Ocean Chemistry Data Report: Alice Arm, Observatory Inlet; Part 1, December 1981, January 1982, June 1982, January 1983

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Canadian Data Report Of Hydrography and Ocean Sciences

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OCEAN CHEMISTRY DATA REPORT : ALICE ARM, OBSERVATORY INLET; PART 1, DECEMBER 1981, JANUARY 1982, JUNE 1982, JANUARY 1983

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ABSTRACT

Macdonald, R.W., M.C. O'Brien, D.M. Macdonald 1984. Ocean Chemistry Data Report: Alice Arm, Observatory Inlet; Part 1 December 1981, January 1982, June 1982, January 1983. Can. Data Rep. Hydrogr. Ocean Sci. 17 (1), 75 pp.

The preliminary data from four cruises to Alice Arm, B.C., are reported here (Dec. 1981, Jan. 1982, Jun. 1982, Jan. 1983). Included are measurements of salinity, temperature, chlorophyll a silicate, nitrate, phosphate and amounts of material caught in sediment traps.

Key words: Alice Arm, Data, Oceanographic.

RESUME

Macdonald, R.W., M.C. O'Brien, D.M. Macdonald 1984. Ocean Chemistry Data Report: Alice Arm, Observatory Inlet; Part 1 December 1981, January 1982, June 1982, January 1983. Can. Data Rep. Hydrogr. Ocean Sci. 17 (1), 75 pp.

Les données préliminaires obtenues lors de quatre expéditions au bras Alice (C.-B.) sont présentées (déc. 1981, janv. 1982, juin 1982 et janv. 1983). Celles-ci comprennent des mesures de salinité et de température et des dosages de chlorophylle a, silicate, nitrate, phosphate et de matériaux recueillis dans des pièges à sédiments.

Mots clés: Bras Alice, données, océanographie

ACKNOWLEDGEMENTS

We thank Coastal Zone Oceanography for their generous assistance during the sampling programme, for permission to use the temperature and salinity data from their CTD record, and their measurements of dissolved oxygen. The manuscript was prepared by C. Priestley, and figures by P. Frank. S. Thomson helped with advice on style and format. We thank the officer and crew of the C.S.S. Parizeau who assisted with the Dec. 81 and Jan. 82 cruises and those of the C.S.S. Vector who assisted with the June 82 and Jan. 83 cruises.

INTRODUCTION

As part of an investigation of the transport and fate of mine tailings disposed in a coastal fjord, Ocean Chemistry conducted two cruises to Alice Arm, Hastings Arm and Observatory Inlet. During these cruises the water column and sediments were sampled, and sediment traps were deployed and recovered in Alice Arm. During another two cruises organized by Coastal Zone Oceanography, we deployed and recovered sediment traps in Alice Arm. Additionally, we collected nutrient samples during two other Coastal Zone Oceanography cruises. The background and preliminary data from these cruises are reported in three parts as follows.

Part 1. December 1981, CZO Alice Arm cruise 02 (nutrients)
January 1982, CZO Alice Arm cruise 03 (nutrients)
June 1982, CZO Alice Arm cruise 05 (nutrients, sediment traps)
January 1983, CZO Alice Arm cruise 08 (sediment traps)

Part 2. March 1982, Ocean Chemistry cruise OC-82-IS-001
(nutrients, particulates, trace metals, sediment traps)

Part 3. September-October, 1982, Ocean Chemistry cruise OC-82-IS-003
(nutrients, particulates, sediment traps, sediment cores)

Reported here in Part 1 are nutrients (reactive silicate, phosphate and nitrate plus nitrite) which were sampled by Coastal Zone Oceanography and analyzed at Ocean Chemistry under contract to Seakem Oceanography. Salinity and temperature were taken from Coastal Zone's CTD record for the cast just before the bottlecast. Oxygens were sampled and determined by Coastal Zone Oceanography. Sediment trap collections were made by Ocean Chemistry.

SAMPLING STATIONS

We have used the same sampling stations and terminology as Coastal Zone Oceanography. To avoid conflict, we placed our sediment traps near but not exactly at four of the regular stations in Alice Arm; ST-1 (AA-1), ST-2 (AA-2), ST-3 (AA-3), ST-4 (AA-4). Station locations are shown in Figure 1 with exact coordinates listed later in the tables. The arrangement of sediment traps in longitudinal section is shown in Figure 2.

SAMPLING METHODS

Sea Water

Samples were collected in 1.7 L Niskin bottles from which subsamples for oxygen and nutrients were drawn. Oxygen samples were taken first, pickled with manganous chloride/alkaline iodide solution and determined within one day of sampling. Nutrients were sampled into screw cap test-tubes (2 plastic, 2 glass) which were transferred immediately to a chest freezer, frozen in the upright position and later placed in labelled Zip-lok bags. Salinities and temperatures reported here were interpolated from computer printout for the corresponding CTD cast, the complete record being archived by Coastal Zone Oceanography. Their instrument is built by Guildline Instruments Ltd. (Analogue CTD Model #8700). The instrumental resolution and accuracy for equivalent salinity, temperature and pressure are listed in Table 1.

Sediment Traps

Sediment traps (Figure 3) consisted of PVC cylinders, 48.3 cm high with a diameter of 13.9 cm (aspect ratio=3.5). Baffles were placed in the top (grid size 1.3 x 1.3 x 5 cm) and in the sample cup at the bottom (1.3 x 1.3 x 6.4 cm). The collection area of the traps was 0.0129 m^2. Before the first use (March, '82) the traps were washed with soap and water, rinsed with methanol and soaked in 1% HNO for one month. Between cruises the traps were washed and stored in 1% HNO_3 until the next cruise, at which time they were rinsed with Milli-Q water and stored dry in wooden boxes. During transport, the traps were sealed with tight fitting plexiglass lids (Fig. 3) and kept in specially constructed wooden boxes.

Sediment trap deployment

The sediment traps were placed in a paired configuration as shown in Fig. 4. Before placing on the hydrowire, a dense solution was placed in the bottom of each trap by adding approximately 500 mL of 5% NaCl solution. The "a" side was poisoned by adding NaN_3 to the NaCl solution (0.013 g L^{-1}) and also by placing a 15 mL inverted tube into the trap with the bottom sitting in the sample cup. This inversion tube was filled with a solution containing 20% NaCl and 0.48 g L^{-1} of NaN_3. The density contrast would cause this solution to diffuse into the sample cup after deployment.

The traps were moored using stainless steel hydrowire cut to specific lengths for the depths at the four stations in Alice Arm. Stainless steel loops were fastened at pre-measured distances along the wire so the traps could be attached at the required depths.

To deploy the traps, several lengths of iron chain (∿200 kg) were connected to the bottom thimble of the wire with a shackle and 1" braided nylon rope. At each station, the weight was placed into the water over the ship's stern ("A" frame) and wire was payed out to the first set of loops. The trap assembly was connected with a stainless steel carabiner at the top and shock cord at the bottom. The two plastic lids were removed and the traps were lowered to the surface where they were allowed to fill flowly. Once full, the wire was again payed out to the next set of loops and the process repeated. Once all the traps were placed on the line and the end of the wire reached, a set of 4 or 5 Viny floats (40 lb buoyancy per float) was attached to the top thimble. Above this was attached a 3/8" polypropylene line with a surface float for retrieval. The 3/8" line was long enough to allow about 5 m free play at high tide. The Viny floats remained submerged by several meters at low tide. Retrieval was carried out in the reverse order. It took between 5-25 minutes to deploy or retrieve each of the trap lines, depending on the water depth and number of traps.

To investigate the behaviour of our trap lines in the ambient current regime we used a sub-surface mooring model and computer program devised by Bell (1979, 1977). Current profiles were estimated from Krauel (1981) for Alice Arm, generally by taking the maximum expected currents at a given depth. The results of the model are plotted in Figure 5 (a,b,c,d). The angle of tilt in the line was found to be generally below 5^{o}, although a tilt of 8^{o} was possible at the bottom of station ST-2 during maximum currents.

During the March cruise (reported in part 2) rhodamine B dye was used to investigate the possibility of trap flushing, either during the sampling period, or during deployment/recovery operations. At station 1, outside the Alice rock sill (probably the most dynamic of the trap locations) no dye was evident when the traps were recovered after a period of about 10 days. (This was the longest collection period during the study.) Dye remained in all of the other traps where it had been placed.

Subsampling of sediment traps - June 1982

After recovery, the traps were placed back in their boxes with the plastic lids sealing them from the ambient environment and the contents were allowed to settle for several hours. Figure 6 shows schematically the sediment trap subsampling process. The traps were brought into an enclosure constructed from plastic sheeting in which the air was filtered. Here, water was drained from a spigot above the sampling cup and baffle. In all cases this water was clear. Some of the water was saved in a wash bottle for rinses. The bottom of the sediment trap was unscrewed and the sample cup removed. The baffle was removed, care being taken to rinse any sediment back into the cup. The sediment in the cup was passed through a 333 μm Nitex sieve and into a 1 L acid cleaned polybottle. The polybottle was labelled, bagged and stored in a dark cooler at 4 C until further subsampling. The

portion greater than 333 μm was back-washed off the sieve using pH 8 Milli-Q water and filtered onto a 0.1 μm Nuclepore filter. This was stored frozen in a petri-slide and returned to the lab for microscopic examination and dry weight determination. The sample in the polybottle (333 μm fraction) was subjected to the following procedures after the total volume had been measured.

1. A 10 mL sample was filtered through a 2.5 cm GF/C filter, sprayed with a 1% $MgCO_3$ suspension, folded into a Whatman #1 filter, labelled and placed in a darkened bottle with silica gel in a chest freezer. This was returned to the lab for chorophyll a determination.

2. A 15 mL sample was placed in a small glass vial, preserved with 5 mL of 5% buffered formalin and stored in a cooler at 4°C for microscopic examination.

3. From the sediment traps which had not been preserved with NaN_3 (b side), samples were removed without further sieving. A 20-30 mL sample was taken for POC, PON determination and filtered through a 47 mm GF/G filter which was rinsed, folded and wrapped in Aluminum foil, frozen and returned to the lab. Method of treatment of this sample and results are reported elsewhere.

The remaining volume was divided into two or three portions by pouring into 250 mL plastic cylinders. The total content of each cylinder was filtered through 0.4 μm, 47 mm, acid-cleaned nuclepore filters (6N HCl overnight followed by 0.1% HNO_3 overnight, rinsed with Milli-Q water, dried at 40°C overnight and weighed). The material remaining on the filters was rinsed with three 10 mL portions of pH8 Milli-Q water and stored in acid cleaned petri-slides in a freezer. These were returned to the lab for dry weight determination and metal analyses.

4. From the traps poisoned with NaN_3 (side a), after chlorophyll a and microscopic samples were removed, the remaining volume was passed through a 64 μm Nitex screen. The 64-333 μm fraction was washed off the sieve with pH8 Milli-Q water. This fraction was divided volumetrically, approximately one fifth being used for POC, PON determinations (treated as described in 3 above) and the remainder was filtered onto an acid cleaned preweighed 0.4 μm 47 mm nuclepore filter. This was stored in an acid cleaned petri-slide, frozen and returned to the lab for dry weight and metal determinations. For the less than 64 μm portion, approximately 30 mL was taken for POC, PON determinations, and the remainder was divided into two or three portions for dry weight and metal determinations. The procedures were the same as described in step 3 above.

During all volumetric manipulations the polybottle was shaken gently to keep the sample well mixed before subsamples were poured out. The subsampling of the trap was done on board CSS Vector during the 3 days following trap retrieval (June 22-June 24/82). All equipment for handling sediment trap material was acid cleaned. Filtration equipment and forceps were rinsed for 24 hours in 6N HCl and approximately 1 month in 1% HNO_3.

The 1L polybottles, funnels, graduated cylinders, polyethylene beakers and inversion tubes were soaked for about one month in 1% HNO_3 between cruises. The nitex screens were soaked in 10% HCl overnight and then 1% HNO_3 overnight (This procedure did not affect screen size.).

Subsampling of sediment traps - January 1983

After recovery, the traps were treated in the same manner as in June 1982. However, after transferring the trap contents to the 1 L polybottles, these were stored at 4°C in the dark and returned to Ocean Chemistry for subsampling in the trace metal clean room. Approximately 10 days elapsed between placing the trap contents in polybottles and subsequent subsampling in the lab.

Steps 1 and 2 of the subsampling described for the June '82 cruise were repeated. Step 4 was carried out for all sediment traps (a and b side).

For the traps at 150 m, Station 4, a different procedure was employed. Three extra wet sieve steps were used (500 μm, 202 μm and 35 μm) to divide the material. Procedures for preparing POC, PON, chlorophyll a microscopic and metal samples were the same as described above.

ANALYTICAL METHODS

Oxygen

Oxygen was determined by the methods outlined in Strickland and Parsons (1972).

Nutrients

Nutrients were determined using Technicon Autoanalyzer II components. Reactive silicate and nitrate plus nitrite were determined according to Technicon Industrial Methods No. 186-72 W and 158-71 W respectively, and soluble orthophosphate was determined by a modified Technicon method (Brynjolfson, 1973). Sagami primary standards, prepared in 3.05% NaCl solutions were used for calibration. The instrument was calibrated twice each day (3 points in triplicate, $r > 0.9999$) and readings were interpolated to allow for daily drift (<1.2%). Before analysis, samples were thawed an appropriate time depending on solubility and storage time (Macdonald and McLaughlin, 1982). For these data sets we evaluated precision by selecting random blind replicates which are reported in the data tables. This measures error due both to bias and random fluctuation. For each data set, a pooled estimate of variance was calculated for each nutrient as $s_p^2 = \frac{1}{2n} \Sigma \Delta^2$ where n is the number of replicates and Δ the difference between duplicates. The results are summarized in Table 1.

Sediment Trap Materials

Sediment trap particulates were determined by drying the filters at 40° overnight or longer until they came to constant weight. They were weighed on a Perkin-Elmer auto-balance (AD-2) to the nearest 0.1 mg. Calibration was carried out in accordance with the instruction manual using class 5 NBS weights. The instrument is very linear, and calibration does not appear to contribute significantly to error (see Macdonald et al. 1983). The major weighing problem is static on the filters and this we have avoided by using a Poα source static eliminator and an anti-static gun. Filter blanks are well below the 0.1 mg level. We have determined the detection limit ($3s_B$) and the quantification limit ($10s_B$) to be 0.15 mg and 0.50 mg respectively. Here we are weighing quantities in the 100's to 1000's of milligrams, and therefore well above the limit of quantification. To estimate the precision of volumetrically splitting each sample, filtering and weighing, we calculated a pooled-estimate of variance based on the replicates reported in Tables 5(a) and 6(a). For the June cruise we found that the precision expressed as a coefficient of variation was ± 1.5% (1s) for the traps containing normal quantities of material. For the deep traps at Station 4 where large amount of particulates were settling, precision was better (∿ ± 0.2%). For the January cruise repeatability was better than 1.2% (1s) for 18 sets of duplicates. The difference between replicate traps moored at the same depth (a and b sides) was slightly larger with an average coefficient of variation of 5% for June (15 duplicates) and 4.5% (9 duplicates) for January.

Absolute accuracy can be affected by salt retention, incomplete capture of material by the filter, and balance inaccuracy. We have calibrated with class 5 (NBS) standards and the latter problem does not contribute significantly (Macdonald et al., 1983). If the material on the filter comprised 50% salt water (30 $^{o}/_{oo}$), and no rinses were used, salt would contribute, at most, 1% of the total weight. Therefore this source of bias appears to be potentially only a small factor. As noted above the 0.4 μm filter size by definition separates particulate and dissolved. With the amounts of sediment involved in the traps (70-90,000 mg) we do not believe filter losses contribute much, and certainly less than 1%. For example, the concentration of particulate matter in the samples from the sediment traps was ∿1000 mg L^{-1} or more. We can visually detect water with 4 mg L^{-1} by its turbidity. Since filtered water was always clear, less than 0.4% of the material could have been lost in the filtrate. However, we have no absolute check on the accuray or efficiency of the sediment traps themselves, although replicates indicate that they perform with precision.

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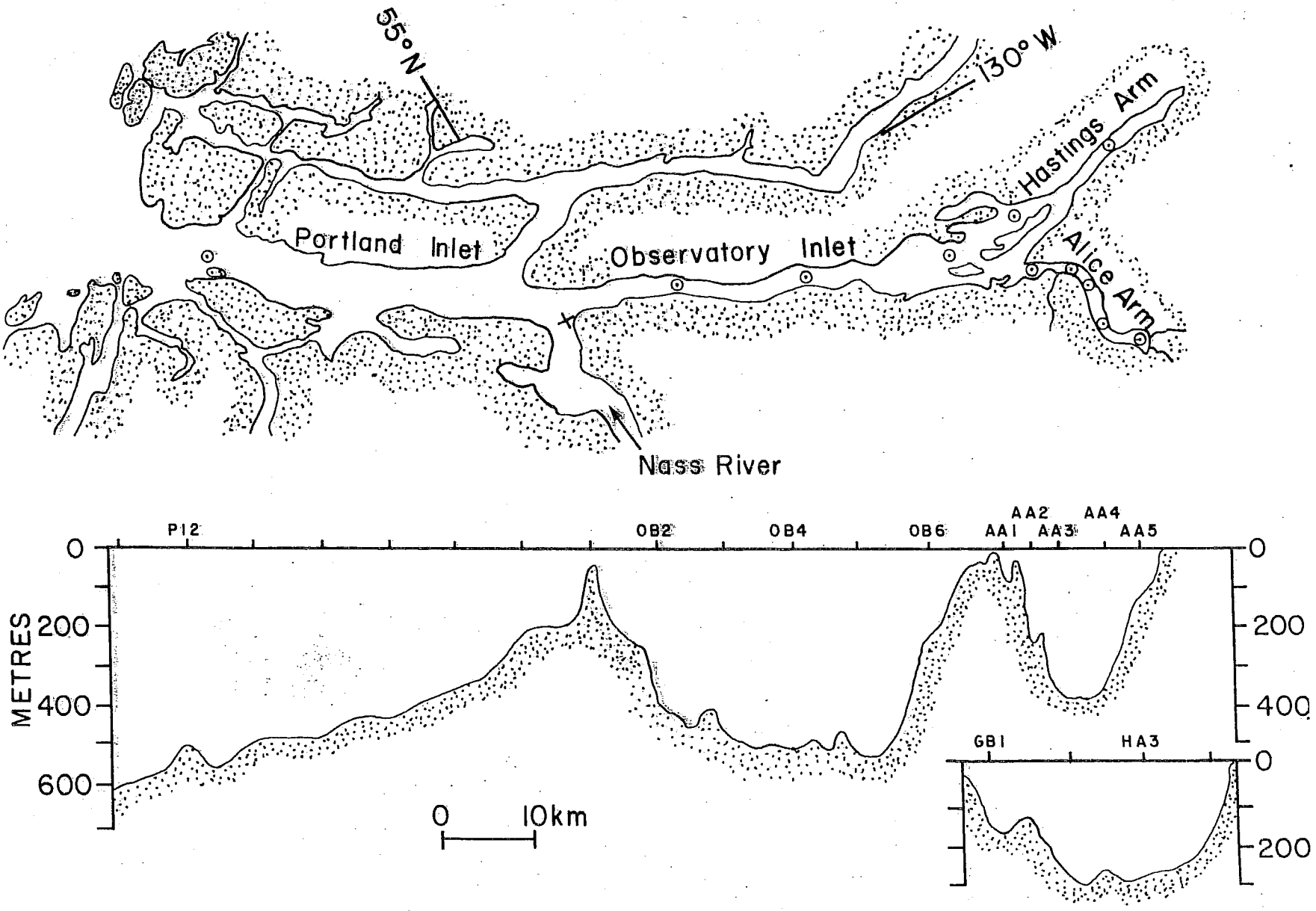


Fig. 1. Station locations

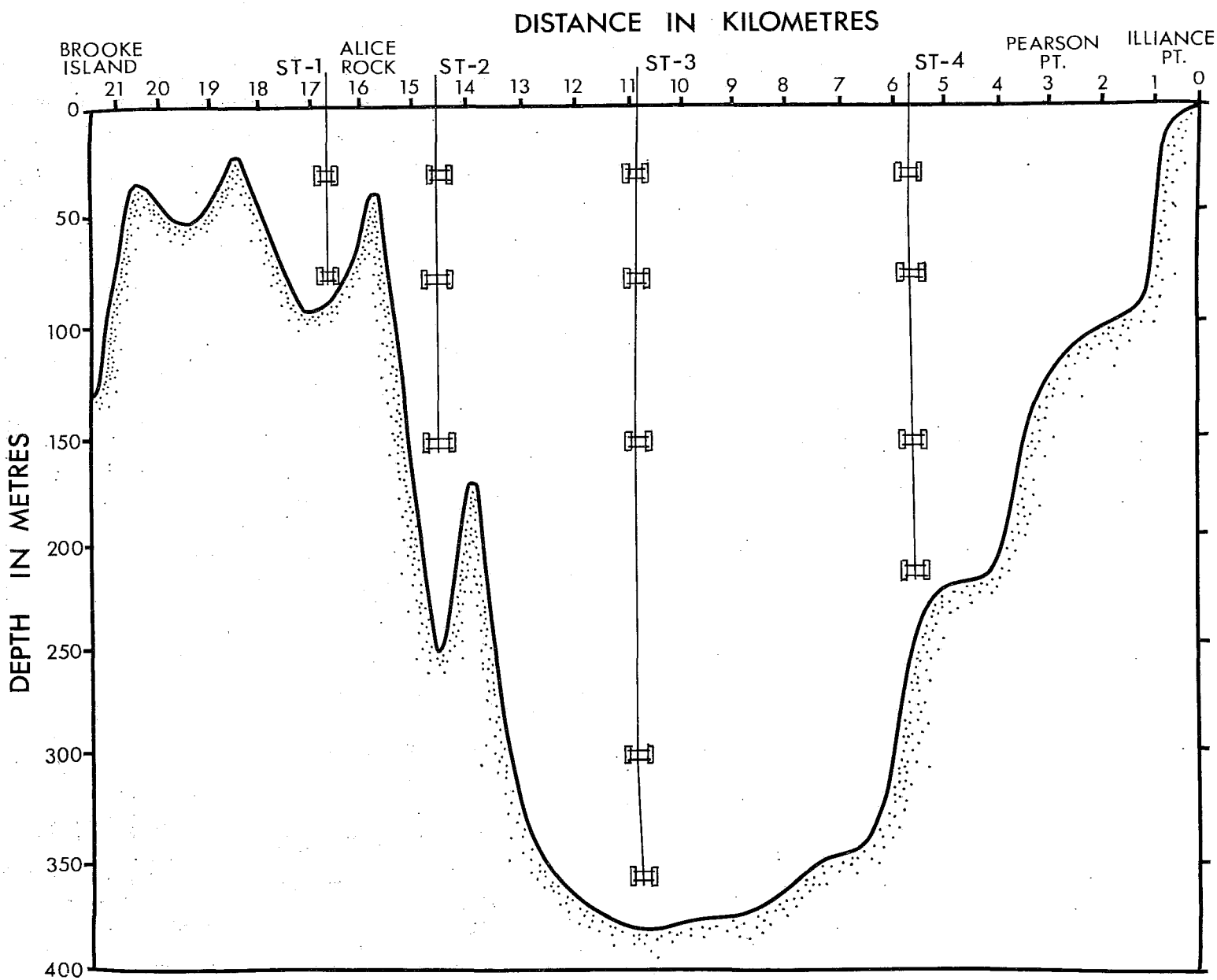


Fig. 2. Sediment trap deployment locations

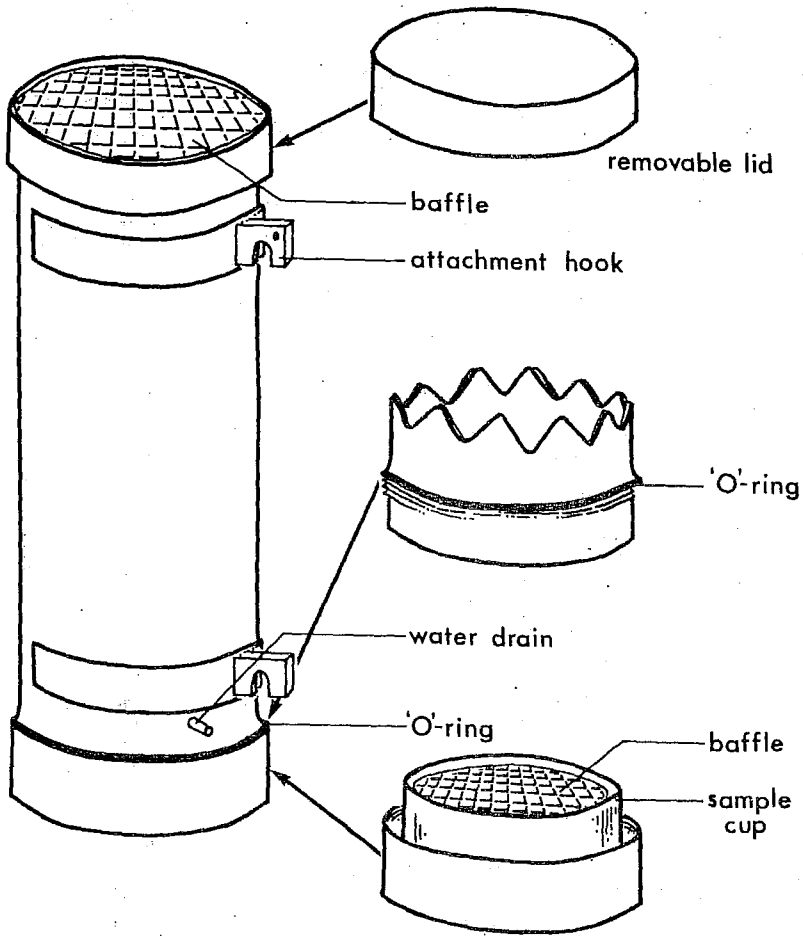


Fig. 3. Sediment trap design

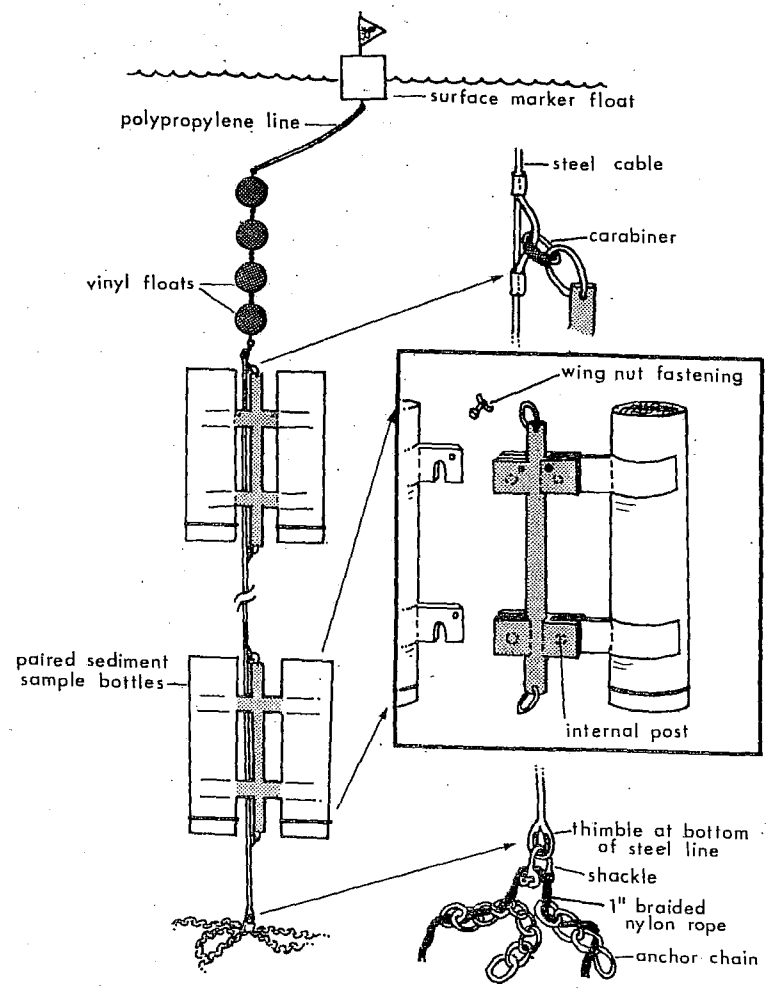


Fig. 4. Sediment trap deployment

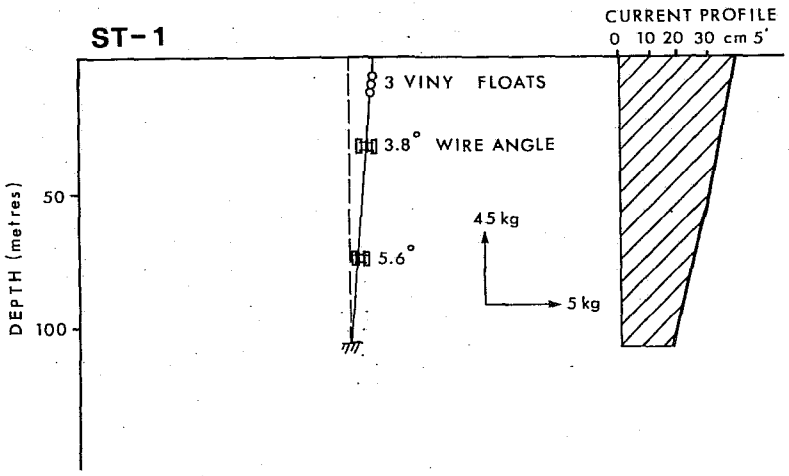


Fig. 5(a). Subsurface mooring model results - ST-1

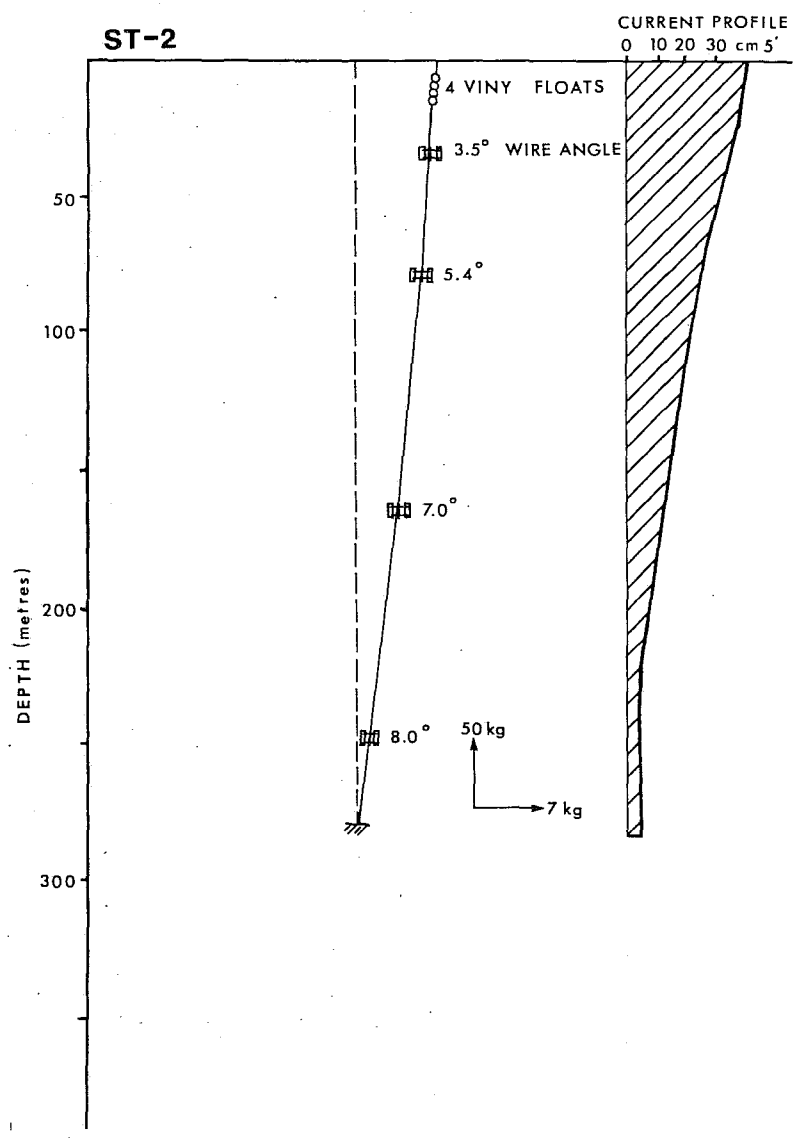


Fig. 5(b) Subsurface mooring model results - ST-2

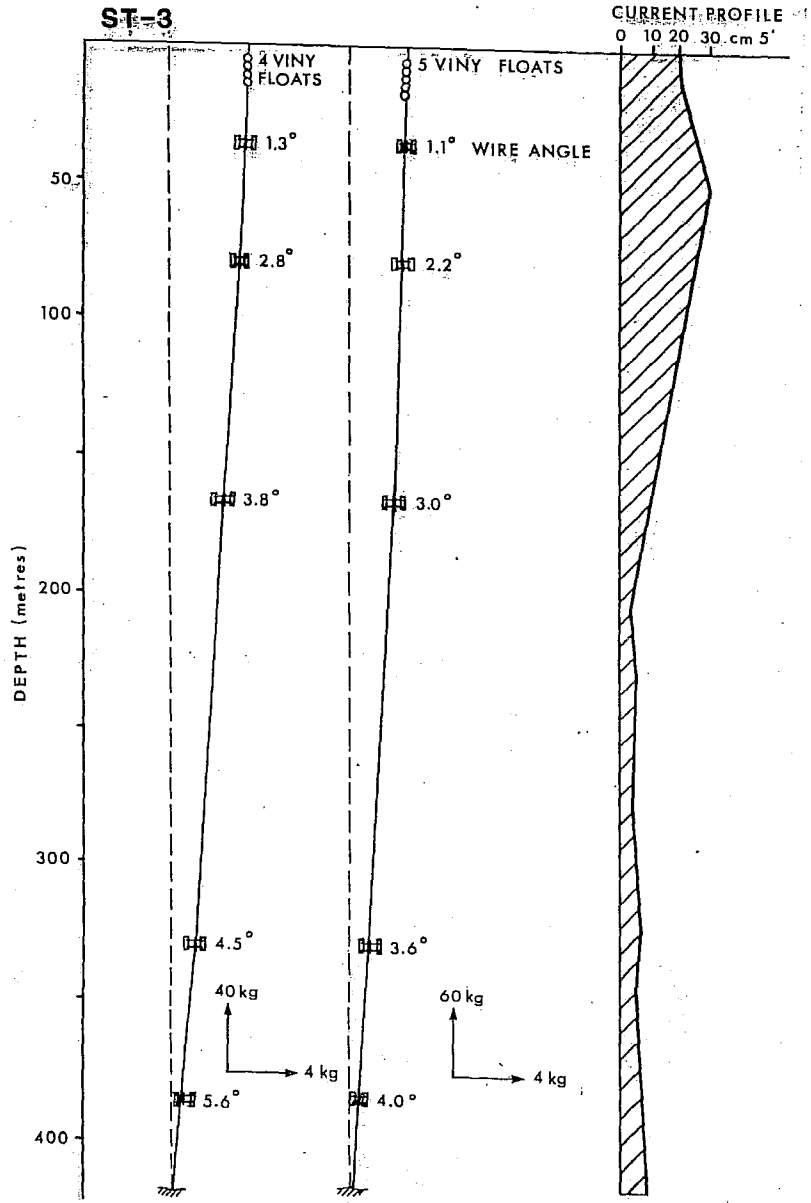


Fig. 5(c). Subsurface mooring model results - ST-3

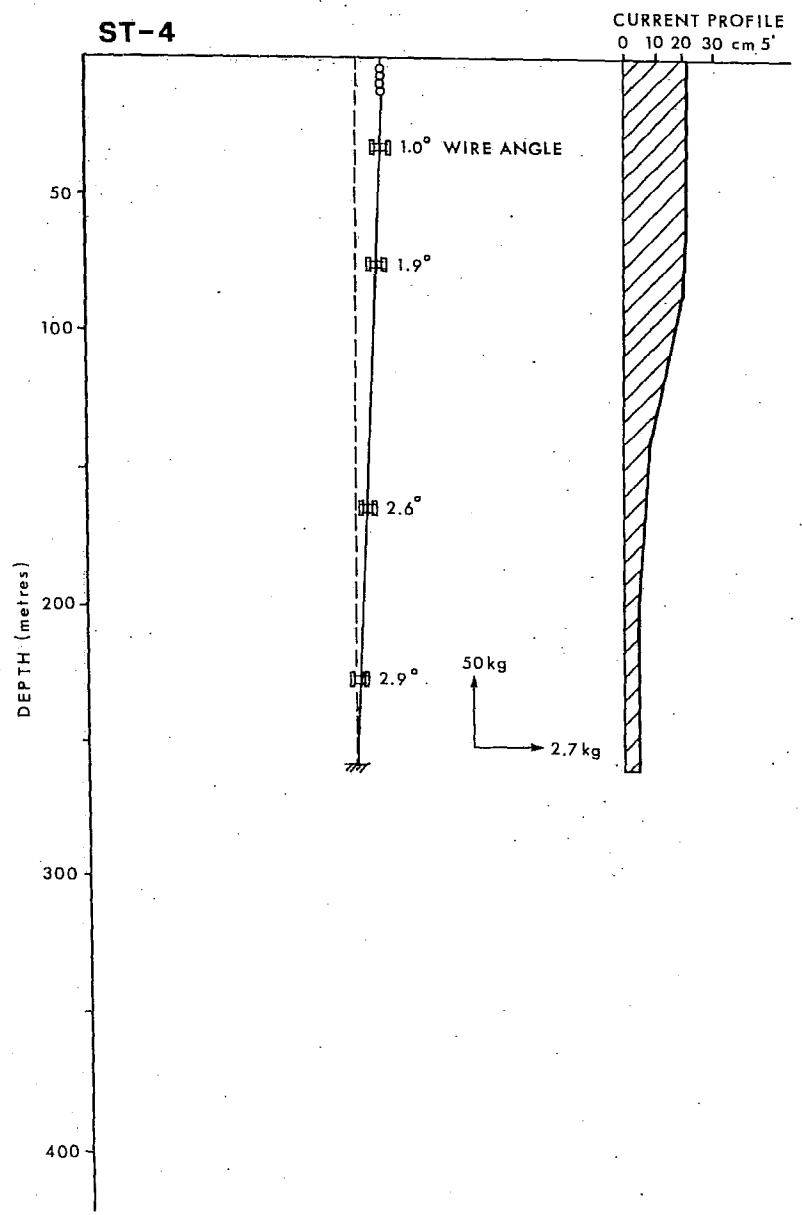
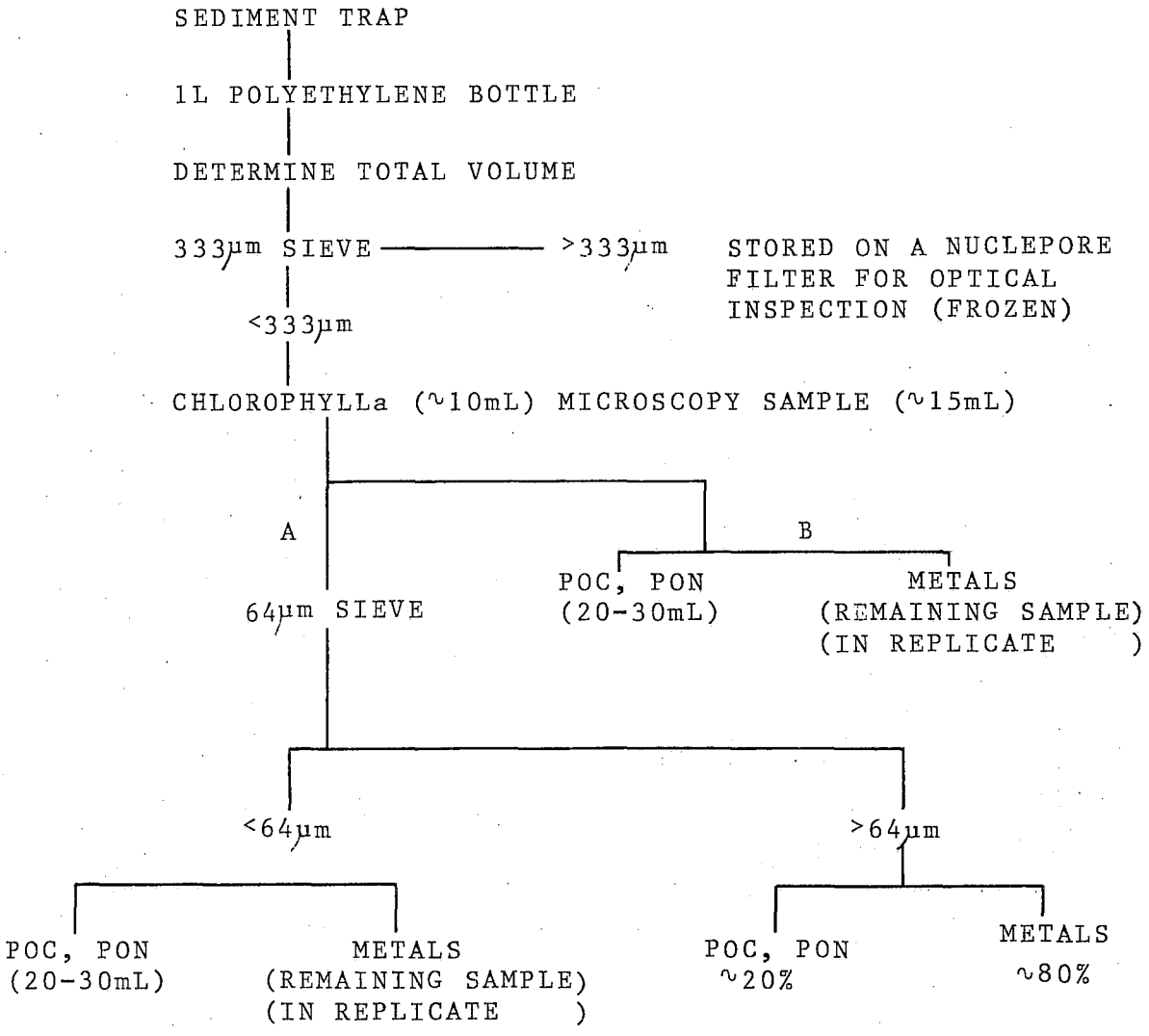


Fig. 5(d). Subsurface mooring model results - ST-4



NOTES

For the June 1982 Cruise, the NaN_3 (a-side) trap material was treated according to branch A while the unpreserved side followed branch B.

For the January 1983 Cruise all trap contents were treated according to route A, with the exception of the traps at 150m, ST-4. Those were treated as shown in Figure 6(b).

Fig. 6(a). Flow diagram for subsampling of sediment trap materials

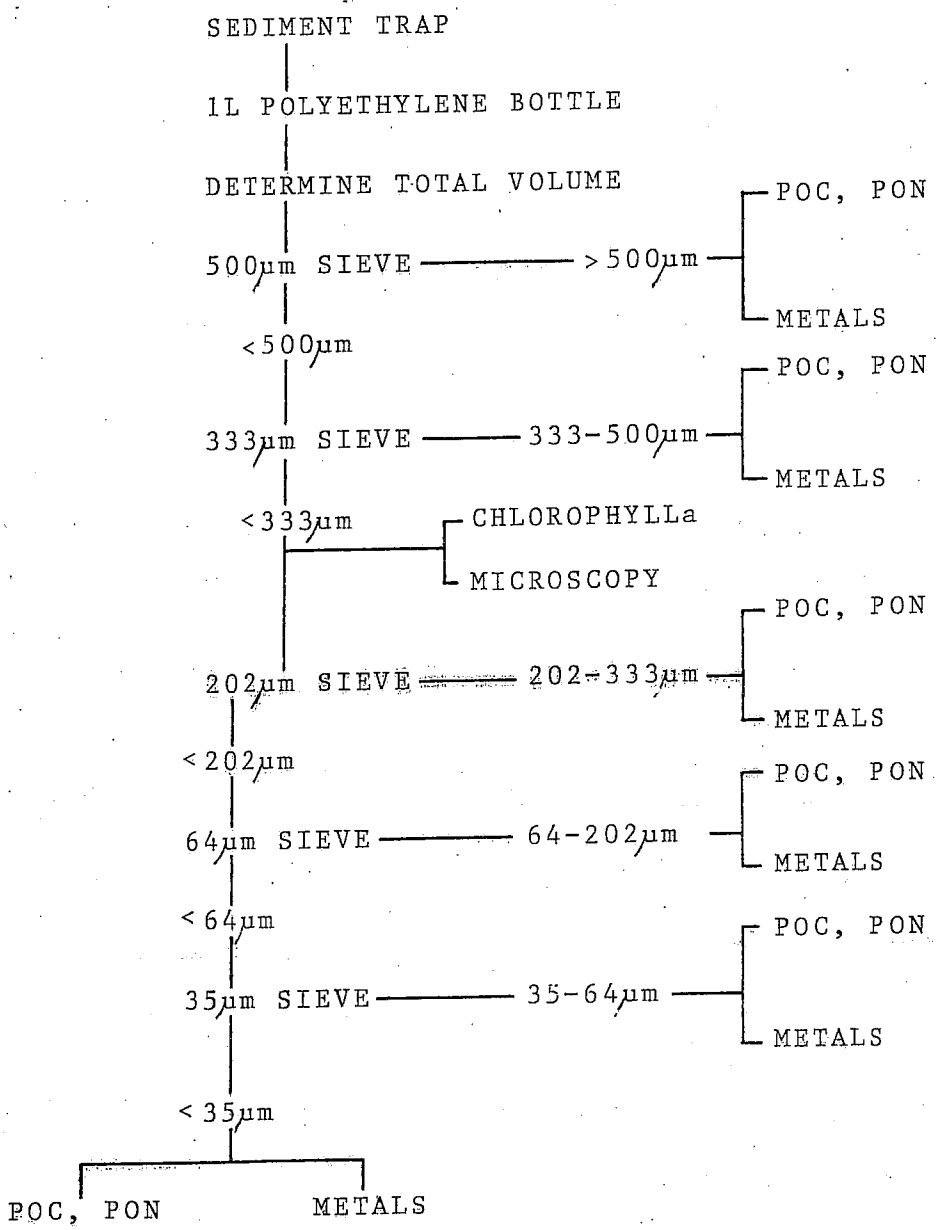


Fig. 6(b). Flow diagram for subsampling of sediment trap materials from ST-4, 150m (January 1983).

Appendix 1.

Data Tables.

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TABLE 1. ESTIMATES OF PRECISION, ACCURACY AND DETECTION LIMIT.

Measurement	Date	Precision (1s)	Accuracy (1s)	Detection limit
Salinity (CTD)		±0.005 °/oo [4]	±0.01 °/oo	
Temperature (CTD)		±0.003 C° [4]	±0.01 C°	
Pressure		±0.05% FSP [4]	±0.25% FSP	FSP = 500 db
Oxygen		±0.09 mmol m^{-3}	Slight negative error at [1] (O_2) <3 mmol m^{-3}	0.16 mmol m^{-3} at 22 mmol m^{-3}, ideal conditions ∿0.1 mmol m^{-3}
Silicate	Dec.81	<±4.5% (n=10) [3]	±4.5% [2]	
	Jan.82	<±1.9% (n=12)	±1.9% [2]	
	Jun.82	<±7.5% (n=10)	±7.5% [2]	
Nitrate	Dec.81	<±4.6% (n=10)	±4.6% [2]	∿0.05 mmol m^{-3}
	Jan.82	<±0.8% (n=12)	±0.8% [2]	
	Jun.82	<±1.5% (n=10)	±1.5% [2]	
Phosphate	Dec.81	<5.9% (n=10)	±5.9% [2]	∿0.03 mmol m^{-3}
	Jan.82	<9.1% (n=12)	±9.1% [2]	
	Jun.82	<9.5% (n=10)	±9.5% [2]	
Sediment traps				
Particulate weight within traps	Jun.	<1.5% (n=27)	No absolute check possible	<0.2 mg
	Jan.	<1.2% (n=18)		
Between traps a and b	Jun.	∿±5 %	No absolute check possible	
	Jan.	∿±4.5%		

1. Estimate given in Strickland and Parsons (1982) but not evaluated here.
2. Referenced to Sagami standards.
3. n refers to number of duplicate or triplicate determinations.
4. Manufacturers specifications.

TABLE 2. STATION LOCATIONS FOR WATER SAMPLING (CTD, O_2, Nutrients)

STATION	DATE	TIME (Z+8)	LOCATION LATITUDE N	LONGITUDE W
AA-1	7/12/81	1026	55° 24.75'	129° 40.75'
	27/01/82	1630	"	"
AA-2	7/12/81	1057	55° 26.00'	129° 40.05'
	27/01/82	1721	"	"
AA-3	7/12/81	1157	55° 27.15'	129° 37.05'
	27/01/82	1754	"	"
	21/06/82	1355	"	"
AA-3.5	7/12/81	1250	55° 26.94'	129° 33.60'
AA-4	27/01/82	2004	55° 26.69'	129° 31.80'
	21/06/82	1235	"	"
AA-5	7/12/81	1344	55° 27.90'	129° 29.25'
	27/01/82	2128	"	"
HA-1	21/06/82	1955	55° 24.90'	129° 43.10'
HA-3	7/12/81	0727	55° 32.50'	129° 47.10'
	28/01/82	0058	"	"
	21/06/82	1835	"	"
OB-6	7/12/81	0441	55° 21.30'	129° 45.70'
	28/01/82	0405	"	"
	21/06/82	2104	"	"
OB-4	3/12/81	2327	55° 13.90'	129° 51.10'
	28/01/82	0607	"	"
	21/06/82	2259	"	"
OB-2	7/12/81	0056	55° 6.70'	129° 57.30'
	22/06/82	0044	"	"
PI-6	22/06/82	0337	54° 56.10'	130° 6.90'
PI-2	6/12/81	1758	54° 43.80'	130° 24.30'
	28/01/81	1647	"	"
	22/06/82	0615	"	"

TABLE 3. ALICE ARM CHEMICAL DATA (DEC. 1981, JAN. 1982, JUNE 1982).

STATION AA-1 7/12/81 1026 (Z+8) CTD DEPTH 86m
1035 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY X10^{3}	SIGMA T * kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	7.88	29.83	23.24		1.70	39.2	21.1
50	8.21	30.16	23.45		1.76	39.9	21.1
75	8.42	30.41	23.62		1.83 (1.87)	42.3 (41.2)	21.2 (21.1)

STATION AA-2 7/12/81 1057 (Z+8) CTD DEPTH 258m
1121 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY X10^{3}	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	7.23	29.19	22.81		1.71	39.2	21.2
50	7.98	29.92	23.29		1.74	39.9	21.5
75	8.17	30.14	23.45		1.77	41.0	21.5
100	8.18	30.22	23.50		1.77	41.3	21.6
150	7.87	30.43	23.71		1.83	40.1	21.5
200					2.20	58.9	27.7

* Sigma T has been calculated according to the new definition;

$$\sigma_{T\ new} = \left(\rho(S,T,0) - 1000\right)\ kg\ m^{-3}$$

where $\rho(S,T,0)$ is in kg m^{-3}. The offset between the new definition and Knudsen's is;

$$\sigma_{T\ (Knudsen)} - \sigma_{T\ (new)} = 0.025$$

TABLE 3 (CONTINUED)

STATION AA-3 7/12/81 1157 (Z+8) CTD DEPTH 386m
1220 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	7.63	29.48	22.99	223	1.71 (1.73)	39.6 (39.5)	21.5 (21.5)
50	7.82	29.87	23.27	191	1.78	41.3	22.9
75	8.06	30.06	23.39	193	1.82	41.7	22.8
100	8.05	30.16	23.47	195	1.82	42.0	22.6
150	7.83	30.40	23.69	190	1.85	45.3	23.9
300	5.82	31.23	24.60	145	2.10 (2.02)	64.8 (64.6)	28.5 (28.5)

STATION AA-3.5 7/12/81 1250 (Z+8) CTD DEPTH
1310 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	7.64	29.48	22.99	211	1.75	39.8	22.3
50	7.47	29.79	23.27	202	1.77	39.8	22.8
75	7.80	30.01	23.39	188	1.77	42.2	23.5
100	7.60	30.09	23.47	190	1.81	42.6	23.1
150	7.45	30.29	23.65	190	1.82	43.8	23.3
200	6.03	31.03	24.41	166	2.13 (1.96)	59.5 (58.6)	27.8 (27.8)
250	5.88	31.18	24.55	151	2.12	62.9	28.4

TABLE 3 (CONTINUED)

STATION AA-5 7/12/81 1344 (Z+8) CTD DEPTH 104m
1353 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	7.55	29.62	23.11	182	1.83	42.1	24.1
50	7.39	29.81	23.29	178	1.82	43.3	24.6
75	7.49	30.01	23.42	179	1.87	43.5	24.5

STATION HA-3 7/12/81 0727 (Z+8) CTD DEPTH 282m
0745 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	8.29	30.37	23.60	173	1.76	40.6	22.0
50	8.05	30.89	24.05	167	2.01	46.0	24.5
75	8.00	31.10	24.21	164	2.04	48.2	25.6
100	6.97	31.70	24.82	146	2.22	54.6	28.0
150	6.91	31.98	25.06	144	2.34	56.5	27.9
200	6.88	32.04	25.11	138	2.21	57.0	28.1

TABLE 3 (CONTINUED)

STATION OB-6 7/12/81 0441 (Z+8) CTD DEPTH 242m
0458 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	8.69	30.44	23.60	212	1.74	39.0	20.8
50	9.06	31.09	24.05	204	1.82	41.6	21.2
75	8.99	31.31	24.24	194	1.82	41.4	21.2
100	8.68	31.51	24.44	182	1.89 (1.82)	45.4 (52.6)	23.1 (23.2)
150	7.27	32.22	25.20	145	2.29 (2.11)	48.5 (55.0)	24.5 (27.8)
200	6.78	32.63	25.58		2.40	59.1	29.4

STATION OB-4 3/12/81 2327 (Z+8) CTD DEPTH 503m
4/12/81 0014 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	8.83	30.49	23.62	218	1.63	38.0	19.6
50	9.25	31.23	24.13	200	1.69	40.1	20.0
75	8.96	31.48	24.38	193	1.78 (1.49)	40.8 (41.9)	21.0 (20.9)
100	8.64	31.64	24.54	177	1.99	45.2	23.2
150	7.07	32.42	25.38	140	2.25	56.0	28.3
200	6.79	32.65	25.59	134	2.44	58.9	29.3
250	6.70	32.74	25.68	132	2.19 (2.47)	60.5 (58.9)	29.9 (29.8)
300	6.68	32.76	25.70	132	2.40	59.8	29.9
400	6.67	32.78	25.72	128	2.51	60.9	29.9
500					2.34	60.7	29.9

TABLE 3 (CONTINUED)

STATION OB-2 7/12/81 0056 (Z+8) CTD DEPTH 430m
0128 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
75	9.46	31.39	24.22	227	1.62	37.5	18.9
150	7.51	32.30	25.23	149	2.22	54.2	27.7
300	6.70	32.77	25.70	131	2.43	59.0	29.9

STATION PI-2 6/12/81 1758 (Z+8) CTD DEPTH 540m
1853 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	8.71	30.31	23.49	278	1.43	31.3	16.2
50	9.20	31.07	24.01	279	1.46 (1.26)	27.5 (27.3)	15.7 (15.7)
75	9.33	31.33	24.19	279	1.39	26.5	15.3
100	9.69	31.64	24.38	249	1.53	30.4	16.8
150	7.74	32.77	25.56	152	2.23	53.3	26.8
200	7.20	32.98	25.80	133	2.39	59.3	29.5
250	6.96	33.07	25.91	125	2.48	61.4	30.6
300	6.80	33.15	25.99	121	2.47	62.1	31.3
400	6.50	33.26	26.12	116	2.60	65.2	32.1
500	6.47	33.29	26.14	111	2.60 (2.56)	64.3 (64.1)	32.4 (32.1)

TABLE 3 (CONTINUED)

STATION AA-1 27/1/82 1630 (Z+8) CTD DEPTH 86m
1642 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	5.97	31.21	24.57	252	1.90 (1.49)	46.4 (45.5)	22.7 (23.0)
50	6.04	31.31	24.64	249	1.94	46.2	22.8
75	6.14	31.38	24.68	247	1.96	46.2	22.8

STATION AA-2 27/1/82 1721 (Z+8) CTD DEPTH 258m
1829 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	5.77	30.81	24.27	259	1.89	45.9	22.8
50	5.84	30.88	24.32	255	1.91	45.9	22.8
75	5.81	30.93	24.36	-	-	-	-
100	5.83	30.98	24.40	256	1.92 (1.68)	45.6 (45.5)	22.9 (23.1)
150	5.88	31.06	24.46	256	1.92	45.6	22.8

TABLE 3 (CONTINUED)

STATION AA-3 27/1/82 1754 (Z+8) CTD DEPTH 386m
1925 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	5.97	30.86	24.28	251	1.90	45.9	22.9
50	6.37	30.95	24.31	243	1.90	45.9	22.8
75	6.06	30.95	24.35	230	1.91	45.8	22.9
100	5.88	30.97	24.39	247	1.93 (1.68)	47.0 (47.1)	23.2 (23.4)
150	5.78	31.05	24.46	241	1.94	48.5	23.8
200	5.79	31.06	24.47	246	1.93	47.3	23.4
250	5.81	31.10	24.49	244	1.94	40.2	19.9
300	5.84	31.14	24.52	179	1.96 (1.81)	58.6 (60.4)	26.6 (27.4)

STATION AA-4 27/1/82 2004 (Z+8) CTD DEPTH 278m
2004 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	6.10	30.85	24.26	247	1.85	45.3	23.1
50	6.44	30.94	24.30	239	1.89	45.4	23.2
75	6.17	30.95	24.34	295	1.94 (1.66)	46.5 (46.6)	23.3 (23.4)
100	6.02	30.98	24.38	247	1.94	46.7	23.3
150	5.79	31.02	24.44	240	1.92	48.9	23.8
200	5.80	31.06	24.47	229	1.97	49.6	24.3
250	5.80	31.08	24.48		2.05	51.3	24.7

TABLE 3 (CONTINUED)

STATION AA-5 27/2/82 2128 (Z+8) CTD DEPTH 104m
2130 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	6.34	30.90	24.28	239	1.94	45.7	23.4
50	6.39	30.94	24.30	234	2.03 (1.73)	46.7 (47.1)	23.6 (23.6)
75	6.09	30.97	24.36	234	2.08	47.1	23.7

STATION HA-3 28/1/82 0058 (Z+8) CTD DEPTH 282m
0102 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	6.80	31.59	24.76	211	2.10	46.9	23.8
50	7.05	31.65	24.77	197	2.17	48.6	24.5
75	7.27	31.76	24.84	192	2.14 (1.92)	48.3 (48.9)	24.4 (24.3)
100	6.86	31.75	24.88	187	2.07	46.6	23.7
150					2.33 (2.06)	53.6 (54.4)	26.6 (26.5)
200					2.41	55.7	27.8
250					2.46	56.9	28.1

TABLE 3 (CONTINUED)

STATION OB-6 28/1/82 0405 (Z+8) CTD DEPTH 242m
0433 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	5.85	31.44	24.76	267	1.93	43.9	22.6
50	5.91	31.52	24.81	263	1.93	43.2	22.5
75	6.87	31.90	24.99	186	2.03	46.0	23.7
175	7.19	32.35	25.31	183	2.17 (2.06)	49.2 (52.1)	25.1 (25.2)

STATION OB-4 28/1/82 0607 (Z+8) CTD DEPTH 503m
0622 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-2}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	5.19	31.27	24.70	278	1.88	43.0	21.9
50	5.33	31.35	24.75	277	1.90	43.2	22.0
75	5.61	31.48	24.82	231	1.95	43.9	22.7
100	6.28	31.75	24.95	187	1.95	44.2	22.8
150	6.87	32.14	25.19	191	2.08	47.0	24.1
200	7.10	32.35	25.32	157	2.22	50.4	25.7
250	7.06	32.50	25.44	128	2.42 (2.17)	55.9 (57.2)	28.2 (28.1)
300	6.92	32.61	25.55	170	2.47	57.3	28.7
400	6.80	32.68	25.62	97	2.51	59.0	29.3
500	6.75	32.71	25.65		2.51	60.0	29.5

TABLE 3 (CONTINUED)

STATION PI-2 28/1/82 1647 (Z+8) Bottlecast DEPTH 540m

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25	6.11	31.11	24.47	260	1.54	29.7	16.4
50	6.53	31.44	24.68	252	1.54	29.7	16.5
75	5.96	31.50	24.80	243	1.71	35.5	19.1
100	6.32	31.95	25.10	224	1.89 (1.76)	40.5 (41.3)	21.4 (21.5)
150	7.33	32.71	25.58	146	2.25	52.5	26.7
200	7.15	32.89	25.74	131	2.39	56.1	28.1
250	7.05	32.95	25.80	124	2.44	57.7	28.9
300	6.97	32.98	25.84	124	2.45 (2.10)	58.2 (60.1)	29.2 (29.1)
400	6.94	33.02	25.87	121	2.48	58.7	29.5
500	6.93	33.05	25.90	112	2.57	61.1	30.2

TABLE 3 (CONTINUED)

STATION AA-3 21/06/82 1340 (Z+7) CTD DEPTH 386m
1455 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				281	1.33	22.5	12.1
50				256	1.65 (1.39)	30.0 (31.1)	17.5 (18.0)
75				243	1.75	34.6	21.1
100				252	1.71	34.1	21.6
150				252	1.98	38.9	23.3
200					1.78	44.1	21.0
250					1.90	45.7	24.2
300					1.90 (1.87)	46.8 (48.0)	25.0 (25.5)

TABLE 3 (CONTINUED)

STATION AA-4 21/06/82 1215 (Z+7) CTD DEPTH 278m
1335 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				260	1.27 (1.39)	20.5 (32.5)	10.3 (10.7)
50				259	1.53	32.9	17.5
75				250	1.60	31.2	18.8
100				254	1.69	32.1	20.6
150				247			
200					1.93 (1.90)	41.8 (43.0)	23.9 (24.2)
250					1.93	44.9	24.6

STATION HA-1 21/06/82 1942 (Z+7) CTD DEPTH 168m
2055 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				272	1.50	22.0	15.2
50				186	2.14	49.5	26.8
75				180	2.41	49.7	26.6
100				176	2.23 (2.34)	51.5 (53.5)	26.9 (27.1)
150				172	2.30	52.4	27.2

TABLE 3 (CONTINUED)

STATION HA-3 21/06/82 1803 (Z+7) CTD DEPTH 282m
1935 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				311	1.25	11.6	7.5
50				191	2.45		27.7
75				178	2.41	46.5	27.4
100				158	2.37	49.9	27.5
150				130	2.73	61.9	29.2
200					2.36 (2.37)	50.5 (51.8)	26.5 (26.6)
250					2.27	50.9	26.6

STATION OB-6 21/06/82 2027 (Z+7) CTD DEPTH 242m
2204 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				215	1.80	38.1	22.5
50				179	2.13	49.8	26.7
75				151	2.58	56.6	28.3
100				149	2.17	57.9	28.8
150				146	2.26	60.1	28.6

TABLE 3 (CONTINUED)

STATION OB-4 21/06/82 2235 (Z+7) CTD DEPTH 503m
2359 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				228	1.95 (1.85)	33.9 (35.0)	20.5 (21.5)
50				180	2.29	48.8	25.4
75				167	2.33	57.3	27.0
100				149	2.33	56.8	28.5
150				146	2.47 (2.20)	57.9 (59.7)	28.8 (28.4)
200					2.26	54.1	27.4
250					2.28	51.1	27.2
300					2.41	50.9	27.4
400					2.34	51.7	27.7
500					2.67	51.7	28.1

TABLE 3 (CONTINUED)

STATION OB-2 22/06/82 0027 (Z+7) CTD DEPTH 430m
0144 Bottlecast

DEPTH M	TEMP. ^{o}C	SALINITY $X10^{3}$	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				227	1.84	34.4	21.1
50				197	1.96 (1.75)	43.5 (45.9)	24.9 (25.2)
75				160	2.41	53.8	27.7
100				155	2.43	55.2	27.7
150				154	2.41	55.3	27.5
200					2.50	54.0	27.7
250					2.36	52.8	27.1
300					2.43	53.2	27.1
350					2.09	52.8	27.7

TABLE 3 (CONTINUED)

STATION PI-6 22/06/82 DEPTH 339m

0437 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25					1.85 (2.21)	43.4 (45.3)	24.2 (24.8)
50					2.25	56.3	27.3
75					2.13	53.0	28.1
100					2.24	53.6	28.1
150					2.44	55.0	29.8
200					2.43	56.8	30.4
250					2.41	56.1	30.5
300					2.52	56.8	30.7

TABLE 3 (CONTINUED)

STATION PI-2 22/06/82 0551 (Z+7) CTD DEPTH 540m
0715 Bottlecast

DEPTH M	TEMP. °C	SALINITY X10^3	SIGMA T kg m^{-3}	OXYGEN mmol m^{-3}	PHOSPHATE mmol m^{-3}	SILICATE mmol m^{-3}	NITRATE mmol m^{-3}
25				235	1.70	29.1	18.6
50				183	2.07	46.9	25.8
75				161	2.23	51.8	27.8
100				156	2.34	49.6	28.6
150				154	2.31	54.5	29.7
200				143	2.45	55.6	30.1
250					2.27	56.1	30.4
300					2.36	57.0	30.8
400					2.15	58.5	30.3
500					2.31	58.1	31.0

TABLE 4. SEDIMENT TRAP STATIONS

STATION	LOCATION LAT. °N	LOCATION LONG. °W	TRAP DEPTH (METERS)	DEPLOYED 12/06/82 TIME	RECOVERED 21/06/82 TIME	DEPLOYMENT INTERVAL (DAYS)
ST-1 (95m)	55°24.56'	129°41.12'	30	0820	1645	9.34
			67	0820	1650	9.35
ST-2 (252m)	55°26.20'	129°40.10'	30	0929	1605	9.28
			70	0926	1606	9.28
			150	0923	1608	9.28
			226	0920	1610	9.28
ST-3 (387m)	55°27.13'	129°37.75'	30	1000	1505	9.21
			70	0953	1509	9.22
			150	0947	1513	9.23
			300	0940	1516	9.23
			353	0934	1520	9.24
ST-4 (245m)	55°26.67'	129°31.50'	30	1045	1400	9.15
			70	1040	1405	9.15
			150	1035	1410	9.16
			208	1030	1415	9.16

TABLE 4. SEDIMENT TRAP STATIONS (CONTINUED)

STATION	LOCATION LAT. °N	LONG. °W	TRAP DEPTH (METERS)	DEPLOYED 12/06/82	TIME	RECOVERED 21/06/82 [1]	DEPLOYMENT INTERVAL DAYS
				15/1/83		21/1/83	
ST-1 (112m)	55°24.56'	129°41.12'	30	1647		1550	5.96
			67	1645		1552	5.96
ST-3 (382m)	55°27.13'	129°37.75'	70	1604		1500	5.96
			300	1555		1505	5.97
			353	1550		1510	5.97
ST-4 (259m)	55°26.67'	129°31.50'	30	1505		1418	5.97
			70	1502		1420	5.97
			150	1500		1422	5.98
			208	1445		1425	5.99

1 Some sediment traps were lost during rough weather at cape St. James resulting in a reduced sampling program.

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-1	30	9.31	a	710	<333	15	8.0				
					64-333			18.5	78	0.2135	0.37
					<64			26.0	206	0.3287	1.60
									218	0.3456	1.59
									222	0.3481	1.57
		9.31	b	690	<333	15	9.8	27	218	0.4965	2.28
									208	0.4666	2.24
									214	0.4743	2.22
	67	9.31	a	800	<333	15	8.1				
					64-333			22	80	0.2103	0.33
					<64			30	244	0.3695	1.51
									234	0.3545	1.52
									242	0.3699	1.53
			b	680	<333	15	7.8	30	212	0.4756	2.24
									182	0.4037	2.22
									220	0.5162	2.35

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-2	30	9.28	a	570	<333	15					
					64-333			15	76	0.4591	0.96
					<64			21	196	0.4681	2.39
									156	0.3847	2.47
									172	0.4223	2.46
			b	680	<333	15	9.1	26	210	0.6105	2.91
									214	0.6307	2.95
	70	9.28	a	675	<333	15	7.5				
					64-333			18	99	0.4315	0.76
					<64				192	0.5072	2.64
									216	0.5431	2.51
									186	0.4667	2.51
			b	600	<333	15	7.2	25	170	0.6137	3.61
									184	0.6703	3.64
									197	0.7553	3.83

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (µm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CHla ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-2	150	9.28	a	655	<333	15	7.9				
					64-333			17	98	0.3649	0.65
					<64			27	195	0.3942	2.02
									168	0.3364	2.00
									218	0.4280	1.96
			b	695	<333	15	8.5	26	204	0.5689	2.79
									198	0.5289	2.67
									240	0.6554	2.73
	226	9.28	a	750	<333	15	9.1				
					64-333			22.5	72	0.2587	0.45
					<64			30	210	0.3359	1.60
									238	0.3800	1.60
									234	0.3674	1.57
			b	790	<333			27.5	250	0.5561	2.22
									240	0.5139	2.14
									242	0.5208	2.15

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-2	150	9.28	a	655	<333	15	7.9				
					64-333			17	98	0.3649	0.65
					<64			27	195	0.3942	2.02
									168	0.3364	2.00
									218	0.4280	1.96
			b	695	<333	15	8.5	26	204	0.5689	2.79
									198	0.5289	2.67
									240	0.6554	2.73
	226	9.28	a	750	<333	15	9.1				
					64-333			22.5	72	0.2587	0.45
					<64			30	210	0.3359	1.60
									238	0.3800	1.60
									234	0.3674	1.57
			b	790	<333			27.5	250	0.5561	2.22
									240	0.5139	2.14
									242	0.5208	2.15

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-3	30	9.21	a	620	333	15	7.0				
					64-333			17	94	0.0700	0.13
					64			22	278	0.6088	2.19
									282	0.6164	2.19
			b	590	<333	15	7.9	24	270	0.6778	2.51
									272	0.6636	2.44
	70	9.22	a	635	<333	15	6.4				
					64-333			19	89	0.0607	0.12
					<64			20	284	0.5560	1.96
									284	0.5636	1.98
			b	630	<333	15	9.3	26	286	0.6535	2.28
									282	0.6345	2.25

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-3	150	9.23	a	560	<333	15	7.1				
					64-333			20	87	0.1410	0.31
					<64			29	246	0.5071	2.06
									252	0.5205	2.07
			b	620	<333	15	8.2	23	281	0.6526	2.32
									286	0.6667	2.33
	300	9.23	a	575	<333	15	5.9				
					64-333			19	84	0.2355	0.50
					<64			28	260	0.5517	2.12
									254	0.5385	2.12
			b	615	<333	15	5.9	28	270	0.6975	2.58
									274	0.7061	2.58

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (µm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION: VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-3	353	9.24	a	660	<333	15	7.5				
					64-333			21.5	100	0.2403	0.44
					<64			25	272	0.9415	3.46
									268	0.9345	3.49
			b	670	<333	15	6.8	28	278	1.1553	4.16
									278	1.1622	4.18
ST-4	30	9.23	a	640	<333	15	5.3				
					64-333			17	85	0.0887	0.17
					<64			25	284	1.0071	3.55
									286	1.0175	3.56
			b	605	<333	15	6.2	14	280	1.1395	4.07
									274	1.1054	4.03
	70	9.23	a	590	<333	15	7.0				
					64-333			18	95	0.1899	0.38
					<64			23	268	1.7167	6.41
									265	1.7447	6.58
			b	690	<333	15	6.3	14	286	1.7331	6.06
									298	1.7810	5.95

TABLE 5(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JUNE 1982

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-4	150	9.23	a	635	<333	15	3.6				
					64-333			12	95	0.4303	0.76
					<64			13	296	2.9277	9.89
									280	2.8075	10.03
			b	610	<333	15	4.4	11	292	3.3716	11.55
									294	3.3961	11.55
	208	9.23	a	665	<333	15	6.0				
					64-333			12	115	2.9135	4.81
					<64			9	282	11.1249	39.45
									280	11.0626	39.51
			b	745	<333	15	3.1	10	284	12.5378	44.15
									280	12.3243	44.02

TABLE 5(b). AMOUNTS CAUGHT IN SEDIMENT TRAPS, JUNE 1982

STATION	DEPTH (m)	TOTAL SEDIMENTATION $gm^{-2}day^{-1}$ DRY WEIGHT ($\bar{X}\pm s$ (n)) a) NaN_3	b) No Preservative	AVERAGE TOTAL SEDIMENTATION $gm^{-2}day^{-1}$ a and b sides $\bar{X}\pm s$	% COARSER THAN 64μm
ST-1	30	11.56 ± 0.10(3)	12.91 ± 0.18(3)	12.24 ± 0.95	19
	67	12.31 ± 0.06(3)	12.86 ± 0.37(3)	12.59 ± 0.39	18
ST-2	30	16.19 ± 0.27(3)	16.64 ± 0.16(2)	16.42 ± 0.32	28
	70	18.66 ± 0.55(3)	18.51 ± 0.59(3)	18.59 ± 0.11	23
	150	14.47 ± 0.22(3)	15.85 ± 0.34(3)	15.16 ± 0.97	25
	226	12.78 ± 0.00(3)	14.32 ± 0.30(3)	13.56 ± 1.09	22
ST-3	30	12.11 ± 0.00(2)	12.31 ± 0.23(2)	12.21 ± 0.14	5.6
	70	11.16 ± 0.08(2)	12.02 ± 0.13(2)	11.59 ± 0.61	5.7
	150	11.20 ± 0.03(2)	12.11 ± 0.04(2)	11.66 ± 0.64	13
	300	12.67 ± 0.00(2)	13.33 ± 0.00(2)	13.00 ± 0.47	19
	353	21.73 ± 0.13(2)	23.44 ± 0.08(2)	22.59 ± 1.21	11
ST-4	30	19.11 ± 0.04(2)	20.58 ± 0.14(2)	19.9 ± 1.00	4.6
	20	32.21 ± 0.59(2)	34.89 ± 0.32(2)	33.6 ± 1.90	5.5
	150	53.12 ± 0.53(2)	59.18 ± 0.00(2)	56.2 ± 4.30	7.1
	208	247.40 ± 0.30(2)	275.90 ± 0.60(2)	262. ±20.	11

TABLE 6(a). SEDIMENT TRAP SUBSAMPLING DATA JANUARY 1983

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CHla ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-1	30	5.96	a	520	<333	15	11.8				
					64-333			29	30	0.0263	0.099
					<64			56	223	0.1741	0.781
									217	0.1715	0.790
			b	610	<333	15	9.2				
					64-333			25	23	0.0305	0.104
					<64			45	255	0.1796	0.704
									278	0.1932	0.695
	67	5.96	a	583	<333	15	9.6				
					64-333			35	58	0.0748	0.206
					<64			41	261	0.3788	1.45
									252	0.3670	1.46
			b	660	<333	15	12				
					64-333			23	18	0.0558	0.192
					<64			45	208	0.2759	1.33
									198	0.2578	1.30
									176	0.2298	1.31

TABLE 6(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JANUARY 1983

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-3	70	5.96	a	575	<333	15	8.6				
					64-333			19.5	25	0.00999	0.031
					<64			48.5	249	0.0857	0.344
									245	0.0859	0.350
			b	535	<333	15	11.0				
					64-333			12.5	15	0.0110	0.038
					<64			60	232	0.0826	0.356
									216	0.0761	0.352
ST-3	300	5.97	a	575	<333	15	9.8				
					64-333			20	16	0.0189	0.074
					<64			45	240	0.4077	1.70
									260	0.4417	1.70
			b	545	<333	15	11.0	20	30	0.0264	0.081
					64-333			33	242	0.4330	1.79
					<64				237	0.4217	1.78

TABLE 6(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JANUARY 1983

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (um)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-3	353	5.97	a	570	<333	15	8.6				
					64-333			30	36	0.02543	0.082
					<64			50	250	0.5957	2.38
									242	0.5739	2.37
			b	560	<333	15	11.2				
					64-333			29.5	23.5	0.0197	0.079
					<64			44	249.5	0.5879	2.36
									238	0.5607	2.36
ST-4	30	5.97	a	540	<333	15	9.1				
					64-333			26.5	26	0.0049	0.018
					<64			55	223	0.0478	0.210
									228	0.0473	0.212
			b	470	<333	15	9.7				
					64-333			17.5	17	0.0118	0.051
					<64			45	210	0.0523	0.249
									201	0.0497	0.247

TABLE 6(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JANUARY 1983

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CH1a ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION: VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-4	70	5.97	a	545	<333	15	11.4				
					64-333			32	32	0.0062	0.023
					<64			42	248	0.1466	0.591
									222	0.1304	0.587
			b	570	<333	15	8.8				
					64-333			23	27	0.0084	0.027
					<64			55	246	0.1452	0.590
									244	0.1433	0.587
	150	5.97	a	575	>500			30	27		
					333-500			18	18		
					<333	15	8.4				
					202-333			23	38	0.0024	0.007
					64-202			33	31	0.0086	0.031
					35-64			37.5	36	0.0176	0.062
					<35			53	251	0.2993	1.192
									252	0.3063	1.215
			b	585	>500			22	21		
					333-500			29	32		
					<333	15	10				
					202-333			29	24	0.0012	0.005
					64-202			21	21	0.0074	0.025
					35-64			49	52	0.0197	0.065
					<35			54	253	0.2753	1.088
									252	0.2774	1.101

TABLE 6(a). SEDIMENT TRAP SUBSAMPLING DATA (CONTINUED) JANUARY 1983

SIDE a - CONTAINED SODIUM AZIDE
SIDE b - NO SODIUM AZIDE

STN.	DEPTH (m)	TIME (DAYS)	SIDE OF TRAP	TOTAL VOLUME (mL)	SIZE FRACTION (μm)	VOLUME FOR MICROSCOPE ANALY. (mL)	VOLUME FOR CHla ANALY. (mL)	VOLUME FOR POC.N ANALYSIS (mL)	SUBSAMPLES FOR METAL ANALYSIS AND DRY WEIGHT DETERMINATION		
									VOL. (mL)	WEIGHT OF SEDIMENT (g)	CONC. (gL-1)
ST-4	208	5.99	a	435	<333	15	9				
					64-333			21	22	0.0216	0.097
					<64			40	186	0.6118	3.289
									186	0.6167	3.316
			b	575	<333	15	10				
					64-333			20	26.5	0.0305	0.093
					<64			48	250	0.7083	2.833
									258	0.7401	2.869

TABLE 6(b). AMOUNTS CAUGHT IN SEDIMENT TRAPS, JANUARY 1983

STATION	DEPTH (m)	TOTAL SEDIMENTATION $gm^{-2} day^{-1}$ DRY WEIGHT ($\bar{X} \pm s$ (n)) a) NaN_3	b) No Preservative	AVERAGE TOTAL SEDIMENTATION $gm^{-2} day^{-1}$ a and b sides $\bar{X} \pm s$	% COARSER THAN 64µm a	b
ST-1	30	5.97 ± 0.05(2)	6.37 ± 0.05(2)	6.17 ± 0.28	10.1	12.9
	67	12.59 ± 0.06(2)	12.93 ± 0.15(2)	12.76 ± 0.24	12.4	12.8
ST-3	70	2.84 ± 0.04(2)	2.72 ± 0.02(2)	2.78 ± 0.08	8.3	13.8
	300	13.52 ± 0.00 (2)	13.21 ± 0.06(2)	13.37 ± 0.22	4.3	4.3
	353	18.19 ± 0.06(2)	17.74 ± 0.00(2)	17.97 ± 0.32	3.4	3.2
ST-4	30	1.61 ± 0.02(2)	1.83 ± 0.01(2)	1.72 ± 0.15	8.1	17.0
	70	4.32 ± 0.02(2)	4.57 ± 0.10(2)	4.45 ± 0.18	3.6	4.6
	150	9.74 ± 0.14(2)	9.04 ± 0.08(2)	9.39 ± 0.49	2.9	2.6
	208	19.15 ± 0.12(2)	21.91 ± 0.20(2)	20.5 ± 2.0	2.8	3.1

TABLE 6(c). PERCENT MATERIAL IN THE VARIOUS SIZE FRACTIONS FOR TRAPS a AND b AT STATION 4, 150m

SIZE RANGE μm	% MATERIAL a	b
202-333	0.53	0.43
64-202	2.40	2.16
35-64	4.80	5.46
<35	92.3	92.0

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Appendix 2.

Longitudinal sections

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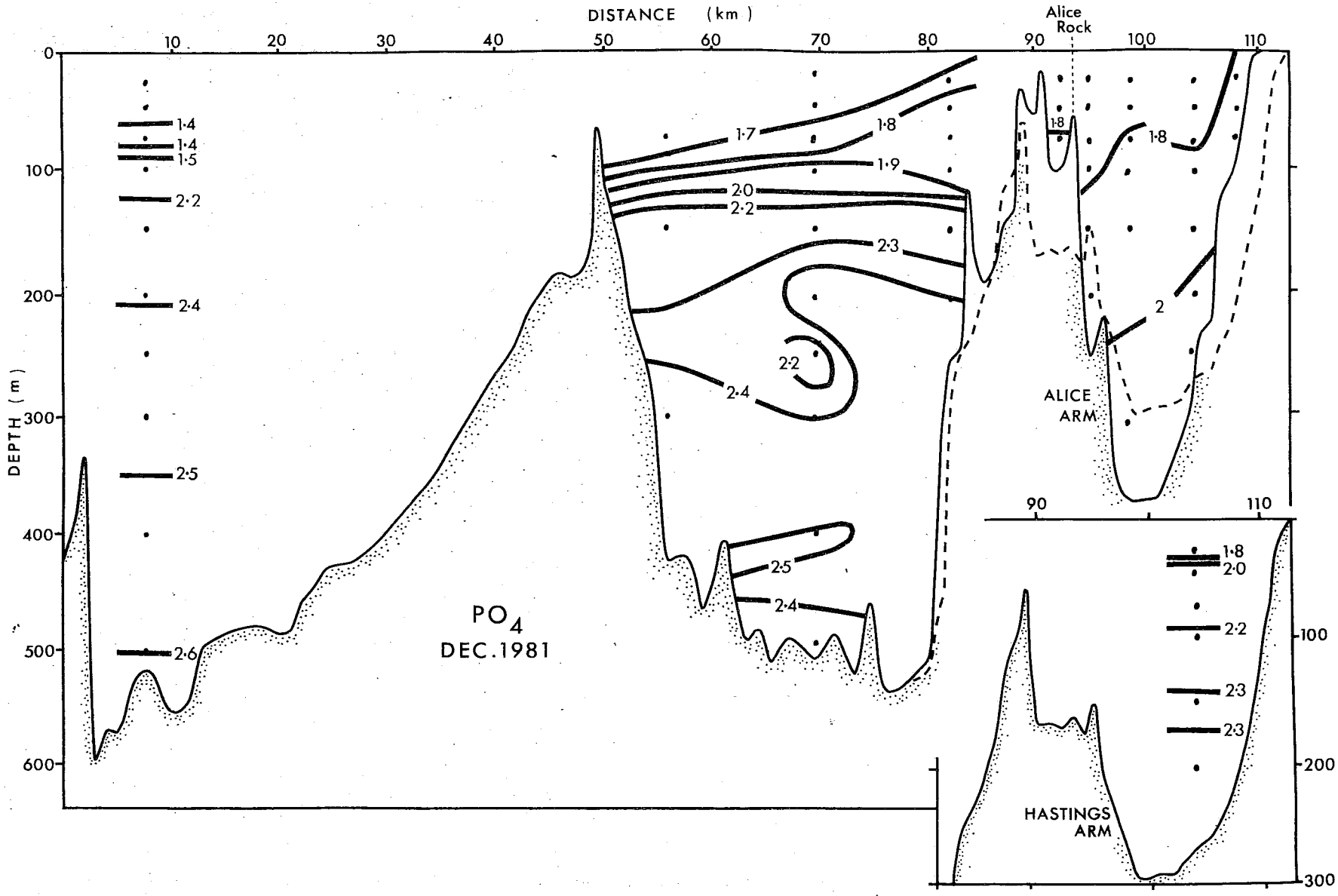
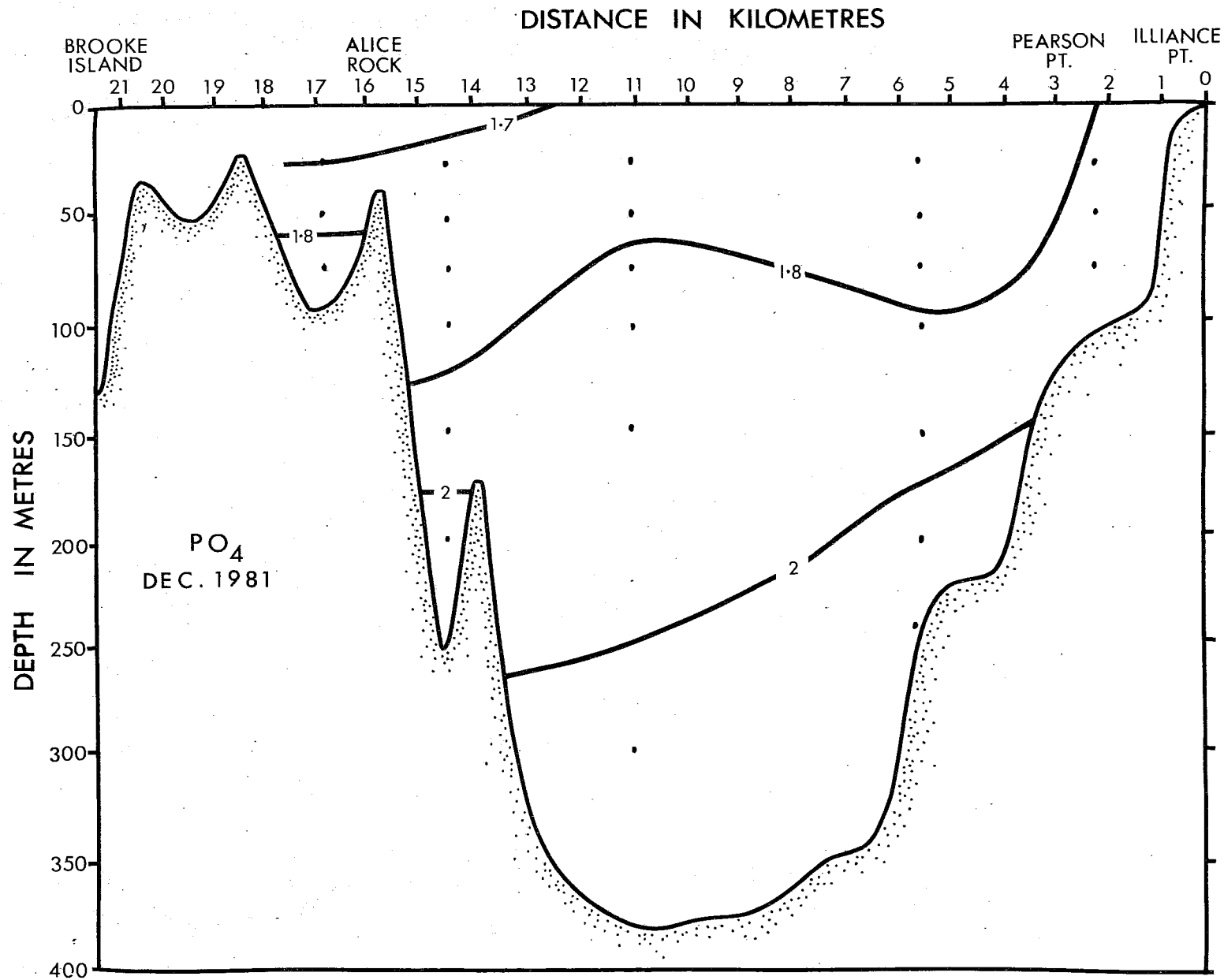
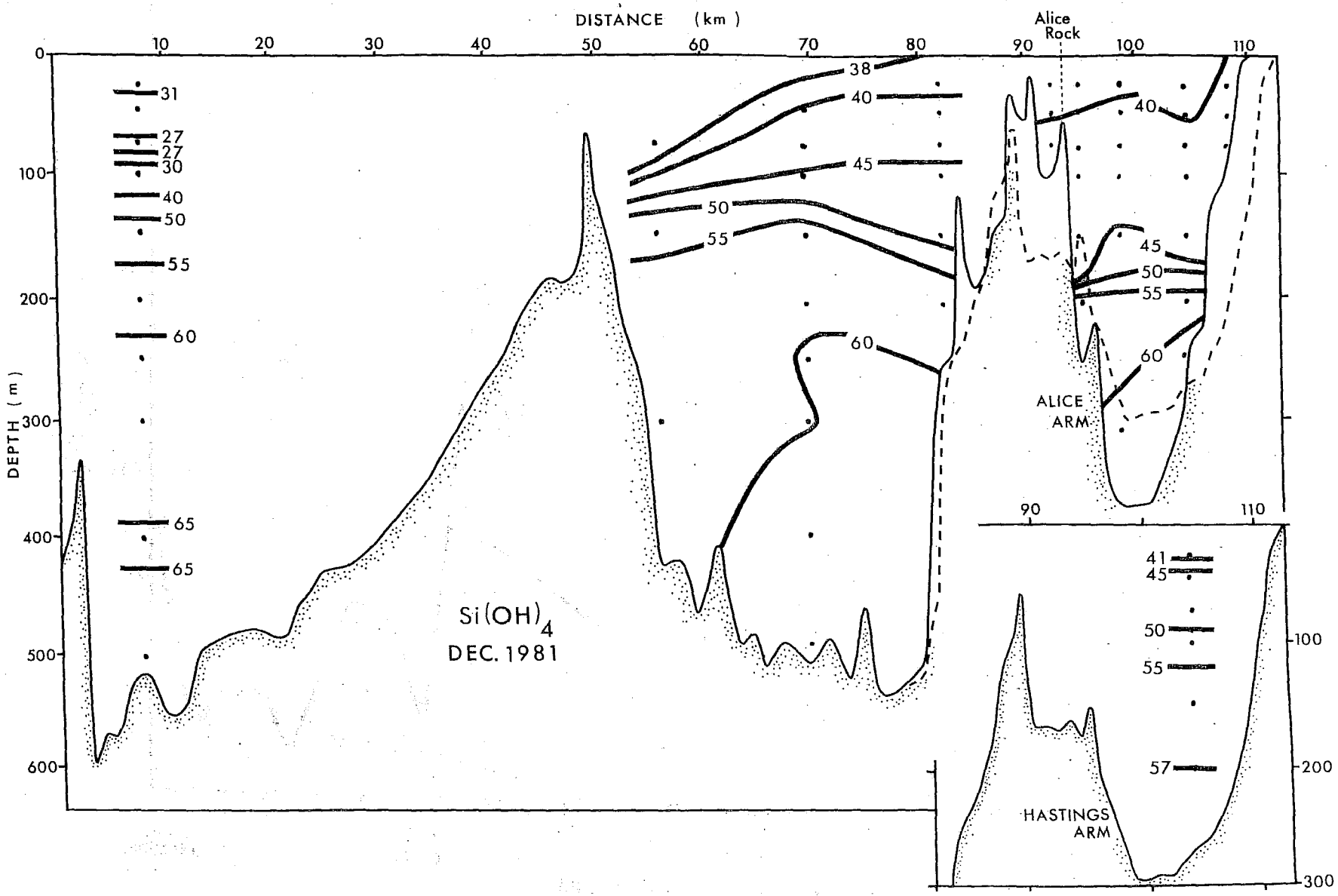
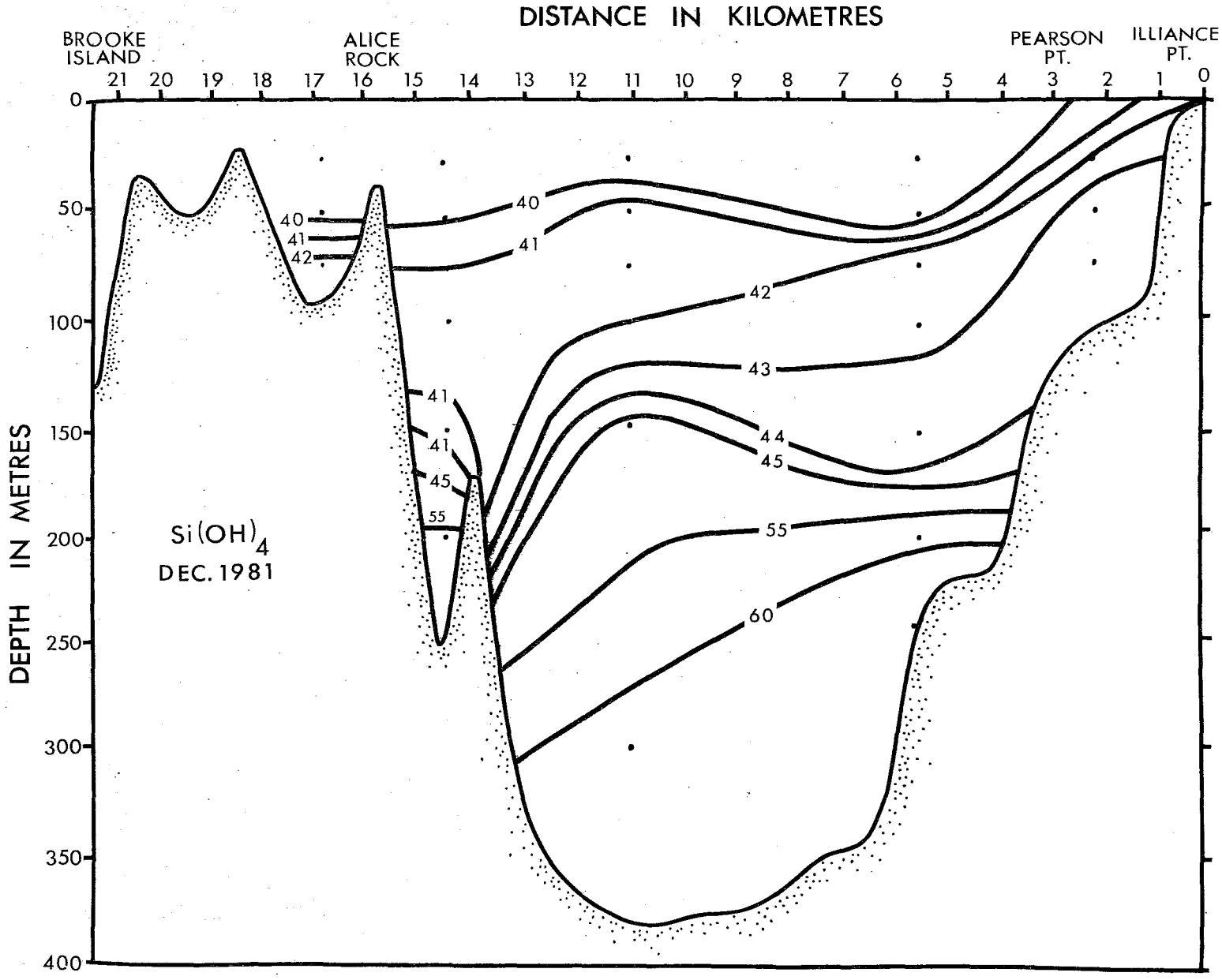
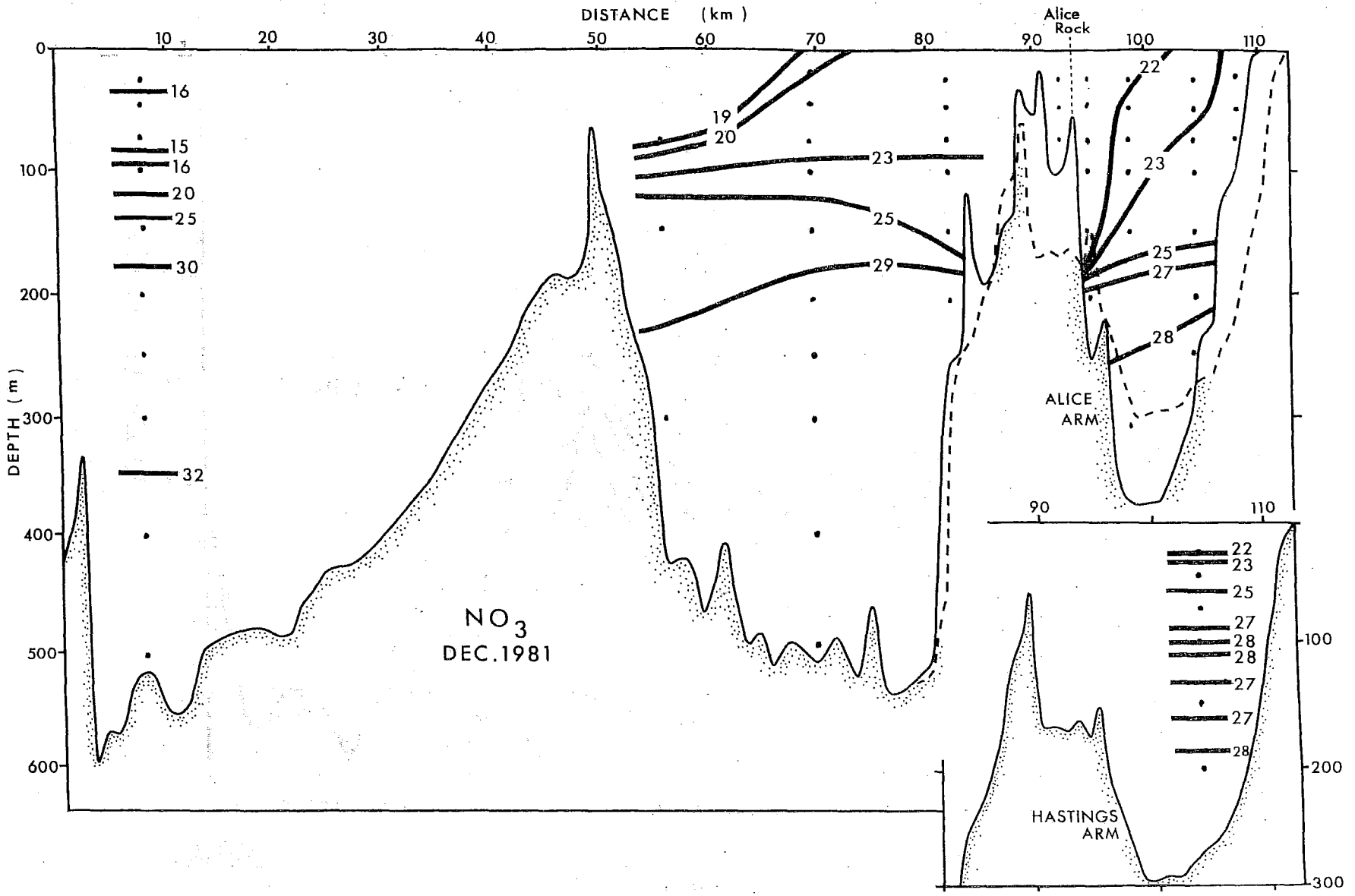
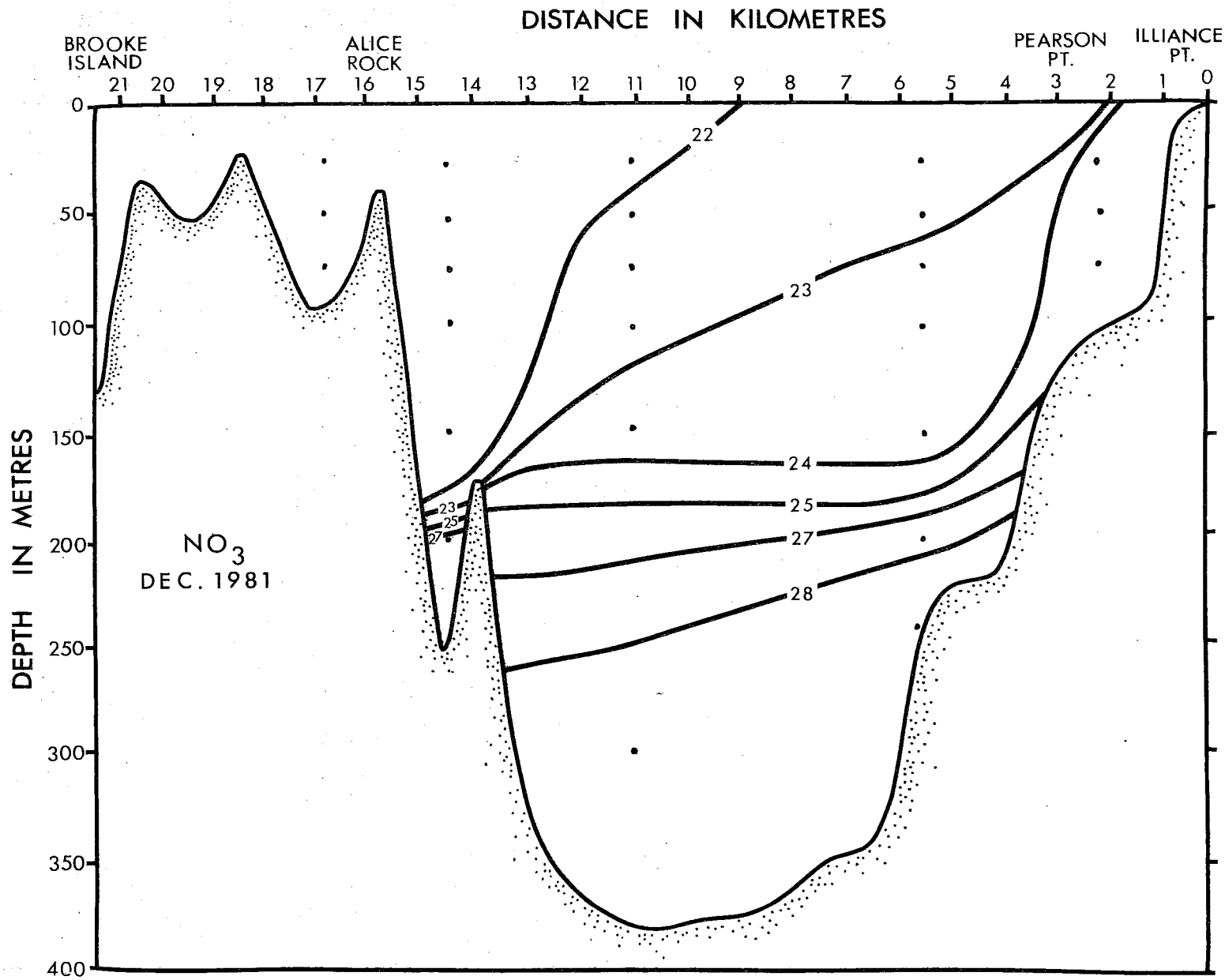

DISTANCE (km)
Alice Rock
DEPTH (m)
PO4
DEC.1981
ALICE ARM
HASTINGS ARM

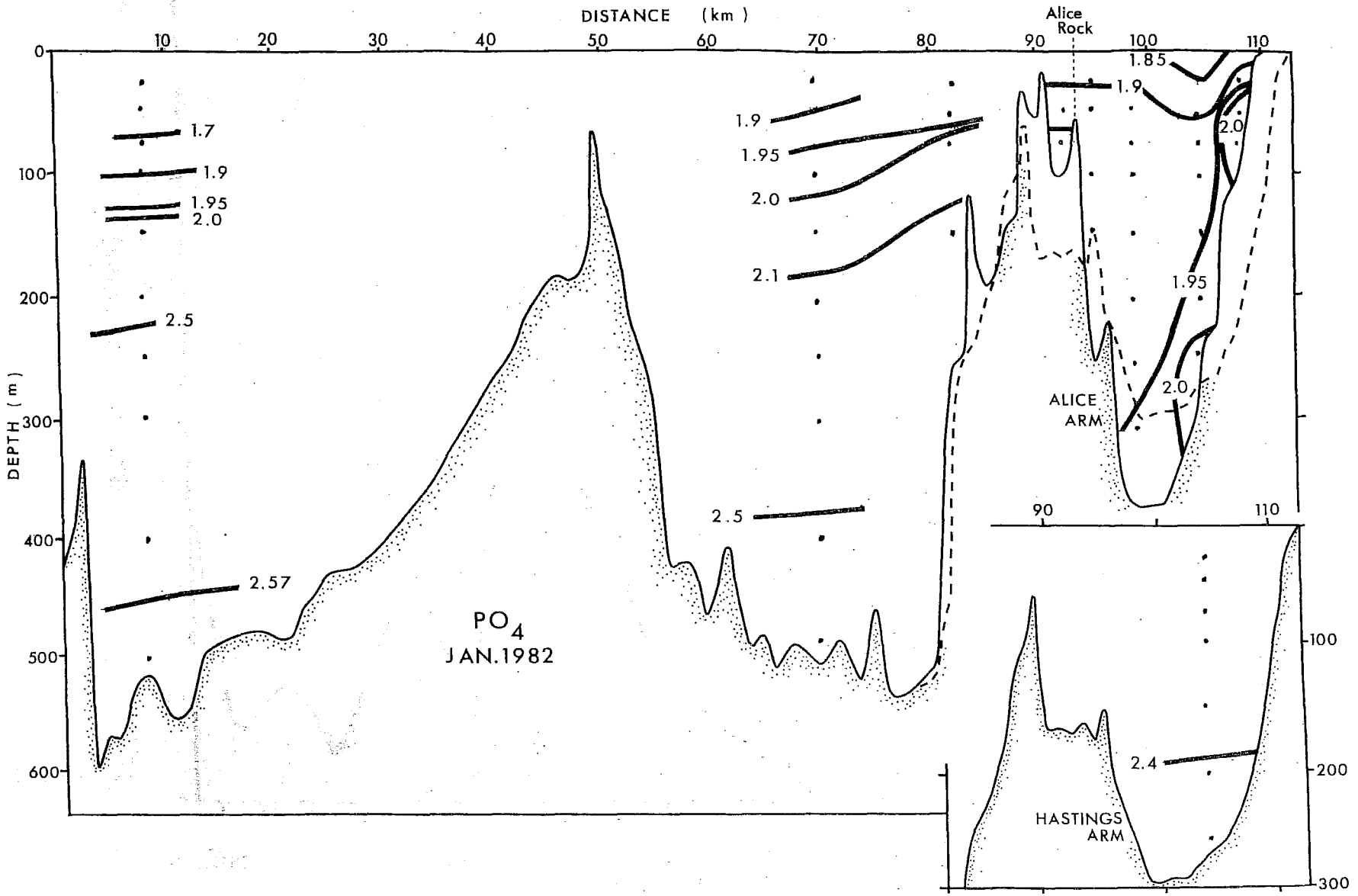

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
DEPTH IN METRES
0 50 100 150 200 250 300 350 400
1·7
1·8
1·8
2
2
PO4
DEC. 1981

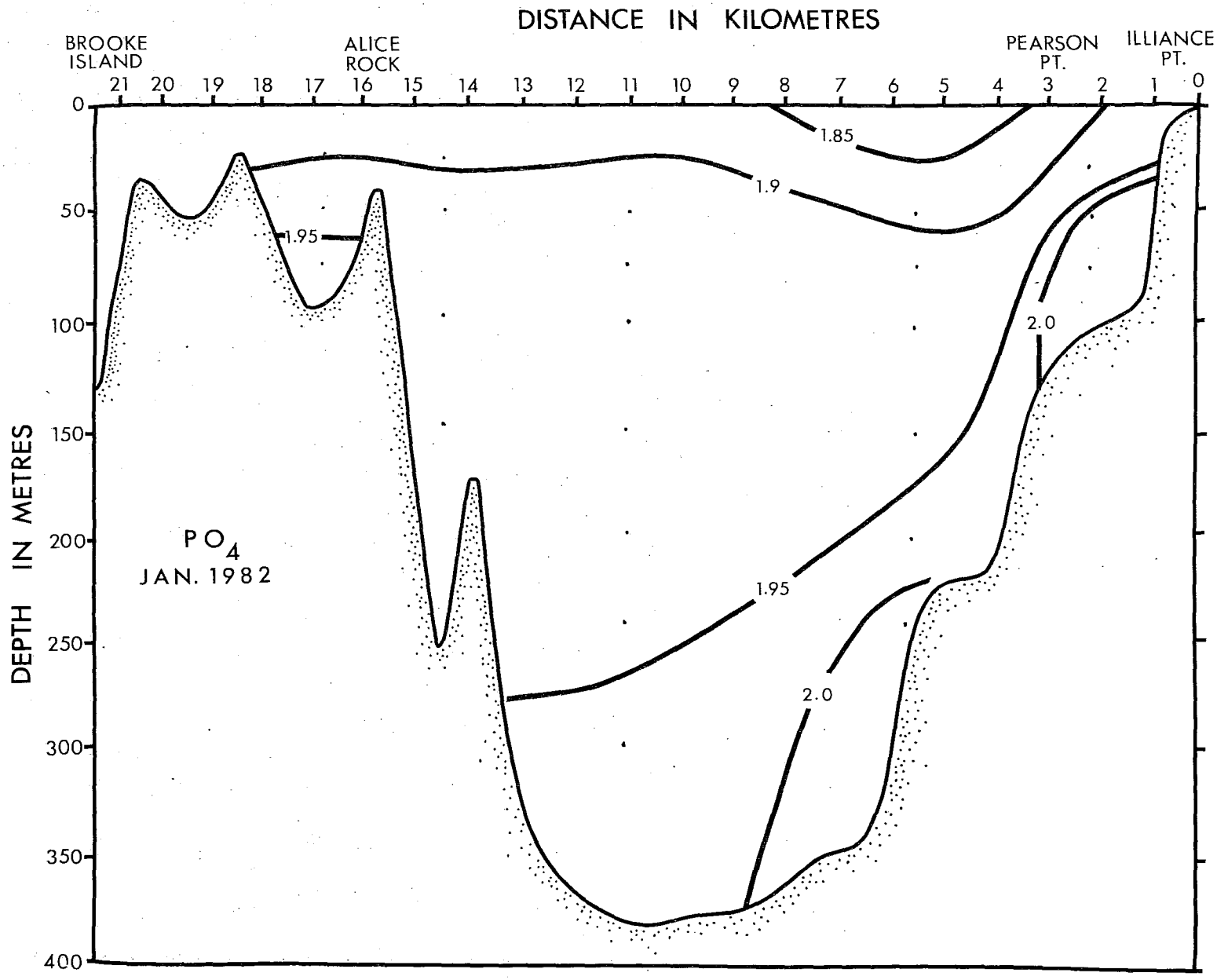

DISTANCE (km)
Alice Rock
DEPTH (m)
Si(OH)4
DEC. 1981
ALICE ARM
HASTINGS ARM

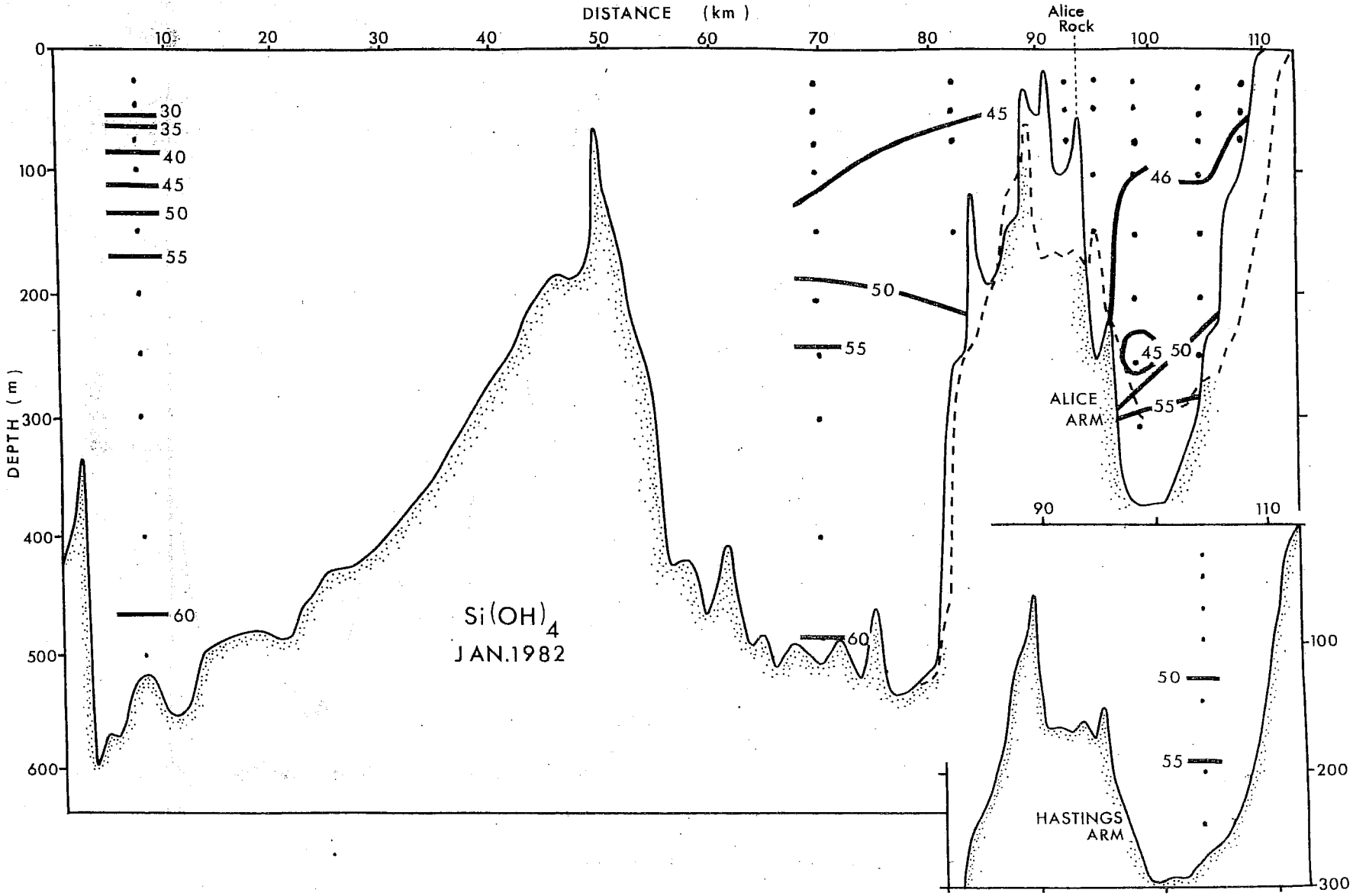

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
DEPTH IN METRES
0 50 100 150 200 250 300 350 400
Si(OH)4
DEC. 1981
40
41
42
40
41
42
43
41
41
45
55
44
45
55
60

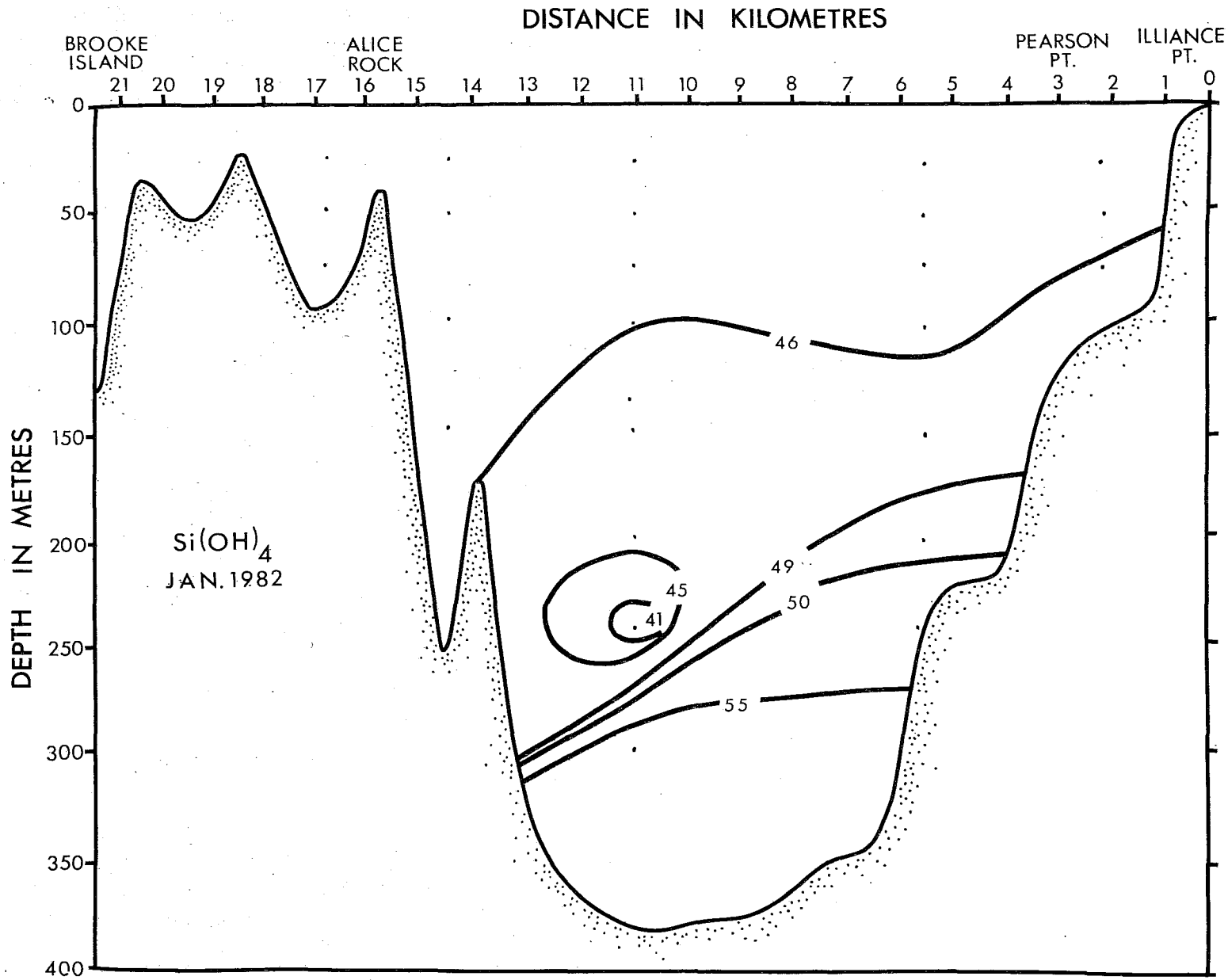

DISTANCE (km)
Alice Rock
DEPTH (m)
NO3
DEC.1981
ALICE ARM
HASTINGS ARM

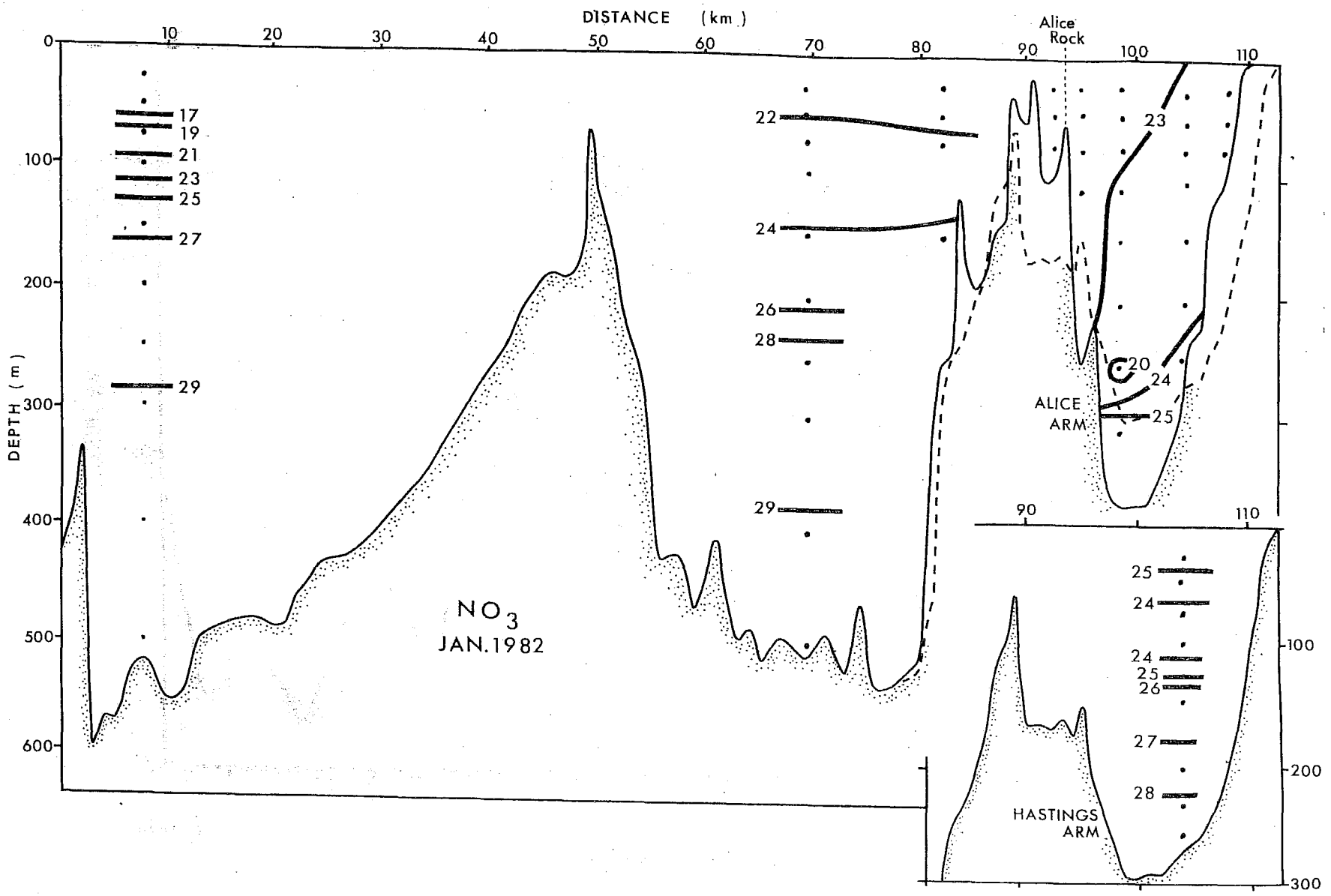

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
DEPTH IN METRES
0 50 100 150 200 250 300 350 400
22
23
24
25
27
28
NO3
DEC. 1981

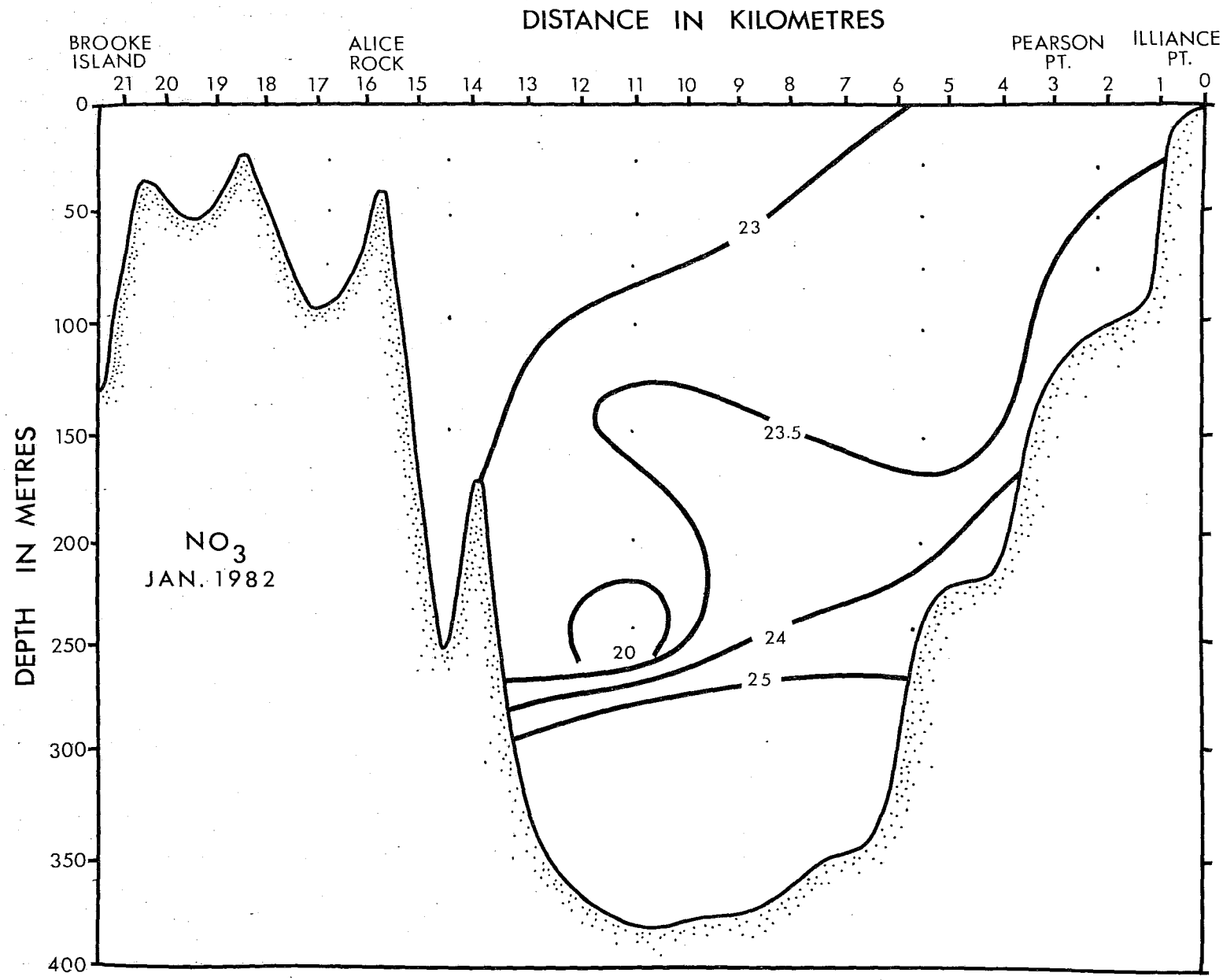

DISTANCE (km)
10
20
30
40
50
60
70
80
90
100
110
Alice Rock
0
100
200
300
400
500
600
DEPTH (m)
1.7
1.9
1.95
2.0
2.5
2.57
1.9
1.95
2.0
2.1
2.5
1.85
1.9
2.0
1.95
2.0
ALICE ARM
90
110
100
200
300
2.4
HASTINGS ARM
PO4
JAN.1982

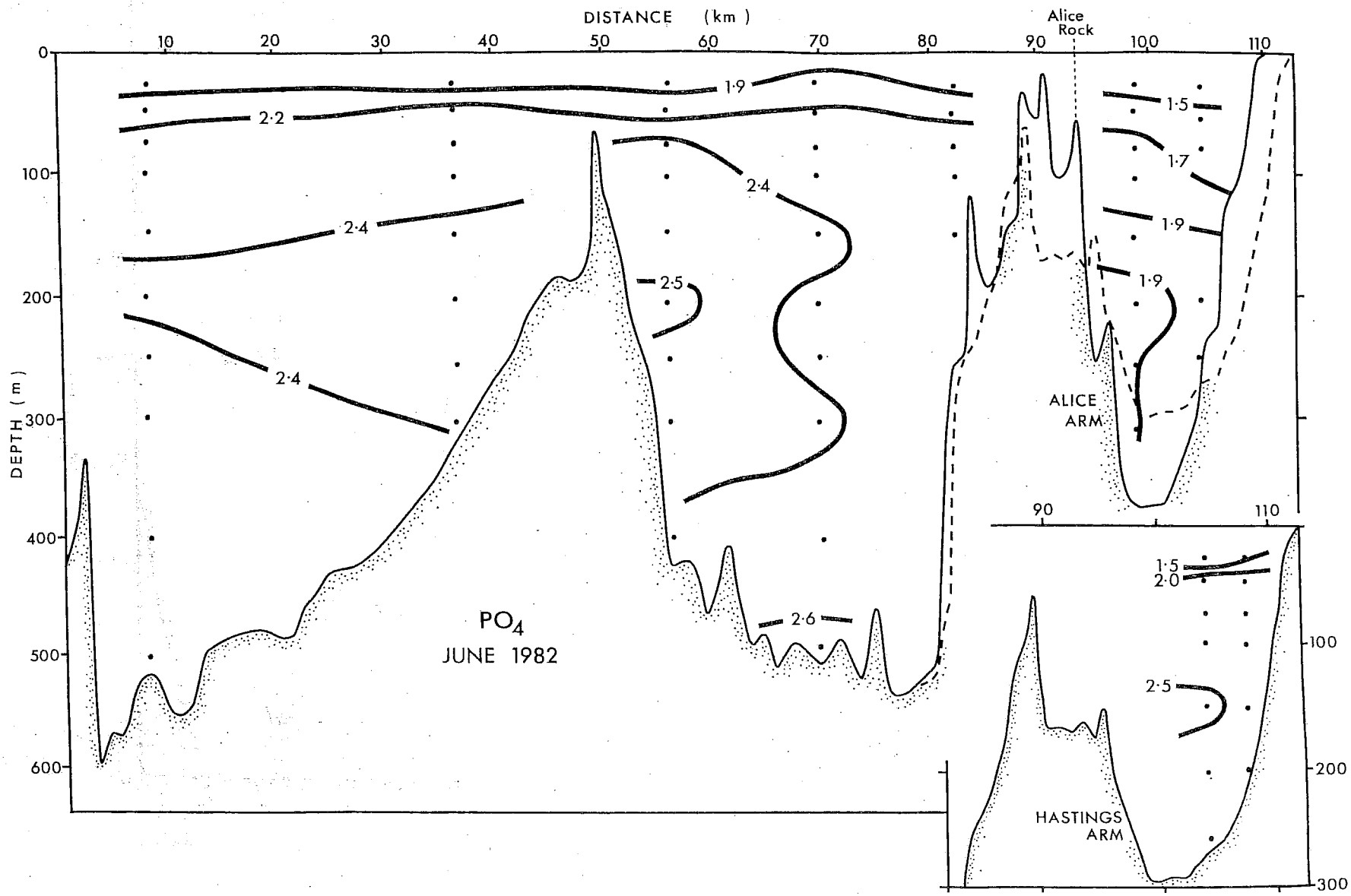

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
DEPTH IN METRES
0 50 100 150 200 250 300 350 400
1.85
1.9
1.95
2.0
1.95
2.0
PO4
JAN. 1982

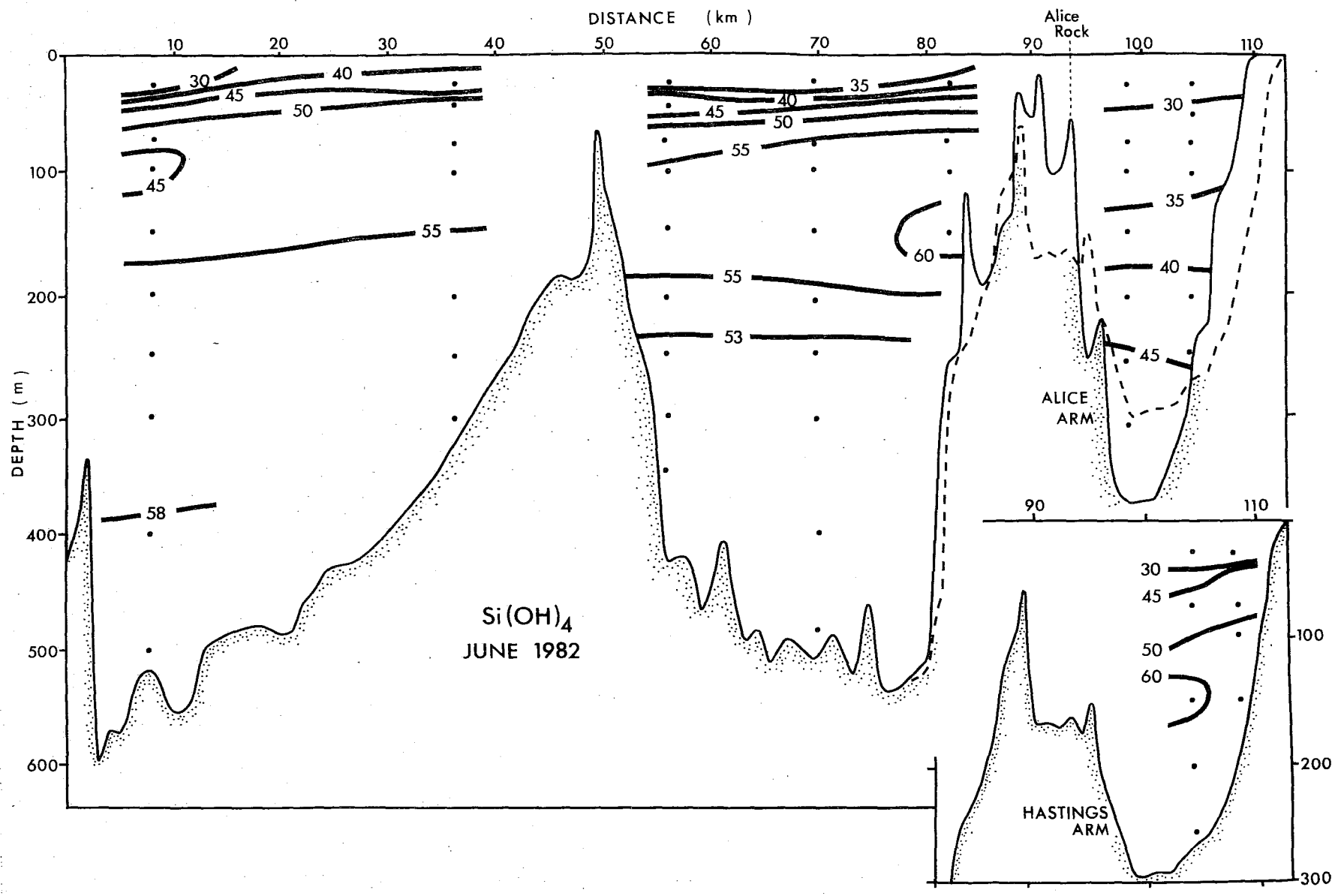

DISTANCE (km)
Alice Rock
DEPTH (m)
Si(OH)4
JAN.1982
ALICE ARM
HASTINGS ARM

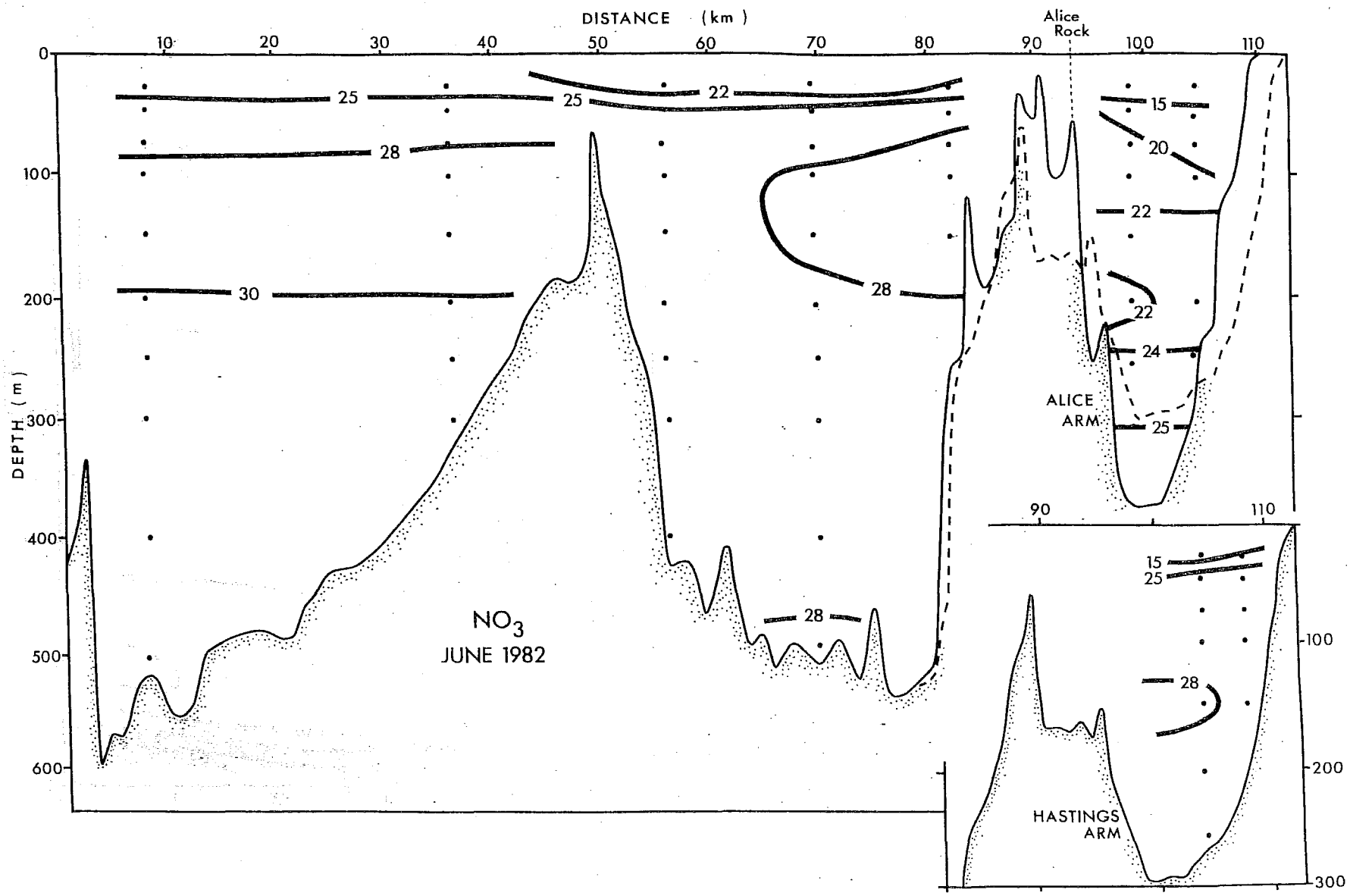

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
DEPTH IN METRES
0 50 100 150 200 250 300 350 400
Si(OH)4
JAN. 1982
46
49
45
41
50
55

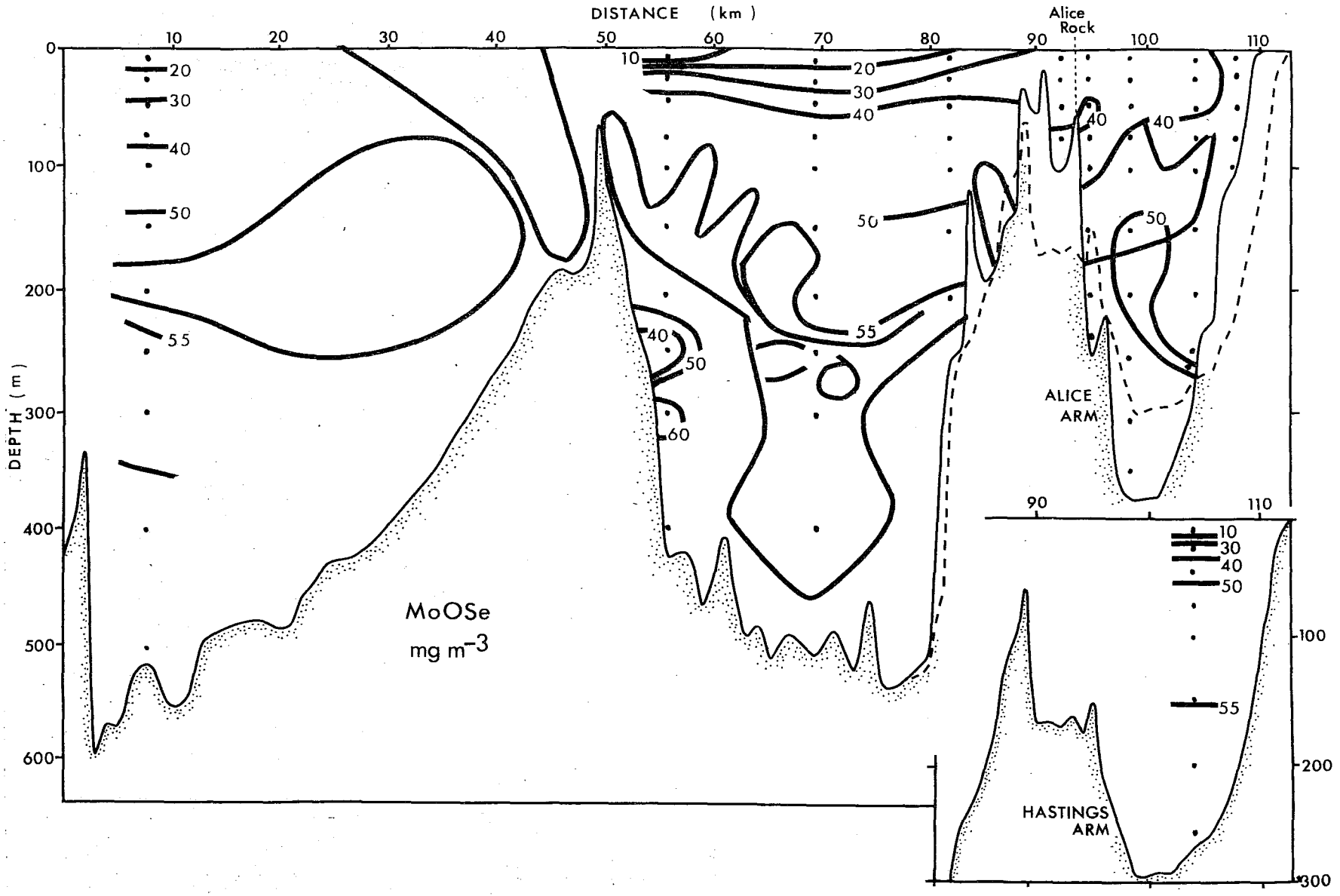

DISTANCE (km)
0
10
20
30
40
50
60
70
80
90
100
110
Alice Rock
DEPTH (m)
100
200
300
400
500
600
17
19
21
23
25
27
29
22
24
26
28
29
23
20
24
25
ALICE ARM
90
110
25
24
24
25
26
27
28
100
200
300
HASTINGS ARM
NO3
JAN.1982

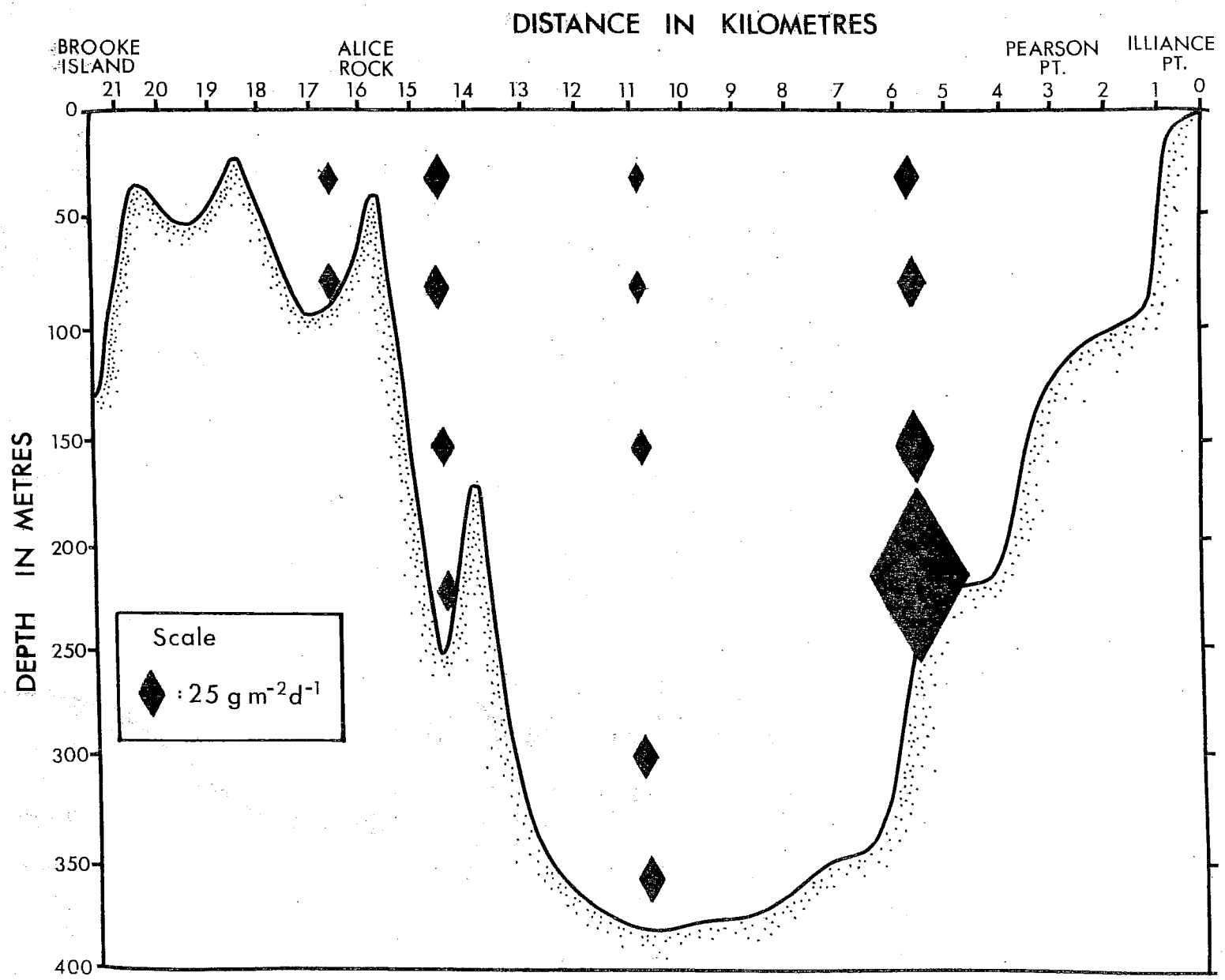

DISTANCE IN KILOMETRES
BROOKE ISLAND
ALICE ROCK
PEARSON PT.
ILLIANCE PT.
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
0
50
100
150
200
250
300
350
400
DEPTH IN METRES
NO_3
JAN. 1982
23
23.5
24
25
20


DISTANCE (km)
Alice Rock
DEPTH (m)
1·9
2·2
2·4
2·5
2·6
1·5
1·7
ALICE ARM
HASTINGS ARM
2·0
PO4
JUNE 1982

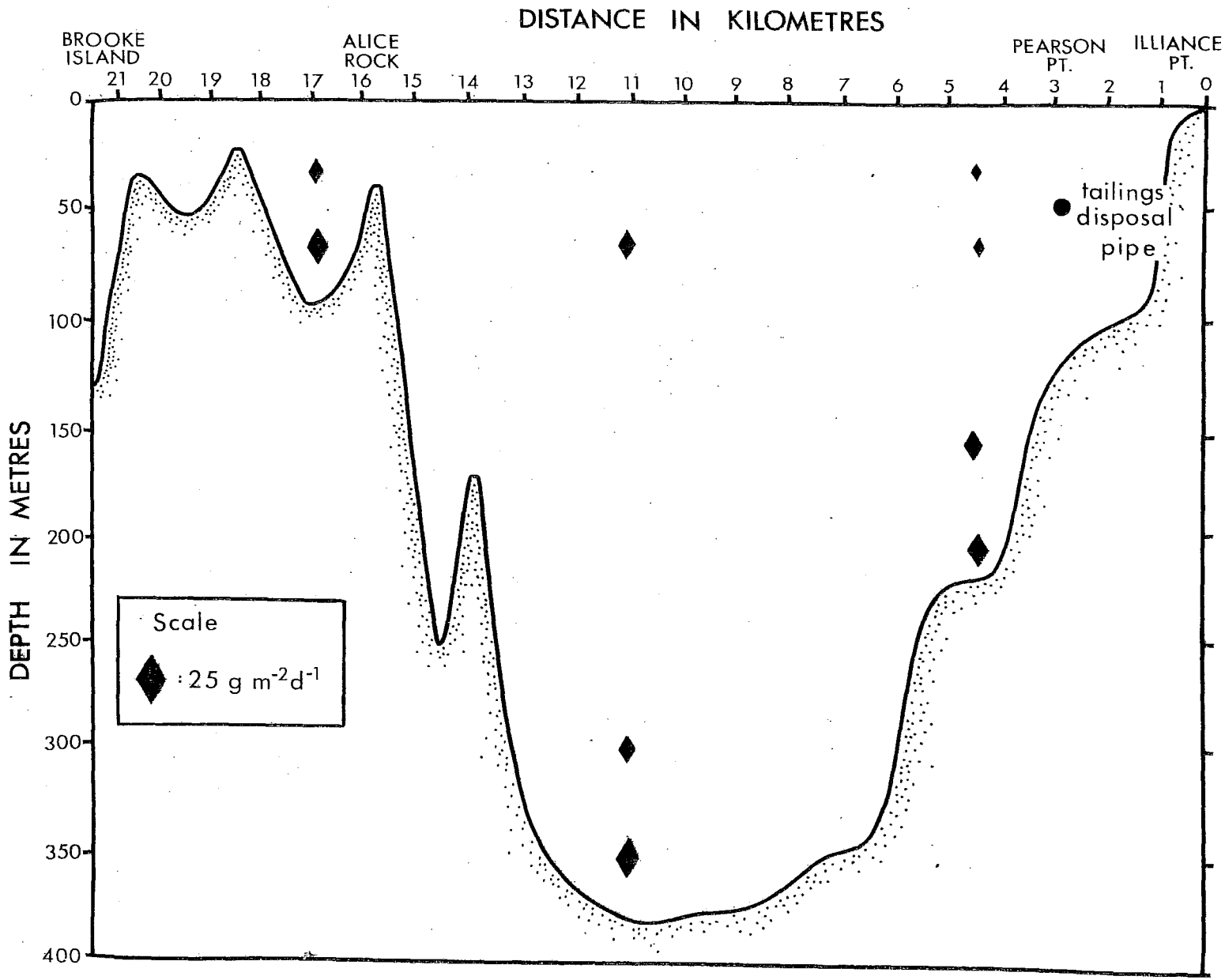

DISTANCE (km)
Alice Rock
DEPTH (m)
Si(OH)4
JUNE 1982
ALICE ARM
HASTINGS ARM


DISTANCE (km)
10
20
30
40
50
60
70
80
90
100
110
Alice Rock
0
100
200
300
400
500
600
DEPTH (m)
25
25
22
28
30
28
15
20
22
22
24
25
ALICE ARM
90
110
15
25
28
100
200
300
HASTINGS ARM
28
NO_3
JUNE 1982


DISTANCE (km)
Alice Rock
DEPTH (m)
MoOSe
mg m-3
ALICE ARM
HASTINGS ARM



SEDIMENTATION in ALICE ARM JUN. '82



SEDIMENTATION in ALICE ARM JAN. '83