata* D'ORBIGNY.—Pl. VII, figs. 11a, b.

*Triloculina tricarinata*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 6, pl. 3, fig. 17.

*Triloculina trigonula* (LAMARCK).—Pl. VII, figs. 12a b.

*Triloculina trigonula*, BARKER, 1960, ibid., p. 6, pl. 3, figs. 15, 16.

*Trochammina globigeriniformis* (PARKER & JONES).—Pl. VII, figs. 3a, b.

*Trochammina globigeriniformis*, HADA, 1931, Sci. Rept., Tohoku Imp. Univ., ser. 4, no. 1, p. 91, figs. 43a, b.

*Trochammina globigeriniformis*, MORISHIMA & CHIJI, 1952, Mem. Coll. Sci., Univ. Kyoto, ser. B, vol. 20, no. 2, pl. 1, figs. 11a–c.

*Trochammina inflata* (MONTAGU).—Pl. VII, 1a, b.

*Trochammina inflata*, CHUSMAN & McCULLOCH, 1939, Allan Hancock Pacific Exped. vol. 6, no. 1, p. 120, pl. 11, fig. 2.

*Trochammina pacifica* CUSHMAN var. *simplex* CUSHMAN & McCULLOCH.—Pl. VII, figs. 2a, b.

*Trochammina pacifica simplex* CUSHMAN & McCULLOCH, 1939, ibid., vol. 6, no. 1, p. 104, pl. 11, fig. 4.

*Uvigerina proboscidea* SCHWAGER.—Pl. X, figs. 20, 21.

*Uvigerina proboscidea*, CUSHMAN & McCULLOCH, 1948, ibid., vol. 6, no. 5, p. 627, pl. 34, fig. 4.

*Vertebralina striata* D'ORBIGNY.—Pl. VII, fig. 8,

*Vertebralina striata*, GRAHAM & MILITANTE, 1959, Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, p. 60, pl. 9, figs. 11, 12a, b.

*Wiesnerella auriculata* (EGGER).—Pl. VII, fig. 6.

*Planispirina auriculata*, CUSHMAN, 1929, U.S. Nat. Mus. Bull. 104, pt. 6, p. 93, pl. 22, figs. 3a, b.

*Wiesnerella auriculata*, CUSHMAN, 1933, Contr. Cush. Lab. Foram. Res., vol. 9, pt. 2, p. 33, pl. 3, figs. 7–9.

**Planktonic Foraminifera**

*Globigerina bulloides* D'ORBIGNY.—Pl. XIII, figs. 14a. b.

*Globigerina bulloides*, PARKER, 1962, Micropaleont., vol. 8, no. 2, p. 221, pl. 1, figs. 1–8.

*Globigerina quinqueloba* NATLAND.—Pl. XIII, figs. 12a, b.

*Globigerina quinqueloba*, PARKER, 1962, ibid., vol. 8, no. 2, p. 225, pl. 2, figs. 15, 16.

*Globigerinoides triloba* (REUSS) *immatura* LEROY.—Pl. XIII, figs. 15a, b.

*Globigerinoides triloba immatura*, BLOW, 1959, Amer. Paleont., vol. 39, no. 178, p. 188, pl. 11, figs. 62a, b.

*Globigerinoides triloba* (REUSS) *triloba* (REUSS).—Pl. XIII, fig. 16,

*Globigerinoides triloba triloba*, BLOW, 1959, ibid., vol. 39, no. 178, p. 187, pl. 11, figs. 60a, b.

*Globorotaloides* cf. *variabilis* BOLLI,—Pl. XIII, figs. 13a, b.

*Globorotaloides variabilis* BOLLI, 1957, U.S. Nat. Mus. Bull. 215, p. 117, pl. 27, figs. 15a–20c.

*Hastigerina siphonifera* (D'ORBIGNY).—Pl. XIII, fig. 11a, b.

*Hastigerina* (*Hastigerina*) *siphonifera*, BANNER & BLOW, 1960, Micropaleont., vol. 6, no. 1, p. 22, figs. 2, 3.

*Globigerinella siphonifera*, PARKER, 1962, ibid., vol. 8, no. 2, p. 228, pl. 2, figs. 22–28.

*Pulleniatina obliquiloculata* (PARKER & JONES).—Pl. XIV, figs. 1a, b.

*Pullenia obliquiloculata*, CUSHMAN, 1914, U.S. Nat. Mus. Bull. 71, pt. 4, p. 22, pl. 10, fig. 3; pl. 12, figs. 2, 3.

*Pulleniatina obliquiloculata*, BARKER, 1960, Taxonomic Notes, Soc. Econ. Paleont. & Min. Spec. Publ. 9, p. 174, pl. 84, figs. 16–20.

## REFERENCES

ANDERSEN, H.D., 1961. Foraminifera of the Mudlumps, Low Mississippi River Delta. Geol. Bull., La. Geol. Surv., no. 35, pt. 2, pp. 1-208 (pl. 29).

Ariake Bay Research Group, 1965. Quaternary system of the Ariake and the Shiranui Bay areas, with special referrences to the Ariake Soft Clay. Assoc. Geol. Collab. Japan., Monogr. 11.

ASANO, K., 1950–1952. Illustrated catalogue of Japanese Tertiary smaller Foraminifera, Pt. 1–Pt. 15, supl. 1.

————, 1956–1960. The Foraminifera from the adjacent sea of Japan, collected by the S.S. Soyo-maru, 1922–1930. Pt. 1–Nodosariidae. Sci. Rept., Tohoku Univ., ser. 2, vol. 27, pp. 1–55, pls. 1–6 (1956); Pt. 2–Miliolidae, ibid., vol. 27, pp. 57–83, pls. 7–9 (1956); Pt. 3–Planktonic Foraminifera, ibid., vol. 28, pp. 1–26, pls. 1, 2 (1957); Pt. 4–Buliminidae, ibid., vol. 29, pp. 1–41, pls. 1–7 (1958); Pt. 5–Nonionidae, ibid., Spec. vol., no. 4, pp. 189–201, pls. 21, 22 (1960).

BLOW, W.H., 1959. Age, correlation and biostratigraphy of the upper Tocuyo (San Lorenzo) and Pozón Formations, Eastern Falcón, Venezuela. Bull. Amer. Paleont., vol. 39, no. 178, pp. 67–251 (pls. 6–19).

BOLLI, H.M., 1957. Planktonic Foraminifera from the Oligocene-Miocene Cipero and Lengua Formations of Trinidad, B.W.I. U.S. Nat. Mus. Bull. 215, pp. 97–123, pls. 22–29.

CHIJI, M., 1961. Foraminifera from the Asahiyama shell-bed, Himi City, Toyama Prefecture. Prof. J. Makiyama Memorial Volume, pp. 229–238, pls. 1–2.

————, 1963. Foraminiferal Faunules from the Uemati Formation, Osaka City. Bull. Osaka Mus. Nat. Hist., no. 16, pp. 53–67, pls. 5–7.

————, 1964. Foraminiferal faunules from the Sahama Member, around the Hamana Lake, Tokai District, Central Japan. Rept. Geol. Surv., Hamamatsu City (Hamamatsu City Gavern. Publ.). pp. 181–200 (pls. 1–2).

CUSHMAN, J.A., 1910–1917. A monograph of the Foraminifera of the North Pacific Ocean. U.S. Nat. Mus. Bull. 71, Pt. 1–Pt. 8.

————, 1918–1931. The Foraminifera of the Atlantic Ocean, Pt. 1–Pt. 8, U.S. Nat. Mus. Bull. 104.

————, 1921. Foraminifera of the Philippine and adjacent seas. U.S. Nat. Mus. Bull. 100.

————, 1922. Shalow-water Foraminifera of the Tortugas region. Carnegie Inst. Washington Publ. 311, vol. 17, pp. 1–85, pls. 14.

————, 1928. On *Rotalia beccarii* (LINNÉ). Contr. Cush, Lab. Foram. Res., vol. 4, pt. 4, pp. 103–107, pl. 1.

————, 1939. A monograph of the Foraminiferal Family Nonionidae. U.S. Geol. Surv. Prof. Paper 191, pp. 1–100 (pls. 1–20).

FEYLING-HANSSEN, R.W., 1964. Foraminifera in Late Quaternary deposits from the Oslofjord area. Norges Geol. Under., no. 225, pp. 1–383, pls. 1–21.

FUSE, S., YAMAZI I. & HARADA, E., 1958. A study on the productivity of the Tanabe Bay (Pt. 1), I: Oceanographic conditions of the Tanabe Bay, results of the survey in the autumn of 1956. Rec. Ocean. Works, Japan, Spec. no. 2, pp. 3–9.

FUSE, S., 1959. A study on the productivity of Tanabe Bay (Pt. 2), III: Oceanographic conditions of Tanabe Bay (2), Stratification and fluctuation of hydrological conditions on two sectional survey lines. ibid., Spec. no. 3, pp. 31–45.

FUSE, S. & HARADA, E., 1960. A study on the productivity of Tanabe Bay (Pt. 3), Oceanographic conditions of Tanabe Bay (3), Results of the survey in the summer of 1958. ibid., Spec. no. 4, pp. 13–28.

GRAHAM, J.J. & MILITANTE, P.J., 1959. Recent Foraminifera from the Puerto Galera area nothern Mindoro, Philippines. Stanford Univ. Publ., Geol. Sci., vol. 6, no. 2, pp. 1–171, (pls. 1–19).

ISHIWADA, Y., 1958. Studies on the brackish water, III: Recent Foraminifera from the brackish Lake Hamana-Ko. Rept. Geol. Surv. Japan, no. 181, pp. 1–19, pls. 1–2 (in Japanese with English abstract).

KONDA, I., 1967. Foraminiferal faunules from the Minabe-sakai shell-bed, Kii Peninsula, Central Japan. Bull. Osaka Mus. Nat. Hist., no. 20, pp. 31–38, pls. 2–4.

KUWANO, Y., 1956. On the staining method for living foraminifera. Misc. Rept., Shigen. Ken., nos. 41–42. pp. 67–75. (in Japanese).

LOEBLICH, A.R. & TAPPAN, H., 1953. Studies of Arctic Foraminifera. Smith. Inst. Misc. Coll., vol. 121, no. 7, pp. 1–150, pls. 1–24.

MII, H., 1962. Coastal Geology of Tanabe Bay. Sci. Rept., Tohoku Univ., vol. 34, no. 1, pp. 1–93, pls. 1–6.

MILLETT, F.W., 1898–1904. Report on the Recent Foraminifera of the Malay Archipelago, collected by Mr. A. Durrand, F.R.M.S., Pt. 1–Pt. 17, Jour. Roy. Micro. Soc.

MORISHIMA, M., 1947. On the accumulation of Foraminiferal tests in Obama and Maizuru Bays. SEIRI SEITAI (Physiology & Ecology), vol. 2, nos. 3–4, pp. 168,–174. (in Japanese with English abstract),

————, 1948(a). The accumulation of Foraminiferal tests in Inlets of Wakasa Bay on the Inland Sea of Japan. Rept. Comm. Mar. Ecol. and Paleoecol., no. 7, Nat. Res. Concil., pp. 89–91.

————, 1948(b). Foraminiferal thanatocoenoses of Ago Bay, Kii Peninsula, Japan. ibid., no. 8, pp. 111–117.

MORISHIMA, M. & CHIJI, M., 1952. Foraminiferal thanatocoenoses of Akkeshi Bay and its vicinity. Mem. Coll. Sci., Univ. Kyoto, ser. B, vol. 20, no. 2, pp. 113–117, pls. 1–2.

NAKASEKO, K. & CHIJI, M., 1956. On the fossil Foraminifera in the subsurface sediments in Osaka City and its suburbs. Sci. Rept., North & South Coll., Osaka Univ., no. 4, pp. 43–71 (pls. 1–2).

PARKER, F.L., 1948. Foraminifera of the Continental shelf from the Gulf of Maine to Maryland. Bull. Mus. Comp. Zool., Harvard, vol. 100, no. 2, pp. 213–241, pls. 1–7.

PARKER, F.L., PHLEGER, F.B. & PEIRSON, J.F., 1953. Ecology of Foraminifera from San Antonio Bay and Environs, Southwest Texas. Chus. Found. Foram. Res., Spec. Publ. no. 2, pp. 1–75 (pls. 1–4).

PARKTR, F.L. & ATHEARN, W.D., 1959. Ecology of marsh foraminifera in Poponesset Bay, Massachusetts. Jour. Paleont., vol. 33, no. 2, pp. 333–343. pl. 50.

PHLEGER, F.B., 1951. Ecology of Foraminifera, northwest Gulf of Mexico, Pt. 1, Foraminiferal distribution. Geol. Soc. Amer. Mem., no. 46, pp. 1–86.

————, 1952. Foraminifera distribution in some sediment samples from the Canadian and Greenland Arctic. Contr. Cush. Found. Foram. Res., vol. 3, pp. 80–89, pls. 13, 14.

PHLEGER, F.B. & WALTON, W.R., 1950. Ecology of Marsh Bay Foraminifera Barnstable, Mass. Amer. Jour. Sci., vol. 248, pp. 274–294.

PHLEGER, F.B. & PARKER, F.L., 1951. Ecology of Foraminifera, northwest Gulf of Mexico. Pt. 2: Foraminiferal species. Geol. Soc. Amer. Mem., no. 46, pp. 1–64, pls. 1–20.

SAID, R., 1949. Foraminifera of the north Red Sea. Cush. Lab. Foram. Res., Spec. Publ. 26, pp. 1–44, pls. 1–4.

————, 1950. The distribution of Foraminifera in the northern Red Sea. Contr. Cush. Found. Foram. Res., vol. 1, pp. 9–29.

SVERDRUP, H.U., JOHNSON, M.W. & FLEMING, R.H., 1942. The oceans. pp. 1–1087. New York, Prentice-Hall.

TODD, R., 1965. The Foraminifera of the Tropical Pacific Collection of the "Albatross", 1899–1900. Pt. 4, U.S. Nat. Mus. Bull. 161, pp. 1–179, (pls. 1–27).

UCHIO, T., 1960. Ecology of living benthonic Foraminifera from the San Diego, California area. Cush. Found Foram. Res., Spec. Publ. no. 5, pp. 1–72 (pls. 1–10).

————, 1962. Recent Foraminifera thanatocoenoses of beach and nearshore sediments along the coast of Wakayama-Ken, Japan. Publ. Seto Mar. Biol. Lab., vol. 10, no. 1, pp. 133–143.

WALTON, W.R., 1952. Techniques for recognition of living Foraminifera. Contr. Cush. Found. Foram. Res., vol. 3, pt. 2, pp. 56–60.

Table 3. Distribution of Foraminifera in Tanabe Bay, Kii Peninsula.

(pp. 118–125)

Table 3. Distribution of Foraminifera in Tanabe Bay, Kii Peninsula

BENTHONIC FORAMINIFERA

| | Species \ Station No. | 98 | 97 | 82 | 84 | 75 | 61 |
|---|---|---|---|---|---|---|---|
| 1 | *Ammobaculites agglutinans* | — | — | — | — | — | — |
| 2 | *Ammomarginulina foliaceus* | — | — | — | 5, (139, )Vr | 9, 3(134, 45) F | — |
| 3 | *Ammonia beccarii tepida* | — | — | 22, 1(724, 33) F | 24, 1(667, 28) F | 22, 5(328, 75) C | 2, (127, )Vr |
| 4 | *A. beccarii* "forma A" | — | 2, ( 4, )Vr | 2, ( 66, )Vr | 5, (140, )R | 1, ( 15, )Vr | 1, ( 63, )Vr |
| 5 | *A. nipponica* | — | — | — | — | — | — |
| 6 | *A. ketienziensis angulata* | 1, ( 22, )Vr | — | 1, ( 33, )Vr | — | — | — |
| 7 | *Ammopemphix* sp. | — | — | — | — | 1, ( 15, )Vr | — |
| 8 | *Amphistegina madagascariensis* | 3, ( 66, )R | 189, (353, )VA | — | — | — | — |
| 9 | *A. radiata* | 52, 1(1137, 22) C | 53, ( 99, )C | 11, (362, )R | 9, (250, )R | 1, ( 15, )Vr | — |
| 10 | *Angulodiscorbis quadrangularis* | — | — | — | 1, ( 28, )Vr | — | 2, (127, )Vr |
| 11 | *Anomalina globulosa* | 1, ( 22, )Vr | — | 8, (263, )R | 3, ( 83, )Vr | — | — |
| 12 | *A. grosserugosa* | — | — | 1, ( 33, )Vr | 1, ( 28, )Vr | — | — |
| 13 | *A.* spp. | 1, ( 22, )Vr | — | 1, ( 33, )Vr | 1, 1( 28, 28)Vr | — | 4, (253, )Vr |
| 14 | *Articulina conico-articulata* | — | — | — | — | — | 3, (190, )Vr |
| 15 | *Astrononion stelligerium* | — | — | 2, ( 66, )Vr | 1, ( 28, )Vr | — | 1, ( 63, )Vr |
| 16 | *Bolivina glutinata* | 2. ( 44, )Vr | 1, ( 2, )Vr | 7, (230, )R | 6, (168, )R | 1, ( 15, )Vr | 1, ( 63, )Vr |
| 17 | *B. robusta* | 7, (153, )R | — | 11, (362, )R | 13, 1(361, 28) R | — | — |
| 18 | *B. subangularis* | 2, ( 44, )Vr | — | 3, ( 99, )Vr | — | — | — |
| 19 | *Bolivinella elegans* | 1, ( 22, )Vr | — | 1, ( 33, )Vr | — | — | — |
| 20 | *B. folium* | — | — | 2, ( 66. )Vr | 4, (111, )Vr | 1, ( 15, )Vr | 3, (190, )Vr |
| 21 | *Brizalina acerosa* | — | — | — | — | — | — |
| 22 | *B. compacta* | — | — | — | — | — | — |
| 23 | *B. seminuda* | 1, ( 22, )Vr | — | 1, ( 33, )Vr | 6. (168, )R | 3, ( 45, )R | 1, ( 63, )Vr |
| 24 | *B. spathula* | — | — | 2, ( 66, )Vr | — | — | — |
| 25 | *B. striatula* | 2, ( 44, )Vr | — | 7, (230, )R | 13, (361, )R | 1, ( 15, )Vr | 3, (190, )Vr |
| 26 | *B. variabilis* | — | — | 1, ( 33, )Vr | 2, ( 56, )Vr | — | 4, (253, )Vr |
| 27 | *Bulimina aculeata* | — | — | — | — | — | — |
| 28 | *B. elongata subulata* | — | — | 3, ( 99, )Vr | — | — | — |
| 29 | *B. marginata* | 1, ( 22, )Vr | — | 3, ( 99, )Vr | — | — | 5, (316, )R |
| 30 | *B. subornata* | — | — | — | 2, ( 56, )Vr | — | — |
| 31 | *B.* sp. | — | — | — | — | — | — |
| 32 | *Buliminella elegantissima* | — | — | 5, (165, )R | 1, ( 28, )Vr | — | — |
| 33 | *Calcarina hispida* | 3, ( 66, )R | 15, ( 28, )F | — | — | — | — |
| 34 | *Cassidulina laevigata* | — | — | 2, ( 66, )Vr | 2, ( 56, )Vr | — | — |
| 35 | *C.* cf. *minuta* | — | — | 3, ( 99, )Vr | 3, ( 83, )Vr | — | — |
| 36 | *C.* spp. | — | — | 1, ( 33, )Vr | — | — | 2, (127, )Vr |
| 37 | *Cellanthus craticulatus* | — | 9, ( 17, )R | — | 1, ( 28, )Vr | — | — |
| 38 | *Cibicides aknerianus* | — | — | — | 5, (139, )Vr | — | — |
| 39 | *C. lobatulus* | 1, ( 22, )Vr | 1, ( 2, )Vr | 6, (198, )R | 9, (250, )R | — | 8, (506, )R |
| 40 | *C. pseudoungerianus* | 8. (175, )R | — | 3, ( 99, )Vr | 4, (111, )Vr | 1, ( 15, )Vr | 11, (696, )R |
| 41 | *C. refulgens* | 13, (284, )F | 3, ( 6, )Vr | 9, (296, )R | 12, (333, )R | — | 18, (1139, )R |
| 42 | *C. subhaidingerii* | 11, (240, )F | 2, ( 4, )Vr | 2, ( 66, )Vr | 2, ( 56, )Vr | — | — |
| 43 | *C.* spp. | 1, ( 22, )Vr | — | 2, ( 66, )Vr | 1, ( 28, )Vr | 5, ( 75, )R | — |
| 44 | *Clavulina yabei ckiensis* | — | — | — | 2, ( 56, )Vr | — | — |
| 45 | *Conorboides advena* | — | — | 2, ( 66, )Vr | — | — | — |
| 46 | *Cribrostomoides columbiense* | 7, (153, )R | 1, ( 2, )Vr | — | — | 1, ( 15, )Vr | — |
| 47 | *Cyclogyra involvens* | — | — | 2, ( 66, )Vr | 1, ( 28, )Vr | — | 10, (633, )R |
| 48 | *Cymbaloporetta bradyi* | — | — | 1, ( 33, )Vr | 5, (139, )Vr | 3, ( 45, )R | 11, (696, )R |
| 49 | *Discorbinella araucana* | — | — | — | 6, (168, )R | — | — |
| 50 | *Discorbis mira* | 3, ( 66, )R | 1. ( 4, )Vr | 3, ( 99, )Vr | 1, ( 28, )Vr | — | 6, (380, )R |
| 51 | *Elphidium advena* | 1, ( 22, )Vr | 1, ( 2, )Vr | 1, ( 33, )Vr | 1, ( 28, )Vr | 10, 1(150, 15) F | 3, (190, )Vr |
| 52 | *E. articulatum rugulosum* | — | — | — | 4, (111, )Vr | — | — |
| 53 | *E. crispum* | 8, (175, )R | 7, ( 13. )R | 3, ( 99. )Vr | 2, ( 56, )Vr | — | 4, (253, )Vr |
| 54 | *E. discoidale* | — | — | — | — | 1, ( 15, )Vr | — |
| 55 | *E.* cf. *fimbriatulum* | — | — | — | — | — | 2, (127, )Vr |
| 56 | *E. hispidulum* | 2, ( 44, )Vr | — | — | 1, ( 28, )Vr | 1, ( 15, )Vr | 2, (127, )Vr |
| 57 | *E. incertum* | — | — | — | 4, (111, )Vr | 1, ( 15, )Vr | — |
| 58 | *E. jenseni* | — | 2, ( 4, )Vr | — | 2, ( 56, )Vr | — | 3, (190, )Vr |
| 59 | *E. matagordanum* | 1, ( 22, )Vr | — | 6, (198, )R | 3, ( 83, )Vr | 3, ( 45, )R | 8, (506, )Vr |
| 60 | *E. striatopunctatum* | 1, ( 22, )Vr | — | — | — | — | — |
| 61 | *E. translucens* | — | — | — | 1, ( 28, )Vr | 9, (134, )F | — |
| 62 | *Epistominella tamana* | — | — | — | 4, (111, )Vr | 1, ( 15, )Vr | — |
| 63 | *E.* sp. A | — | — | 1, ( 33, )Vr | 1, ( 28, )Vr | — | — |
| 64 | *Fissurina lacunata* | — | — | 2, ( 66, )Vr | — | — | — |
| 65 | *F. lucida* | — | — | 1, ( 33, )Vr | — | — | — |
| 66 | *F. marginata* | — | — | 3. ( 99, )Vr | — | — | — |
| 67 | *Florilus grateloupi* | 3, ( 66, )R | — | 9, (296, )R | — | — | 2, (127, )Vr |
| 68 | *F. joponicus* | — | — | 2, ( 66, )Vr | 6, (168, )R | 2, ( 30, )R | 2, (127, )Vr |
| 69 | *Fursenkoina ishikiensis* | — | — | — | — | — | — |

| 55 | 51 | 47 | 20 | 31 | 28 | 26 | 34 | |
|---|---|---|---|---|---|---|---|---|
| — | 2, *1*( 9, *4*) R | — | — | — | — | — | — | 1 |
| — | 19, *3*( 84, *13*) C | — | 5, ( 65, ) Vr | 1, ( 5, ) Vr | 16, *5*( 76, *24*) F | 5, *1*( 36, *7*) R | — | 2 |
| 37, (761, ) C | 10, ( 44, ) F | 17, *1*(374, *22*) F | 30, *1*(388, *13*) F | 60, *4*(288, *19*) A | 47, *7*(223, *33*) C | 42, *8*(299, *57*) C | 3, ( 9, ) Vr | 3 |
| 4, ( 82, ) R | 2, *1*( 9, *4*) R | 5, (110, ) R | — | 8, *1*( 38, *5*) R | 44, *19*(209, *90*) C | 30, *14*(213, *100*) C | 74, *37*(218, *109*) A | 4 |
| — | 2, ( 9, ) R | — | — | — | — | — | — | 5 |
| — | — | — | 5, ( 65, ) Vr | — | — | 1, ( 7, ) Vr | — | 6 |
| — | — | 1, ( 22, ) Vr | — | — | — | — | — | 7 |
| — | 1, ( 4, ) Vr | — | — | — | — | — | — | 8 |
| — | — | — | — | — | — | — | — | 9 |
| — | — | — | — | — | — | 1, ( 7, ) Vr | — | 10 |
| — | — | 1, ( 22, ) Vr | 2, ( 26, ) Vr | — | — | — | — | 11 |
| 3, ( 62, ) R | — | — | — | — | — | — | — | 12 |
| 1, ( 21, ) Vr | — | — | 1, ( 13, ) Vr | — | — | — | — | 13 |
| — | — | — | 3, *1*( 40, *13*) Vr | — | — | 1, ( 7, ) Vr | — | 14 |
| — | — | — | — | — | — | — | — | 15 |
| — | 1, ( 4, ) Vr | 2, ( 44, ) Vr | — | — | 1, ( 5, ) Vr | — | — | 16 |
| 3, ( 62, ) R | — | — | 8, (103, ) R | — | — | — | — | 17 |
| — | — | — | — | — | — | — | — | 18 |
| — | — | — | — | — | — | — | — | 19 |
| — | — | — | — | — | — | — | — | 20 |
| — | — | — | 2, ( 26, ) Vr | — | — | — | — | 21 |
| — | — | — | 1, ( 13, ) Vr | — | — | 2, ( 14, ) Vr | — | 22 |
| 1, ( 21, ) Vr | — | 1, ( 22, ) Vr | 3, ( 40, ) Vr | — | — | — | — | 23 |
| — | — | — | 4, ( 52, ) Vr | 1, ( 5, ) Vr | 1, ( 5, ) Vr | — | — | 24 |
| 6, (124, ) R | 11, ( 48, ) F | 2, ( 44, ) Vr | 4, ( 52, ) Vr | 2, ( 10, ) R | 5, ( 24, ) R | 4, ( 28, ) R | — | 25 |
| — | — | — | — | 1, ( 5, ) Vr | 2, *1*( 10, *5*) Vr | — | — | 26 |
| — | — | — | — | — | 1, ( 5, ) Vr | 1, ( 7, ) Vr | — | 27 |
| — | — | 1, ( 22, ) Vr | — | — | — | 6, ( 42, ) R | — | 28 |
| 4, ( 82, ) R | — | 3, ( 66, ) Vr | 1, ( 13, ) Vr | 1. ( 5, ) Vr | 1, ( 5, ) Vr | 5, ( 36, ) R | — | 29 |
| — | — | — | — | — | — | — | — | 30 |
| 2, ( 41, ) Vr | — | — | 2, ( 26, ) Vr | — | 2, ( 10, ) Vr | - | — | 31 |
| 1, ( 21, ) Vr | 1, ( 4, ) Vr | — | 1, ( 13, ) Vr | — | — | 2, ( 14, ) Vr | — | 32 |
| — | — | — | — | — | — | — | — | 33 |
| — | — | — | 1, ( 13, ) Vr | — | — | — | — | 34 |
| — | — | — | 1, ( 13, ) Vr | — | — | — | — | 35 |
| — | — | — | — | — | — | — | — | 36 |
| — | — | — | — | — | — | 1, ( 7, ) Vr | — | 37 |
| 2, ( 41, ) Vr | 1, ( 4, ) Vr | — | — | — | — | — | — | 38 |
| — | — | 1, ( 22, ) Vr | 1, ( 13, ) Vr | — | — | — | 1, ( 3, ) Vr | 39 |
| — | — | 3, ( 66, ) Vr | 9, (116, ) R | — | 1, ( 5, ) Vr | 1, ( 7, ) Vr | — | 40 |
| — | 1. ( 4, ) Vr | 5, (110, ) R | 1, ( 13, ) Vr | — | — | — | — | 41 |
| 3, ( 62, ) R | — | 2, ( 44, ) Vr | — | — | — | — | — | 42 |
| 1, ( 21, ) Vr | — | — | 9, (116, ) R | — | — | — | — | 43 |
| — | — | — | — | — | — | — | - | 44 |
| — | — | — | — | — | — | — | - | 45 |
| 1, *1*( 21, *21*) Vr | — | — | — | — | — | — | - | 46 |
| 1, ( 21, ) Vr | — | — | 5, ( 65, ) Vr | — | — | 2, ( 14, ) Vr | — | 47 |
| — | — | — | 1, ( 13, ) Vr | — | — | — | — | 48 |
| — | — | — | — | — | — | — | — | 49 |
| — | — | 1, ( 22, ) Vr | — | — | — | — | . | 50 |
| — | 5, *1*( 22, *4*) R | 9, (198, ) R | 6, ( 78, ) R | 7, ( 34, ) R | 1, ( 5, ) Vr | 4, ( 28, ) R | 17, ( 50, ) F | 51 |
| — | — | — | — | — | — | — | — | 52 |
| — | 4, ( 18, ) R | — | 3, ( 40, ) Vr | — | — | 2, ( 14, ) Vr | 1, ( 3, ) Vr | 53 |
| — | — | 1, ( 22, ) Vr | 2, ( 26, ) Vr | — | — | 2, ( 14, ) Vr | — | 54 |
| 2, *1*( 41, *21*) Vr | — | — | 1, ( 13, ) Vr | — | — | — | — | 55 |
| 3, ( 62, ) R | 2, ( 9, ) R | 4, ( 88, ) R | 5, ( 65, ) Vr | — | 12, ( 57, ) F | 4, ( 28, ) R | 1, ( 3, ) Vr | 56 |
| 6, (124, ) R | 3, *1*( 13, *4*) R | 1, ( 22, ) Vr | 2, ( 26, ) Vr | 6, ( 29, ) R | 10, ( 47, ) R | 3, *1*( 21, *7*) R | 1, ( 3, ) Vr | 57 |
| — | — | 3, ( 66, ) Vr | 1, ( 13, ) Vr | — | 1, ( 5, ) Vr | — | — | 58 |
| 12, (247, ) F | 2, ( 9, ) R | 5, (110, ) R | 5, ( 65, ) Vr | 7, ( 34, ) R | 5, *1*( 24, *5*) R | 2, ( 14, ) Vr | — | 59 |
| — | — | — | 4, ( 52, ) Vr | — | — | — | 10, *1*( 29, *3*) F | 60 |
| — | — | 3, ( 66, ) Vr | 12, (115, ) R | 10, ( 48, ) F | 6, *1*( 29, *5*) R | 23, (164, ) F | — | 61 |
| — | — | — | 3, ( 40, ) Vr | — | — | — | — | 62 |
| — | — | — | — | — | — | — | — | 63 |
| — | — | — | — | — | — | — | — | 64 |
| — | — | — | — | — | — | — | — | 65 |
| — | — | — | — | — | — | — | — | 66 |
| 11, (226, ) F | — | 8, (176, ) R | 2, *1*( 26, *13*) Vr | — | 3, *1*( 14, *5*) R | — | — | 67 |
| 4. ( 82, ) R | 3, ( 13, ) R | 4, *1*( 88, *22*) R | 10, (129, ) R | — | 6, ( 29, ) R | 4, ( 28, ) R | — | 68 |
| — | — | 1, ( 22, ) Vr | 1, ( 13, ) Vr | — | — | 1, *1*( 7, *7*) Vr | — | 69 |

Table 3. (Continued)

| | Species \ Station No. | 98 | 97 | 82 | 84 | 75 | 61 |
|---|---|---|---|---|---|---|---|
| 70 | *F. pauciloculata* | — | — | 2, ( 66, )Vr | 4, *1*(111, *28*)Vr | — | 2, (127, )Vr |
| 71 | *F. schreibersiana* | — | — | 1, ( 33, )Vr | 1, ( 28, )Vr | — | — |
| 72 | *Gaudryina arenaria* | — | — | — | 1, ( 28, )Vr | — | — |
| 73 | *G. robusta* | 2, ( 44, )Vr | — | 3, ( 99, )Vr | 2, ( 56, )Vr | — | 6, (380, )R |
| 74 | *G. siphonifera* | — | 1, ( 2, )Vr | — | — | — | — |
| 75 | *G. subglabrata* | — | — | 2, ( 66, )Vr | 2, ( 56, )Vr | — | 3, (190, )Vr |
| 76 | *G.* spp. | — | — | — | 1, ( 28, )Vr | — | 1, ( 63, )Vr |
| 77 | *Gavelinopsis* cf. *praegeri* | 5, (109, )R | — | 15, (494, )R | 33, (916, )F | 8, *1*(119, *15*)R | 13, (823, )R |
| 78 | *Glabratella australensis* | 2, ( 44, )Vr | — | 1, ( 33, )Vr | 2, ( 56, )Vr | — | — |
| 79 | *G. opercularis* | 6, (131, )R | — | 10, (329, )R | 8, (222, )R | 1, ( 15, )Vr | 8, (506, )R |
| 80 | *G. opercularis nakamurai* | 4, ( 87, )R | — | 4, (132, )Vr | 1, ( 28, )Vr | 1, ( 15, )Vr | 4, (253, )Vr |
| 81 | *G. patelliformis* | 1, ( 22, )Vr | 1, ( 2, )Vr | 4, (132, )Vr | 6, (168, )R | 1, ( 15, )Vr | 16, (1013, )R |
| 82 | *G.* cf. *pulvinata* | — | — | 1, ( 33, )Vr | — | — | 5, (316, )R |
| 83 | *G.* sp. A | — | — | — | — | — | — |
| 84 | *G.* sp. B | — | — | — | — | — | 2, (127, )Vr |
| 85 | *Globobulimina* cf. *pacifica* | — | — | 1, ( 33, )Vr | — | — | — |
| 86 | *Globocassidulina* cf. *crassa* | — | — | 2, ( 66, )Vr | — | — | — |
| 87 | *G. subglobosa* | 2, ( 44, )Vr | — | 4, (132, )Vr | 4, (111, )Vr | 1, *1*( 15, *15*)Vr | 1, ( 63, )Vr |
| 88 | *Gyroidina soldanii* | 2. ( 44, )Vr | — | — | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 89 | *Hanzawaia nipponica* | 3, ( 66, )R | — | 4, (132, )Vr | 1, ( 28, )Vr | — | 1, ( 63, )Vr |
| 90 | *Haplophragmoides canariensis* | — | — | — | — | — | — |
| 91 | *H.* spp. | — | — | — | — | — | — |
| 92 | ?*Haplophragmoides* sp. | — | — | — | — | — | — |
| 93 | *Hauerina bradyi* | 1, ( 22, )Vr | — | — | — | — | — |
| 94 | *H. fragilissima* | — | — | — | — | 1, ( 15, )Vr | 1, ( 63, )Vr |
| 95 | *H. orientalis* | — | — | — | — | — | 1, ( 63, )Vr |
| 96 | *H. pacifica* | 1, ( 22, )Vr | — | — | — | — | 2, (127, )Vr |
| 97 | *Heterostegina glutinata* | — | 1, ( 2, )Vr | — | — | — | — |
| 98 | *Lagena chaesteri* | — | — | — | 1, ( 28, )Vr | — | — |
| 99 | *L. laevis* | — | — | 1, ( 33, )Vr | — | 1, ( 15, )Vr | — |
| 100 | *L. perlucida* | — | — | — | 1, *1*( 28, *28*)Vr | — | — |
| 101 | *L. striata* | 1, ( 22, )Vr | — | 1, ( 33, )Vr | 2, ( 56, )Vr | — | — |
| 102 | ?*Laterostomella* sp. | — | — | — | 3, ( 83, )Vr | — | — |
| 103 | *Lenticulina* cf. *cultratus* | — | — | — | 2, ( 56. )Vr | 1, ( 15, )Vr | — |
| 104 | *L. kamakuraensis* | — | 1, ( 2, )Vr | — | — | — | — |
| 105 | *L. limbosus* | — | 1, ( 2, )Vr | — | — | — | — |
| 106 | *L.* sp. | — | — | — | 2, ( 56, )Vr | — | — |
| 107 | *Loxostomoides durrandii* | — | — | — | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 108 | *L. limbatum* | — | — | — | 2, ( 56, )Vr | — | 3, (190, )Vr |
| 109 | *Martinottiella bradyana* | — | — | — | — | — | — |
| 110 | *Massilina inaequalis* | — | — | 1, ( 33, )Vr | 3, ( 83, )Vr | 4, ( 60, )R | 1, ( 63, )Vr |
| 111 | *M. planata* | — | — | — | — | — | — |
| 112 | *M.* sp. (new species from Noto) | — | — | — | 2, ( 56, )Vr | 1, ( 15, )Vr | — |
| 113 | *M.* sp. | — | — | 1, ( 33, )Vr | — | — | 1, ( 63, )Vr |
| 114 | *Melonis nikobarensis* | — | — | 1, ( 33, )Vr | 1, ( 28, )Vr | 2, ( 30, )Vr | — |
| 115 | *Miliolinella circularis* | — | — | — | 1, ( 28, )Vr | 2, ( 30, )Vr | 3, (190, )Vr |
| 116 | *M. oblonga* | 1, ( 22, )Vr | — | 12, (395, )R | 5, (139, )Vr | — | — |
| 117 | *Neoconorbina stachi* | — | — | — | — | — | 3, (190, )Vr |
| 118 | *N. terquemi* | 2, ( 44, )Vr | — | 1, ( 33, )Vr | — | — | 4, (253, )Vr |
| 119 | *Nodosaria* sp. | — | — | — | — | — | 2, (127, )Vr |
| 120 | *Nonion baueanum* | 1, ( 22, )Vr | — | — | — | — | — |
| 121 | *N. japonicum* | — | — | — | — | 3, ( 45, )R | 4, (253, )Vr |
| 122 | *N. pacificum* | — | — | — | — | — | 1, *1*( 63, *63*)Vr |
| 123 | *Nonionella miocenica* | — | — | — | — | — | — |
| 124 | *N. pulchella* | — | — | 5, (165, )R | 5, (139, )Vr | — | — |
| 125 | *Nonionellina labradrica* | 1, ( 22, )Vr | — | 2, ( 66, )Vr | 8, (222, )R | — | — |
| 126 | *Nouria polymorphinoides* | — | — | — | — | — | — |
| 127 | *Nummoloculina contraria* | — | 1, ( 2, )Vr | — | — | — | — |
| 128 | *Operculina ammonoides* | 7, *1*(153, *22*)R | 1, ( 2, )Vr | 4, (132, )Vr | 1, ( 28, )Vr | — | — |
| 129 | *Pararotalia* cf. *imperatoria globosa* | — | — | 1, ( 33, )Vr | — | — | — |
| 130 | *P. murrayi* | — | — | 5, (165, )R | 4, (111, )Vr | 4, ( 60, )R | 5, (316, )R |
| 131 | *P. ozawai* | — | — | 1, ( 33, )Vr | — | 2, ( 30, )Vr | — |
| 132 | *Patellina corrugata* | — | — | — | 2, ( 56, )Vr | — | 2, (127, )Vr |
| 133 | *Patellinella inconspicua* | — | — | 2, ( 66, )Vr | — | — | — |
| 134 | *Peneroplis pertusus* | — | — | — | — | 1, *1*( 15, *15*)Vr | — |
| 135 | *Planispirinella exiqua* | — | — | — | — | — | 3, (190, )Vr |
| 136 | *Planodiscorbis* sp. | — | — | 2, ( 66, )Vr | — | — | — |
| 137 | *Planorbulina* cf. *mediterranensis* | 1, ( 22, )Vr | — | 1, ( 33, )Vr | 1, ( 28, )Vr | — | 7, (443, )R |
| 138 | *Planulina subdepressa* | — | — | 1, ( 33, )Vr | — | — | 1, ( 63, )Vr |

| 55 | 51 | 47 | 20 | 31 | 28 | 26 | 34 | |
|---|---|---|---|---|---|---|---|---|
| — | — | 2, ( 44, )Vr | 6, ( 78, )R | — | 5, *1*( 24, *5*)R | 1, ( 7, )Vr | — | 70 |
| 1, ( 21, )Vr | — | — | — | — | — | — | — | 71 |
| — | — | — | — | — | — | — | — | 72 |
| — | — | — | — | — | — | — | — | 73 |
| — | — | — | — | — | — | — | — | 74 |
| — | — | — | — | — | — | — | — | 75 |
| — | — | — | — | — | — | — | — | 76 |
| 4, ( 82, )R | 1, ( 4, )Vr | 15, (331, )F | 14, (181, )R | — | 2, ( 10, )Vr | — | — | 77 |
| — | — | — | 5, ( 65, )Vr | — | — | — | — | 78 |
| — | — | 2, ( 44, )Vr | 2, ( 26, )Vr | — | — | — | — | 79 |
| — | — | — | — | — | — | — | — | 80 |
| 2, ( 41, )Vr | 2, ( 9, )R | 9, (198, )R | 7, ( 90, )R | — | — | — | 1, ( 3, )Vr | 81 |
| — | — | 2, ( 44, )Vr | — | — | — | — | — | 82 |
| — | — | — | 3, ( 40, )Vr | — | — | — | — | 83 |
| — | — | — | — | — | — | — | — | 84 |
| — | — | — | — | — | — | — | — | 85 |
| — | — | — | — | — | — | — | — | 86 |
| 2, ( 41, )Vr | 1, ( 4, )Vr | — | 1, ( 13, )Vr | 1, ( 5, )Vr | — | 1, ( 7, )Vr | — | 87 |
| — | — | — | — | — | — | — | — | 88 |
| — | 1, ( 4, )Vr | — | — | — | — | — | — | 89 |
| — | — | 4, ( 88, )R | — | — | — | — | 3, *1*( 9, *3*)Vr | 90 |
| 7, (144, )R | — | — | — | — | — | — | — | 91 |
| — | — | — | 1, ( 13, )Vr | — | — | 8, *3*( 57, *21*)R | — | 92 |
| — | — | 1, ( 22, )Vr | 2, ( 26, )Vr | — | — | — | — | 93 |
| — | 1, ( 4, )Vr | 1, ( 22, )Vr | 1, ( 13, )Vr | — | — | — | — | 94 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 95 |
| — | 1, ( 4, )Vr | 2, ( 44, )Vr | — | — | — | — | — | 96 |
| — | — | — | — | — | — | — | — | 97 |
| — | — | — | — | — | — | — | — | 98 |
| — | — | — | — | — | — | — | — | 99 |
| — | — | — | — | — | — | — | — | 100 |
| — | — | — | 1, ( 13, )Vr | — | 1, ( 5, )Vr | — | — | 101 |
| — | — | — | — | — | — | — | — | 102 |
| — | — | — | 1. *1*( 13, *13*)Vr | — | — | — | — | 103 |
| — | — | — | — | — | — | — | — | 104 |
| — | — | — | — | — | — | — | — | 105 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 106 |
| — | — | 1, ( 22, )Vr | 3, ( 40, )Vr | — | — | — | — | 107 |
| 1, ( 12, )Vr | 1, ( 4, )Vr | — | 3, ( 40, )Vr | — | — | — | — | 108 |
| — | — | — | — | — | — | 2, ( 14, )Vr | — | 109 |
| 5, (103, )R | 2, ( 9, )Vr | 7, *2*(154, *44*)R | 5, ( 65, )Vr | — | 1, ( 5, )Vr | — | — | 110 |
| 4, ( 82, )R | 1, ( 4, )Vr | — | 5, ( 56, )Vr | — | — | — | — | 111 |
| — | — | — | 2, ( 26, )Vr | — | — | — | — | 112 |
| — | 1, ( 4, )Vr | 1, ( 22, )Vr | — | — | — | — | — | 113 |
| 2, ( 41, )Vr | — | — | 3, ( 40, )Vr | — | — | — | — | 114 |
| — | — | — | 20, (258, )R | — | — | — | — | 115 |
| — | — | — | 3, ( 40, )Vr | 6, ( 29, )R | 2, ( 10, )Vr | 6, ( 42, )R | — | 116 |
| — | — | — | — | — | — | — | — | 117 |
| — | 1. ( 4, )Vr | 1, ( 22, )Vr | — | — | — | — | — | 118 |
| — | — | — | — | — | — | — | — | 119 |
| — | 2, ( 9, )Vr | — | — | — | — | — | — | 120 |
| 1, ( 21, )Vr | — | — | 1, *1*( 13, *13*)Vr | — | — | — | — | 121 |
| — | — | — | — | — | — | — | — | 122 |
| 3, ( 62, )Vr | — | — | 9, *1*(116, *13*)R | 3, *1*( 14, *5*)R | 5, *1*( 24, *5*)R | 7, *1*( 50, *7*)R | — | 123 |
| — | — | — | — | — | — | — | — | 124 |
| 2, ( 41, )Vr | — | — | 1, ( 13, )Vr | — | — | — | — | 125 |
| — | — | — | — | — | — | 1, *1*( 7, *7*)Vr | 2, *2*( 6, *6*)R | 126 |
| — | — | — | — | — | — | — | — | 127 |
| — | — | — | — | — | — | — | — | 128 |
| 9, (185, )F | 1, ( 4, )Vr | — | 1, ( 13, )Vr | 7, ( 34, )R | 1, ( 5, )Vr | — | — | 129 |
| 3, ( 62, )R | — | 6, (132, )R | 10, (129, )R | 1, ( 5, )Vr | — | 1, ( 7, )Vr | — | 130 |
| — | 1, ( 4, )Vr | 1, ( 22, )Vr | — | — | 1, 5, )Vr | — | — | 131 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 132 |
| — | — | — | — | — | — | — | — | 133 |
| — | — | — | 1. ( 13, )Vr | — | — | — | — | 134 |
| — | — | — | — | — | — | — | — | 135 |
| — | — | — | — | — | — | — | — | 136 |
| — | — | 5, (110, )R | 1, ( 13, )Vr | — | — | — | — | 137 |
| — | — | — | — | 1, ( 5, )Vr | — | — | — | 138 |

Table 3. (Continued)

| | Species \ Station No. | 98 | 97 | 82 | 84 | 75 | 61 |
|---|---|---|---|---|---|---|---|
| 139 | *Podolia* sp. | — | — | — | — | 2, ( 30, )R | 4, (253, )Vr |
| 140 | *Poroeponides cribrorepandus* | 2, ( 44, )Vr | 1, ( 2,. )Vr | — | 1, ( 28, . )Vr | — | — |
| 141 | *Pseudorotalia gaimardii* | — | — | 2, ( 66, )Vr | 3, ( 83, )Vr | — | — |
| 142 | *Pyrgo denticulata* | 2, ( 44, )Vr | 1, ( 2, )Vr | — | — | — | 6, (380, )R |
| 143 | *Quinqueloculina agglutinans* | — | — | 1, ( 33, )Vr | — | 6, ( 89, )R | — |
| 144 | *Q. agglutinata* | 2, ( 44, )Vr | — | — | — | — | — |
| 145 | *Q. bicarinata* | 4, ( 87, )R | 1, ( 2, )Vr | — | — | — | — |
| 146 | *Q. bicornis* | 1, ( 22, )Vr | — | — | — | 2, ( 30, )R | 1, ( 63, )Vr |
| 147 | *Q. bosciana* | — | — | 5, (165, )R | — | — | — |
| 148 | *Q. bardyana* | 3, ( 66, )R | — | 2, ( 66, )Vr | 7, (194, )R | 4, ( 60, )R | 14, (886, )R |
| 149 | *Q. candeiana* | 5, (109, )R | — | 2, ( 66, )Vr | — | — | — |
| 150 | *Q. contorta* | 4, ( 87, )R | — | — | 1, ( 28, )Vr | — | 2, (127, )Vr |
| 151 | *Q. crassa* | 1, ( 22, )R | 1, ( 2, )Vr | — | — | — | — |
| 152 | *Q. elongata* | — | — | — | — | 2, ( 30, )R | 2, (127, )Vr |
| 153 | *Q. granulosa* | — | 1, ( 2, )Vr | — | 16, (444, )R | 3, ( 45, )R | 3, (190, )Vr |
| 154 | *Q. laevigata* | — | 2, ( 4, )Vr | 32, (1053, )F | 13, (361, )R | — | 29, (1836, )F |
| 155 | *Q. lamarckiana* | — | — | — | 5, (139, )Vr | 7, (105, )R | — |
| 156 | *Q.* cf. *lata* | — | — | — | 2, ( 56, )Vr | — | — |
| 157 | *Q. limbata* | — | — | — | — | — | 1, ( 63, )Vr |
| 158 | *Q. parkeri* | — | 4, ( 8, )R | — | — | — | 3, (190, )Vr |
| 159 | *Q. poeyana* | — | — | — | — | — | 3, (190, )Vr |
| 160 | *Q. poeyana* var. | — | — | — | — | — | — |
| 161 | *Q. polygona* | — | — | — | 2, ( 56, )Vr | — | — |
| 162 | *Q. reticulata* | — | 8, ( 15, )R | 1, ( 33, )Vr | — | — | — |
| 163 | *Q. seminulum* | 3, ( 66, )R | 1, ( 2, )Vr | 3, ( 99, )Vr | 1, ( 28, )Vr | 2, ( 30, )R | — |
| 164 | *Q. subagglutinata* | — | 2, ( 4, )Vr | — | — | — | 2, (127, )Vr |
| 165 | *Q. sulcata* | — | — | — | — | — | 3, (190, )Vr |
| 166 | *Q. vulgaris* | 7, (153, )R | 9, ( 17, )R | 3, ( 99, )Vr | 17, (472, )R | — | 1, ( 63, )Vr |
| 167 | *Q.* sp. A | 1, ( 22, )Vr | — | 1, ( 33, )Vr | — | — | — |
| 168 | *Q.* sp. B | — | — | 1, ( 33, )Vr | — | — | — |
| 169 | *Q.* spp. | 2, ( 44, )Vr | 3, ( 6, )Vr | 3, ( 99, )Vr | 7, (194, )R | 7, (105, )R | 18, (1139, )R |
| 170 | *Reophax bacillaris* | — | — | — | — | — | — |
| 171 | *R.* cf. *curtus* | — | — | 1, ( 33, )Vr | — | — | — |
| 172 | *R. fusiformis* | — | — | — | — | — | — |
| 173 | *R. gracilis* | — | — | — | — | — | — |
| 174 | *R.* sp. | — | — | — | — | — | — |
| 175 | *Reussella aculeata* | 5, (109, )R | 1, ( 2, )Vr | — | 6, (168, )R | 4, ( 60, )R | 7, (443, )R |
| 176 | *R. simplex* | — | — | — | — | 1, ( 15, )Vr | — |
| 177 | *R.* sp. | — | — | — | 4, (111, )Vr | — | — |
| 178 | *Rosalina bradyi* | — | 3, ( 6, )Vr | — | — | — | — |
| 179 | *R. concinna* | 1, ( 22, )Vr | — | 5, (165, )R | — | — | 2, (127, )Vr |
| 180 | *R. floridana* | 4, ( 87, )R | — | 17, (560, )R | 29, (805, )F | — | 25, (1583, )F |
| 181 | *R. globularis* | 3, ( 66, )R | — | 6, (198, )R | 13, (361, )R | 12, (179, )F | 18, (1139, )R |
| 182 | *R. micens* | 1, ( 22, )Vr | — | — | — | — | — |
| 183 | *R. rugosa* | — | — | 6, (198, )R | — | — | — |
| 184 | *R. subbertheloti* | 2, ( 44, )Vr | — | — | — | — | 2, (127, )Vr |
| 185 | *R. vilardeboana* | 6, (131, )R | — | 5, (165, )R | — | — | 1, ( 63, )Vr |
| 186 | *R.* spp. | — | — | 2, ( 66, )R | 6, (168, )R | 10, (150, )F | 5, (316, )R |
| 187 | *Saccammina* cf. *sphaerica* | — | — | — | — | — | — |
| 188 | ?*Saccammina* sp. | — | — | — | 1, ( 28, )Vr | — | — |
| 189 | *Schlumbergerina alveoliniformis* | — | — | — | 1, ( 28, )Vr | 1, ( 15, )Vr | — |
| 190 | *Scutuloris* sp. A | 7, (153, )R | 1, ( 2, )Vr | 4, (132, )R | 7, (194, )R | 2, ( 30, )R | 22, *1*(1393, *63*)F |
| 191 | *Sigmavirgulina tortuosa* | 1, ( 22, )Vr | — | — | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 192 | *Sigmoilina* sp. | — | — | — | — | 1, ( 15, )Vr | — |
| 193 | *Sigmoilopsis schlumbergeri* | — | — | — | 10, (280, )R | 6, ( 89, )R | — |
| 194 | *Siphogenerina virgula* | — | — | — | — | — | — |
| 195 | *Siphotextularia saulcyana* | — | — | 1, ( 33, )Vr | — | — | 1, ( 63, )Vr |
| 196 | *Sorites marginalis* | 3, ( 66, )R | — | — | — | — | — |
| 197 | *Spirillina vivipara* | 1, ( 22, )Vr | — | 3, ( 99, )Vr | — | — | — |
| 198 | *Spiroloculina corrugata* | — | 1, ( 2, )Vr | 1, ( 33, )Vr | 1, ( 28, )Vr | — | 4, (253, )Vr |
| 199 | *S. cymbium* | — | — | 1, ( 33, )Vr | — | — | — |
| 200 | *S. faveolata* | — | — | — | 1, ( 28, )Vr | — | — |
| 201 | *S. lucida* | 1, ( 22, )Vr | — | — | — | | — |
| 202 | *S.* cf. *perforata* | — | — | — | — | — | — |
| 203 | *S.* spp. | — | — | — | — | — | 1, ( 63, )Vr |
| 204 | *Spiroplectammina biformis* | — | — | — | — | 1, ( 15, )Vr | — |
| 205 | *Textularia articulata* | 5, *1*(109, *22*)R | — | — | — | — | — |
| 206 | *T. calva* | — | 8, ( 15, )R | 1, ( 33, )Vr | — | — | — |
| 207 | *T. candeiana* | 3, ( 66, )R | — | 3, ( 99, )Vr | — | — | 14, (886, )R |

| 55 | 51 | 47 | 20 | 31 | 28 | 26 | 34 | |
|---|---|---|---|---|---|---|---|---|
| — | — | — | — | — | — | — | — | 139 |
| — | — | — | — | — | — | — | — | 140 |
| 1, ( 21, )Vr | — | — | — | — | — | — | — | 141 |
| — | — | — | 2, ( 26, )Vr | — | — | 1, ( 7, )Vr | — | 142 |
| — | 3, ( 13, )R | — | — | — | — | — | — | 143 |
| — | — | — | — | — | — | — | — | 144 |
| — | — | — | — | — | — | — | — | 145 |
| — | — | — | 1, ( 13, )Vr | — | — | — | — | 146 |
| 5, (103, )R | 1, ( 4, )Vr | 1, ( 22, )Vr | 14, (181, )R | — | — | — | — | 147 |
| — | 2, ( 9, )R | 5, (110, )R | 5, ( 65, )Vr | — | — | — | — | 148 |
| — | 1, ( 4, )Vr | — | — | — | — | — | — | 149 |
| — | — | — | 5, ( 65, )Vr | — | — | — | — | 150 |
| — | — | — | — | — | — | — | — | 151 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 152 |
| — | 1, *1*( 4, *4*)Vr | 1, ( 22, )Vr | 13, (168, )R | — | — | 1, ( 7, )Vr | — | 153 |
| 22, (453, )F | 5, *2*( 22, *9*)R | 23, (507, )F | 53, (685, )F | 12, *1*( 58, *5*)F | 3, ( 14, )R | — | — | 154 |
| 7, (144, )R | 1, ( 4, )Vr | — | — | — | — | 1, ( 7, )Vr | — | 155 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 156 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 157 |
| — | — | — | 1, ( 13, )Vr | — | — | — | — | 158 |
| — | — | — | — | — | — | — | — | 159 |
| — | — | — | — | 1, ( 5, )Vr | — | — | — | 160 |
| — | — | 1, ( 22, )Vr | 1, ( 13, )Vr | — | — | — | — | 161 |
| — | — | — | — | — | — | — | — | 162 |
| — | 3, ( 13, )R | 1, ( 22, )Vr | 3, ( 40, )Vr | 1, ( 5, )Vr | 11, *2*( 52, *10*)F | 1, ( 7, )Vr | — | 163 |
| — | — | — | — | — | — | — | — | 164 |
| — | — | 1, ( 22, )Vr | 5, ( 65, )Vr | — | — | — | — | 165 |
| 4, ( 82, )R | 4, ( 18, )R | 6, (132, )R | 1, ( 13, )Vr | 4, ( 19, )R | — | 1, ( 7, )Vr | — | 166 |
| — | — | — | — | — | — | — | — | 167 |
| — | — | — | — | — | — | — | — | 168 |
| — | 6, ( 26, )F | 19, (418, )F | 20, (258, )R | 5, *2*( 24, *10*)R | 4, ( 19, )R | 3, ( 21, )R | — | 169 |
| — | — | — | — | — | — | — | 1, *1*( 3, *3*)Vr | 170 |
| — | — | — | — | — | — | — | — | 171 |
| — | — | 2, ( 44, )Vr | — | — | 1, ( 5, )Vr | — | — | 172 |
| — | — | — | — | 1, *1*( 5, *5*)Vr | 1, ( 5, )Vr | — | 2, ( 6, )Vr | 173 |
| — | — | — | — | — | — | — | 6, ( 18, )R | 174 |
| 3, ( 62, )R | — | 7, *1*(154, *22*)R | 15, (194, )R | — | — | — | — | 175 |
| — | — | — | — | — | — | — | 1, ( 3, )Vr | 176 |
| — | — | — | — | — | — | — | — | 177 |
| — | — | — | — | — | — | — | — | 178 |
| — | 1, ( 4, )Vr | 3, ( 66, )Vr | 1, ( 13, )Vr | — | — | — | — | 179 |
| 6, (124, )R | — | — | 10, (129, )R | — | 1, ( 5, )Vr | — | — | 180 |
| 3, ( 62, )R | 1, ( 4, )Vr | 4, ( 88, )R | 29, (375, )F | 1, ( 5, )Vr | — | 3, ( 21, )R | — | 181 |
| — | — | 2, ( 44, )Vr | — | — | — | — | — | 182 |
| — | — | 3, ( 66, )Vr | — | — | — | — | — | 183 |
| 2, ( 42, )Vr | 1, ( 4, )Vr | — | — | — | — | — | — | 184 |
| 1, ( 21, )Vr | — | 2, ( 44, )Vr | — | 3, ( 14, )R | — | — | — | 185 |
| — | — | — | 3, ( 40, )Vr | — | 1, ( 5, )Vr | 1, ( 7, )Vr | 1, ( 3, )Vr | 186 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 187 |
| 1, ( 21, )Vr | — | — | — | — | — | — | — | 188 |
| — | — | — | — | — | — | — | — | 189 |
| — | — | 11, (253, )R | 22, (283, )R | 1, ( 5, )Vr | — | — | — | 190 |
| — | — | 1, ( 22, )Vr | — | — | — | — | — | 191 |
| — | 1, ( 4, )Vr | — | 1, ( 13, )Vr | — | — | — | — | 192 |
| 1, ( 21, )Vr | 2, ( 9, )R | 2, ( 44, )Vr | 13, (168, )R | 5, *1*( 24, *5*)R | 11, *1*( 52, *5*)F | 15, (107, )F | — | 193 |
| — | — | — | 4, ( 52, )Vr | — | — | — | — | 194 |
| — | — | — | 5, ( 65, )Vr | — | — | — | — | 195 |
| — | — | — | — | — | — | — | — | 196 |
| — | — | — | — | — | — | — | — | 197 |
| — | — | 2, ( 44, )Vr | 1, ( 13, )Vr | — | — | — | — | 198 |
| — | — | — | — | — | — | — | — | 199 |
| — | — | — | — | — | — | — | — | 200 |
| — | — | 1, ( 22, )Vr | 1, ( 13, )Vr | — | — | — | — | 201 |
| — | — | — | 2, ( 26, )Vr | — | — | — | — | 202 |
| 1, ( 21, )Vr | — | — | — | — | — | — | — | 203 |
| — | — | 6, (132, )R | — | — | — | 4, ( 28, )R | 4, *3*( 12, *9*)R | 204 |
| — | — | — | — | — | — | — | — | 205 |
| — | — | — | — | — | — | — | — | 206 |
| — | — | 5, (110, )R | 1, ( 13, )Vr | — | — | — | — | 207 |

Table 3. (Continued)

| | Station No. / Species | 98 | 97 | 82 | 84 | 75 | 61 |
|---|---|---|---|---|---|---|---|
| 208 | *T. conica* | 3, ( 66, )R | — | 6, (198, )R | 14, (389, )R | — | 3, (190, )Vr |
| 209 | *T. crecentiformis* | — | — | — | — | — | — |
| 210 | *T.* cf. *earlandi* | — | — | — | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 211 | *T. foliacea* | 1, ( 22, )Vr | — | — | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 212 | *T. kerimbaensis* | 1, ( 22, )Vr | — | 8, (263, )R | 11, (305, )R | — | 6, (380, )R |
| 213 | *T. orbica* | — | — | — | — | — | — |
| 214 | *T. pseudogramen* | 1, ( 22, )Vr | 3, ( 6, )Vr | 1, ( 33, )Vr | — | — | — |
| 215 | *T. secasensis* | 1, ( 22, )Vr | 4, ( 8, )R | — | — | 6, ( 89, )Vr | 5, (316, )R |
| 216 | *T. vola* | — | — | 1, ( 33, )Vr | — | — | — |
| 217 | *T.* spp. | 2, ( 44, )Vr | — | 1, ( 33, )Vr | — | — | 1, ( 63, )Vr |
| 218 | *Tretomphalus* sp. | — | — | 2, ( 66, )Vr | — | — | 1, ( 63, )Vr |
| 219 | *Trifarina* sp. | — | — | 1, ( 33, )Vr | — | — | — |
| 220 | *Triloculina affinis* | 1, ( 22, )Vr | — | 5, (165, )R | 3, ( 83, )Vr | 4, ( 60, )R | 5, (316, )R |
| 221 | *T. bertheliniana* | — | 2, ( 4, )Vr | — | — | — | — |
| 222 | *T.* cf. *cuneata* | — | 1, ( 2, )Vr | — | — | — | — |
| 223 | *T. irregularis* | — | — | — | — | — | 3, (190, )Vr |
| 224 | *T. oblonga* | — | — | — | 1, ( 28, )Vr | — | — |
| 225 | *T. planciana* | — | — | 6, (198, )R | — | — | 4, (253, )Vr |
| 226 | *T. tricarinata* | — | — | 1, ( 33, )Vr | 2, ( 56, )Vr | 3, ( 45, )R | 2, (127, )Vr |
| 227 | *T. trigonula* | 3, ( 66, )R | 3, ( 6, )Vr | 9, (296, )R | 1, ( 28, )Vr | — | — |
| 228 | *T. subangularis* | — | — | — | — | 1, ( 15, )Vr | — |
| 229 | *T.* spp. | 2, ( 44, )Vr | — | 1, ( 33, )Vr | 2, ( 56, )Vr | — | 1, ( 63, )Vr |
| 230 | *Trochammina globigeriniformis* | 2, ( 44, )Vr | — | 4, (132, )R | 2, ( 56, )Vr | — | — |
| 231 | *T. inflata* | — | — | — | — | — | — |
| 232 | *T. nana* | 1, ( 22, )Vr | — | — | — | — | — |
| 233 | *T.* cf. *pacifica simplex* | 1, ( 22, )Vr | — | — | — | 3, ( 45, )R | — |
| 234 | *T.* spp. | — | — | — | — | — | — |
| 235 | *Uvigerina proboscidea* | 1. ( 22, )Vr | — | 4, (132, )R | 2, ( 56, )Vr | — | 3, (190, )Vr |
| 236 | *U.* cf. *canariensis* | — | — | — | — | — | — |
| 237 | *Vertebralina striata* | 1, ( 22, )Vr | — | — | — | — | 4, (253, )Vr |
| 238 | *Wiesnerella suriculata* | | — | 2, ( 66, )Vr | 6, (168, )R | — | — |
| 239 | MISCELLANEOUS | 10, (219, )R | 3, ( 6, )Vr | 15, (494, )R | 18, (500, )R | 6, ( 89, )R | 12, (759, )R |
| | TOTAL BENTHONIC FORAMINIFERA | 291, *3*(6374, *66*) | 359, (677, ) | 433, *1*(14270, *33*) | 518, *5*(14415, *140*) | 208, *12*(3110, *180*) | 477, *2*(30188, *126*) |

PLANKTONIC FORAMINIFERA

| | Station No. / Species | 98 | 97 | 82 | 84 | 75 | 61 |
|---|---|---|---|---|---|---|---|
| 1 | *Globigerina bulloides* | 10, (219,) | — | 4, *1*(132, *33*) | 5, (139, ) | — | 10, *1*(633, *63*) |
| 2 | *G. quinqueloba* | — | — | 14, *2*(461, *66*) | 4, (111, ) | — | — |
| 3 | *G.* sp. | — | — | — | 1, ( 28, ) | — | — |
| 4 | *Globigerinita glutinata* | 1, *1*( 22, *22*) | — | 16, (527, ) | 1, ( 28, ) | — | — |
| 5 | ?*Globigerinita* sp. | — | — | — | | — | — |
| 6 | *Globigerinoides triloba immatura* | — | — | 2, ( 66, ) | | — | 5, (316, ) |
| 7 | *G. triloba triloba* | | 1, ( 2, ) | — | | 1, ( 15, ) | — |
| 8 | *G.* sp. | — | — | 1, ( 33, ) | 1, ( 28, ) | — | — |
| 9 | *Globorotalia inflata* | — | — | 1, ( 33, ) | 1, ( 28, ) | — | — |
| 10 | *G. menardii* | — | — | — | — | — | — |
| 11 | *G. hirsuta* | 1, ( 22, ) | — | — | — | — | — |
| 12 | *G. pumilio* | — | — | — | — | — | — |
| 13 | *Globorotaloides* cf. *variabilis* | 1, ( 22, ) | — | 1, ( 33, ) | — | — | 1, ( 63, ) |
| 14 | *Hastigerina siphonifera* | — | — | 6, (198, ) | 4, (111, ) | — | 1, ( 63, ) |
| 15 | *Pulleniatina obliqueloculata* | — | 1, ( 2, ) | — | | 1, ( 15, ) | — |
| 16 | MISCELLANEOUS | | — | 1, ( 33, ) | — | — | — |
| | TOTAL PLANKTONIC FORAMINIFERA | 13, *1*(285, *22*) | 2, ( 4, ) | 46, *3*(1516, *99*) | 17, (473, ) | 2, ( 30, ) | 17, *1*(1075, *63*) |

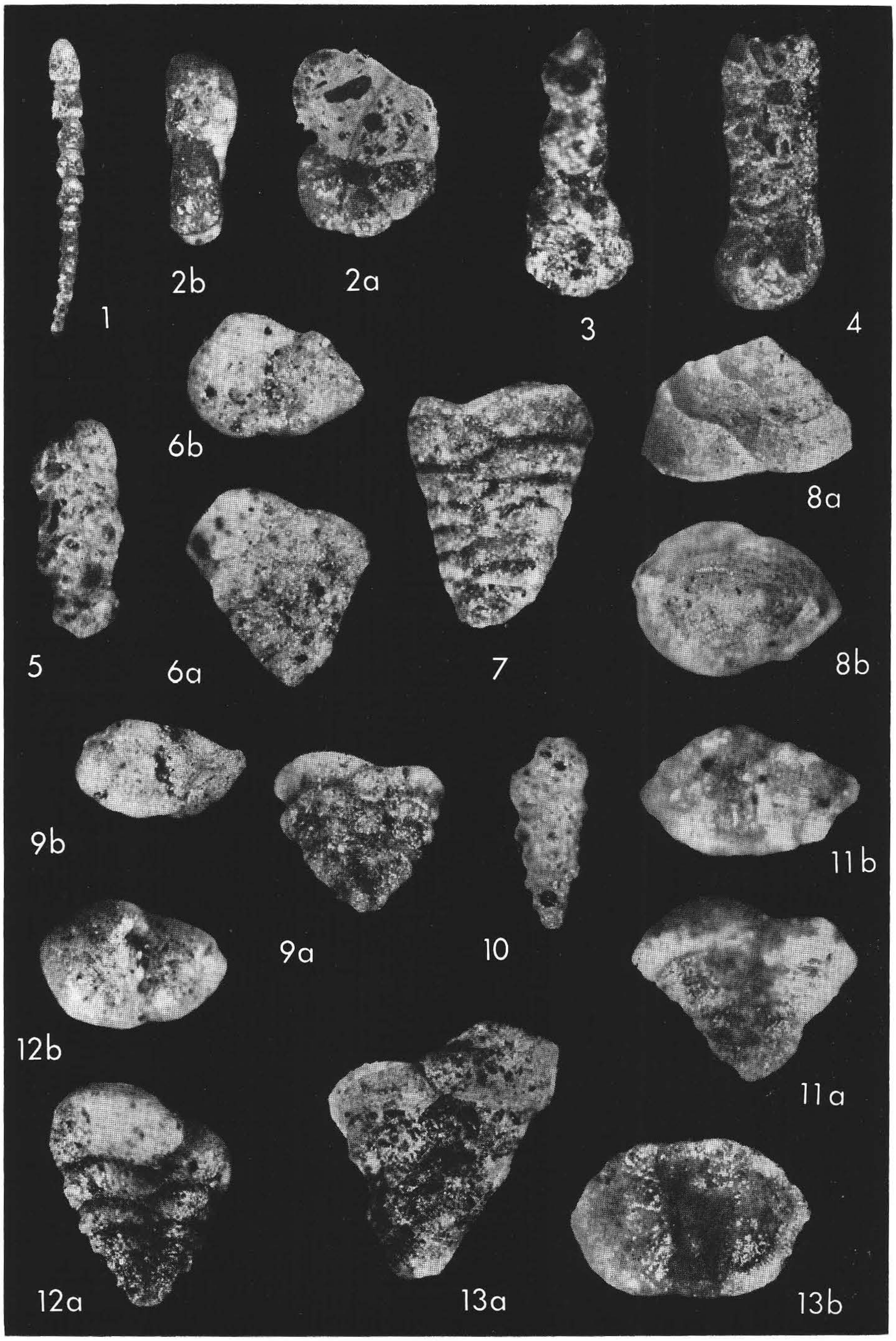
| 55 | 51 | 47 | 20 | 31 | 28 | 26 | 34 | |
|---|---|---|---|---|---|---|---|---|
| — | — | 5, (110, )R | 5, ( 65, )Vr | — | — | — | — | 208 |
| — | — | — | 1, ( 13, )Vr | 2, *1*( 10, *5*)R | — | — | 2, ( 6, )Vr | 209 |
| — | — | — | — | 3, ( 14, )R | 1, ( 5, )Vr | 3, ( 21, )R | 8, *2*( 24, *6*)F | 210 |
| — | 3, ( 13, )R | 4, ( 88, )R | 1, ( 13, )Vr | — | — | — | — | 211 |
| — | — | 3, ( 66, )Vr | 6, ( 78, )R | — | — | — | — | 212 |
| — | 1, ( 4, )Vr | 1, ( 22, )Vr | 3, ( 40, )Vr | — | — | — | — | 213 |
| — | — | — | — | — | — | — | — | 214 |
| — | — | 3, ( 66, )Vr | — | — | — | — | — | 215 |
| — | — | — | — | — | — | — | — | 216 |
| — | — | 3, ( 66, )Vr | — | — | — | — | — | 217 |
| — | — | — | 3, ( 40, )Vr | — | — | — | — | 218 |
| — | — | — | — | — | — | — | — | 219 |
| — | 1, ( 4, )Vr | 2, ( 44, )Vr | 4, ( 52, )Vr | — | — | — | — | 220 |
| — | — | — | — | — | — | — | — | 221 |
| — | — | — | — | — | — | — | — | 222 |
| — | — | — | — | — | — | 1, ( 7, )Vr | — | 223 |
| — | — | — | 10, (129, )R | — | — | — | — | 224 |
| — | — | — | 1, ( 13, )Vr | — | — | — | — | 225 |
| 2, ( 42, )Vr | — | — | 3, ( 40, )Vr | — | — | — | — | 226 |
| — | 2, ( 9, )R | — | — | 1, ( 5, )Vr | — | 1, ( 7, )Vr | — | 227 |
| — | — | — | — | — | — | — | — | 228 |
| — | — | — | 1, ( 13, )Vr | — | — | — | — | 229 |
| 2, ( 42, )Vr | 9, *2*( 40, *9*)F | 5, (110, )R | 2, ( 26, )Vr | 13, ( 63, )F | 18, ( 85, )F | 19, *6*(135, *43*)F | 48, (141, )A | 230 |
| — | — | — | — | — | — | — | 4, ( 12, )R | 231 |
| — | 1, *1*( 4, *4*)Vr | 1, ( 22, )Vr | 1, ( 13, )Vr | — | — | — | — | 232 |
| — | 5, ( 22, )R | 1, ( 22, )Vr | 10, *2*(129, *26*)R | 8, ( 38, )R | — | — | — | 233 |
| — | — | — | 3, ( 40, )Vr | — | 6, ( 28, )R | — | — | 234 |
| — | — | — | 1, ( 13, )Vr | — | — | — | — | 235 |
| — | — | 1, ( 22, )Vr | 1, ( 13, )Vr | — | 7, ( 33, )R | 5, ( 36, )R | — | 236 |
| — | — | — | 2, ( 26, )Vr | — | — | — | — | 237 |
| — | — | 2, ( 44, )Vr | — | — | — | — | — | 238 |
| 5, (103, )R | 3, ( 13, )R | 5, (110, )R | 15, (194, )R | 3, ( 15, )R | 1, ( 5, )Vr | 3, ( 21, )R | — | 239 |
| 220, *2*(4536, *42*) | 145, *12*(629, *55*) | 296, *5*(6515, *110*) | 574, *8*(7405, *104*) | 187, *12*(902, *59*) | 249, *40*(1188, *192*) | 239, *36*(1693, *256*) | 191, *47*(564, *139*) | |

| 55 | 51 | 47 | 20 | 31 | 28 | 26 | 34 | |
|---|---|---|---|---|---|---|---|---|
| 5, (103, ) | — | — | — | — | — | 3, ( 21, ) | — | 1 |
| — | 1, ( 4, ) | — | 6, *1*( 78, *13*) | — | — | — | — | 2 |
| 1, ( 21, ) | — | — | — | — | — | — | — | 3 |
| 1, ( 21, ) | — | — | — | — | — | — | — | 4 |
| — | — | — | — | — | 2, ( 10, ) | — | — | 5 |
| — | — | — | — | — | — | 1, ( 7, ) | — | 6 |
| — | 1, ( 4, ) | 1, ( 22, ) | — | 1, ( 5, ) | — | — | — | 7 |
| — | — | — | — | — | — | — | — | 8 |
| — | — | — | — | — | — | — | — | 9 |
| — | — | — | 1, ( 13, ) | — | — | — | — | 10 |
| — | — | — | — | — | — | — | — | 11 |
| 1, ( 21, ) | — | — | — | — | — | — | — | 12 |
| — | — | — | — | — | — | — | — | 14 |
| 2, ( 42, ) | — | — | 1, ( 13, ) | — | 1, ( 5, ) | — | — | 13 |
| — | — | — | — | — | — | — | — | 15 |
| 1, ( 21, ) | — | — | — | — | — | — | — | 16 |
| 11, (229, ) | 2, ( 8, ) | 1, ( 22, ) | 8, *1*(104, *13*) | 1, ( 5, ) | 3, ( 15, ) | 4, ( 28, ) | 0, ( 0, ) | |

The numbers show the number of specimens counted in the actually examined fraction of respective samples, those in parantheses are the number of specimens estimated in the 20 g aliquot of respective samples, the numbers in italic concern the living, stained specimens. The frequency at each station is expressed in the following grades; VA: >46%, A: 46–22%, C: 22–10%, F: 10–4%, R: 4–1%, Vr: <1%.

## Plate VI

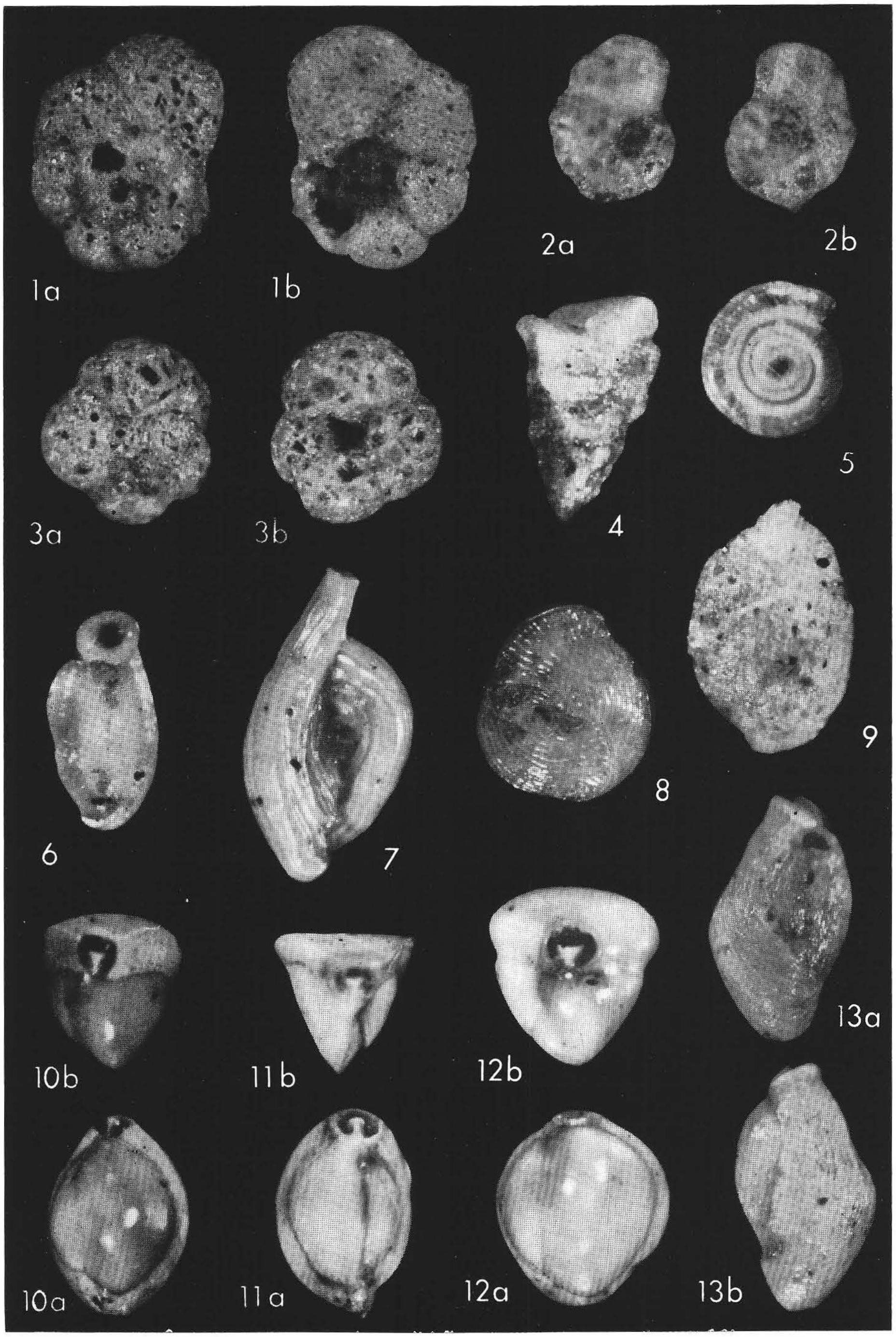
1: *Reophax gracilis* (Kiaer), OMNH Reg. No. F10715F, ×80
2a, b: *Cribrostomoides columbiense* (Cushman), OMNH Reg. No. F10642F, ×80
3: *Ammobaculites agglutinans* (d'Orbigny), OMNH Reg. No. F10617F, ×80
4: *Ammomarginulina foliaceus* (Brady), OMNH Reg. No. F10618F, ×80
5: *Spiroplectammina biformis* (Parker & Jones), MNHO Reg. No. F10728F, ×80
6a, b: *Textularia secasensis* Lalicker & McCulloch, OMNH Reg. No. F10736F, ×80
7: *T. pseudogramen* Chapman & Parr, OMNH Reg. No. F10735F, ×50
8a, b: *T. conica* d'Orbigny. OMNH Reg. No. F10732F, ×40
9a, b: *T. kerimbaensis* Said, OMNH Reg. No. F10734F, ×60
10: *T.* cf. *earlandii* Parker, OMNH Reg. No. F10733F, ×120
11a, b: *T. candeiana* d'Orbigny, OMNH Reg. No. F10731F, ×80
12a, b: *T. articulata* d'Orbigny, OMNH Reg. No. F10729F, ×60
13a, b: *T. calva* Lalicker, OMNH Reg. No. F10730F, ×35




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate VII

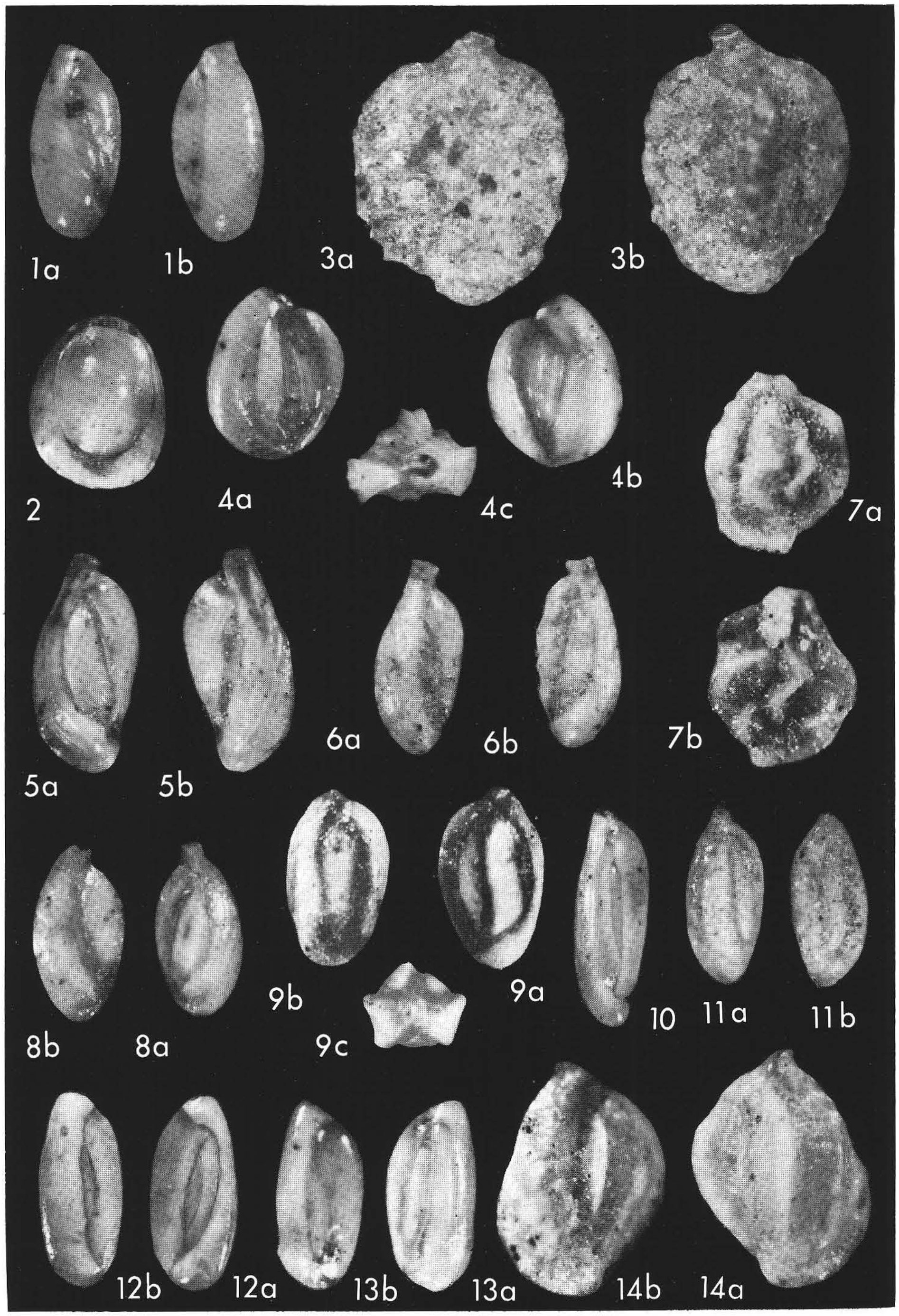
1a, b: *Trochammina inflata* (Montagu), OMNH Reg. No. F10743F, ×80
2a, b: *T. pacifica simplex* Cushman & McCulloch, OMNH Reg. No. F10744F, ×120
3a, b: *T. globigeriniformis* (Parker & Jones), OMNH Reg. No. F10742F, ×80
4: *Gaudryina robusta* Cushman, OMNH Reg. No. F10660F. ×60
5: *Cyclogyra involvens* (Reuss), OMNH Reg. No. F10643F, ×100
6: *Wiesnerella auriculata* (Egger), OMNH Reg. No. F10747F, ×100
7: *Spiroloculina corrugata* Cushman & Todd, OMNH Reg. No. F10727F, ×80
8: *Vertebralina striata* d'Orbigny, OMNH Reg. No. F10746F, ×80
9: *Sigmoilopsis schlumbergeri* (Silvestri), OMNH Reg. No. 10726F, ×80
10a, b: *Triloculina affinis* d'Orbigny, OMNH Reg. No. F10737F, ×60
11a, b: *T. tricarinata* d'Orbigny, OMNH Reg. No. F10740F, ×80
12a, b: *T. trigonula* (Lamarck), OMNH Reg. No. F10741F, ×60
13a, b: *T. planciana* d'Orbigny, OMNH Reg. No. F10739F, ×60




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate VIII

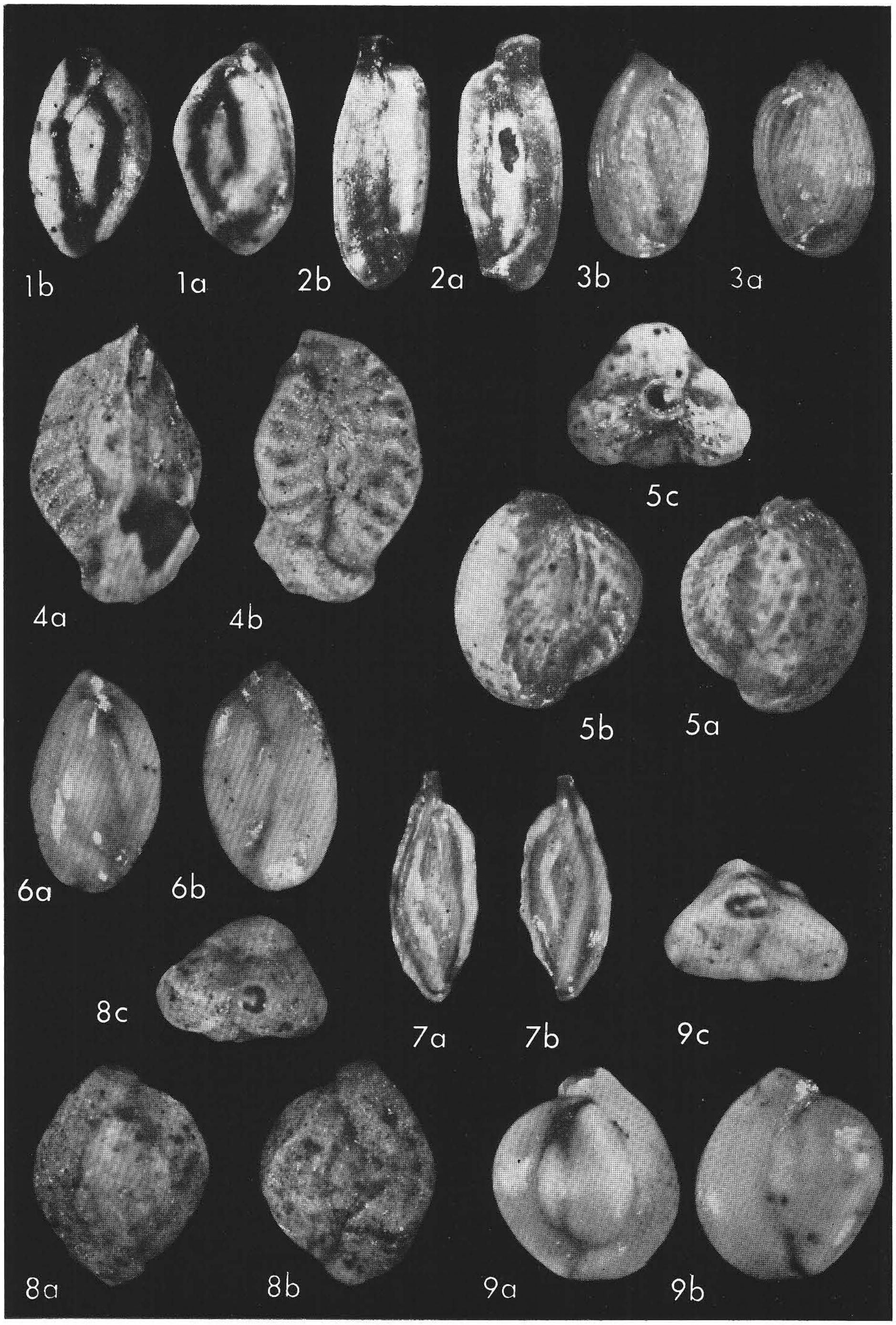
| | |
|---|---|
| 1a, b: | *Triloculina oblonga* (Montagu), OMNH Reg. No. F10738F, ×80 |
| 2: | *Pyrgo denticulata* (Brady), OMNH Reg. No. F10692F, ×55 |
| 3a, b: | *Quinqueloculina aggutinans* d'Orbigny, OMNH Reg. No. F10693F, ×35 |
| 4a, b, c: | *Q. bicarinata* d'Orbigny, OMNH Reg. No. F10694F, ×100 |
| 5a, b: | *Q. bicornis* (Walker & Jacob), OMNH Reg. No. F10695F, ×80 |
| 6a, b: | *Q. bociana* d'Orbigny, OMNH Reg. No. F10696F, ×80 |
| 7a, b: | *Q. bradyana* Cushman, OMNH Reg. No. F10697F, ×80 |
| 8a, b: | *Q. candeiana* d'Orbigny, OMNH Reg. No. F10698F, ×100 |
| 9a, b, c: | *Q. contorta* d'Orbigny, OMNH Reg. No. F10699F, ×80 |
| 10: | *Q. elongata* Natland, OMNH Reg. No. F10700F, ×55 |
| 11a, b: | *Q. granulosa* Natland, OMNH Reg. No. F10701F, ×120 |
| 12a, b: | *Q. laevigata* d'Orbigny, OMNH Reg. No. F10704F, ×120 |
| 13a, b: | *Q. lacvigata* d'Orbigny, OMNH Regl No. F10705F, ×120 |
| 14a, b: | *Q. lamarckiana* d'Orbigny, OMNH Reg. No. F10703F, ×80 |




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## PLATE IX

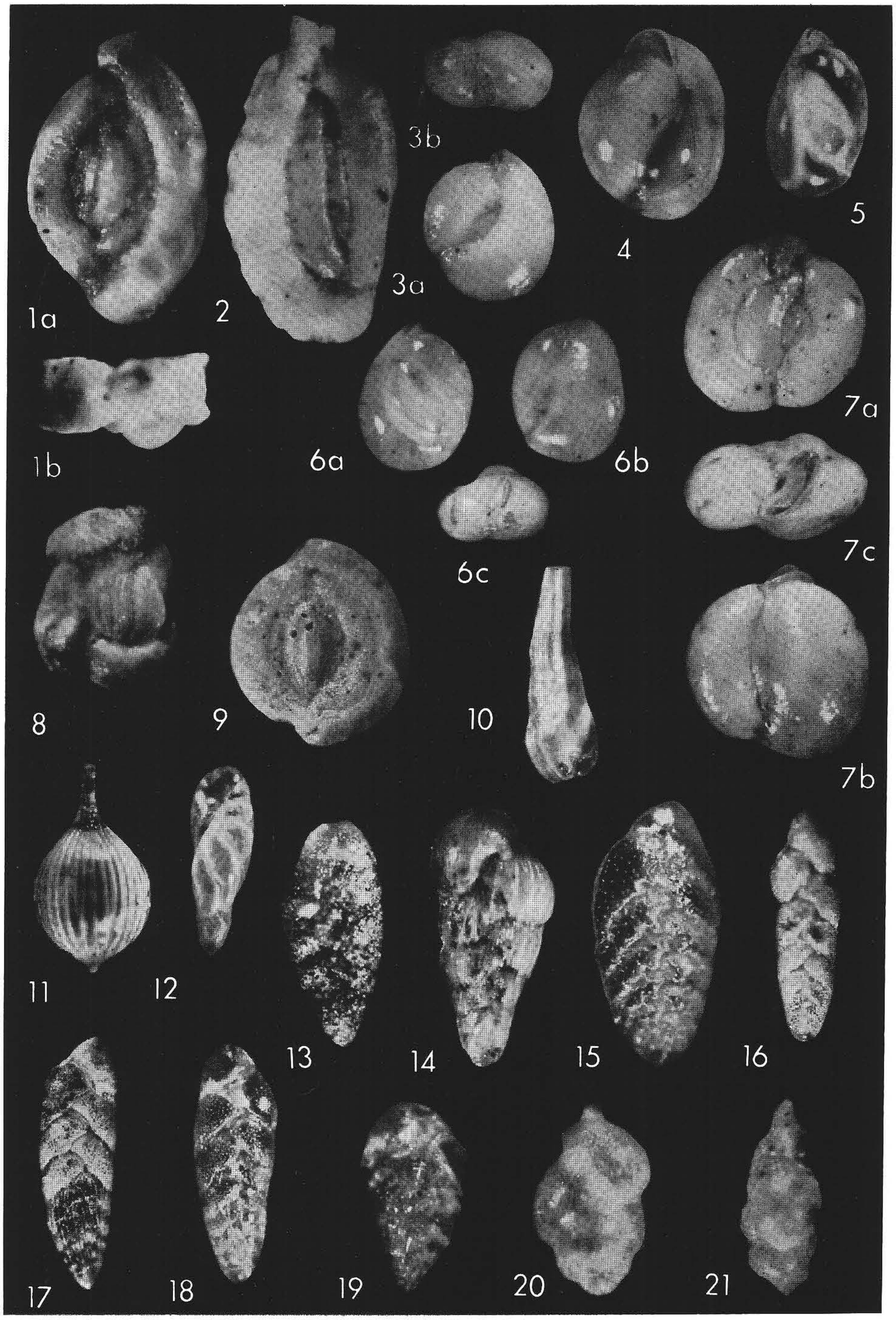
| | |
|---|---|
| 1a, b: | *Quinqueloculina* cf. *lata* TERQUEM, OMNH Reg. No. F10706F, ×60 |
| 2a, b: | *Q. limbata* D'ORBIGNY. OMNH Reg. No. F10707F, ×50 |
| 3a, b: | *Q. poeyana* D'ORBIGNY, OMNH Reg. No. F10709F, ×120 |
| 4a, b: | *Q. parkeri* (BRADY), OMNH Reg. No. F10708F, ×40 |
| 5a, b, c: | *Q. reticulata* (D'ORBIGNY), OMNH Reg. No. F10710F, ×50 |
| 6a, b: | *Q. seminulum* (LINNÉ), OMNH Reg. No. F10711F, ×120 |
| 7a, b: | *Q. sulcata* D'ORBIGNY, OMNH Reg. No. F10713F, ×80 |
| 8a, b: | *Q. subagglutinata* ASANO, OMNH Reg. No. F10712F, ×36 |
| 9a, b, c: | *Q. vulgaris* D'ORBIGNY, OMNH Reg. No. F10714F, ×60 |




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate X

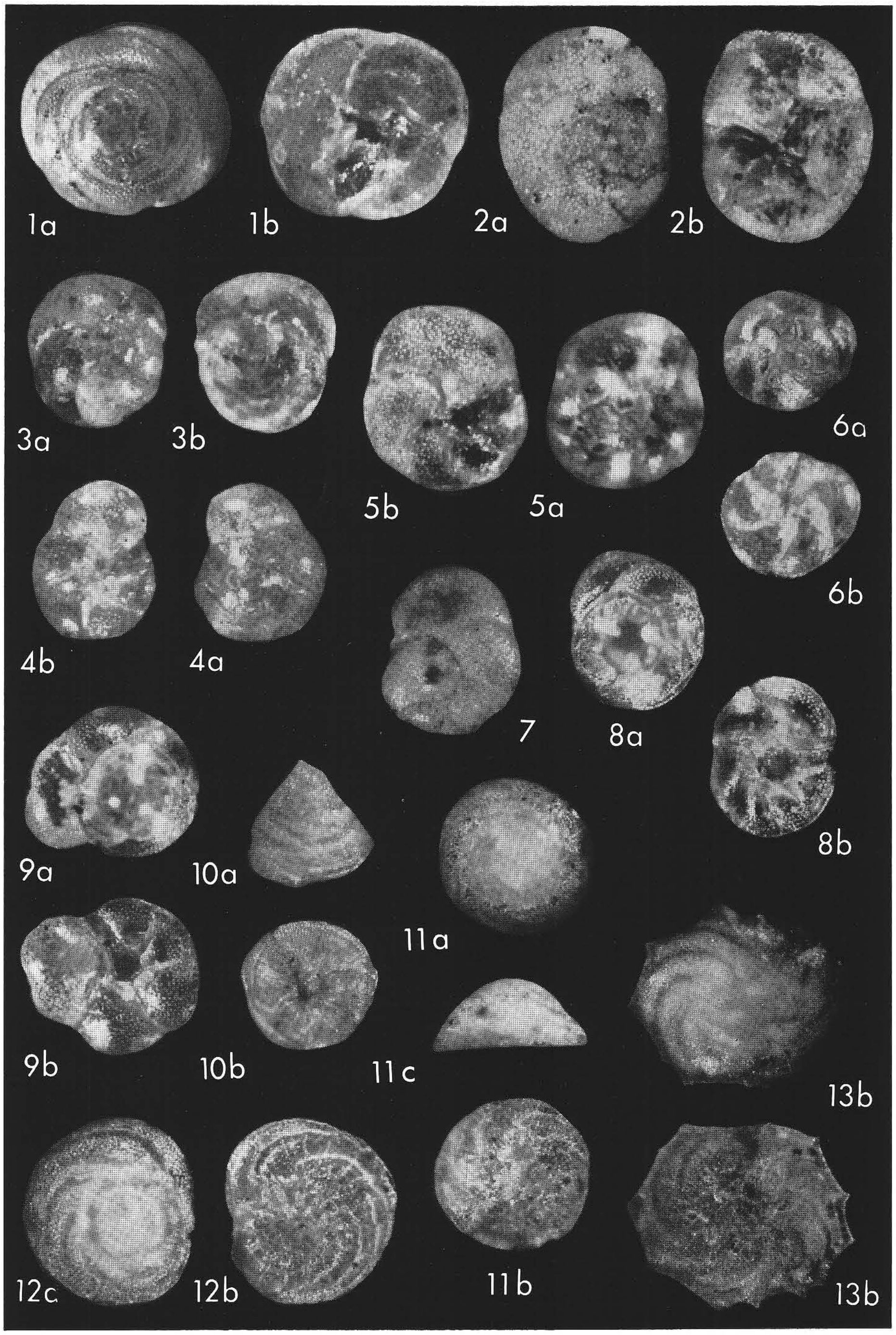
1a, b: *Massilina inaequalis* Cushman, OMNH Reg. No. F10674F, ×80
2: *M. planata* Cushman, OMNH Reg. No. F10675F, ×80
3a, b: *Miliolinella circularis* (Borenemann), OMNH Reg. No. F10679F, ×80
4: *M. circularis* (Borenemann), OMNH Reg. No. F10677F, ×60
5: *M. oblonga* (Montagu), OMNH Reg. No. F10678F, ×120
6a, b, c: *Scutuloris* sp. A, OMNH Reg. No. F10723F, ×80
7a, b, c: *S.* sp. A, OMNH Reg. No. F10724F, ×50
8: *Hauerina pacifica* Cushman, OMNH Reg. No. F10671F, ×105
9: *H. fragilissima* (Brady), OMNH Reg. F10670F, ×65
10: *Articulina conico-articulata* Batch, OMNH Reg. No. F10625F, ×105
11: *Lagena striata* (d'Orbigny), OMNH Reg. No. F10657F, ×105
12: *Buliminella elegantissima* d'Orbigny, OMNH Reg. No. F10635F, ×105
13: *Bolivina glutinata* Egger, OMNH Reg. No. F10627F, ×105
14: *B. subangularis* Brady, OMNH Reg. No. F10629F, ×65
15: *B. robusta* Brady, OMNH Reg. No. F10628F, ×80
16: *Brizalina seminuda* (Cushman), OMNH Reg. No. F10632F, ×65
17: *B. striatula* (Cushman), OMNH Reg. No. F10633F, ×80
18: *B. striatula* (Cushman), OMNH Reg. No. F10634F, ×100
19: *Reussella sculeata* Cushman, OMNH Reg. No. F10716F, ×80
20: *Uvigerina proboscidea* Schwager, OMNH Reg. No. F10745-1F, ×120
21: *U. proboscidea* Schwager, OMNH Reg. No. F10745-2F, ×120




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate XI

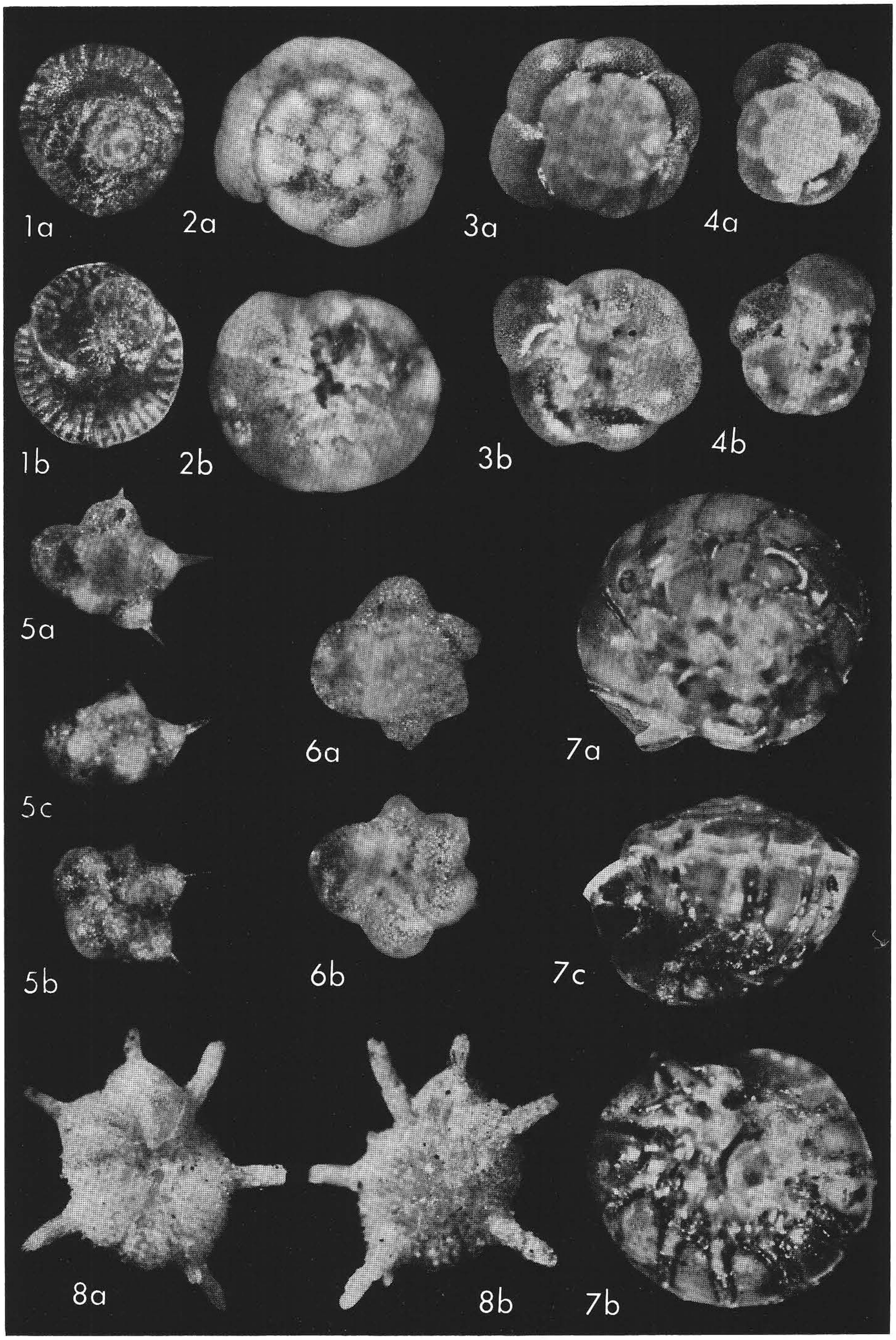
1a, b: *Neoconorbina terquemi* (Rzehak), OMNH Reg. No. F10680F, ×80
2a, b: *Rosalina globularis* d'Orbigny, OMNH Reg. No. F10720F, ×60
3a, b: *R. concinna* (Brady), OMNH Reg. No. F10718F, ×100
4a, b: *R. rugosa* d'Orbidny, OMNH Reg. No. F10721F, ×100
5a, b: *R. floridana* (Cushman), OMNH Reg. No. F10717F, ×100
6a, b: *R. vilardeboana* d'Orbigny, OMNH Reg. No. F10722F, ×100
7: *R. subbertheloti* Cushman, OMNH Reg. No. F10719F, ×100
8a, b: *Gavelinopsis* cf. *praegeri* (Heron-Allen & Earland), OMNH Reg. No. F10662F, ×80
9a, b: *G.* cf. *praegeri* (Heron-Allen & Earland), OMNH Reg. No. F10661F, ×80
10a, b: *Glabratella patelliformis* (Brady), OMNH Reg. No. F10665F, ×80
11a, b: *G. australensis* (Heron-Allen & Earland), OMNH Reg. No. F10663F, ×105
12a, b: *G. opercularis* (d'Orbigny), OMNH Reg. No. F10664F, ×105
13a, b: *G. opercularis nakamurai* Asano, OMNH Reg. No. F10648F, ×80




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## PLATE XII

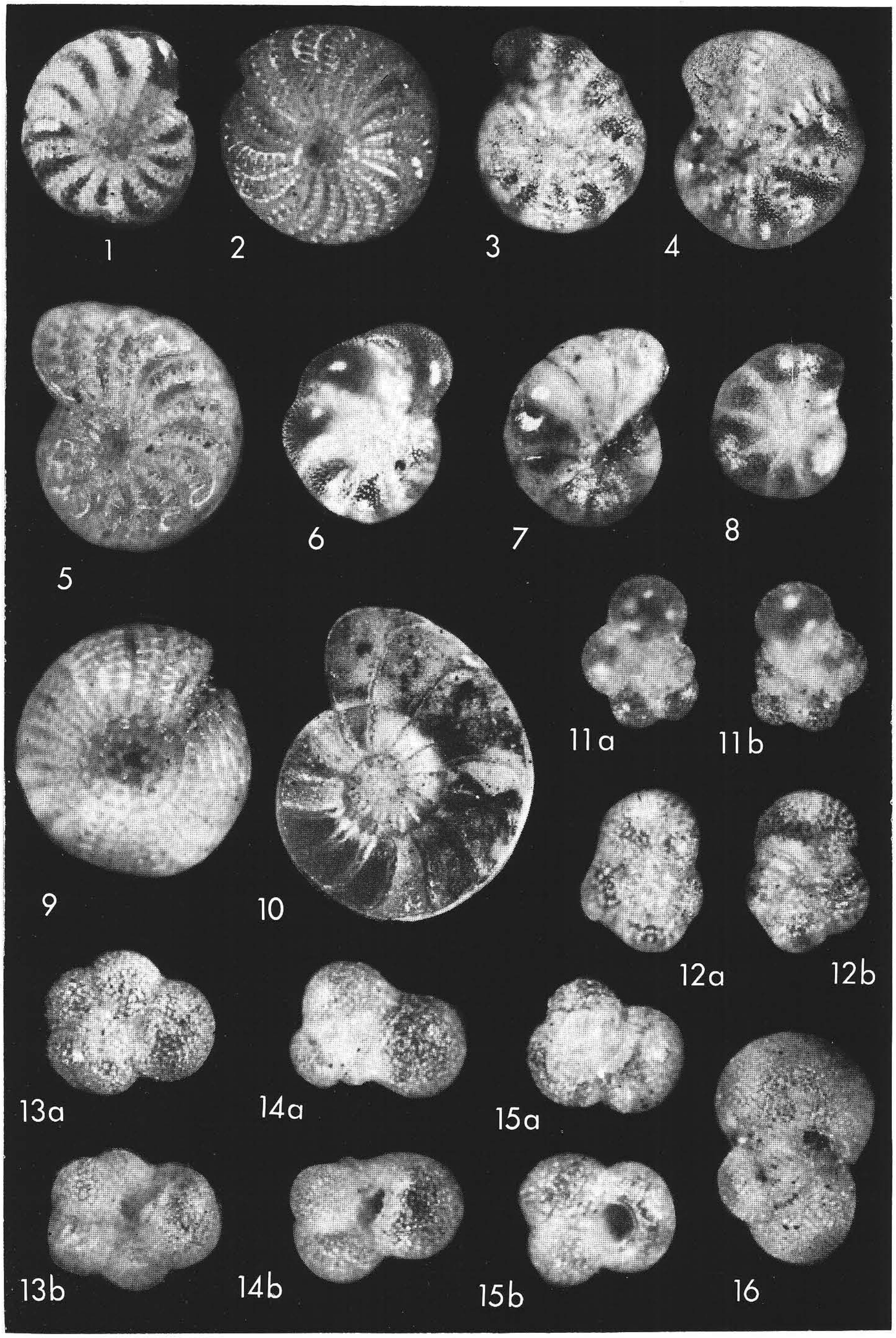
| | |
|---|---|
| 1a, b: | *Patellina corrugata* WILLIAMSON, OMNH Reg. No. F10689F, ×100 |
| 2a, b: | *Ammonia beccarii* (LINNÉ) "forma A"., OMNH Reg. No. F10621F, ×100 |
| 3a, b: | *A. beccarii tepida* (CUSHMAN), OMNH Reg. No. F10620F, ×135 |
| 4a, b: | *A. beccarii tepida* (CUSHMAN), OMNH Reg. No. F10619F, ×135 |
| 5a, b, c: | *Pararotalia* cf. *imperatoria globosa* MILLETT, OMNH Reg. No. F10688F, ×160 |
| 6a, b: | *P. murrayi* (HERON-ALLEN & EARLAND), OMNH Reg. No. F10687F, ×140 |
| 7a, b, c: | *Pseudorotalia gaimardii* (D'ORBIGNY), OMNH Reg. No. F10691F, ×40 |
| 8a, b: | *Calcarina hispida* BRADY, OMNH Reg. No. F10636F, ×35 |




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate XIII

1: *Elphidium advena* (Cushman), OMNH Reg. No. F10646F, ×80
2: *E. crispum* (Linné), OMNH Reg. No. F10647F, ×50
3: *E. hispidulum* Cushman, OMNH Reg. No. F10649F, ×80
4: *E. striatopunctatum* (Fichtel & Moll)?, OMNH Reg. No. F10650F, ×80
5: *E. jenseni* (Cushman), OMNH Reg. No. F10651F, ×80
6: *E. matagordanum* (Kornfeld), OMNH Reg. No. F10652F, ×94
7: *E. incertum* (Williamson), OMNH Reg. No. F10653F, ×120
8: *E. translucens* Natland, OMNH Reg. No. F10654F, ×165
9: *Cellanthus craticulatum* (Fichtel & Moll), OMNH Reg. No. F10637F, ×50
10: *Operculina ammonoides* Gronovius, OMNH Reg. No. F10685F, ×24
11a, b: *Hastigerina siphonifera* (d'Orbigny), OMNH Reg. No. F10748F, ×140
12a, b: *Globigerina quinqueloba* Natland, OMNH Reg. No. F10748F, ×120
13a, b: *Globorotaloides* cf. *variabilis* Bolli, OMNH Reg. No. F10754F, ×80
14a, b: *Globigerina bulloides* d'Orbigny, OMNH Reg. No. F10749F, ×100
15a, b: *Globigerinoides triloba immatula* LeRoy, OMNH Reg. No. F10752F, ×120
16: *G. triloba triloba* (Reuss), OMNH Reg. No. F10753F, ×60




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate XIV

1a, b: *Pulleniatina obliqueloculata* (Parker & Jones), OMNH Reg. No. F10755F, ×80

2a, b: *Amphistegina radiata* (Fichtel & Moll), OMNH Reg. No. F10623F, ×30

3a, b: *A. madagascariensis* d'Orbigny, OMNH Res. No. F10622F, ×30

4a, b, c: *Cibicides subhaidingerii* Parr, OMNH Reg. No. F10641F, ×53

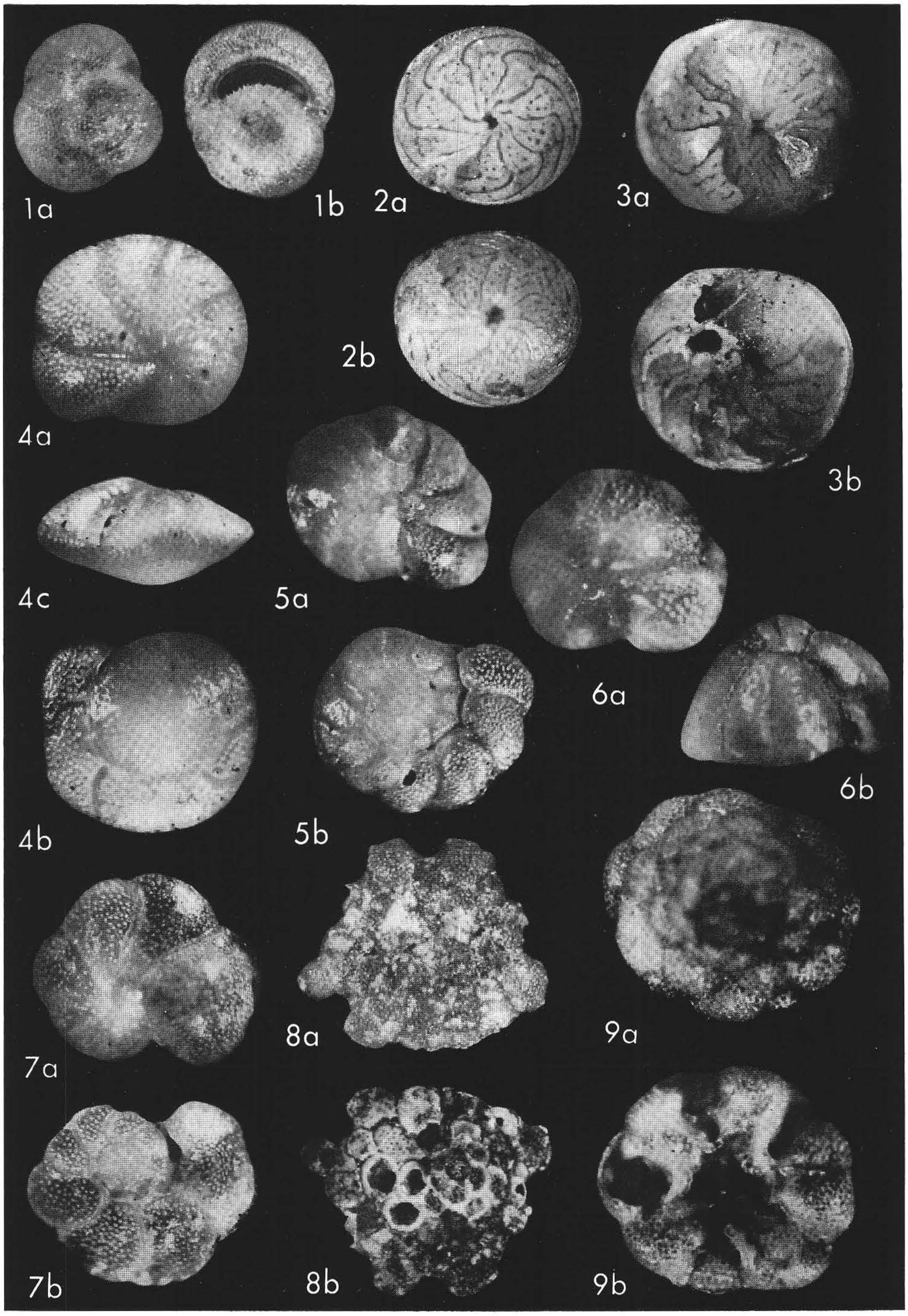
5a, b: *C. pseudoungerianus* (Cushman) OMNH Reg. No. F10639F, ×53

6a, b: *C. refulgens* Montfort, OMNH Reg. No. F10640F, ×80

7a, b: *C. lobatulus* (Walker & Jacob), OMNH Reg. No. F10638F, ×53

8a, b: *Planorbulina* cf. *mediterranensis* d'Orbigny, OMNH Reg. No. F10690F, ×53

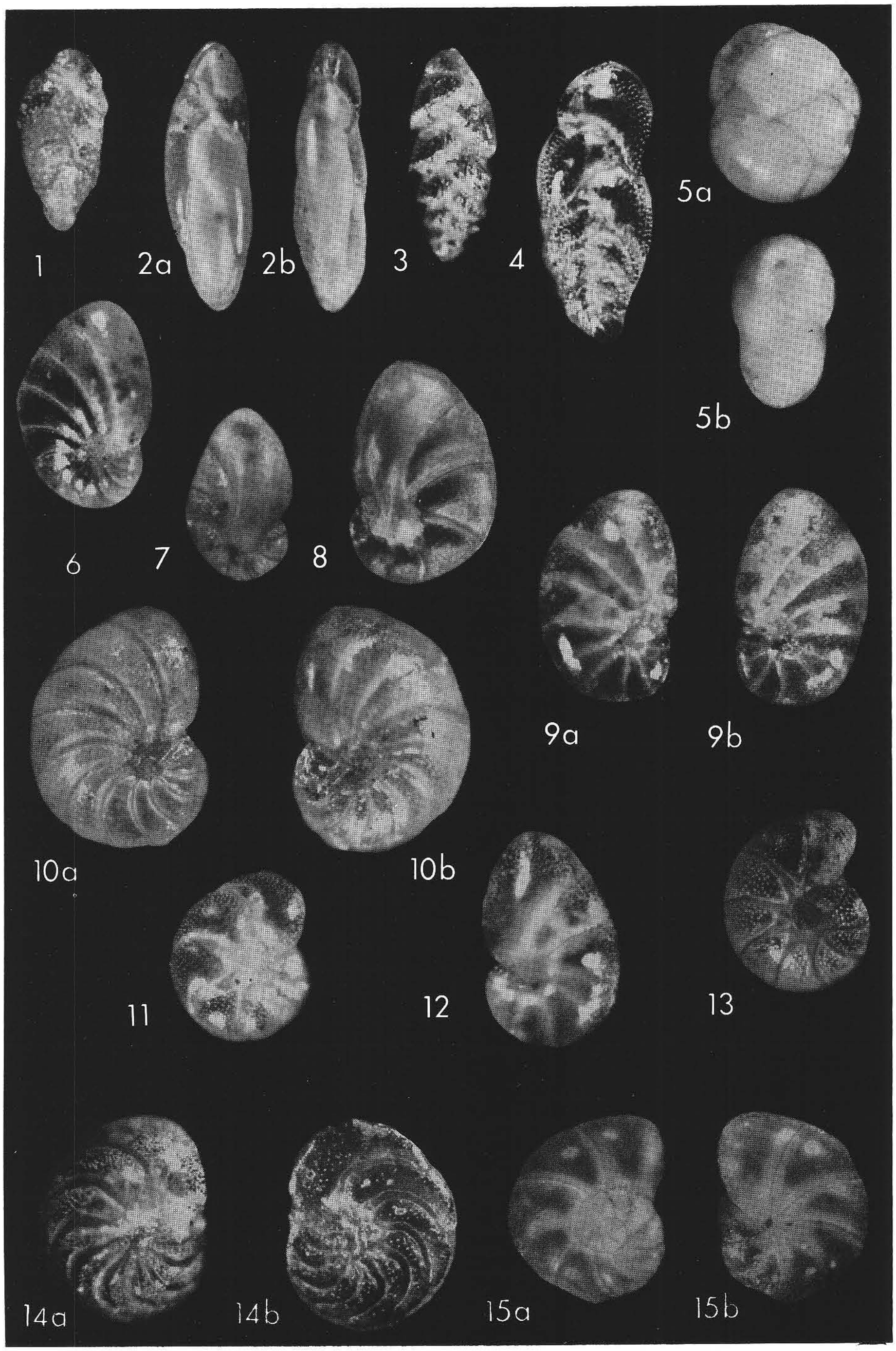
9a, b: *Cymbaloporetta bradyi* (Cushman), OMNH Reg. No. 10645F, ×60




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*

## Plate XV

1: *Sigmavirgulina tortuosa* Brady, OMNH Reg. No. F10725F, ×80
2a, b: *Fursenkoina pauciloculata* (Brady), OMNH Reg. No. F10659F, ×80
3: *Loxostomoides durrandii* (Millett), OMNH Reg. No. F10672F, ×105
4: *L. limbatum* (Brady), OMNH Reg. No. F10673F, ×105
5a, b: *Globocassidulina subglobosa* (Brady), OMNH Reg. No. F10667F, ×130
6: *Nonion japonicum* Asano, OMNH Reg. No. F10681F, ×80
7: *Nonionella miocenica* Cushman, OMNH Reg. No. F10682F, ×160
8: *N. pulchella* Hada, OMNH Reg. No. F10683F, ×160
9a, b: *Florilus grateloupi* (d'Orbigny), OMNH Reg. No. F10655F, ×132
10a, b: *F. japonicus* (Asano), OMNH Reg. No. F10656F, ×80
11: *Astrononion stelligerum* (d'Orbigny), OMNH Reg. No. F10626F, ×132
12: *Nonionellina labradrica* (Dawson), OMNH Reg. No. F10684F, ×160
13: *Melonis nikobarense* (Cushman), OMNH Reg. No. F10676F, ×120
14a, b: *Hanzawaia nipponica* Asano, OMNH Reg. No. F10668F, ×80
15a, b: *Anomalina globulosa* Chapman, OMNH Reg. No. F10624F, ×105




M. CHIJI and S. M. LOPEZ: *Foraminiferal Assemblages in Tanabe Bay*