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9. Preliminary Report on Foraminifera from the Habitat of *Nautilus* off the Southeast Coast of Viti Levu, Fiji

by

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The field study on the habitat of *Nautilus* off the southeast coast of Viti Levu Island, Fiji was carried out during the period from 26 th August to 30 th September, 1983 in comparison with that in the Philippines (HAYASAKA *et al.*, 1982 : HAYASAKA *ed.*, 1983). During the field work, bottom samples for the ecological study on foraminifera were collected from ten stations off Suva (SV-1, SV-3, SV-4, SV-5, SV-7, SV-8, SV-9, SV-10, SV-11 and SV-12) and three stations off Pacific Harbor (PH-1, PH-3 and PH-5). Because the identification of foraminifera has not been completed, here the writer wishes to describe the general features of the foraminiferal assemblages in the

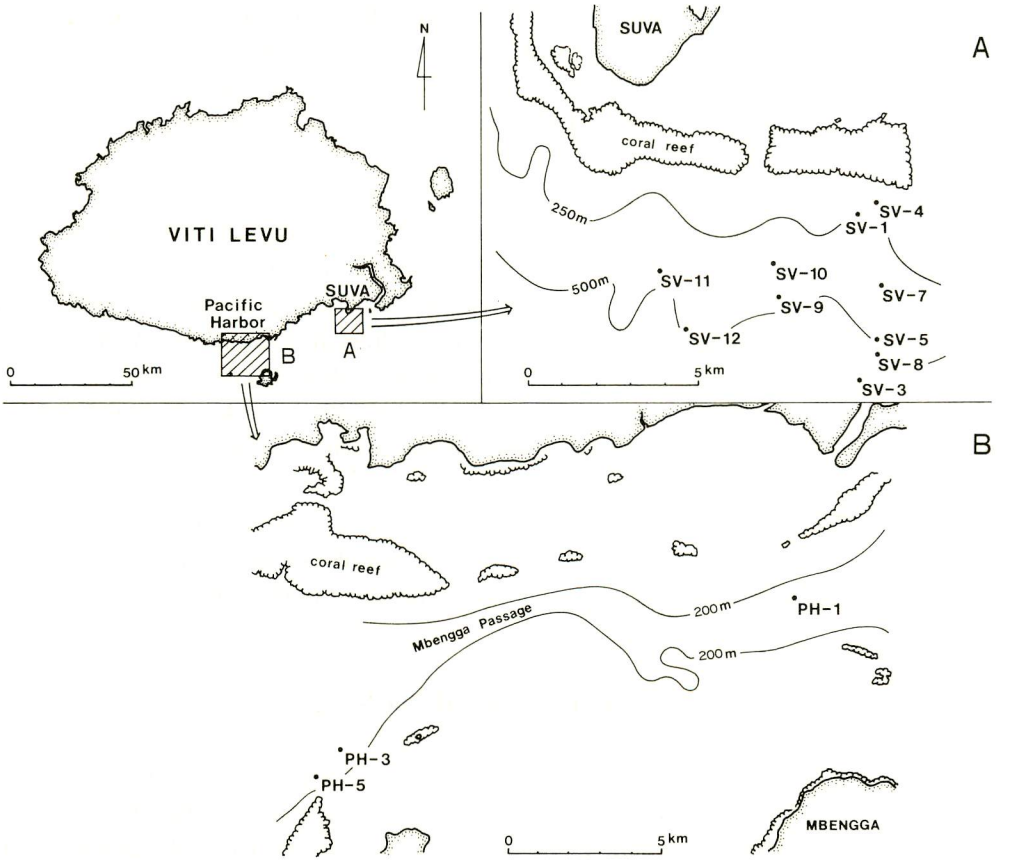

Fig. 1. Index map showing the studied area and the sampling stations (A : off Suva, B : off Pacific Harbor).

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studied areas to give a basic information for future ecological studies.

Oceanographic Background of the Area Studied

HAYASAKA *el al.* (1985) described in detail the results of the field studies on the environmental background of the habitat of *Nautilus*. Based on their description, here the writer outlines the oceanographic environment of the present area (Fig. 1).

The samples of foraminifera studied by the writer are collected from the two separate areas, off Suva (A) and off Pacific Harbor (B), both on the southeast coast of Viti Levu, Fiji. Submarine topographic features of the two areas are contrasted with each other. Namely, in the area A, the submarine topography is characterized by a steep slope with a few submarine canyons abruptly deepening from the outer margin of the barrier reef to the deep ocean bottom, while the area B is a narrow channel (Mbengga Passage) between the barrier reefs off Viti Levu Island and surrounding Mbengga Island.

In spite of the difference in topography, the vertical distribution patterns of water temperature in the two areas are similar to each other. The temperature of water shallower than 100 m seems to be rather constant (24.40-25.42°C) and gradually lowers from 100 m (about 24.5°C) to 600 m (about 7°C) in depth. The same may be said of the changes of salinity with depth. Salinity of waters shallower than 100 m ranges from 34.2 to 34.4 ‰, and that of water deeper than 100 m gradually changes from 34.0 to 32.0 ‰. DO values of waters shallower than 600 m range from 5.7 to 8.4.

According to the result of mechanical analysis (HAYASAKA *et al.*, 1985), the median diameters (Md ϕ) of bottom sediments collected from the area deeper than 180 m are all plotted within a narrow range, from 5.18-6.41 (Mean : 5.91, Standard deviation : 0.40). This suggests that both areas deeper than 180 m off Suva and off Pacific Harbor are under the condition of silt deposition irrespective of water depth. The bottom samples from the five stations (SV-9F, SV-11L, PH-1L, PH-2L and PH-4F), of which grain-size compositions fall within the field of sandy silt in the SHEPARD's triangle, show bimodal grain-size distribution with the peaks around 6 ϕ and 3 ϕ and negative skewnesses (α ϕ). The peak around 3 ϕ recognized in the grain-size distribution of these bottom sediments implies that the sediments were supplied to the site of deposition not by the everlasting bottom current but by some accidental power of transportation, e. g. submarine sliding originated from the shallower bottom. This may be endorsed by the fact that the tests of shallow water benthonic foraminifera are abundantly comprised in these sediments.

Materials and Methods

The bottom samples used for this study were collected at ten stations off Suva and three stations off Pacific Harbor with a small dredge connected to the trap for *Nautilus* (Fig. 6 in Plate 1). All samples were preserved in buffered formaline (5 %) and the surface part of each sample was stained with Rose Bengal for discriminating the living foraminifera.

In the laboratory, each bottom sample was washed through a 200-mesh (0.074 mm openings) sieve and oven-dried. Dry samples were split with a microsplitter to yield an aliquot containing

Table 1. Composition of foraminifera in the bottom sediments obtained from the 14 stations off Suva (SV-1～4 and SV-7～12) and off Pacific Harbor (PH-1, 3 and 5), Fiji.

Station Number		SV-1	SV-3	SV-4	SV-5	SV-7	SV-8	SV-9	SV-10	SV-11	SV-12	PH-1	PH-3	PH-5
Depth (m)		275	640	180	460	365	550	460	330	420	460	330	460	420
Volume of Sediment Sample (cc)		15.4	13.3	16.1	21.2	24.6	20.4	23.3	20.4	26.7	28.7	25.0	20.0	20.4
Benthonic Population	in 10 cc of sediment	17330	5678	33232	6158	8846	28737	21864	54714	31065	10615	37581	20288	9004
	actually counted	417	236	209	204	340	229	199	436	324	238	367	317	574
Agglutinated Foraminifera (%)		4.8	16.5	6.2	15.2	21.5	14.0	16.6	5.5	15.7	15.1	7.4	30.3	25.1
Calcareous Porcelaneous Foraminifera (%)		12.7	3.8	16.7	8.3	6.8	7.4	9.0	11.7	11.1	12.6	12.5	11.0	9.9
Calcareous Hyaline Foraminifera (%)		82.5	79.7	77.0	76.5	71.8	78.6	74.4	82.8	73.1	72.3	80.1	58.7	65.0
Planktonic Population	in 10 cc of sediment	6234	5991	5406	7215	4813	33506	21425	41035	20231	14584	7782	4288	1192
	actually counted	150	249	34	239	185	267	195	327	211	327	76	67	76
	Pl. /Pl. + Ben. (%)	26.5	51.3	14.0	54.0	35.2	53.8	49.5	42.9	39.4	57.9	17.2	17.4	11.7
	Pl. /Pl. + Rads. (%)	94.3	87.7	87.2	94.1	93.0	95.0	96.1	97.6	90.2	96.2	97.4	82.7	80.9

Pl.: Planktonic Foraminifera ; Ben.: Benthonic Foraminifera ; Rads.: Radiolaria

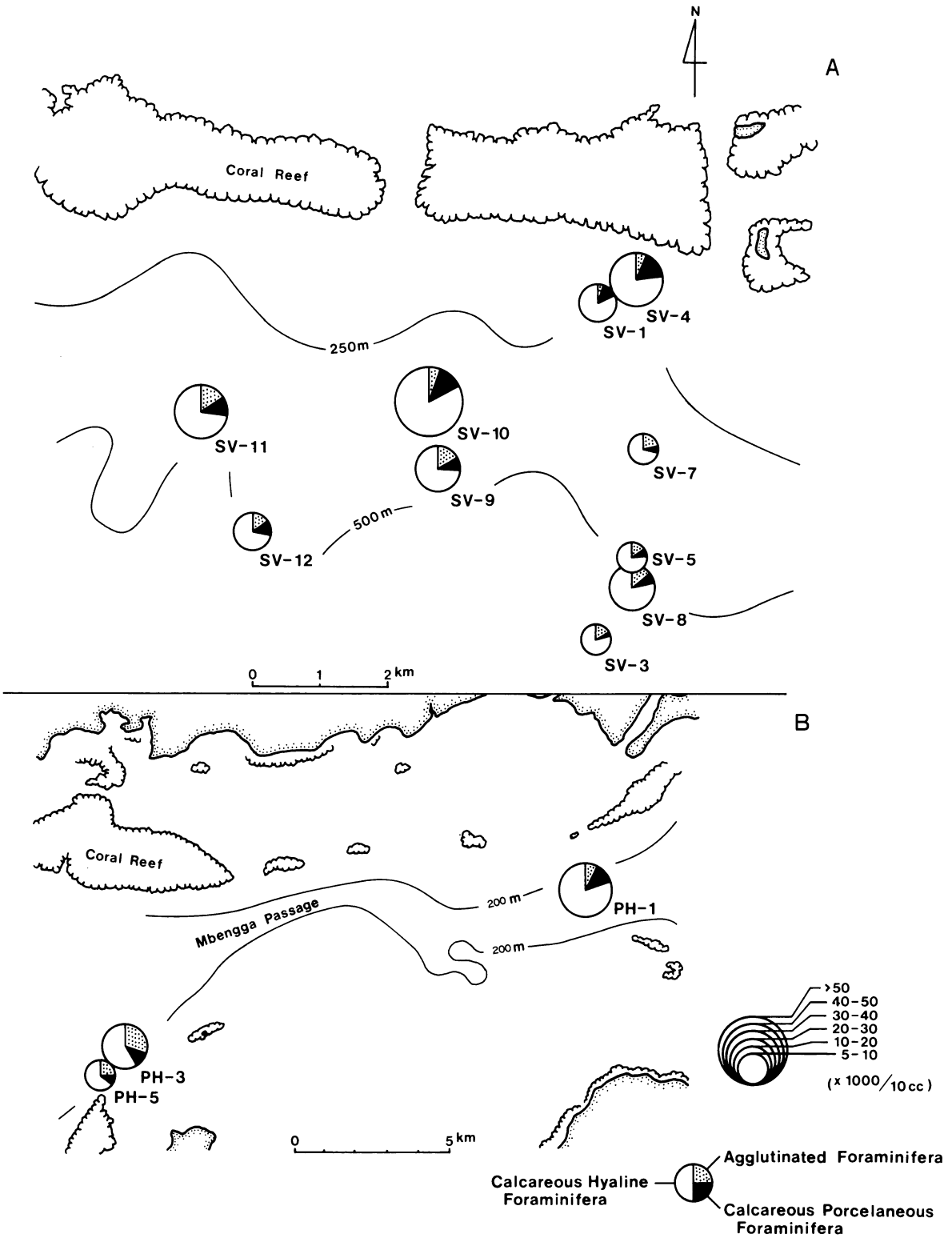

Fig. 2. Map showing the composition and the total number of benthonic foraminifera in 10 cc of wet sediment (A : off Suva, B : off Pacific Harbor).

more than 200 specimens, and all specimens contained were picked from the aliquot. Aliquots containing less than 200 individuals of benthonic foraminifera were supplemented by additional splits.

Remarks on Foraminifera

The total number of benthonic and planktonic foraminifera in each sample, and respective ratio of agglutinated, porcelaneous and hyaline benthonic foraminifera to the total benthonic foraminifera, planktonic to the total foraminifera and of planktonic foraminifera to the total number of planktonic foraminifera plus radiolaria are given in Table 1. Through the analysis mentioned above, the following several points were made clear.

1) The total number of benthonic foraminifera ranging from 5678 to 54714 in 10 cc of

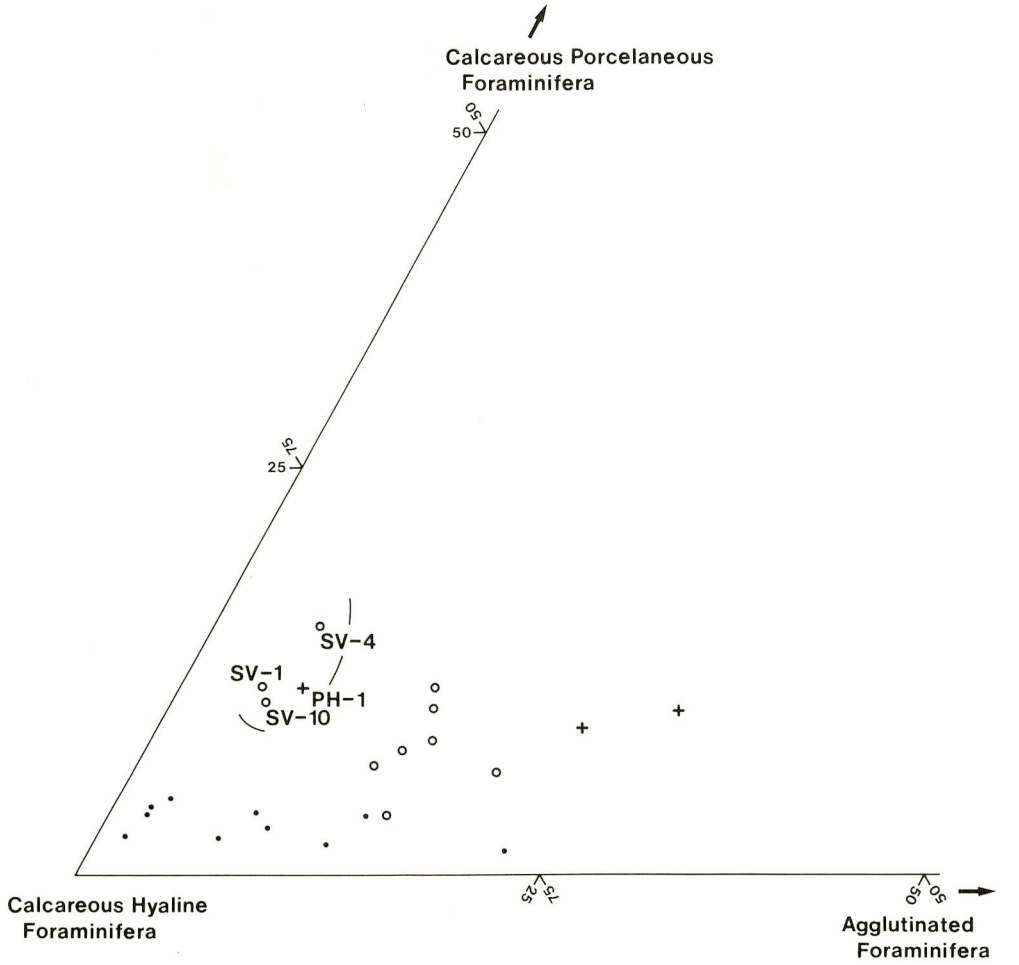

Fig. 3. Triangular diagram of the ratios of the three kinds of benthonic foraminiferal tests in each sample (○ : stations off Suva, + : stations off Pacific Harbor, ● : stations in Tañon strait, the Philippines).

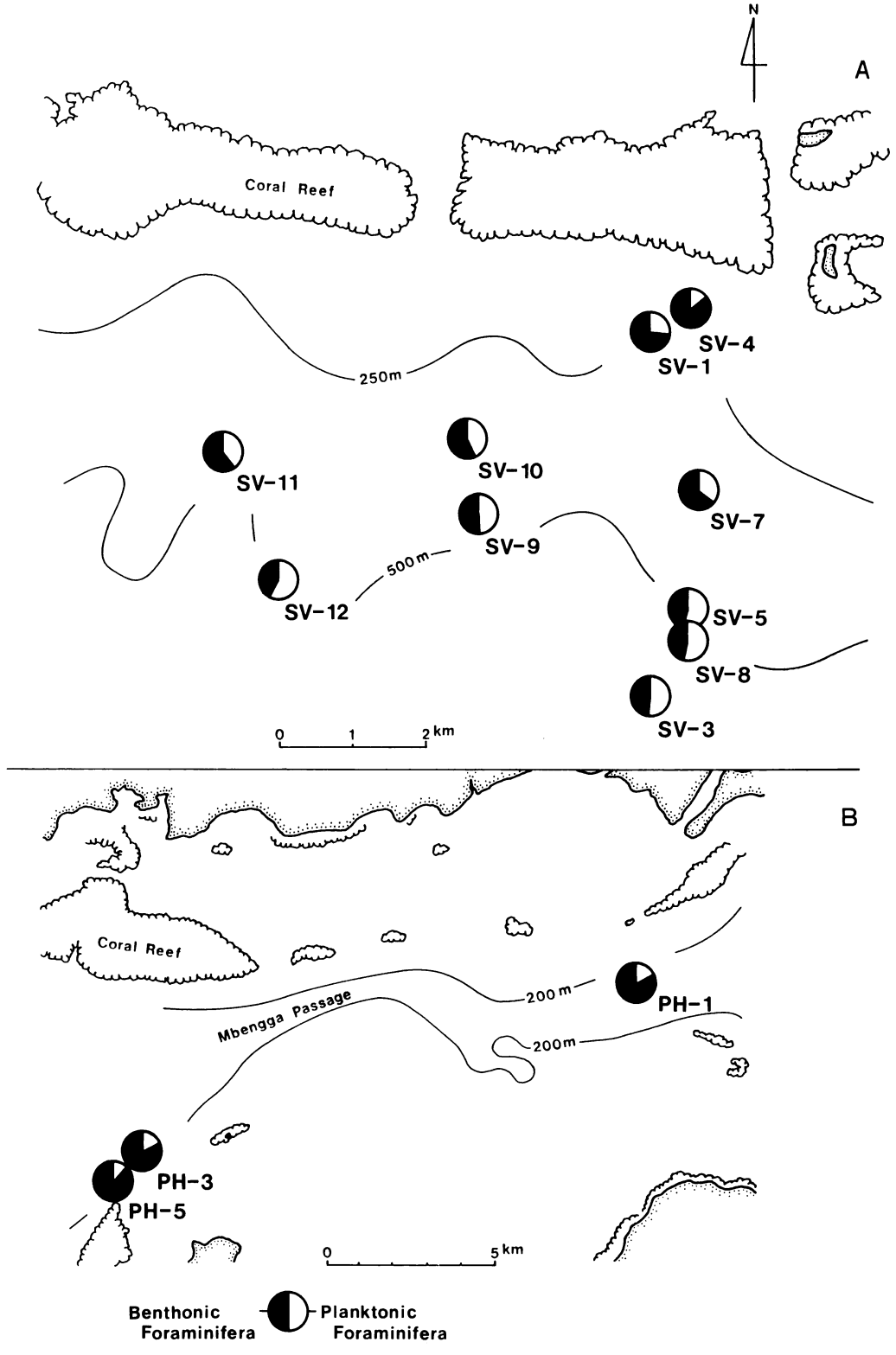

Fig. 4. Map showing the frequencies of planktonic and benthonic foraminifera in the bottom sediments collected from each station off the southeast coast of Viti Levu Island, Fiji.

sediment never represents the correlation with the water depth. The same may be said of the total number of planktonic foraminifera and radiolaria in 10 cc of sediment (Table 1).

2) The composition of benthonic foraminifera contained in the bottom sediments off the southeast coast of Viti Levu, Fiji are given in Figs. 2 and 3. The ratios of the agglutinated and calcareous porcelaneous foraminifera to the total number of benthonic foraminifera are higher than those (less than 5.0 %) recognized in the samples from Tañon Strait, the Philippines (ŌKI, 1983). At the stations PH-3 and PH-5, frequency of agglutinated foraminifera is characteristically more than 25.1 %, and that of calcareous hyaline foraminifera is less than 65 %.

The assemblages of benthonic foraminifera contained in the bottom sediments are divided into two groups by the ratio of the calcareous porcelaneous and the agglutinated foraminifera. One group (SV-1, SV-4, SV-10 and PH-1) is characterized by the frequencies of agglutinated foraminifera less than 7.4 % and those of calcareous porcelaneous foraminifera ranging from 11. 7 to 16.7 %. Another group (SV-3, SV-5, SV-7, SV-8, SV-9, SV-11, SV-12, PH-3 and PH-5) is characterized by the frequencies of agglutinated foraminifera more than 14 % and those of calcareous porcelaneous foraminifera less than 12.6 %. The former is recognized in the sediments from the bottom shallower than 330 m and the latter deeper than 365 m.

3) The ratio of planktonic foraminifera to the total foraminifera off Suva increases with depth (Fig. 4). From the figure showing the correlation between the frequency of planktonic foraminifera and the depth of water, it is recognized that each point plotted against the two parameters mentioned above is on or near a parabola (Fig. 5). The ratio of planktonic foraminifera to the total foraminifera at every depth is about 40 % less than that in the cace of Tañon Strait, the Philippines. The ratio of planktonic foraminifera to the total foraminifera off Pacific

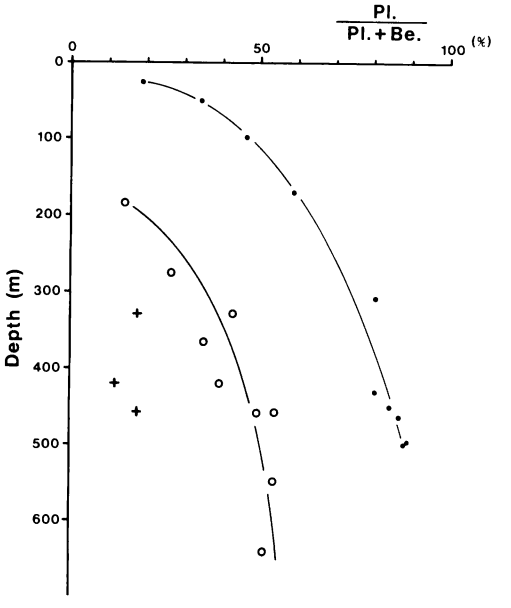

Fig. 5. The correlation between the frequency of planktonic foraminifera in the bottom sediments and the water depth off the southeast coast of Viti Levu Island (Pl. : planktonic foramimifera, Be. : benthonic foraminifera, ○ : off Suva, + : off Pacific Harbor) and in Tañon Strait, the Philippines(●).

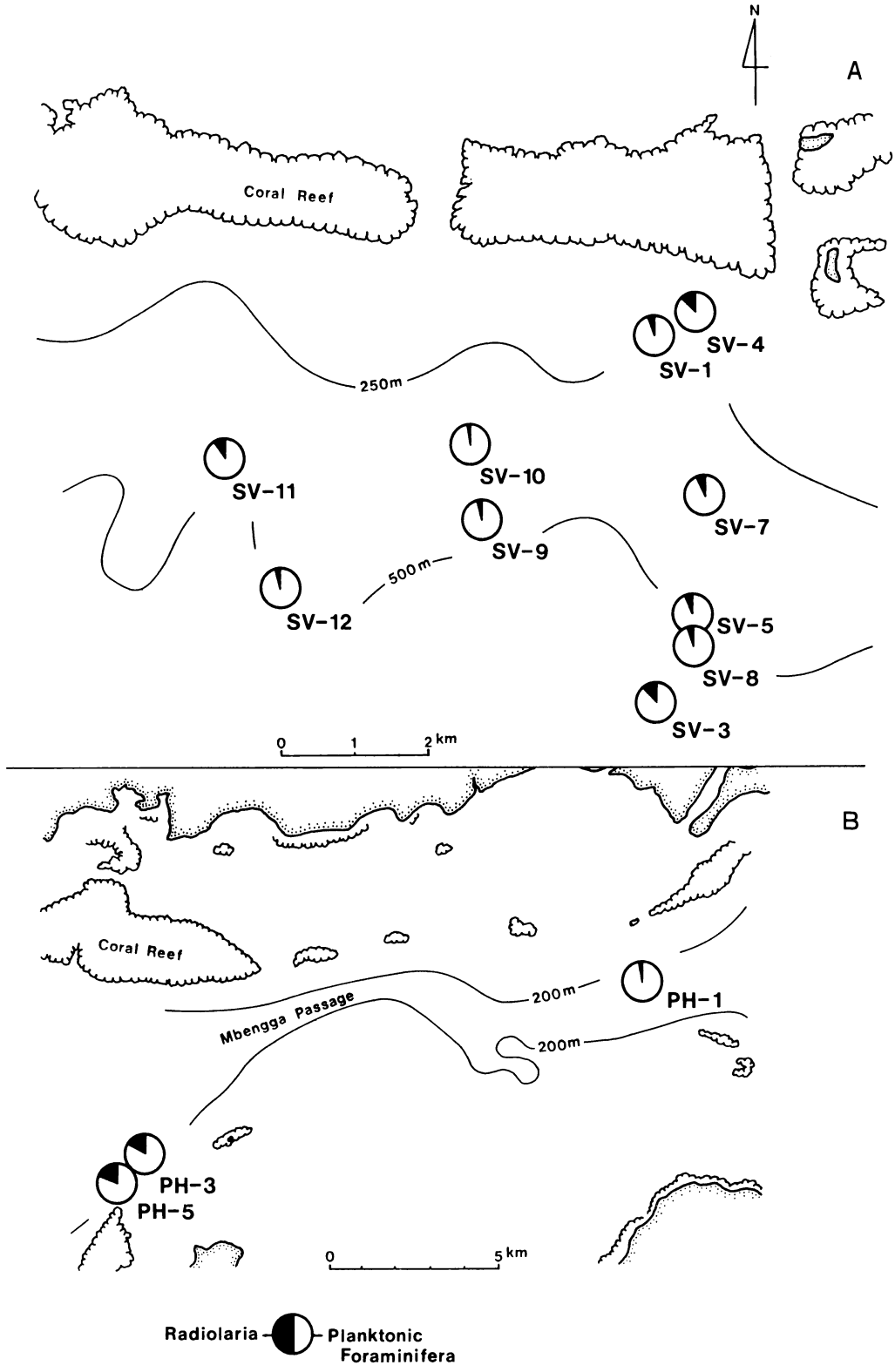

Fig. 6. Map showing the frequency of planktonic foraminifera and radiolaria in the bottom sediments collected from each station off the southeast coast of Viti Levu Island (A : off Suva, B : off Pacific Harbor), Fiji.

Harbor is less than 17.4 %.

4) At every station, the ratio of number of individuals of planktonic foraminifera to the total number of planktonic foraminifera and radiolaria is more than 87.2 % except for the two stations (PH-3 and PH-5) (Fig. 6).

The writer wishes to work out the detailed taxonomic study of foraminifera and to make the comparative study of them with those from the other waters taking geologic, biological and oceanographic data into consideration.

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Explanation of Plate 29

Foraminiferal tests in the bottom sediments at the eight stations off the southeast coast of Viti Levu, Fiji.

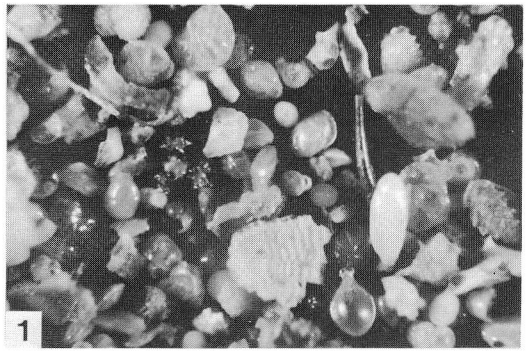
Off Suva :

Fig. 1. Station SV-4 (Depth 180 m).
Fig. 2. Station SV-1 (Depth 275 m).
Fig. 3. Station SV-7 (Depth 365 m).
Fig. 4. Station SV-11 (Depth 420 m).
Fig. 5. Station SV-8 (Depth 550 m).
Fig. 6. Station SV-3 (Depth 640 m).

Off Pacific Harbor :

Fig. 7. Station PH-1 (Depth 330 m).
Fig. 8. Station PH-3 (Depth 460 m).

(Foraminiferal tests concentrated by flotation using carbon tetrachloride ; Bar scale=1 mm).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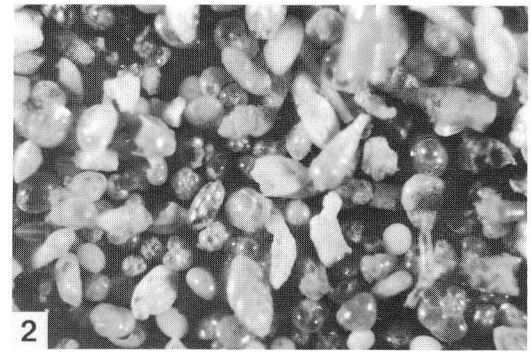
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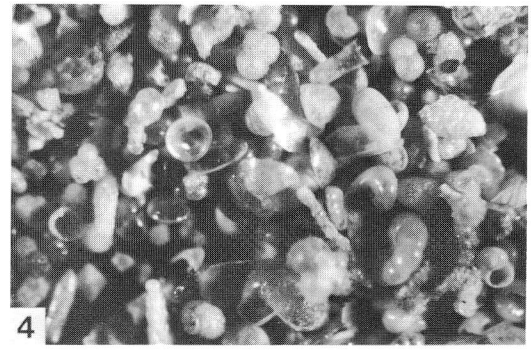
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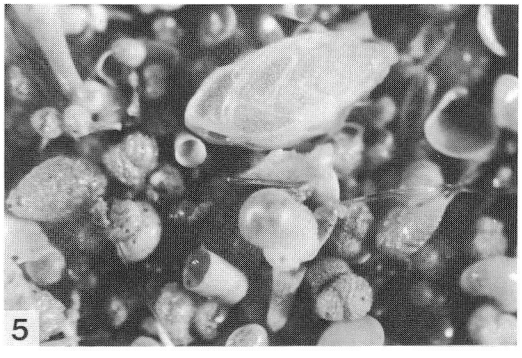
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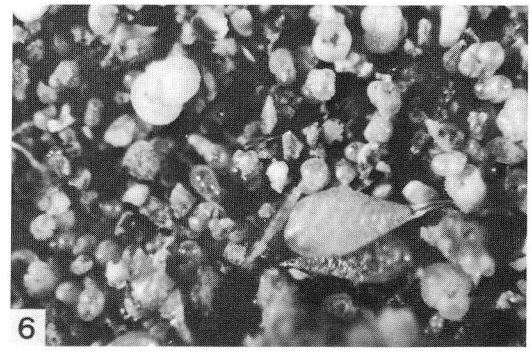
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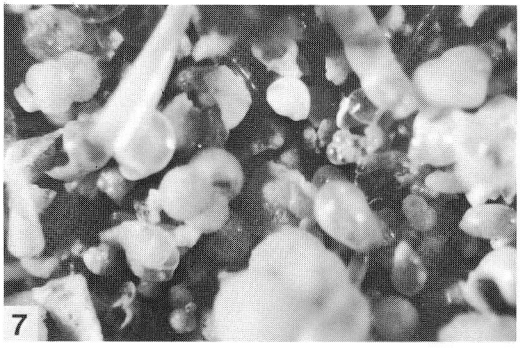
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