OCEANOGRAPHICAL OBSERVATIONS
IN THE INDIAN OCEAN IN 1964
H.M.A.S. *DIAMANTINA*
Cruise Dm5/64

OCEANOGRAPHICAL CRUISE REPORT NO. 40

DIVISION OF FISHERIES AND OCEANOGRAPHY
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL
RESEARCH ORGANIZATION, AUSTRALIA 1968

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MELBOURNE, 1968

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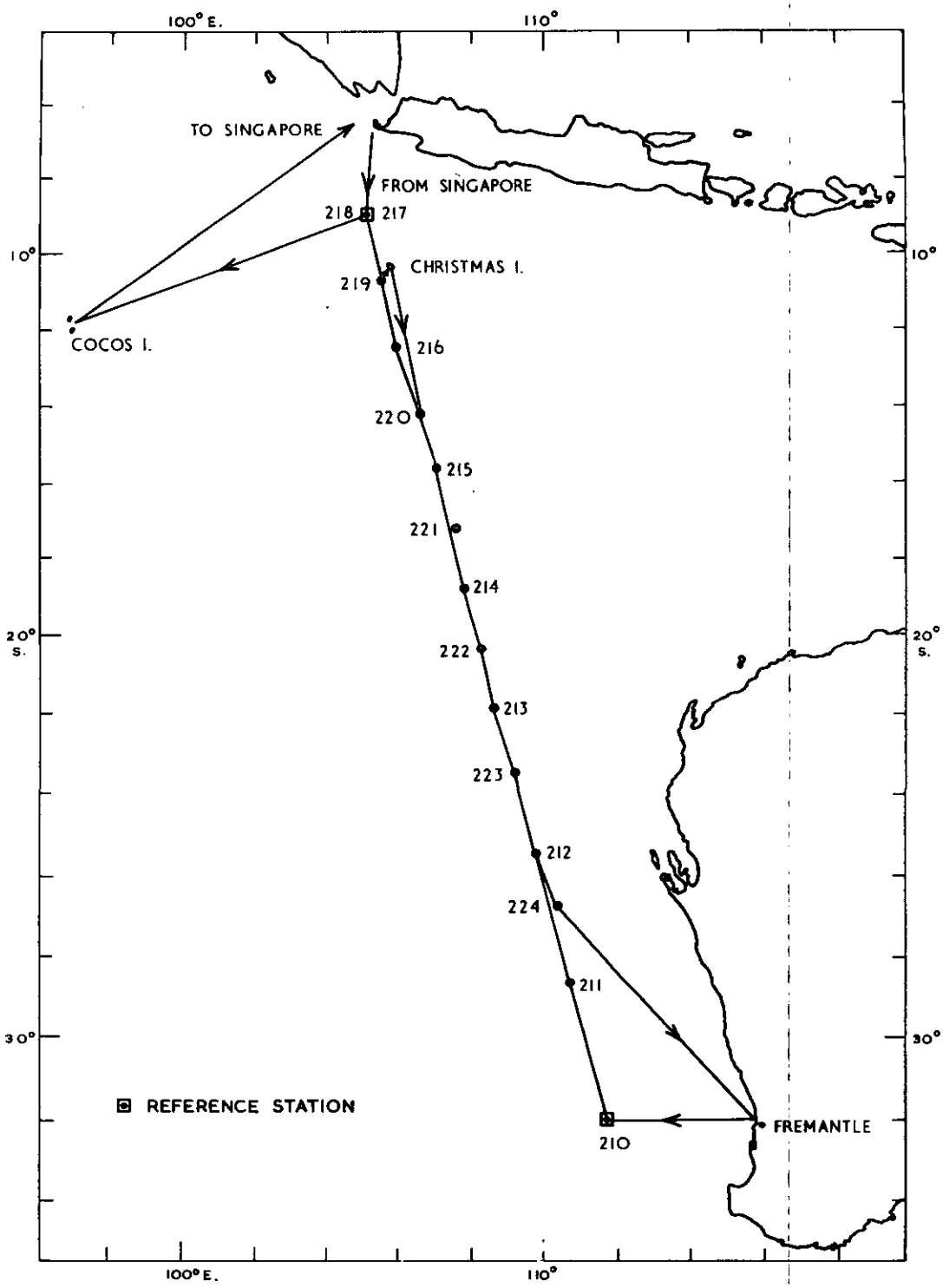

Fig. 1. Track chart

OCEANOGRAPHICAL CRUISE REPORT

No. 40

Oceanographical Observations in the Indian Ocean in 1964

H.M.A.S. Diamantina

Cruise Dm5/64

August 10 - September 10, 1964

I. INTRODUCTION

This report records the data collected during the fifth cruise in 1964 of H.M.A.S. Diamantina, Royal Australian Navy oceanographical frigate.

Objectives

To study the distribution of suspended particulate matter from surface to bottom in the eastern Indian Ocean and the relation of this to the hydrological system.

To study the differences in chemical composition of suspended particulate matter in relation to depth and latitude.

To make Indian Ocean Standard Net plankton hauls for the Indian Ocean Biological Centre, Cochin, India.

Itinerary

The cruise began at Fremantle, worked SCOR-UNESCO Reference Station 1, then a line of stations north to Reference Station 2. From Reference Station 2, the cruise proceeded to the Cocos Is. then Singapore. The cruise left Singapore on August 29, worked Reference Station 2 then a series of stations to Christmas I. and then Fremantle, where the cruise ended (Fig. 1).

Scientific Personnel

B. Newell (Cruise Leader)
G. Dal Pont
J. Klye
J. Prothero
B. Scott

The analyses of hydrological samples were done in the ship's laboratory by Messrs Dal Pont, Klye, and Prothero. Nitrate analyses were done at Cronulla by Mr Klye. Particulate carbon,

nitrogen, carbohydrate, and phosphorus analyses were done at Cronulla by Mr Dal Pont. Mr Scott carried out the incubation and Geiger counting of the primary production samples in the ship's laboratory. The zooplankton samples were concentrated and stored on board.

The data were processed under the direction of Mr W. Hedge, using computer programmes designed by Mr A.D. Crooks. The track chart was prepared for publication by Mr R. Breach.

II. WORK ACCOMPLISHED

Fifteen stations were worked (Dm5/210/64-Dm5/224/64). Bathythermograph casts were made and surface and subsurface hydrology samples collected, at 15 stations. Primary production samples were collected at 10 stations, and zooplankton and particulate matter samples at 14 stations.

TABLE 1

WORK DONE AT EACH STATION

Stn No.	BT	Hydrology Surface to Depth (m)	Primary Production	Zoo-plankton	Particulate Matter Surface to Depth (m)
210	+	4500		+	4500
211	+	5000		+	5000
212	+	3500		+	3500
213	+	2500	+	+	2500
214	+	5000	+	+	5000
215	+	5000	+	+	5000
216	+	5000	+	+	5000
217	+	5000	+	+	5000
218	+	5000		+	
219	+	4000	+	+	4000
220	+	5000	+	+	5000
221	+	5000	+	+	5000
222	+	4000	+		4000
223	+	3000	+	+	4000
224	+	4000		+	4000

BT Bathythermograph
Zooplankton Indian Ocean Standard Net haul

III. METHOD OF COLLECTION AND ANALYSIS OF SAMPLES

1. Physics

Temperature.—Water temperatures were taken with deep-sea reversing thermometers; protected thermometers with a range of -2° to 30°C, and unprotected thermometers with a range of either -2° to 30°C or -4° to 60°C. The accuracy of the temperatures is considered to be ± 0.03 degC.

Thermometric Depth.—Depth calculations were made by the method described by Pollak (1950), and are considered accurate to ± 15 m at depths greater than 1000 m, and to 1% above that depth.

Bathythermograms.—A 900-ft bathythermograph was used at each of the stations indicated in Table 1. Slides were digitized according to the method of the U.S. National Oceanographic Data Centre (1964) and the results transferred to punched cards.

Sigma-t.—Sigma-t values were computed from temperature and salinity values, using the equations of Knudsen (La Fond 1951).

2. Chemistry

Salinity.—Salinity was measured on board with an inductive salinometer (Brown and Hamon 1961).

Dissolved Oxygen.—A version of the standard Winkler method was used to determine the amount of dissolved oxygen in the seawater samples. The version used is a modification of that described by Jacobsen, Robinson, and Thompson (1950). Potassium iodate was used as the iodometric standard and the reagents necessary to fix the oxygen in solution were used at different concentrations (Rochford 1963). Duplicate titrations were made on approximately every tenth sample. Saturation values were calculated by computer using the simpler of the equations given by Richards and Corwin (1956) -

$$O_2(\%\ \text{Satn.}) = \frac{O_2(\text{ml/l}) \times (33.5 + T°C) \times 100}{332.4 - (1.854 \times S‰)}$$

Nitrate.—After collection, water samples were stored in plastic bottles and preserved with 2 drops of saturated $HgCl_2$. Nitrate was determined at Cronulla by the strychnidine method (Rochford 1947). The reagent was prepared by the addition of

0.64 g strychnidine to a litre of nitrate-free sulphuric acid. Five ml of this reagent were added, with minimum agitation, to 5 ml seawater or standard nitrate solution. The standards were made up in a mixture of equal volumes of artificial seawater and nitrate-free sulphuric acid. The standards and samples were shaken to distribute the reagent, and the colour developed for 2 hr. The solutions were read in a Unicam SP 600 spectrophotometer at a wavelength of 530 mμ using a 5 mm cell. Samples with an absorbance greater than that of the standard corresponding to 14.4 μg-atom/l were diluted with artificial seawater-sulphuric acid mixture before reading. Results are given in μg-atom/l.

Particulate Matter.—Six litres of water collected by means of a Jitts twin sampler (Jitts 1964), or five litres collected with a plastic sampler (Davis 1957) were passed through a Whatman GF/C glass paper filter and the filters returned to Cronulla. Where the Jitts sampler was used, duplicate samples were generally obtained.

At Cronulla, each filter was cut into eight equal sectors, and estimations of particulate carbon, particulate carbohydrate, particulate protein-nitrogen, and particulate phosphorus made by the following methods:-

Particulate Carbon. Four diagonally opposite sectors were combusted and CO_2 evolved measured by the method of Dal Pont and Newell (1963).

Particulate Carbohydrate. One sector of the GF/C glass paper filter was placed in a conical centrifuge tube. To this was added 1 ml of distilled water, 2 ml of a 4.5% solution of phenol, and 5 ml of conc. H_2SO_4. After thorough stirring with a glass rod, the whole volume was filtered through a sintered glass disc and the absorbance of the filtrate at 490 mμ measured in a 1 cm cell in a Unicam SP 600 spectrophotometer. The method was calibrated with standard glucose solutions and results are expressed as μg glucose-equivalent per litre of seawater. Reagent and filter blanks were measured and subtracted.

Particulate Protein-Nitrogen. One sector of the GF/C glass paper filter was placed in a 15 ml centrifuge tube and covered with 1 ml of 50% v/v HCl. The tube was then heated to dryness (2-3 hr) in an aluminium block heater at 115°C. The dry residue was dissolved overnight in 1.5 ml distilled water, centrifuged, and 1 ml of the solution transferred to a second 15 ml centrifuge tube. One ml of 0.4 M sodium citrate buffer (0.4 ml normal sodium hydroxide solution and 42 g citric acid in 1 litre of distilled water) was then added. Two ml of ninhydrin reagent (2 g of indane-trione-hydrate dissolved in 50 ml of cellosolve and 50 ml of 0.4 M sodium citrate buffer) were then added and the whole thoroughly mixed with a glass rod. The centrifuge tubes were

heated in a boiling water bath for 30 min, cooled and the absorbance read at 570 mμ in a 1 cm glass cell in a Unicam SP 600 spectrophotometer. Glutamic acid solutions were used as standards.

At the levels of nitrogen present (c. 1 μg) this method gave about 70% recovery of amino-nitrogen from standard albumen solutions. The analytical results have been multiplied by 1.4 to convert them to amino-nitrogen, expressed as μg N per litre of seawater. The yield falls off rapidly with increasing levels of nitrogen present above 2 μg. Reagent and filter blanks were measured and subtracted.

Particulate Phosphorus. Two sectors of the GF/C glass paper filter were autoclaved at 125°C for two hours in a 15 ml centrifuge tube with 1 ml of 9.36% v/v H_2SO_4. After autoclaving, 9 ml of distilled water were added to each tube, the contents mixed, and the tubes centrifuged at 1500 g for 15 min. The 10 ml of supernatant was then poured into a 50 ml Erlenmeyer flask containing 14 ml of distilled water and 1 ml of 0.6% ammonium molybdate solution. The final conditions were thus the same as those employed for the determination of inorganic and total phosphate in seawater samples collected by this laboratory viz., 0.14 N H_2SO_4 and 0.025% ammonium molybdate.

After standing for 5 min, 1 drop of a 1% solution of stannous chloride dihydrate was added to each flask. Absorbance of each solution was measured at 700 mμ after 10 min for colour development. Calibration was effected with standard solutions of potassium dihydrogen phosphate. Results are expressed as μg PO_4-P per litre of seawater. Reagent and filter blanks were measured and subtracted.

3. Primary Production

Surface samples were taken with a twin 6-litre plastic sampler, 300 ml poured into clear and dark Pyrex bottles and the samples exposed to sunlight from noon to sunset in a clear plastic tank of running surface seawater.

The ^{14}C techniques described by Dyson et al. (1965) were used.

4. Zooplankton

Sampling consisted of vertical hauls from 200-0 m with the Indian Ocean Standard Net (IOSN). The IOSN was used in the standard manner (Currie 1963) except that a heavier (100 lb) weight was attached to keep the net under control; this was replaced with a 30 lb weight during washing operations. No flowmeter was used. Wire angle averaged 20° and never exceeded 40°. The length of wire paid out to place the net at 200 m varied from 200-260 m

with a mean of 214 m.

Samples were removed from the net in the following manner. The plankton bucket was detached and the contents poured into a larger container and the bucket replaced. The net was lowered into the water up to the ring and raised again, and the washings collected as before. Remnants still adhering to the codend were washed into the bucket by slopping water from the outside. Finally the net was lowered into the water and washed through without the bucket attached.

Samples were concentrated in the shipboard laboratory and stored in neutral 10% formalin in plastic bottles.

Samples were sent to the Indian Ocean Biological Centre, Cochin, India, for taxonomic studies.

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IV. DATA SHEETS

Hydrology data were processed in a C.D.C. 3600 Computer. An explanation of the headings used is given at the beginning of each part.

DATA

PART 1

HYDROLOGY

EXPLANATION OF HEADINGS

Part 1	Hydrology
STATION	Gives the station identification. For example, Dm5/210/64 signifies the 210th station worked by Diamantina in 1964, on her 5th cruise for that year
DATE	Given as day/month/year
TIME	Given in Zone Time, and is the time at the beginning of the first cast. The code letter used for the time zone follows the time. Zone Times during the cruise were GMT + 7 and 8 hr, Codes G and H, respectively
LATITUDE LONGITUDE	Given in degrees and minutes
SONIC DEPTH	Given in metres, measured at standard sound velocity of 800 fm (1463 m) per second
AIR TEMP. WET DRY	Air temperatures recorded from wet and dry bulb thermometers in °C
WIND DIR. SP.	Wind direction and speed are coded using Tables 8 and 9 in U.S. Hydrogr. Office (1955)
ANEM. HEIGHT	The average height of the anemometer above sea level, given in metres
CLOUD TYPE AMT.	Cloud type and amount are coded using Tables 2 and 3 in U.S. Hydrogr. Office (1955)
VIS.	Visibility is coded using Table 4 in U.S. Hydrogr. Office (1955)
SEA DIR. AMT.	Sea direction and amount are coded using Tables 5 and 8 in U.S. Hydrogr. Office (1955)
SWELL DIR. AMT.	Sea swell direction and amount are coded using Tables 6 and 8 in U.S. Hydrogr. Office (1955)

ATMOS. PRESSURE	Atmospheric pressure given in millibars
WIRE ANGLES CAST 1 CAST 2 CAST 3	Wire angles are measured at the surface and expressed in degrees for each cast
CAST	The cast number corresponding to the wire angle is shown
DEPTH	Actual sampling depth, given in metres
TEMP.	Sea temperatures recorded in °C
SALINITY	Given in parts per thousand
SIGMA-T	Sigma-t to 2 decimal places
OXYGEN	Given in ml/l
OXYGEN % SAT.	Oxygen percentage saturation
NITRATE	Given in µg-atom/l

* and *** indicate no data available

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 210/64	11/ 8/64	0801 H	32 00 S	111 45 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
4938	14.2	15.0	27	7	16	6	8	7	27	3	30	1	1016.8	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	17.14	35.758	26.08	5.45	100	***	***	0.2
3	24	16.98	35.758	26.12	5.42	99	***	***	0.0
3	48	16.35	35.766	26.27	5.42	98	***	***	0.5
3	71	16.00	35.743	26.34	5.46	98	***	***	0.2
3	95	15.15	35.586	26.41	5.26	92	***	***	1.2
3	143	14.44	35.545	26.53	5.38	93	***	***	1.7
3	190	13.45	35.377	26.61	5.35	91	***	***	3.5
3	286	11.85	35.136	26.74	5.52	90	***	***	6.7
2	488	9.51	34.747	26.86	5.55	86	***	***	13.7
2	679	8.33	34.505	26.86	5.35	81	***	***	18.8
2	870	5.64	34.421	27.16	4.59	65	***	***	29.5
2	1062	3.90	34.406	27.35	4.32	59	***	***	33.3
2	1253	3.26	34.589	27.56	3.80	51	***	***	34.5
2	1444	3.04	34.585	27.57	3.54	47	***	***	35.9
1	1992	2.42	***	***	3.73	***	***	***	35.9
1	2490	2.01	34.726	27.77	3.81	50	***	***	34.7
1	2988	1.65	34.725	27.80	4.09	53	***	***	34.7
1	3486	1.41	34.722	27.81	4.34	56	***	***	33.9
1	3984	1.23	34.715	27.82	4.47	57	***	***	36.4
1	4482	1.15	34.712	27.83	4.57	58	***	***	35.1

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 211/64	12/ 8/64	0815 H	28 37 S	110 47 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5486	12.2	14.4	24	5	16	6	5	7	24	3	23	1	1010.6	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	19.02	35.750	25.61	5.25	100	***	***	0.3
3	25	19.01	35.749	25.61	5.25	100	***	***	0.2
3	50	19.00	35.749	25.61	5.28	100	***	***	0.1
3	75	19.00	35.752	25.61	5.28	100	***	***	0.1
3	100	18.66	35.775	25.72	5.12	96	***	***	0.2
3	150	18.23	35.843	25.88	5.25	98	***	***	0.2
3	200	17.39	35.783	26.04	5.01	92	***	***	0.8
3	300	13.48	35.395	26.62	5.34	90	***	***	3.6
2	500	9.96	34.826	26.84	5.67	89	***	***	12.0
2	700	8.32	34.607	26.94	5.40	81	***	***	18.1
2	900	5.15	34.403	27.21	4.48	63	***	***	31.4
2	1100	4.20	34.518	27.40	3.32	46	***	***	35.3
2	1300	3.72	34.583	27.51	3.10	42	***	***	36.1
2	1500	3.10	34.612	27.59	3.35	45	***	***	35.3
1	1921	2.50	34.693	27.71	3.68	49	***	***	35.3
1	2402	2.05	34.726	27.77	3.83	50	***	***	35.7
1	2888	1.72	34.724	27.79	4.13	53	***	***	32.6
1	3383	1.43	34.723	27.81	4.33	56	***	***	33.9
1	3883	1.25	34.717	27.82	4.42	57	***	***	34.9
1	4383	1.19	34.729	27.84	4.54	58	***	***	34.7
1	4883	1.13	34.713	27.83	4.66	59	***	***	33.9

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 212/64	13/ 8/64	0801 H	25 24 S	109 48 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
3749	14.4	18.3	22	4	16	6	7	8	22	2	25	1	1018.8	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	20.94	35.376	24.81	5.06	99	***	***	0.2
3	25	20.85	35.391	24.85	5.02	98	***	***	0.3
3	50	20.79	35.438	24.90	4.99	98	***	***	0.2
3	75	20.03	35.711	25.31	4.93	95	***	***	0.2
3	100	19.73	35.735	25.41	5.08	98	***	***	0.0
3	150	19.39	35.781	25.53	4.80	92	***	***	0.4
3	200	18.57	35.843	25.79	5.02	94	***	***	0.3
3	300	14.58	35.579	26.53	5.14	89	***	***	2.7
2	480	9.79	34.806	26.86	5.61	88	***	***	12.0
2	671	7.56	34.544	27.00	4.96	74	***	***	21.8
2	863	5.06	34.511	27.30	3.50	49	***	***	33.5
2	1055	4.56	34.577	27.41	2.79	39	***	***	37.6
2	1247	3.76	34.586	27.50	3.03	41	***	***	37.8
2	1439	3.27	34.624	27.58	3.12	42	***	***	38.9
1	1976	2.39	34.717	27.74	3.56	47	***	***	35.7
1	2470	1.98	34.729	27.78	3.69	48	***	***	34.9
1	2964	1.62	34.731	27.81	4.07	53	***	***	34.7
1	3458	1.28	34.725	27.83	4.30	55	***	***	34.1

STATION	DATE	TIME	LATITUDE	LONGITUDE
TM 5/ 213/64	14/ 8/64	0830 H	21 57 S	108 44 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
2560	15.6	20.6	12	3	16	6	8	8	12	2	19	1	1023.1	10	10	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	22.28	35.150	24.27	4.90	99	***	***	0.5
2	24	22.22	35.142	24.28	4.87	98	***	***	0.3
2	48	21.83	35.224	24.45	4.67	93	***	***	0.8
2	72	21.43	35.277	24.61	4.48	89	***	***	1.2
2	95	21.31	35.515	24.82	4.66	92	***	***	0.6
2	143	20.04	35.706	25.31	4.69	91	***	***	0.8
2	190	18.10	35.741	25.83	4.53	84	***	***	1.9
2	285	14.79	35.559	26.47	5.04	88	***	***	2.7
2	475	9.94	34.831	26.85	5.60	88	***	***	11.9
1	683	7.20	34.531	27.04	4.78	70	***	***	23.7
1	879	5.44	34.570	27.30	2.83	40	***	***	34.3
1	1074	4.72	34.615	27.42	2.50	35	***	***	37.8
1	1269	4.03	34.634	27.51	2.67	37	***	***	37.4
1	1464	3.41	34.659	27.60	2.98	40	***	***	37.4
1	1952	2.50	34.719	27.73	3.37	44	***	***	35.1
1	2440	2.04	34.733	27.78	3.63	47	***	***	33.9

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 214/64	15/ 8/64	0800 H	18 52 S	107 55 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5394	18.3	22.2	13	3	16	8	2	7	13	2	13	1	1020.5	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	24.72	34.675	23.20	4.70	99	***	***	0.4
3	25	24.53	34.713	23.29	4.81	101	***	***	0.4
3	50	24.05	34.821	23.51	4.41	92	***	***	0.7
3	75	23.61	34.821	23.64	4.17	86	***	***	1.1
3	100	22.22	34.993	24.17	3.87	78	***	***	2.7
3	125	20.48	35.041	24.68	3.23	63	***	***	7.7
3	150	19.22	34.998	24.98	3.00	57	***	***	10.9
3	200	18.71	35.609	25.58	4.14	78	***	***	3.6
3	250	16.65	35.546	26.03	4.14	75	***	***	6.2
3	300	14.89	35.499	26.40	4.64	81	***	***	5.7
2	391	11.90	35.110	26.71	5.06	83	***	***	10.1
2	489	9.54	34.766	26.87	5.23	81	***	***	15.5
2	687	6.56	34.586	27.17	3.06	44	***	***	32.6
2	886	5.65	34.645	27.34	2.09	30	***	***	36.7
2	1085	4.94	34.649	27.43	2.16	30	***	***	38.4
2	1285	4.23	34.653	27.51	2.41	33	***	***	38.4
2	1485	3.61	34.669	27.58	2.73	37	***	***	37.8
1	2000	2.46	34.723	27.73	3.35	44	***	***	35.5
1	2500	2.01	34.732	27.78	3.61	47	***	***	35.5
1	3000	1.61	34.733	27.81	4.00	52	***	***	36.0
1	3500	1.37	34.725	27.82	4.23	54	***	***	34.5
1	4000	1.23	34.720	27.83	4.38	56	***	***	34.7
1	4500	1.19	34.719	27.83	4.44	57	***	***	34.3
1	5000	1.18	34.716	27.83	4.58	59	***	***	33.7

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 215/64	16/ 8/64	0800 H	15 35 S	107 00 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5541	21.1	24.4	15	3	16	0	1	8	15	2	15	1	1015.6	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	25.84	34.487	22.72	4.74	102	***	***	0.1
3	25	25.67	34.475	22.76	4.74	101	***	***	0.0
3	50	25.23	34.566	22.96	4.80	102	***	***	0.1
3	75	25.12	34.702	23.10	4.79	101	***	***	0.0
3	100	24.42	34.873	23.44	4.80	100	***	***	0.0
3	125	23.67	35.002	23.76	4.36	90	***	***	0.9
3	150	20.71	34.953	24.56	3.19	62	***	***	8.6
3	200	18.34	35.096	25.28	3.07	57	***	***	11.7
3	250	16.28	35.216	25.87	3.33	60	***	***	12.7
3	300	13.93	35.127	26.32	3.33	57	***	***	15.6
2	369	11.34	35.000	26.73	4.29	69	***	***	15.2
2	465	9.33	34.750	26.89	3.65	56	***	***	23.0
2	660	7.25	34.640	27.12	2.63	39	***	***	35.5
2	856	6.97	34.642	27.29	1.98	28	***	***	13.8
2	1051	6.15	34.635	27.39	2.08	29	***	***	40.1
2	1247	4.42	34.644	27.48	2.23	31	***	***	40.8
2	1442	3.90	34.679	27.56	2.47	34	***	***	39.8
1	1962	2.63	34.730	27.72	3.14	42	***	***	39.5
1	2460	2.08	34.743	27.78	3.48	45	***	***	38.1
1	2960	1.63	34.736	27.81	3.94	51	***	***	34.2
1	3460	1.36	34.727	27.82	4.21	54	***	***	36.8
1	3960	1.23	34.725	27.83	4.31	55	***	***	35.8
1	4460	1.18	34.727	27.84	4.42	56	***	***	37.5
1	4960	1.16	34.723	27.83	4.52	58	***	***	36.5

STATION	DATE	TIME	LATITUDE	LONGITUDE
CM 5/ 216/64	17/ 8/64	1130 H	12 26 S	105 57 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5669	26.7	23.3	13	4	16	8	5	8	13	2	15	1	1013.5	10	15	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	26.09	34.415	22.59	4.47	96	***	***	0.5
3	25	26.00	34.399	22.60	4.41	95	***	***	0.3
3	50	26.01	34.399	22.60	4.34	93	***	***	0.2
3	75	26.00	34.397	22.60	4.47	96	***	***	0.0
3	100	25.96	34.399	22.61	4.48	96	***	***	0.0
3	125	23.61	34.434	23.35	2.85	59	***	***	10.4
3	150	21.31	34.530	24.07	2.75	54	***	***	12.8
3	200	18.27	34.610	24.93	2.92	54	***	***	17.5
3	250	15.35	34.638	25.63	2.35	41	***	***	21.8
3	300	13.43	34.953	26.29	2.25	38	***	***	24.5
2	365	11.36	34.642	26.45	2.34	38	***	***	27.5
2	462	9.81	34.734	26.80	2.76	43	***	***	28.2
2	659	7.23	34.655	27.14	2.23	33	***	***	35.3
2	857	5.95	34.637	27.29	2.00	29	***	***	37.8
2	1056	4.98	34.628	27.40	2.12	30	***	***	***
2	1255	4.37	34.648	27.49	2.26	31	***	***	41.1
2	1455	3.83	34.689	27.58	2.43	33	***	***	43.6
1	1950	2.67	34.740	27.73	3.09	41	***	***	39.5
1	2437	2.15	34.746	27.78	3.46	45	***	***	41.1
1	2926	1.76	34.737	27.80	3.77	49	***	***	39.9
1	3415	1.42	34.739	27.83	4.07	52	***	***	39.9
1	3907	1.27	34.727	27.83	4.24	54	***	***	40.5
1	4401	1.22	34.724	27.83	4.29	55	***	***	40.3
1	4898	1.17	34.720	27.83	4.49	57	***	***	40.3

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 217/64	18/ 8/64	0800 G	8 58 S	104 59 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5898	22.2	27.8	12	4	16	8	1	8	12	2	14	1	1013.8	15	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	26.91	33.893	21.94	4.61	100	***	***	0.2
3	24	26.40	34.079	22.24	4.58	99	***	***	0.2
3	48	26.23	34.290	22.45	4.66	100	***	***	0.2
3	71	25.07	34.463	22.94	3.44	73	***	***	4.7
3	95	21.60	34.451	23.93	2.93	58	***	***	10.6
3	119	20.07	34.559	24.43	2.62	50	***	***	14.0
3	143	17.22	34.570	25.15	2.63	48	***	***	17.6
3	191	14.01	34.569	25.87	2.40	41	***	***	22.4
3	238	12.30	34.917	26.49	2.12	35	***	***	26.8
3	286	11.35	34.691	26.49	1.95	31	***	***	28.1
2	378	10.24	34.784	26.76	1.82	29	***	***	31.1
2	473	9.29	34.788	26.92	1.95	30	***	***	31.4
2	662	7.49	34.721	27.15	1.69	25	***	***	34.5
2	851	6.07	34.687	27.32	1.78	26	***	***	36.0
2	1041	5.13	34.674	27.42	1.97	28	***	***	37.7
2	1230	4.37	34.679	27.51	2.19	30	***	***	37.1
2	1419	3.90	34.713	27.59	2.30	31	***	***	39.0
1	1896	2.64	34.756	27.74	3.08	41	***	***	38.2
1	2372	2.11	34.747	27.78	3.40	44	***	***	35.4
1	2847	1.72	34.736	27.80	3.72	48	***	***	35.3
1	3323	1.44	34.743	27.83	4.01	52	***	***	33.8
1	3805	1.20	34.720	27.83	4.25	54	***	***	34.3
1	4294	1.15	34.718	27.83	4.41	56	***	***	34.3
1	4787	1.17	34.718	27.83	4.47	57	***	***	33.8

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 218/64	31/ 8/64	1430 H	9 00 S	104 53 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
5760	23.9	27.2	09	4	16	8	3	7	09	2	10	1	1009.3	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	26.14	***	***	4.58	***	***	***	0.3
1	22	26.09	34.373	22.55	4.54	98	***	***	0.4
1	44	26.06	34.360	22.55	4.48	96	***	***	0.3
1	66	26.01	34.360	22.57	4.52	97	***	***	0.1
1	89	23.64	34.439	23.35	2.99	61	***	***	8.4
1	111	21.71	34.491	23.93	2.82	56	***	***	11.3
1	133	19.19	34.588	24.68	2.64	50	***	***	15.0
1	178	15.54	34.573	25.54	2.62	46	***	***	19.3
1	222	12.86	34.597	26.13	2.43	40	***	***	23.8
1	266	11.04	34.626	26.50	2.20	35	***	***	27.8
3	369	9.78	34.711	26.78	1.93	30	***	***	31.5
3	461	8.89	34.743	26.95	1.87	29	***	***	33.8
3	647	7.33	34.731	27.18	1.72	25	***	***	37.5
3	832	5.87	34.671	27.33	1.90	27	***	***	36.8
3	1017	4.88	34.663	27.44	2.05	29	***	***	37.9
3	1202	4.28	34.683	27.53	2.16	30	***	***	37.9
3	1387	4.28	34.730	27.56	2.35	32	***	***	38.2
2	1945	2.51	34.738	27.74	2.79	37	***	***	36.8
2	2330	2.10	34.747	27.78	3.24	42	***	***	34.9
2	2715	1.79	34.747	27.81	3.53	46	***	***	34.5
2	3100	1.55	34.743	27.82	3.08	40	***	***	36.4
2	3485	1.36	34.773	27.86	4.07	52	***	***	36.4
2	3870	1.18	34.726	27.83	4.26	54	***	***	35.6
2	4245	1.14	34.721	27.83	4.35	56	***	***	34.5

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 219/64	3/ 9/64	0915 G	10 45 S	105 26 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
4252	23.3	27.8	14	4	16	6	6	8	14	2	14	1	1011.7	10	15	30

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	26.04	34.273	22.49	4.68	100	***	***	0.2
3	22	25.99	34.263	22.50	4.68	100	***	***	0.2
3	43	25.95	34.264	22.52	4.65	100	***	***	0.3
3	64	24.05	34.376	23.18	3.72	77	***	***	3.7
3	86	22.38	34.447	23.71	2.97	60	***	***	3.0
3	107	20.55	34.428	24.20	3.06	59	***	***	7.8
3	129	19.13	34.590	24.69	2.57	49	***	***	15.2
3	172	16.57	34.551	25.29	2.56	46	***	***	17.1
3	215	13.39	34.624	26.04	2.45	41	***	***	21.5
3	257	11.97	34.612	26.31	2.22	36	***	***	25.6
2	376	9.82	34.707	26.77	1.93	30	***	***	30.1
2	470	8.72	34.688	26.94	2.07	32	***	***	30.1
2	654	7.01	34.671	27.18	1.83	27	***	***	34.9
2	837	5.87	34.652	27.32	1.89	27	***	***	35.8
2	1020	4.87	34.633	27.42	2.15	30	***	***	37.9
2	1204	4.28	34.650	27.50	2.28	31	***	***	37.9
2	1387	3.88	34.699	27.58	2.40	33	***	***	37.9
1	1923	2.66	34.740	27.73	3.09	41	***	***	36.2
1	2417	1.99	34.742	27.79	3.63	47	***	***	35.1
1	2910	1.68	34.734	27.81	3.81	49	***	***	36.0
1	3404	1.36	34.727	27.82	4.11	53	***	***	34.9
1	3898	1.19	34.727	27.83	4.32	55	***	***	36.0

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 220/64	4/ 9/64	0800 G	14 04 S	106 18 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	WIRE ANGLES CAST2	WIRE ANGLES CAST3
5394	22.2	25.0	13	5	16	6	8	7	13	2	15	1	1013.8	15	15	0

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	25.06	34.609	23.05	4.77	101	***	***	0.1
3	25	24.93	34.623	23.10	4.69	99	***	***	0.1
3	50	24.73	34.673	23.20	4.66	98	***	***	0.2
3	75	24.57	34.743	23.30	4.69	98	***	***	0.0
3	100	24.33	34.849	23.45	4.69	98	***	***	0.0
3	125	24.00	34.932	23.61	4.42	92	***	***	0.6
3	150	20.01	34.889	24.69	2.99	58	***	***	10.0
3	200	16.37	34.748	25.49	2.38	43	***	***	18.1
3	250	13.95	34.725	26.00	2.38	41	***	***	21.7
3	300	13.11	34.938	26.34	2.92	49	***	***	19.3
2	376	11.51	34.859	26.59	2.95	48	***	***	21.6
2	473	9.29	34.743	26.89	3.22	50	***	***	24.6
2	667	7.09	34.660	27.16	2.11	31	***	***	34.0
2	862	5.97	34.640	27.29	2.02	29	***	***	36.6
2	1057	5.04	34.628	27.40	2.14	30	***	***	36.6
2	1252	4.38	34.647	27.49	2.26	31	***	***	39.0
2	1447	3.86	34.664	27.56	2.41	33	***	***	38.2
1	1961	2.67	34.719	27.71	2.99	40	***	***	38.2
1	2451	2.10	34.739	27.78	3.37	44	***	***	36.6
1	2942	1.65	34.731	27.80	3.85	50	***	***	35.8
1	3432	1.36	34.729	27.82	3.91	50	***	***	35.3
1	3922	1.24	34.721	27.83	4.27	55	***	***	35.6
1	4412	1.17	34.721	27.83	4.45	57	***	***	34.5
1	4903	1.13	34.717	27.83	4.52	58	***	***	34.5

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 221/64	5/ 9/64	0900 H	17 06 S	107 20 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
***	19.4	22.2	13	5	16	6	8	8	13	2	15	1	1017.2	10	10	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	24.40	34.755	23.36	4.81	100	***	***	0.0
3	25	24.38	34.747	23.36	4.83	101	***	***	0.0
3	50	24.36	34.750	23.37	4.72	99	***	***	0.0
3	75	24.37	34.754	23.37	4.56	95	***	***	0.1
3	100	24.31	34.910	23.50	4.72	99	***	***	0.0
3	125	23.30	34.977	23.85	4.07	83	***	***	2.2
3	150	20.25	34.787	24.55	2.89	56	***	***	11.8
3	200	18.24	35.077	25.29	3.01	56	***	***	12.5
3	250	16.30	35.116	25.79	3.05	55	***	***	14.1
3	300	14.75	35.275	26.26	3.57	62	***	***	12.3
2	400	11.50	35.069	26.76	4.64	75	***	***	12.9
2	500	9.36	34.766	26.90	4.90	76	***	***	17.5
2	700	6.75	34.625	27.18	2.68	39	***	***	32.4
2	900	5.62	34.640	27.34	2.09	30	***	***	38.4
2	1100	4.87	34.634	27.42	2.15	30	***	***	38.4
2	1300	4.21	34.652	27.51	2.33	32	***	***	38.4
2	1500	3.65	34.687	27.60	2.64	36	***	***	38.7
1	1920	2.63	34.730	27.72	3.17	42	***	***	37.6
1	2403	2.13	34.768	27.80	3.34	44	***	***	36.9
1	2887	1.73	34.739	27.81	3.80	49	***	***	35.4
1	3473	1.44	34.728	27.82	4.04	52	***	***	33.9
1	3867	1.26	34.723	27.83	4.29	55	***	***	34.6
1	4364	1.20	34.722	27.83	4.40	56	***	***	35.8
1	4863	1.19	34.722	27.83	4.50	58	***	***	35.8

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 222/64	6/ 9/64	0900 H	20 16 S	108 09 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
4389	20.0	23.3	14	6	16	8	5	7	13	2	14	1	1019.8	10	15	35

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	23.06	34.973	23.92	4.80	98	***	***	0.4
3	21	23.02	34.961	23.92	4.72	96	***	***	0.5
3	43	23.05	34.961	23.91	4.69	96	***	***	0.4
3	64	23.03	34.965	23.92	4.81	98	***	***	0.1
3	86	23.01	34.967	23.93	4.87	99	***	***	0.1
3	129	21.49	35.029	24.40	3.57	71	***	***	4.5
3	172	19.86	35.327	25.07	3.63	70	***	***	6.1
3	258	17.64	35.713	25.92	4.30	79	***	***	3.5
2	453	10.12	34.894	26.87	5.40	85	***	***	12.5
2	646	7.28	34.593	27.08	3.72	55	***	***	26.9
2	842	5.80	34.613	27.29	2.47	35	***	***	36.2
2	1039	5.17	***	***	2.25	***	***	***	37.2
2	1236	4.50	34.639	27.47	2.41	33	***	***	37.4
2	1435	3.85	34.663	27.56	2.68	37	***	***	36.7
1	1976	2.53	34.726	27.73	3.28	43	***	***	36.3
1	2470	2.02	34.737	27.78	3.54	46	***	***	36.7
1	2964	1.63	34.737	27.81	3.87	50	***	***	35.6
1	3457	1.36	34.759	27.85	4.14	53	***	***	35.6
1	3951	1.19	34.738	27.84	4.32	55	***	***	35.6

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 223/64	7/ 9/64	0900 H	23 28 S	109 05 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
***	16.7	20.3	15	5	16	1	1	7	14	2	14	1	1023.6	20	20	35

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	21.26	35.364	24.72	5.02	99	***	***	0.5
3	21	21.24	35.364	24.72	4.96	98	***	***	0.4
3	42	21.24	35.362	24.72	4.87	96	***	***	0.4
3	63	21.12	35.362	24.76	4.96	98	***	***	0.0
3	84	21.06	35.383	24.79	4.98	98	***	***	0.2
3	126	20.32	35.596	25.15	4.81	94	***	***	0.6
3	168	19.82	35.722	25.38	4.74	91	***	***	0.7
3	252	16.66	35.516	26.01	4.01	73	***	***	6.9
2	464	10.93	35.002	26.81	5.39	86	***	***	9.5
2	658	8.70	34.657	26.92	5.28	80	***	***	17.4
2	855	5.43	34.460	27.22	4.01	57	***	***	30.7
2	1054	4.47	34.554	27.40	3.03	42	***	***	36.4
2	1252	3.81	34.593	27.50	2.99	41	***	***	36.8
2	1451	3.33	34.635	27.58	3.17	43	***	***	36.8
1	1884	2.43	34.719	27.73	3.53	47	***	***	36.0
1	2354	2.01	34.753	27.79	3.62	47	***	***	34.9
1	2824	1.64	34.752	27.82	3.98	51	***	***	33.8

STATION	DATE	TIME	LATITUDE	LONGITUDE
DM 5/ 224/64	8/ 9/64	1500 H	26 56 S	110 12 E

SONIC DEPTH	AIR TEMP. WET	AIR TEMP. DRY	WIND DIR.	WIND SP.	ANEM. HEIGHT	CLOUD TYPE	CLOUD AMT.	VIS.	SEA DIR.	SEA AMT.	SWELL DIR.	SWELL AMT.	ATMOS. PRESSURE	WIRE ANGLES CAST1	CAST2	CAST3
4938	16.1	20.0	13	5	16	8	3	8	11	2	13	1	1025.1	30	40	10

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
3	0	19.55	35.669	25.41	5.23	100	***	***	0.4
3	25	19.55	35.675	25.41	5.14	98	***	***	0.5
3	50	19.54	35.674	25.42	5.14	98	***	***	0.1
3	75	19.48	35.672	25.43	5.16	99	***	***	0.0
3	100	19.49	35.673	25.43	5.20	100	***	***	0.0
3	150	19.29	35.790	25.57	4.94	94	***	***	0.2
3	200	18.54	35.839	25.80	5.06	95	***	***	0.3
3	300	15.05	35.608	26.45	5.11	90	***	***	2.5
2	413	11.36	35.065	26.78	5.56	90	***	***	8.0
2	578	9.33	34.734	26.88	5.56	86	***	***	15.1
2	743	7.93	34.578	26.97	5.16	77	***	***	21.0
2	907	5.38	34.442	27.21	4.16	59	***	***	30.6
2	1072	4.44	34.523	27.38	3.25	45	***	***	35.6
2	1236	4.00	34.592	27.48	3.03	41	***	***	37.2
1	1790	2.76	34.681	27.67	3.45	46	***	***	35.2
1	2270	2.21	34.730	27.76	3.57	47	***	***	35.9
1	2755	1.82	34.755	27.81	3.89	51	***	***	35.9
1	3240	1.56	34.732	27.81	4.07	53	***	***	33.7
1	3725	1.34	34.730	27.83	4.31	55	***	***	34.8

DATA

PART 2

PRIMARY PRODUCTION

EXPLANATION OF HEADINGS

Part 2	Primary Production
STATION	Gives the station identification. For example, Dm5/213/64 signifies the 213th station worked by Diamantina in 1964, on her 5th cruise for that year
DATE	Given as day/month/year
LIGHT COUNT	The counts per minute of the filter from the clear bottle
DARK COUNT	The counts per minute of the filter from the dark bottle
PRODUCTION	Production per day, and this is assumed to be twice the production from noon to sunset

PRIMARY PRODUCTION : 0 m

STATION	DATE	LATITUDE	LONGITUDE	LIGHT COUNT	DARK COUNT	PRODUCTION ($mgC/m^3/day$)
Dm5/213/64	14/8/64	21°57'S.	108°44'E.	525	9	2.67
Dm5/214/64	15/8/64	18°52'S.	107°55'E.	178	9	0.87
Dm5/215/64	16/8/64	15°35'S.	107°00'E.	19	12	0.04
Dm5/216/64	17/8/64	12°26'S.	105°57'E.	768	16	3.89
Dm5/217/64	18/8/64	8°58'S.	104°59'E.	317	19	1.54
Dm5/219/64	3/9/64	10°45'S.	105°26'E.	357	14	1.77
Dm5/220/64	4/9/64	14°04'S.	106°18'E.	308	11	1.54
Dm5/221/64	5/9/64	17°06'S.	107°20'E.	400	16	1.99
Dm5/222/64	6/9/64	20°16'S.	108°09'E.	638	7	3.26
Dm5/223/64	7/9/64	23°28'S.	109°05'E.	390	9	1.97

DATA

PART 3

PARTICULATE MATTER

EXPLANATION OF HEADINGS

Part 3	Particulate Matter
STATION	Gives the station identification. For example, Dm5/210/64 signifies the 210th station worked by Diamantina in 1964, on her 5th cruise for that year
DATE	Given as day/month/year
TIME	Given in Zone Time. The code letter used for the time zone (see p.12) follows the time
DEPTH	Depth is given as metres of wire out, since no thermometric data were available for true depth calculation
CARBON	Particulate carbon given as µg C/litre
CARBOHYDRATE	Particulate carbohydrate, given as µg glucose-equivalent/litre
PROTEIN	Particulate protein-nitrogen, given as µg N/litre
PHOSPHORUS	Particulate phosphorus, given as µg PO_4-P/litre

A blank indicates no data available

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/210/64	11/8/64	0800 H	31°60'S.	111°45'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	40			
25	26			
25	26			
50	23			
75	8			
100	15			
150	9			
200	25			
300	43			
500	31			
700	19			
900	41			
1200	12			
1200	9			
1500	34			
2000	22			
3000	28			
4000	36			
4000	6			
4500	6			
4500	2			

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/211/64	12/8/64	0815 H	28°37'S.	110°47'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	20			
25	18			
50)	16			
50)	15			
75	10			
100	15			
150	6			
200	9			
300	15			
500	13			
700	17			
900	22			
1100				
1300)	15			
1300)	4			
1500	27			
2000	17			
3000	20			
4000	30			
5000)	4			
5000)	7			

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/212/64	13/8/64	0800 H	25°24'S.	109°48'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	26			
25	15			
50	22			
75)	14			
75)	6			
100	17			
150	12			
200	16			
300	13			
500	14			
700	10			
900	12			
1100	18			
1300)	5			
1300)	9			
1500	10			
2000	10			
3000)	2			
3000)	4			
3500)	8			
3500)	4			

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/213/64	14/8/64	0830 H	21°57'S.	108°44'E.
DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	27	7.1	1.4	0.6
25	26	6.1	2.2	1.0
50	20	6.5	1.4	0.7
75	11	6.1	0.6	0.4
100)	10	2.5	0.7	0.5
100)	9	4.1	0.3	0.3
150)	8	2.8	0.7	0.3
150)	9	3.2	0.6	0.3
200)	3	3.2	0.2	0.4
200)	4	4.1	0.3	0.1
300	15	9.4	0.6	0.3
400	15	4.1	0.7	0.2
500	10	4.4	0.6	0.1
700	11	5.5	0.7	0.2
900)	19	5.2	0.3	0.5
900)	4	1.3	0.2	0.3
1100	10	5.6	0.7	0.2
1300	10	2.9	0.7	0.2
1500	11	5.1	0.4	0.4
2000)	17	6.7	1.5	0.5
2000)	5	1.9	0.6	0.0
2500)	7	3.2	0.5	0.3
2500)	15	5.1	0.5	0.4

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/214/64	15/8/64	0800 H	18°52'S.	107°55'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	15	7.5	1.0	0.2
25)	18	5.4	1.6	0.2
25)	13	7.5	1.4	0.4
50	14	4.4	1.5	0.4
75	11	4.8	1.2	0.3
100	13	5.8	1.5	0.3
150)	7	2.3	0.9	0.1
150)	7	1.9	0.9	0.1
200)	5	2.5	0.5	0.3
200)	3	1.5	0.8	0.3
300	8	3.0	0.4	1.6
500	11	7.3	0.7	0.6
700	9	3.0	0.7	0.6
900	12	2.5	0.3	0.9
1100	22	7.7	0.8	0.4
1300)	5	3.7	0.6	0.3
1300)	3	2.5	0.3	0.3
1500	10	3.4	0.7	0.4
2000	12	4.4	0.3	0.6
3000	7	10.8	0.8	0.5
4000)	12	6.3	0.8	0.4
4000)	5	2.9	0.7	0.4
5000)	6	2.3	0.7	0.4
5000)	6	2.1	0.5	0.3

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/215/64	16/8/64	0800 H	15°35'S.	107°00'E.
DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	18	3.6	1.9	0.4
25	23	4.8	1.7	0.2
50)	18	3.5	1.4	0.4
50)	12	3.5	1.3	0.2
75	14	4.4	1.1	0.3
100	13	1.6	1.3	0.1
150)	9	1.9	1.2	0.1
150)	9	2.8	0.7	0.2
200)	4	0.7	0.5	0.2
200)	7	0.9	0.4	0.1
300	14	4.6	0.7	0.2
500	16	3.9	1.2	0.2
700	24	2.7	1.1	0.2
900	24	4.6	1.0	0.2
1100)	17	7.0	0.7	0.3
1300)	6	2.3	0.3	0.2
1300	10	4.1	0.7	0.1
1500	17	4.4	1.1	0.0
2000	6	2.5	0.6	0.1
2500)	9	3.5	0.6	0.1
2500)	5	2.0	1.2	0.1
3000	4	2.0	0.7	0.1
4000)	7	3.0	0.7	0.0
4000)	5	3.2	0.6	0.0
5000)	10	0.0	0.7	0.0
5000)	4	2.0	0.6	0.0

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/216/64	17/8/64	1130 H	12°26'S.	105°57'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	25	9.0	2.7	0.6
25	41	12.3	3.0	0.7
50	20	7.7	2.6	0.5
75)	19	7.6	2.3	0.6
75)	19	6.3	2.2	0.5
100	20	6.5	2.2	0.6
150)	9	5.6	0.8	0.2
150)	10	4.7	0.8	0.2
200)	4	3.8	0.5	0.4
200)	3	3.6	0.4	0.4
300	21	12.8	2.6	0.6
500	15	6.0	1.3	0.3
700	19	10.3	0.8	0.4
900	15	13.5	0.7	0.3
1100	13	10.4	0.8	0.4
1300)	3	4.9	0.4	0.4
1300)	5	2.9	0.4	0.2
1500	15	6.7	0.8	0.3
2000	9	8.9	0.4	0.3
3000	9	5.7	0.7	0.2
4000)	11	5.0	0.8	0.5
4000)	6	5.6	0.5	0.2
5000)	6	4.1	0.4	0.2
5000)	4	7.7	0.4	0.3

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/217/64	18/8/64	0800 G	8°58'S.	104°59'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	17	7.2	1.6	0.4
25	17	6.8	1.9	0.3
50	15	7.7	1.6	0.6
75	8	5.3	1.4	0.2
100)	4	2.1	0.6	0.2
100)	7	4.8	0.8	0.2
150)	6	3.5	0.7	0.2
150)	5	4.1	0.8	0.2
200)	4	2.1	0.4	0.3
200)		4.1	0.4	0.2
300	17	9.9	1.1	0.5
500	26	11.7	1.7	0.3
700	19	8.8	2.2	0.3
900	13	12.3	1.4	0.3
1100	8	6.1	0.8	0.4
1300	5	3.6	0.5	0.3
1500	13	4.8	0.9	0.3
2000	12	6.1	0.9	0.3
3000	8	5.6	0.6	0.2
4000)	9	4.1	0.5	0.1
4000)	7	3.7	0.7	0.2
5000)	5	4.0	0.7	0.4
5000)	3	3.1	0.9	0.3

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/219/64	3/9/64	0915 G	10°45'S.	105°26'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	25	7.4	2.5	0.7
25)	33	4.4	3.2	0.5
25	18	4.4	1.8	0.5
50)	18	5.5	2.1	0.3
50	16	5.5	1.8	0.5
75	17	3.6	2.1	0.6
100	9	2.2	1.4	0.3
125	12	2.3	0.8	0.3
150	4	2.0	0.4	0.4
200	3	2.5	0.6	0.5
300	11	2.8	0.8	0.2
500	28	5.1	1.4	0.1
700	12	3.5	0.7	0.3
900	5	4.1	0.7	0.4
1100	8	6.6	0.7	0.1
1300	4	1.9	0.8	0.3
1500	11	3.5	1.0	0.2
2000	14	4.6	2.0	0.3
3000)	16	1.0		0.3
3000	6	2.7	0.6	0.2
4000)	8	0.9	0.7	0.1
4000		1.3	0.4	0.3

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/220/64	4/9/64	0800 G	14°04'S.	106°18'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	11	5.2	1.0	0.4
25	24	4.7	2.1	0.4
50)	10	4.0	1.3	0.3
50)	12	5.8	1.3	0.5
75)	8	3.2	0.7	0.4
75)	10	4.1	1.3	0.3
100	11	4.6	1.4	0.3
125	38	6.9	1.3	0.5
150	4	2.5	0.4	0.2
200	3	0.9	0.3	0.4
300	5	1.4	0.6	0.4
500	9	3.7	0.7	0.2
700	18	12.0	1.0	0.5
900	38	16.0	1.5	0.4
1100	30	9.8	0.8	0.3
1300	1	0.9	0.3	0.4
1500	15	4.8	0.7	0.2
2000	8	3.7	0.4	0.2
3000	8	5.7	2.0	0.4
4000)	6	0.7	0.4	0.3
4000)	6	2.1	0.4	0.1
5000)	6	3.6	0.4	0.2
5000)	1	0.0	0.4	0.2

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/221/64	5/9/64	0900 H	17°06'S.	107°20'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	11	5.0	0.8	0.4
25	22	5.2	2.4	0.3
50	11	6.4	1.8	0.3
75)	10	4.3	1.5	0.2
75)	12	5.0	1.5	0.2
100)	16	8.5	1.8	0.5
100)	12	5.5	1.8	0.3
125	10	5.2	1.4	0.3
150	6	4.1	0.7	0.3
200	2	2.5	0.4	0.3
300	4	2.4	0.7	0.3
500	15	6.4	1.3	0.2
700	18	7.1	1.0	0.2
900	5	5.2	0.6	0.3
1100	5	5.4	0.7	0.2
1500	12	4.7	0.7	0.3
2000	4	0.9	0.4	0.2
3000	15	5.4	0.6	0.3
4000)	15	3.1	0.7	0.1
4000)	15	2.3	0.7	0.1
5000)	4	2.3	0.7	0.2
5000)	7	3.7	1.1	0.1

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/222/64	6/9/64	0900 H	20°16'S.	108°09'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	10	5.6	1.1	0.5
25	23	8.3	2.4	0.5
50	11	4.2	1.3	1.2
75	11	6.0	1.5	0.6
100)	10	4.7	1.3	0.8
100)	14	6.4	1.4	0.4
125)	10	3.5	1.1	0.5
125)	13	5.5	1.4	0.2
150	3	2.3	0.7	0.2
200	3	1.5	0.7	0.2
300	15	3.8	1.1	0.3
500	11	3.1	1.1	0.2
700	8	2.6	0.7	0.2
900	6	3.1	0.7	0.1
1100	13	4.0	1.0	0.2
1300)	4	1.5	0.7	0.3
1300)	5	1.4	0.7	0.2
1500	11	5.2	1.0	0.2
2000	7	3.8	0.7	0.2
3000)	10	1.6	0.8	0.1
3000)	9	2.3	0.7	0.1
4000)	4	0.8	0.4	0.1
4000)	2	0.4	0.4	0.1

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/223/64	7/9/64	0900 H	23°28'S.	109°05'E.

DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	15	6.8	0.7	0.3
25	26	9.4	2.1	0.4
25	15	5.6	1.4	0.3
50	14	4.5	1.5	0.3
50	12	5.0	1.5	0.3
75	15	5.6	1.7	0.5
100	13	6.4	1.4	0.5
125	7	2.3	0.7	0.2
150	7	3.9	0.4	0.1
200	7	2.7	0.4	0.2
300	13	7.1	0.8	0.3
500	12	6.8	1.1	0.2
700	11	4.5	0.3	0.2
900	12	7.3	0.1	0.1
1100	18	12.5	0.6	0.2
1300	3	2.7	0.3	0.1
1500	10	4.7	0.6	0.6
2000	9	4.3	0.6	0.3
3000	12	2.5	0.1	0.1
3000	3	1.2	0.1	0.0
4000	22	3.9	0.4	0.1
4000	14	4.2	0.5	0.2

STATION	DATE	TIME	LATITUDE	LONGITUDE
Dm5/224/64	8/9/64	1500 H	26°56'S.	110°12'E.
DEPTH	CARBON	CARBOHYDRATE	PROTEIN	PHOSPHORUS
0	14	7.7	1.5	0.4
25	22	9.0	3.6	0.3
50)	17	6.2	1.7	0.4
50'	16	5.7	1.5	0.3
75)	11	3.5	1.8	0.2
75'	15	5.3	1.8	0.3
100	11	3.1	1.8	0.3
125	10	3.3	1.4	0.3
150	6	1.9	0.8	0.2
200	4	0.4	0.6	0.1
300	12	3.1	0.8	0.3
500	15	5.9	1.1	0.1
700	11	4.0	1.4	0.2
900	11	5.4	1.0	0.2
1100	18	9.2	1.3	0.2
1300)	9	4.1	1.4	0.2
1300'	5	1.8	0.4	0.2
1500	9	4.5	0.7	0.2
2000	8	2.4	1.1	0.1
2500	8	2.8	0.7	0.5
3000)	12	3.9	0.6	0.0
3000'	8	3.5	0.6	0.1
4000)	7	1.2	1.1	0.1
4000'	5	1.6	0.8	0.0

OCEANOGRAPHICAL CRUISE REPORTS

1. Oceanographical observations in the Indián Ocean in 1959. H.M.A.S. *Diamantina* Cruises Dm1/59 and Dm2/59.
2. Oceanographical observations in the Indian Ocean in 1960. H.M.A.S. *Diamantina* Cruise Dm1/60.
3. Oceanographical observations in the Indian Ocean in 1960. H.M.A.S. *Diamantina* Cruise Dm2/60.
4. Oceanographical observations in the Indian Ocean in 1960. H.M.A.S. *Diamantina* Cruise Dm3/60.
5. Oceanographical observations in the Pacific Ocean in 1960. H.M.A.S. *Gascoyne* Cruises G1/60 and G2/60.
6. Oceanographical observations in the Pacific Ocean in 1960. H.M.A.S. *Gascoyne* Cruise G3/60.
7. Oceanographical observations in the Indian Ocean in 1961. H.M.A.S. *Diamantina* Cruise Dm1/61.
8. Oceanographical observations in the Pacific Ocean in 1961. H.M.A.S. *Gascoyne* Cruise G1/61.
9. Oceanographical observations in the Indian Ocean in 1961. H.M.A.S. *Diamantina* Cruise Dm2/61.
10. Oceanographical observations in the Indian and Pacific Oceans in 1961. H.M.A.S. *Gascoyne* Cruise G2/61.
11. Oceanographical observations in the Indian Ocean in 1961. H.M.A.S. *Diamantina* Cruise Dm3/61.
12. Oceanographical observations in the Pacific Ocean in 1961. H.M.A.S. *Gascoyne* Cruise G3/61.
13. Oceanographical observations in the Pacific Ocean in 1962. H.M.A.S. *Gascoyne* Cruise G1/62.
14. Oceanographical observations in the Indian Ocean in 1962. H.M.A.S. *Diamantina* Cruise Dm1/62.
15. Oceanographical observations in the Indian Ocean in 1962. H.M.A.S. *Diamantina* Cruise Dm2/62.
16. Oceanographical observations in the Pacific and Indian Oceans in 1962. H.M.A.S. *Gascoyne* Cruises G2/62 and G3/62.
17. Oceanographical observations in the Indian Ocean in 1962. H.M.A.S. *Gascoyne* Cruise G4/62.
18. Oceanographical observations in the Indian Ocean in 1962. H.M.A.S. *Diamantina* Cruise Dm3/62.
19. Oceanographical observations in the Pacific Ocean in 1962. H.M.A.S. *Gascoyne* Cruise G5/62.
20. Oceanographical observations in the Indian Ocean in 1962. H.M.A.S. *Diamantina* Cruise Dm4/62.
21. Oceanographical observations in the Indian Ocean in 1963. H.M.A.S. *Gascoyne* Cruise G1/63.
22. Oceanographical observations in the Indian Ocean in 1963. H.M.A.S. *Gascoyne* Cruise G2/63.
23. Oceanographical observations in the Indian Ocean in 1963. H.M.A.S. *Diamantina* Cruise Dm1/63.
24. Oceanographical observations in the Indian Ocean in 1963. H.M.A.S. *Diamantina* Cruise Dm2/63.

OCEANOGRAPHICAL CRUISE REPORTS

(Continued)

25. Oceanographical observations in the Indian Ocean in 1963. H.M.A.S. *Diamantina* Cruise Dm3/63.
26. Oceanographical observations in the Pacific Ocean in 1963. H.M.A.S. *Gascoyne* Cruise G3/63.
29. Oceanographical observations in the Pacific Ocean in 1963. H.M.A.S. *Gascoyne* Cruise G4/63.
31. Oceanographical observations in the Pacific Ocean in 1963. H.M.A.S. *Gascoyne* Cruise G5/63.
32. Oceanographical observations in the Pacific Ocean in 1964. H.M.A.S. *Gascoyne* Cruise G1/64.
34. Oceanographical observations in the Indian Ocean in 1964. H.M.A.S. *Gascoyne* Cruise G2/64.
35. Oceanographical observations in the Indian and Pacific Oceans in 1964. H.M.A.S. *Gascoyne* Cruise G3/64.
36. Oceanographical observations in the Indian Ocean in 1964. H.M.A.S. *Diamantina* Cruise Dm2/64.
39. Oceanographical observations in the Pacific Ocean in 1964. H.M.A.S. *Gascoyne* Cruise G4/64.
40. Oceanographical observations in the Indian Ocean in 1964. H.M.A.S. *Diamantina* Cruise Dm5/64.
41. Oceanographical observations in the Indian Ocean in 1964. H.M.A.S. *Gascoyne* Cruise G5/64.
42. Oceanographical observations in the Pacific Ocean in 1964. H.M.A.S. *Gascoyne* Cruise G6/64.
43. Oceanographical observations in the Indian Ocean in 1965. H.M.A.S. *Gascoyne* Cruise G2/65.
46. Oceanographical observations in the Indian Ocean in 1965. H.M.A.S. *Gascoyne* Cruise G5/65.