1. Environmental Background of the Habitat of *Nautilus* off the East Coast of Viti Levu, Fiji

by

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During the present field study, the writers have been performed the detaild survey on the submarine topography of the area off Suva, of which outline has already been described and discussed in the writers' previous paper (HAYASAKA *et al.,* 1985). In addition, a preliminary survey on the bottom sediments and oceanographic condition was carried out in the area north of Ovalau Island. For the sampling of bottom sediments, a gravity core sampler (the Phleger type) was used. The uppermost 1cm of the obtained core sample was used for the analysis of foraminiferal assemblage and the succeeding 5 cm for the mechanical analysis. Sampling of planktons, oceanographic observation and mechanical analysis were made following in the footsteps of the writers' previous work (HAYASAKA *et al.,* 1985).

Submarine Topography and Bottom Sediments off Suva

In 1983, the writers have carried out a reconnaisance sounding in the area off Suva for understanding the relation between the distribution pattern of *Nautilus* and the submarine topography of its habitat. To clarify the details of submarine topography of the area, echo-sounding was carried out along six parallel lines (*see* Fig. 4) both in the E-W and in the N-S directions. Topographic profiles in the E-W direction are shown in Fig. 1 and in the N-S direction in Fig. 2. A panel diagram drawn based on the combination of these profiles and those described in the previous paper (HAYASAKA *et al.,* 1985) is shown in Fig. 3, and a bathymetric contour map of the area was compiled (Fig. 4.). The latter shows the occurrences of a few submarine valleys deeply cut traversing the bathymetric contour lines parallel with the outer margin of barrier reef. The sea bed on which the stations of high catch record of *Nautilus* concentrate (SV-11 and SV-13 in 1983; SV-32 and SV-34~36 in the present study) is located within one of these valleys. Strictly speaking, its position is on rather gently

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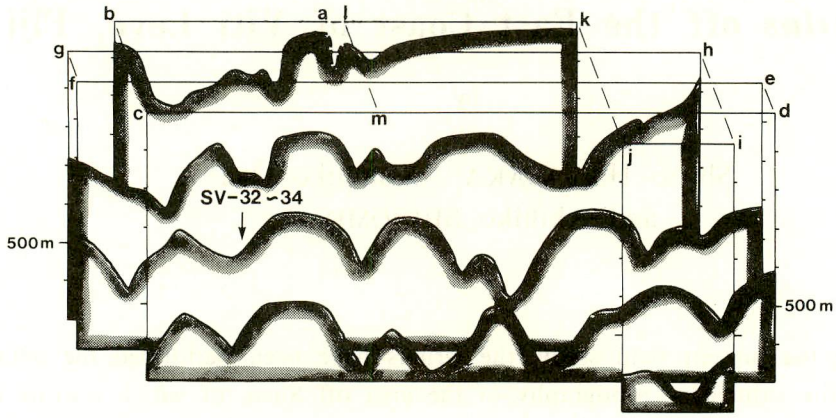

Fig. 1. Bathymetric cross sections of the area off Suva along the E-W lines (Fig. 4).

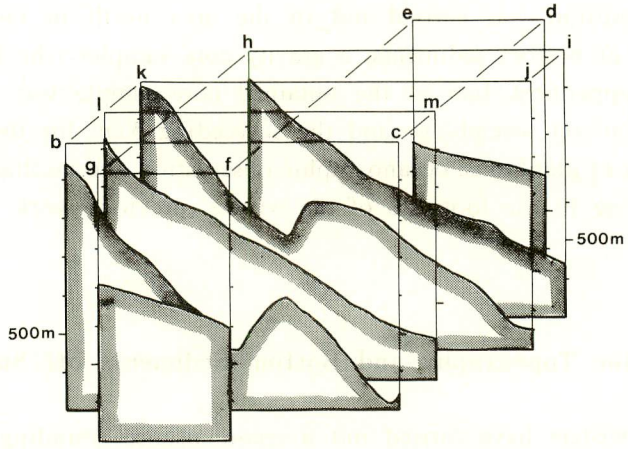

Fig. 2. Bathymetric cross sections of the area off Suva along the N-S lines (Fig. 4).

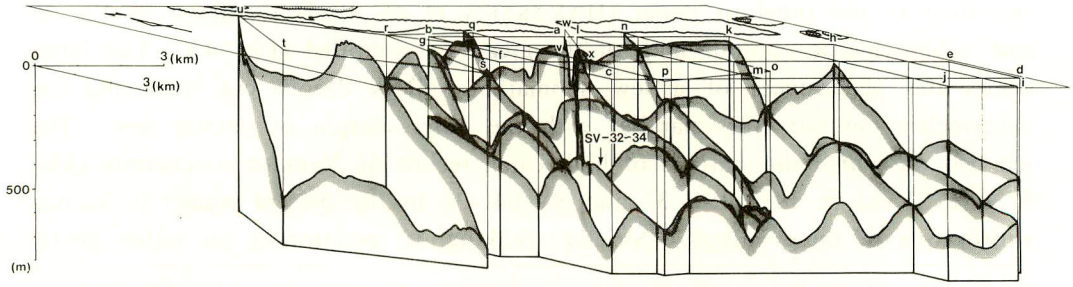

Fig. 3. Panel diagram showing the submarine topographic features of the area off Suva.

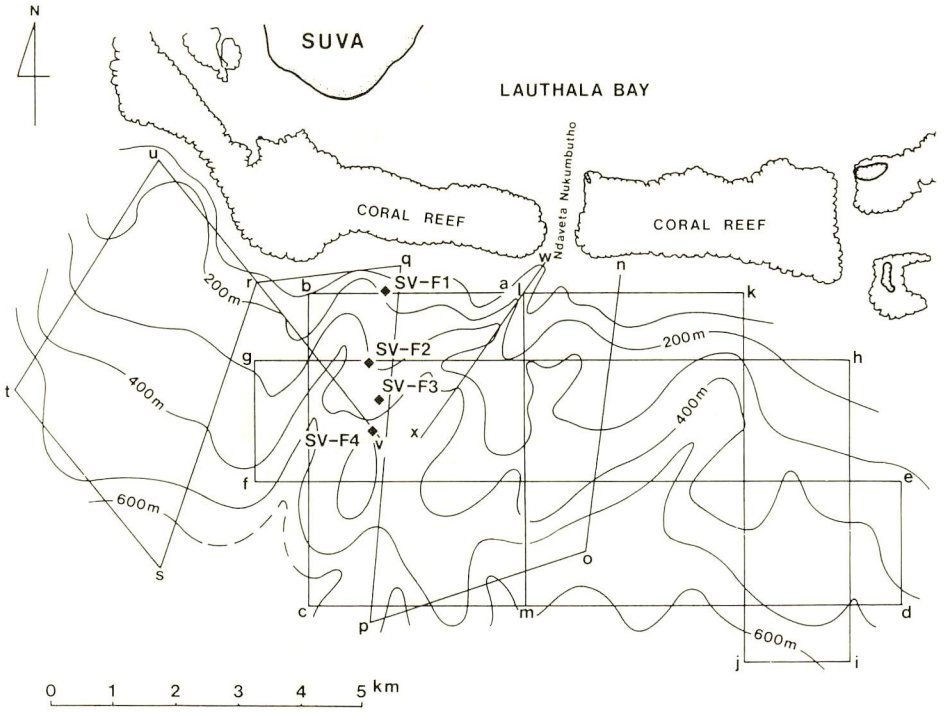

Fig. 4. Bathymetric contour map of the area off Suva, with the echo-sounding lines and the sampling stations of bottom sediments.

Table 1. Grain size measurements of bottom sediments from the areas off Suva (SV) and off Ovalau Island (OL).

Station	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Mdø	Soø	Skø
SV-F1	185	0.0	40.3	57.7	2.0	5.0	2.2	-0.23
SV-F2	275	0.0	72.1	26.0	1.9	2.1	2.3	0.57
SV-F3	366	0.0	1.8	94.5	3.7	6.4	1.1	0.17
SV-F4	458	0.0	1.9	86.1	12.1	6.4	1.2	0.26
OL-F1	403	0.0	10.3	88.1	1.5	5.7	0.8	0.10
OL-F2	458	0.0	11.8	87.4	0.9	5.7	0.7	0.13

sloping bottom (400-500 m deep) of the submarine valley steeply continuing from the Ndaveta Nukumbutho passage of the barrier reef down to the depth more than 600 m. In the writers' previous work, it was pointed out that the distribution pattern of *Nautilus* is infered not to be ubiquitous but rather restricted to some fixed small areas almost permanently. Considering the topographic features mentioned above, it may be explained by the suitable position for *Nautilus* to receive sufficient nutrients supplied from the land through the submarine valley.

In the previous paper, the writers pointed out an occurrence of sediments with 35.9 % sand contents being disharmonious with the grain-size composition of the surrounding bottom sediments. This was explained as the result of an accidental transportation caused by submarine sliding originated from the shallower

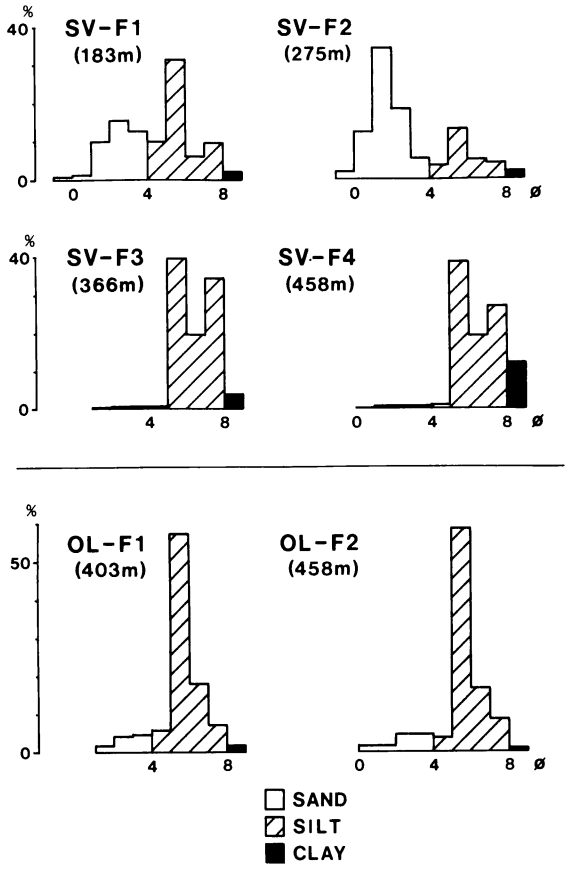

Fig. 5. Grain size ratios of bottom sediments at the six stations off Suva (SV) and off Ovalau Island (OL).

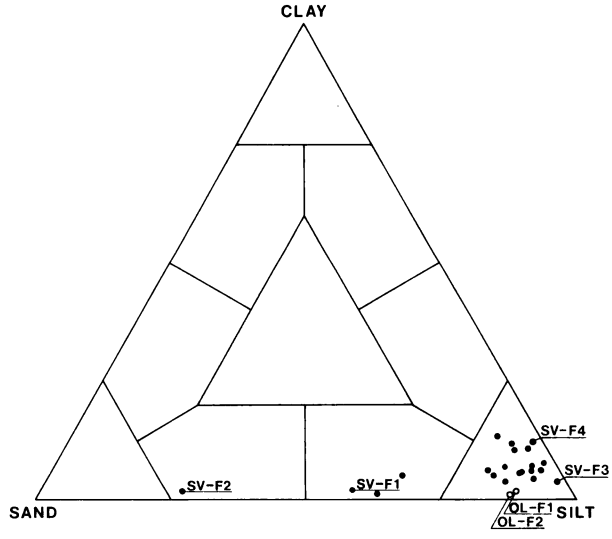

Fig. 6. Textural relations between the samples of sediments indicated on the Shepard's triangle. (●: stations off Suva, ○: stations off Ovalau Island).

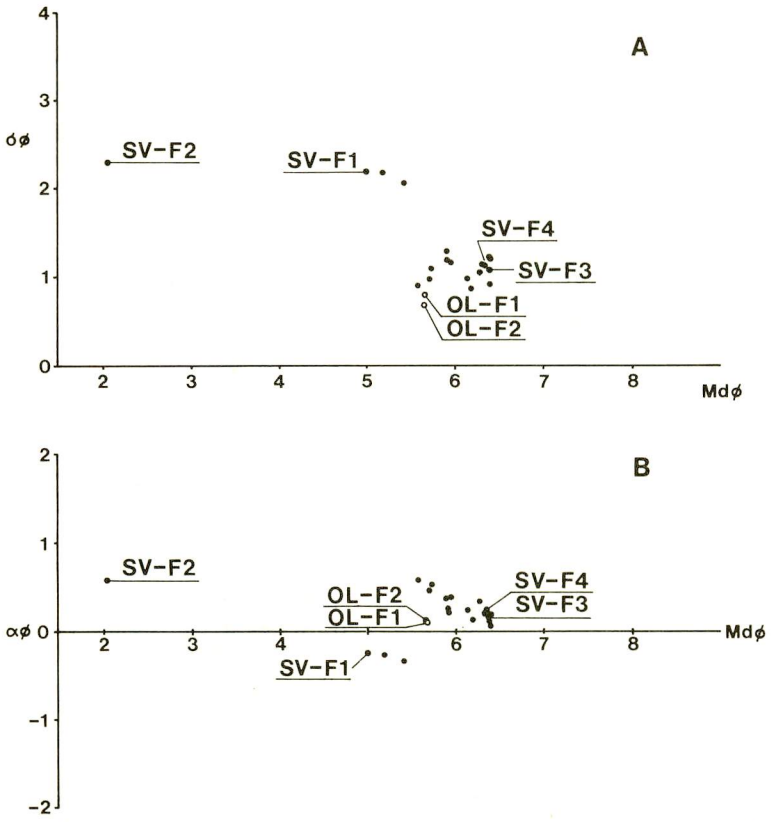

Fig. 7. Relations of grain size to sorting (A) and to skewness (B) of the bottom sediments. (●: stations off Suva, ○: stations off Ovalau Island).

bottom. Through the present field work, bottom sediment with unusually high sand contents (72.1 %; Mdφ: 2.1φ) was collected at the Station SV-F2 (275 m deep and on a topographic ridge) about 2 km off the barrier reef (Table 1; Figs. 5~7). In addition, it contains abundant tests of benthonic foraminifera inhabiting shallower sea bottom. Judging from the foregoing features of sediments in this area, it is infered that the shallow water sediments abundantly comprising the benthonic animals are distributed sporadically on the sea bottom off Suva by stormy disturbances of water.

Bottom Sediments and Sea Water Characteristics off Ovalau Island (Preliminary Survey)

1. Bottom Sediments

In this study, bottom samples were collected at the two stations (OL-F1, 403 m deep; OL-F2, 458 m deep) off Ovalau Island (Fig. 8) and the grain size analyses on them were made (Table 1). The grain size compositions of them

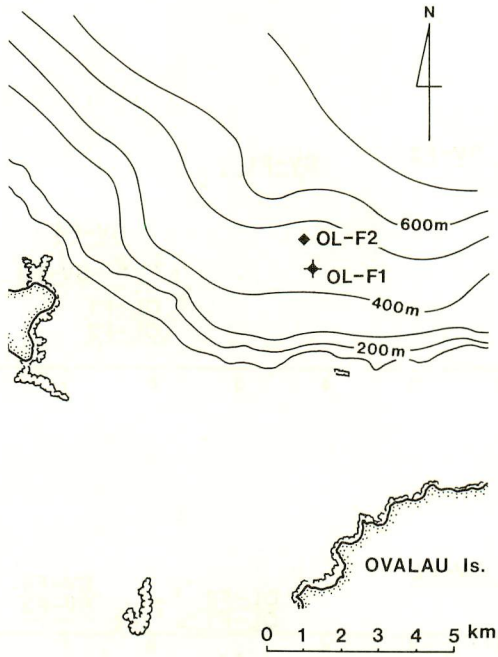

Fig. 8. Map of the area off Ovalau Island, showing the stations for oceanographic observation (+) and sampling of bottom sediments (◆).

are essentially the same as those of the samples from off Suva (Figs. 5～7) except for slightly better sorting of them.

2. Sea Water Characteristics

The water characteristics of the area off Suva have already been described in the previous paper (HAYASAKA *et al.*, 1985). Therefore, the field survey on water masses was carried out in 1986 only in the area off Ovalau Island. Water samples were collected at the Station OL-F2 on September 4, 1986, by bucket from the surface and by two Nansen bottles from the depths of 10, 20, 30, 50, 75, 100, 200, 300 and 400 m. Seawater temperature, salinity and DO were measured on board.

The oceanographic data obtained are shown in Table 2 and Fig. 9. Temperatures of water between the surface and 100 m depth are nearly constant around 24 ℃. Between 100 m and 400 m in depth, on the contrary, water temperature decreases straight down to 13.7 ℃ at 400 m depth with 3-4 ℃ decrease every 100 m. This is quite similar to the vertical distribution of water temperature in the area off Suva recorded in the previous paper (HAYASAKA *et al.*, 1985). Both the present and the previous observations were made during winter season. HAYASAKA *et al.* (1984) reported that in summer the water temperature decreases almost straight from about 28 ℃ at the surface and to about 13 ℃ at the 400

Table 2. Oceanographic data at Stn. OL-2 off Ovalau.

Date	Sep. 4, 1986	Lat.	17°34'24"
Time	11:00-12:00	Long.	178°45'12"
Ship	Nautilus	Depth	450m

Depth(m)	Temp.(°C)	Salinity(‰)	DO(ppm)
0	24.20	35.95	6.30
10	24.15	35.06	6.32
20	24.12	35.00	6.35
30	24.14	35.07	6.25
50	24.18	36.08	6.20
75	23.96	36.49	5.90
100	23.90	36.71	5.85
200	21.00	37.12	5.20
300	18.20	37.55	5.35
400	13.70	37.02	5.55

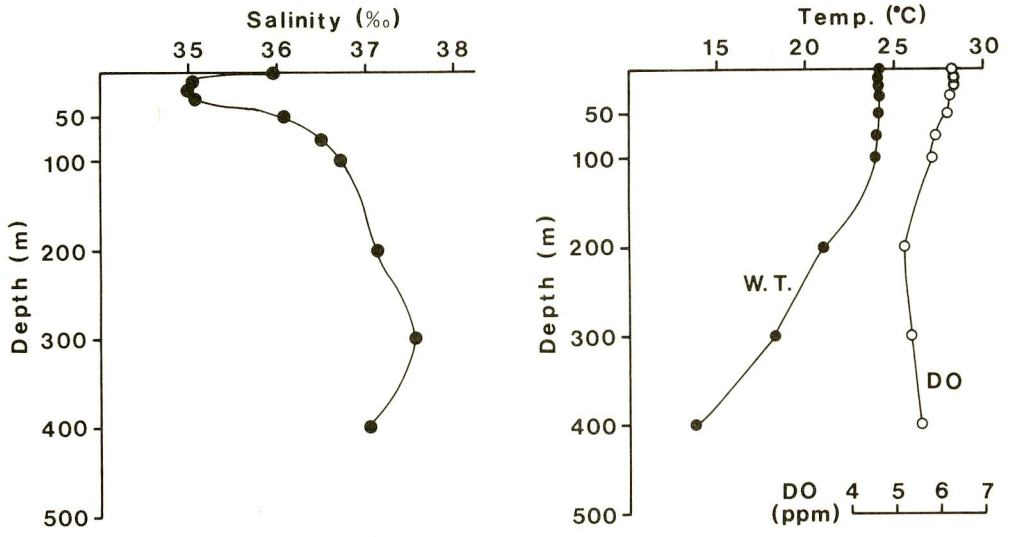

Fig. 9. Vertical distribution of salinity, water temperature (W. T.), and dissolved oxygen (DO) at Stn. OL-2.

m depth as the result of water circulation between the surface and 100 m under the influence of high atmospheric temperature. It is concluded that, in the waters off the northeast coast of Viti Levu, temperature distribution of water shallower than 100 m shows a seasonal change between winter and summer, while that of deeper water layer down to 400 m shows very little annual change in temperature. It is also noticeable that there exists no rapid change in temperature (thermocline) both in deeper and shallower water layers.

The vertical distribution of salinity is as follows. After decrease of salinity

from the surface to 20 m (35.95 ‰ at the surface, 35.05 at 10 m and 35.0 at 20m), it changes to increase below 30 m down to 300 m where the highest salinity (37.55 ‰) was observed, followed by decrease down to 37.02 ‰ at 400 m. The values of water salinity in this area generally higher than those observed in the area off Suva (HAYASAKA *et al.*, 1985).

The DO values show rather constant vertical distribution with slight decrease with depth (Fig. 9). This is similar to the tendency observed in the area off Suva (HAYASAKA *et al.*, 1985).

References

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