OCEANOGRAPHICAL STATION LIST

VOLUME 70

INVESTIGATIONS BY F.R.V. *INVESTIGATOR* ON THE SOUTH AUSTRALIAN TUNA GROUNDS IN 1965

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

OCEANOGRAPHICAL STATION LIST

VOLUME 70

INVESTIGATIONS BY F.R.V. INVESTIGATOR ON THE SOUTH AUSTRALIAN TUNA GROUNDS IN 1965

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

AUSTRALIA

MELBOURNE, 1968

CONTENTS

When citing this station list, abbreviate as follows:
CSIRO Aust. Oceanogr. Stn List 70.

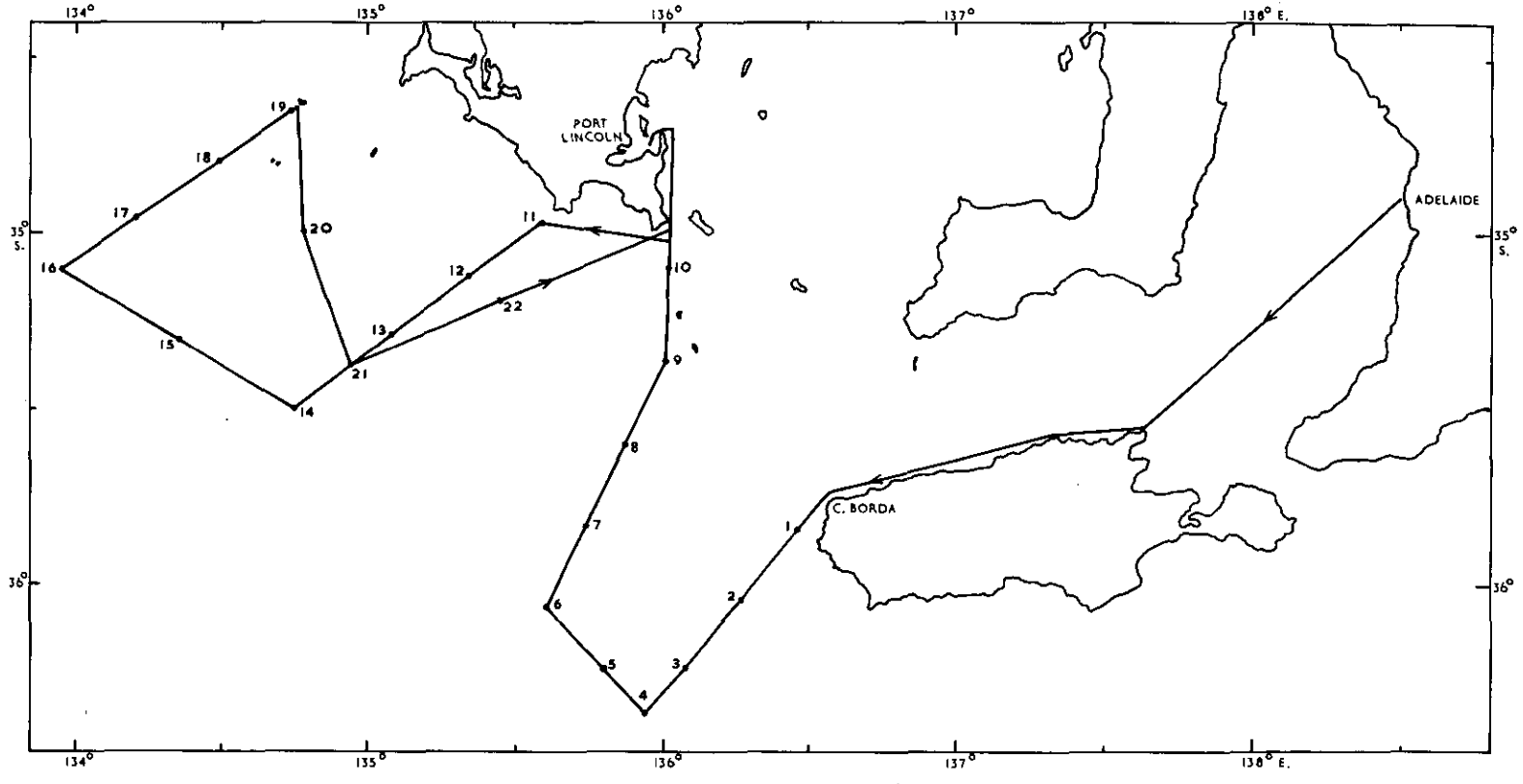

Fig. 1.- Track chart Cruise In 1/65

OCEANOGRAPHICAL STATION LIST

VOLUME 70

Investigations by F.R.V. Investigator on the South Australian Tuna Grounds in 1965

I. INTRODUCTION

This report records the hydrological data collected during the only cruise of F.R.V. Investigator during 1965. The track chart and station positions are shown in Figure 1.

This cruise was planned to investigate hydrological conditions on the tuna grounds. A description of F.R.V. Investigator is given in CSIRO Aust. (1968).

II. WORK ACCOMPLISHED

Twenty-two stations were worked. Bathythermograph casts were made at 22 stations, surface samples were collected at 2 stations, and subsurface samples were collected at 20 stations. The sampling programme was carried out by Messrs R. Bradley and L. Brown.

III. METHOD OF COLLECTION AND ANALYSIS OF SAMPLES

1. Physics

Temperature.—Water temperatures were taken with deep-sea reversing-thermometers. Up to six Nansen water-bottles were used on each cast, each bottle being fitted with two protected thermometers. In addition, four of the water-bottles were fitted with an unprotected thermometer. The temperatures obtained are considered accurate to $\pm$ 0.03 degC.

Bathythermograph.—A 900-ft bathythermograph was used. Slides were digitized by the U.S. National Oceanographic Data Center according to their own method (U.S.N.O.D.C. 1964), and from their punched cards computer listings were produced. The listings are held at Cronulla.

Thermometric Depth.—Depth calculations were made by the second method described by La Fond (1951), plotting thermometric depth against the difference between thermometric and wire depths. Depths are considered accurate to about 3%.

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

2. Chemistry

Salinity.—A chlorinity-temperature meter of the conductivity type (Hamon 1956) was used at Port Lincoln, South Australia, to estimate chlorinity, which was subsequently converted to salinity by the relation -

$$\text{Salinity} = 0.03 + 1.805 \times \text{Chlorinity}$$

Salinities are considered accurate to about $\pm$ 0.05‰.

Dissolved Oxygen.—A version of the standard Winkler method was used to determine the amount of dissolved oxygen in the sea-water samples. The version used is a modification of that described by Thompson and Robinson (1939) and differs in some respects from the revision 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, given as ml/l, were computed, using the simpler of the equations given by Richards and Corwin (1956) -

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

REFERENCES

CSIRO AUST. (1968).—Investigations by F.R.V. Investigator on the South Australian Tuna Grounds in 1962. CSIRO Aust. Oceanogr. Stn List 60.

HAMON, B.V. (1956).—A portable temperature-chlorinity bridge for estuarine investigations and seawater analysis. J. scient. Instrum. 33, 329-33.

JACOBSEN, J.P., ROBINSON, R.J., and THOMPSON, T.G. (1950).—A review of the determination of dissolved oxygen in sea-water by the Winkler method. Publs scient. Ass. Oceanogr. phys. 11.

LA FOND, E.C. (1951).—Processing oceanographic data. U.S. Navy Hydrogr. Off. Publ. No. 614.

RICHARDS, F.A., and CORWIN, N. (1956).—Some oceanographic applications of the solubility of oxygen in sea-water. Limnol. Oceanogr. 1, 263-7.

ROCHFORD, D.J. (1963).—SCOR-UNESCO chemical intercalibration tests; results of 2nd series, R.S. Vityaz, August 2-9, 1962, Australia. (Mimeogr.) (CSIRO : Cronulla.)

THOMPSON, T.G., and ROBINSON, R.J. (1939).—Notes on the determination of dissolved oxygen in seawater. J.mar.Res. 2, 1-8.

U.S. NATIONAL OCEANOGRAPHIC DATA CENTER (1964).—Manual for processing bathythermograph data. Part 1 Instructions for manually digitizing bathythermograph data. Publ. M-3. (U.S. Naval Oceanographic Office : Washington, D.C.)

U.S. NAVY HYDROGRAPHIC OFFICE (1955).—Instruction manual for oceanographic observations. Publ. No. 607.

IV. DATA

The data were processed in a C.D.C. 3600 Computer.

EXPLANATION OF HEADINGS

Parts 1 and 2	Hydrology
STATION	Gives the station identification. For example, Inl/1/65 signifies the 1st station worked by Investigator in 1965, on her 1st 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. Zone Time throughout the cruise was Central Australian Standard Time, GMT +9½ hr, Code J
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. Navy Hydrogr. Office (1955)
ANEM. HEIGHT	Average height of the anemometer above sea level, given in feet
CLOUD TYPE AMT.	Cloud type and amount are coded using Tables 2 and 3 in U.S. Navy Hydrogr. Office (1955)
WEA.	Weather is coded using Table 1 in U.S. Navy Hydrogr. Office (1955)
VIS.	Visibility is coded using Table 4 in U.S. Navy Hydrogr. Office (1955)
SEA DIR. AMT.	Sea direction and amount are coded using Tables 5 and 8 in U.S. Navy Hydrogr. Office (1955)

SWELL DIR. AMT.	Sea swell direction and amount are coded using Tables 6 and 8 in U.S. Navy Hydrogr. Office (1955)
BAROM. or ATMOS. PRESSURE	Atmospheric pressure given in millibars
WIRE ANGLES CAST1 CAST2 CAST3	Wire angles are measured at the surface and expressed in degrees for each cast
CAST	Gives the cast number
DEPTH	Sampling depth given in metres
TEMP.	Sea temperature 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

*, ***, or a blank indicates no data available

DATA

PART 1

HYDROLOGY

SURFACE SAMPLES

VESSEL	CRUISE	STATION NUMBER	YR.	MTH.	DAY	TIME	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DN.	WIND AMT.	SEA DN.	SEA AMT.	SWELL DN.	SWELL AMT.	WEA.	VIS.	BAROM.
76	1	1	65	2	23	0712	J 35 52	S 136 28	E 19.4	35.90	23	4	23	3	22	3	03	8	1014.0
76	1	2	65	2	23	1012	J 36 04	S 136 15	E 18.2	35.82	25	3	25	3	22	3	03	7	1015.0
76	1	3	65	2	23	1247	J 36 15	S 136 02	E 18.4	35.59	25	4	25	3	22	3	03	7	1013.8
76	1	4	65	2	23	1503	J 36 21	S 135 56	E 18.6	35.43	24	4	25	4	22	3	03	7	1013.0
76	1	5	65	2	23	1821	J 36 13	S 135 46	E 18.5	35.50	24	3	25	4	22	3	03	7	1013.8
76	1	6	65	2	23	2036	J 36 04	S 135 36	E 18.7	35.43	24	3	25	4	22	3	03	7	1014.8
76	1	7	65	2	23	2340	J 35 49	S 135 41	E 19.0	35.59	24	3	24	4	22	3	02	7	1014.8
76	1	8	65	2	24	0235	J 35 34	S 135 51	E 18.7	35.59	24	2	24	3	22	3	03	6	1014.2
76	1	9	65	2	24	0512	J 35 18	S 136 00	E 18.7	35.75	24	2	24	3	22	3	52	3	1014.5
76	1	10	65	2	24	0800	J 35 04	S 136 00	E 18.3	35.82	25	1	24	3	22	3	20	8	1016.5
76	1	11	65	2	25	0255	J 35 02	S 135 34	E 18.7	35.77	14	3	14	3	22	3	02	7	1014.5
76	1	12	65	2	25	0540	J 35 11	S 135 18	E 18.8	35.59	11	2	14	3	22	3	03	8	1014.1
76	1	13	65	2	25	0830	J 35 20	S 135 02	E 19.0	35.64	08	2	11	3	22	1	03	8	1014.5
76	1	14	65	2	25	1111	J 35 28	S 134 46	E 18.9	35.30	08	2	08	3	22	3	03	8	1014.5
76	1	15	65	2	25	1600	J 35 18	S 134 22	E 19.1	35.30	09	2	08	3	22	3	01	8	1012.4
76	1	16	65	2	25	1930	J 35 07	S 133 57	E 19.4	35.53	10	2	10	3	22	3	01	7	1012.0
76	1	17	65	2	25	2319	J 34 58	S 134 13	E 19.3	35.57	10	3	10	3	22	3	02	6	1011.5
76	1	18	65	2	26	0230	J 34 49	S 134 30	E 19.0	35.57	10	3	10	3	22	2	03	6	1010.5
76	1	19	65	2	26	0500	J 34 40	S 134 45	E 18.8	35.84	13	2	10	3	22	2	02	6	1009.8
76	1	20	65	2	26	0840	J 35 00	S 134 47	E 19.1	35.62	16	1	10	2	22	2	02	8	1011.5
76	1	21	65	2	26	1240	J 35 22	S 134 58	E 19.2	35.57	15	4	15	3	22	2	02	8	1012.2
76	1	22	65	2	26	1636	J 35 12	S 135 26	E 19.1	35.88	17	4	17	3	22	2	03	8	1011.5

DATA

PART 1

HYDROLOGY

SUBSURFACE SAMPLES

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 1/65	23/ 2/65	0712 J	35 52 S	136 28 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
73	14.4	18.2	23	4	12	6	5	8	23	3	22	3	1014.0	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	19.37	35.900	25.63	5.18	99	***	***	***
1	10	19.36	35.860	25.60	5.22	100	***	***	***
1	20	19.34	35.880	25.62	5.20	99	***	***	***
1	30	19.16	35.860	25.66	5.21	99	***	***	***
1	40	16.34	35.620	26.16	5.53	99	***	***	***
1	50	15.35	35.620	26.39	5.53	97	***	***	***
1	65	14.72	35.460	26.41	5.45	95	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 2/65	23/ 2/65	1012 J	36 04 S	136 15 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
91	15.3	18.4	25	3	12	6	7	7	25	3	22	3	1015.0	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.20	35.820 D	25.87	5.36	100	***	***	***
1	10	18.16	35.640	25.74	5.28	98	***	***	***
1	20	18.14	35.660	25.76	5.32	99	***	***	***
1	30	17.95	35.680	25.82	5.38	100	***	***	***
1	40	17.76	35.770	25.94	5.33	99	***	***	***
1	50	16.57	35.700	26.17	5.39	97	***	***	***
1	75	13.73	35.340	26.53	5.39	92	***	***	***

D PROPERTY DOUBTFUL
N PROPERTY INTERPOLATED

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 3/65	23/ 2/65	1247 J	36 15 S	136 02 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
128	16.4	18.6	25	4	12	9	8	7	25	3	22	3	1013.8	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.41	35.590	25.64	5.28	99	***	***	***
2	10	18.37	35.570	25.63	5.35	100	***	***	***
2	20	18.29	35.610	25.69	5.35	100	***	***	***
2	30	18.20	35.680	25.76	5.37	100	***	***	***
2	40	17.18	35.480	25.86	5.54	101	***	***	***
2	50	16.42	35.430	26.00	5.63	101	***	***	***
1	75	14.74	35.320	26.29	5.74	100	***	***	***
1	100	14.08	35.340	26.45	5.39	92	***	***	***
1	115	13.97	35.300	26.44	5.42	93	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 4/65	23/ 2/65	1503 J	36 21 S	135 56 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
366	17.0	18.8	24	4	12	9	8	7	25	4	22	3	1013.0	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.65	35.430	25.46	5.30	100	***	***	***
2	25	18.64	35.530	25.53	5.31	100	***	***	***
2	50	17.92	35.530	25.72	5.44	101	***	***	***
2	75	14.45	35.140	26.22	5.88	101	***	***	***
2	100	13.63	35.170	26.41	5.74	97	***	***	***
2	150	13.12	35.260	26.59	5.43	91	***	***	***
1	200	12.90	35.250	26.62	5.46	91	***	***	***
1	300	11.91	35.120	26.72	5.42	89	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 6/65	23/ 2/65	2036 J	36 04 S	135 36 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
549	16.7	17.9	24	3	12	*	9	7	25	4	22	3	1014.8	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.69	35.430	25.45	5.30	100	***	***	***
2	25	18.55	35.480	25.52	5.32	100	***	***	***
2	50	15.90	35.250	25.98	5.59	105	***	***	***
2	75	13.73	35.080	26.32	5.80	99	***	***	***
2	100	13.70	35.300	26.50	5.45	93	***	***	***
2	150	13.14	35.230	26.56	5.45	92	***	***	***
1	200	12.88	35.250	26.63	5.50	92	***	***	***
1	300	11.73	35.080	26.72	5.45	89	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 7/65	23/ 2/65	2340 J	35 49 S	135 41 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
146	16.8	17.9	24	3	12	8	6	7	24	4	22	3	1014.8	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	19.01	35.590	25.49	5.28	100	***	***	***
1	25	18.88	35.610	25.54	5.32	101	***	***	***
1	40	18.61	35.590	25.59	5.34	100	***	***	***
1	50	17.04	35.370	25.81	5.59	102	***	***	***
1	75	14.89	35.390	26.31	5.53	96	***	***	***
1	95	14.67	35.390	26.36	5.35	93	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 8/65	24/ 2/65	0235 J	35 34 S	135 51 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
90	16.6	18.3	24	2	12	6	8	6	24	3	22	3	1014.2	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	18.68	35.590	25.57	5.34	101	***	***	***
1	20	18.42	35.500	25.57	5.32	100	***	***	***
1	30	18.38	35.590	25.65	5.32	100	***	***	***
1	40	17.69	35.480	25.73	5.53	102	***	***	***
1	50	15.87	35.320	26.04	5.69	101	***	***	***
1	75	14.43	35.370	26.40	5.35	92	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 9/65	24/ 2/65	0512 J	35 18 S	136 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
75	16.7	17.5	24	2	12	9	8	3	24	3	22	3	1014.5	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	18.67	35.750	25.70	5.27	99	***	***	***
1	20	18.29	35.840	25.86	5.37	101	***	***	***
1	30	17.93	35.880	25.98	5.41	101	***	***	***
1	40	16.77	35.610	26.05	5.61	102	***	***	***
1	50	14.08	35.190	26.34	5.39	92	***	***	***
1	60	13.88	35.350	26.50	5.21	89	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 10/65	24/ 2/65	0800 J	35 04 S	136 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
70	16.7	17.9	25	1	12	9	7	8	24	3	22	3	1016.5	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	18.25	35.820	25.85	5.34	100	***	***	***
1	10	17.78	35.810	25.96	5.41	100	***	***	***
1	20	17.79	35.910	26.04	5.37	100	***	***	***
1	30	17.48	35.910	26.11	5.45	100	***	***	***
1	40	17.09	35.840	26.16	5.33	97	***	***	***
1	50	15.89	35.610	26.26	5.50	98	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 11/65	25/ 2/65	0255 J	35 02 S	135 34 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
80	15.9	18.3	14	3	12	2	3	7	14	3	22	3	1014.5	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	18.66	35.770	25.71	5.32	100	***	***	***
1	10	18.63	35.810	25.75	5.34	101	***	***	***
1	20	18.43	35.840	25.83	5.34	100	***	***	***
1	30	17.17	35.770	26.08	5.50	101	***	***	***
1	40	16.09	35.610	26.21	5.33	99	***	***	***
1	50	14.60	35.390	26.38	5.36	93	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 12/65	24/ 2/65	0540 J	35 11 S	135 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	CAST2	CAST3
88	15.9	18.0	11	2	12	6	3	8	14	3	22	3	1014.1	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.79	35.590	25.54	5.28	100	***	***	***
1	10	18.80	35.570	25.53	5.27	99	***	***	***
1	20	18.78	35.590	25.55	5.22	98	***	***	***
1	30	18.69	35.570	25.58	5.32	100	***	***	***
1	40	18.66	35.700	25.66	5.29	100	***	***	***
1	50	18.47	35.680	25.69	5.32	100	***	***	***
1	75	16.02	35.520	26.16	5.52	99	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 13/65	25/ 2/65	0830 J	35 20 S	135 02 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
91	16.2	18.5	08	2	12	6	7	8	11	3	22	1	1014.5	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	19.00	35.640	25.53	5.23	99	***	***	***
1	10	18.97	35.620	25.52	5.22	99	***	***	***
1	20	18.97	35.620	25.52	5.15	98	***	***	***
1	30	18.96	35.620	25.52	5.21	99	***	***	***
1	40	18.68	35.620	25.60	5.19	98	***	***	***
1	50	18.45	35.620	25.65	4.73	89	***	***	***
1	75	16.48	35.480	26.02	5.21	94	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 14/65	25/ 2/65	1111 J	35 28 S	134 46 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
457	16.6	18.8	08	2	12	6	7	8	08	3	22	3	1014.5	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	18.86	35.300	25.30	5.23	99	***	***	***
2	25	18.57	35.300	25.38	5.07	95	***	***	***
2	50	17.16	35.230	25.67	5.01	91	***	***	***
2	75	14.34	35.140	26.24	5.87	101	***	***	***
2	100	13.32	35.100	26.42	5.66	95	***	***	***
2	150	12.88	35.170	26.57	5.40	90	***	***	***
1	200	12.46	35.170N	26.65	5.38	89	***	***	***
1	300	11.12	35.170	26.90	5.43	87	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 15/65	25/ 2/65	1600 J	35 18 S	134 22 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
549	17.1	19.0	09	2	12	*	0	8	08	3	22	3	1012.4	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	19.08	35.300	25.25	5.26	100	***	***	***
1	25	18.36	35.250	25.39	5.28	99	***	***	***
1	50	15.11	35.070	26.02	6.02	105	***	***	***
1	75	13.44	35.070	26.38	5.90	100	***	***	***
1	100	13.09	35.050	26.43	5.52	93	***	***	***
2	150	12.42	35.100	26.60	5.45	90	***	***	***
1	200	11.89	35.080	26.69	5.43	89	***	***	***
1	300	10.69	34.850	26.73	5.36	85	***	***	***

D PROPERTY DOUBTFUL
N PROPERTY INTERPOLATED

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 16/65	25/ 2/65	1930 J	35 07 S	133 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	WIRE ANGLES CAST2	WIRE ANGLES CAST3
549	17.6	19.2	10	2	12	*	0	7	10	3	22	3	1012.0	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	19.38	35.530	25.35	5.23	100	***	***	***
2	25	18.97	35.520	25.44	***	***	***	***	***
2	50	17.13	35.350	25.77	5.60	102	***	***	***
2	75	14.65	35.210	26.23	5.64	98	***	***	***
2	100	13.62	35.210	26.45	5.35	91	***	***	***
2	150	12.91	35.160	26.55	5.46	91	***	***	***
1	200	12.41	35.100	26.61	5.40	89	***	***	***
1	300	11.32	35.140	26.84	5.38	87	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 17/65	25/ 2/65	2319 J	34 58 S	134 13 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
100	17.8	19.0	10	3	12	*	0	6	10	3	22	3	1011.5	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	19.27	35.570	25.41	5.26	100	***	***	***
1	25	19.10	35.570	25.45	5.26	100	***	***	***
1	50	18.85	35.620	25.55	5.35	101	***	***	***
1	75	16.57	35.480	26.00	5.56	100	***	***	***
1	90	15.48	35.480	26.25	5.07	90	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 18/65	26/ 2/65	0230 J	34 49 S	134 30 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
85	17.5	18.8	10	3	12	2	3	6	10	3	22	2	1010.5	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	19.04	35.570	25.46	5.32	101	***	***	***
1	25	18.81	35.570	25.52	5.26	99	***	***	***
1	50	18.06	35.530	25.68	5.40	100	***	***	***
1	75	16.33	35.480	26.06	5.60	101	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 19/65	26/ 2/65	0500 J	34 40 S	134 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
90	17.5	18.7	13	2	12	2	2	6	10	3	22	2	1009.8	0	*	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
1	0	18.78	35.840	25.74	***	***	***	***	***
1	25	18.73	35.880	25.78	5.22	99	***	***	***
1	50	16.82	35.990	26.03	5.58	101	***	***	***
1	75	14.87	35.410	26.33	5.28	92	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 20/65	26/ 2/65	0840 J	35 00 S	134 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	WIRE ANGLES CAST2	WIRE ANGLES CAST3
75	18.0	19.4	16	1	12	2	1	8	10	2	22	2	1011.5	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	19.07	35.620	25.50	5.33	101	***	***	***
1	10	19.01	35.620	25.51	5.36	102	***	***	***
1	20	18.85	35.680	25.60	5.25	99	***	***	***
1	30	18.61	35.610	25.61	5.30	100	***	***	***
1	40	18.35	35.610	25.67	5.25	98	***	***	***
1	50	18.10	35.680	25.78	5.42	101	***	***	***
1	60	17.43	35.570	25.87	5.42	100	***	***	***

STATION	DATE	TIME	LATITUDE	LONGITUDE
IN 1/ 21/65	26/ 2/65	1240 J	35 22 S	134 58 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
95	17.8	19.3	15	4	12	2	1	8	15	3	22	2	1012.2	0	0	*

CAST	DEPTH	TEMP.	SALINITY	SIGMA-T	OXYGEN	OXYGEN % SAT.	INORG. P	TOTAL P	NITRATE
2	0	19.19	35.570	25.42	5.28	100	***	***	***
1	10	19.07	35.570	25.46	5.28	100	***	***	***
1	20	19.00	35.620	25.51	5.22	99	***	***	***
1	30	18.87	35.620	25.55	5.30	100	***	***	***
1	40	18.80	35.620	25.56	5.29	100	***	***	***
1	50	18.65	35.660	25.63	5.33	100	***	***	***
1	75	16.49	35.460	26.01	5.53	100	***	***	***

OCEANOGRAPHICAL STATION LISTS

1. Hydrological and planktological observations by F.R.V. *Warreen* in south-eastern Australian waters, 1938–39
2. Hydrological and planktological observations by F.R.V. *Warreen* in south-eastern Australian waters, 1940–42
3. Hydrological and planktological observations by F.R.V. *Warreen* in south-western Australian waters, 1947–50
4. Onshore hydrological investigations in eastern Australia, 1942–50
5. Estuarine hydrological investigations in eastern Australia, 1940–50. Queensland: Nerang and Coomera Rivers, Moreton Bay and Brisbane River, Logan River, Dunwich Oyster Lease; New South Wales: Richmond River, Clarence River, Macleay River, Hastings River, Manning River, Port Stephens, Tilligerry Creek, Hawkesbury River
6. Estuarine hydrological investigations in eastern Australia, 1940–50. New South Wales: Middle Harbour and Port Jackson, Georges River–Botany Bay
7. Estuarine hydrological investigations in eastern Australia, 1940–50. New South Wales: Port Hacking, Lake Illawarra, Shoalhaven River, Jervis Bay, Clyde River, Moruya River, Tuross River, Wagonga Inlet; Victoria: Port Phillip; Tasmania: Tamar River, Derwent River, Huon River, D'Entrecasteaux Channel, Pittwater, Lake Dobson (freshwater), Penna Dam (freshwater)
8. Hydrological investigations in south-western Australia, 1944–50
9. Records of twenty-four hourly hydrological observations at selected stations in eastern Australian estuarine systems, 1942–50. Queensland: Logan River; New South Wales: Richmond River, Clarence River, Macleay River, Hastings River, Manning River, Port Stephens, Hawkesbury River, Georges River, Port Hacking, Clyde River, Tuross River; Tasmania: Tamar River, Derwent River
10. Records of twenty-four hourly hydrological observations at Shell Point, Georges River, New South Wales, 1942–50
11. Analyses of bottom deposits in eastern Australia, 1946–50
12. Estuarine hydrological investigations in eastern and south-western Australia, 1951
13. Analysis of bottom deposits in eastern and south-western Australia, 1951 and records of twenty-four hourly hydrological observations at selected stations in eastern Australian estuarine systems, 1951
14. Onshore hydrological investigations in eastern and south-western Australia, 1951
15. Estuarine hydrological investigations in eastern and south-western Australia, 1952
16. Analysis of bottom deposits in eastern and south-western Australia, 1952 and records of twenty-four hourly hydrological observations at selected stations in eastern Australian estuarine systems, 1952
17. Onshore hydrological investigations in eastern and south-western Australia, 1952
18. Onshore hydrological investigations in eastern and south-western Australia, 1953
19. Onshore planktological investigations in eastern Australia, 1945–54
20. Surface sampling in the Tasman Sea, 1953
21. Estuarine hydrological investigations in eastern and south-western Australia, 1953
22. Further onshore planktological investigations in eastern Australia, 1945–54
23. Planktological investigations made by F.R.V. *Derwent Hunter* in eastern Australian waters, 1952–54
24. Onshore hydrological investigations in eastern and south-western Australia, 1954
25. Surface sampling in the Tasman Sea, 1954
26. Estuarine hydrological investigations in eastern and south-western Australia, 1954
27. Onshore and oceanic hydrological investigations in eastern and south-western Australia, 1955
28. Surface sampling in the Tasman and Coral Seas, 1955
29. Estuarine hydrological investigations in eastern and south-western Australia, 1955
30. Onshore and oceanic hydrological investigations in eastern and south-western Australia, 1956
31. Surface sampling in the Tasman and Coral Seas and the south-eastern Indian Ocean, 1956
32. Estuarine hydrological investigations in eastern and south-western Australia, 1956
33. Coastal hydrological investigations in eastern and south-western Australia, 1957
34. Coastal hydrological investigations at Port Hacking, New South Wales, 1957
35. Coastal hydrological investigations at Eden, New South Wales, 1957

OCEANOGRAPHICAL STATION LISTS

(Continued)

36. Surface sampling in the Tasman and Coral Seas, 1957
37. Hydrological investigations from F.R.V. *Derwent Hunter*, 1957
38. Coastal hydrological investigations in the New South Wales tuna fishing area, 1958
39. Surface sampling in the Coral and Tasman Seas, 1958
40. Coastal hydrological investigations in south-eastern Australia, 1958
41. Oceanic investigations in eastern Australian waters, F.R.V. *Derwent Hunter*, 1958
42. Coastal investigations at Port Hacking, New South Wales, 1958
43. Oceanic investigations in eastern Australia, H.M.A. Ships *Queenborough*, *Quickmatch*, and *Warrego*, 1958
44. Oceanic observations in Antarctic waters, M.V. *Magga Dan*, 1959
45. Coastal hydrological investigations in eastern Australia, 1959
46. Coastal hydrological investigations in the New South Wales tuna fishing area, 1959
47. Coastal investigations at Port Hacking, New South Wales, 1959
48. Oceanic investigations in eastern Australian waters, F.R.V. *Derwent Hunter*, 1959
49. Coastal hydrological sampling Rottnest Island, W.A., and Port Moresby, Papua, during the I.G.Y. (1957–58), and surface sampling in the Tasman and Coral Seas, 1959
50. Surface sampling in the Coral and Tasman Seas, 1960
51. Coastal hydrological investigations in eastern Australia, 1960
52. Coastal investigations at Port Hacking, New South Wales, 1960
53. Coastal hydrological investigations in the New South Wales tuna fishing area, 1960
54. Investigations by F.R.V. *Derwent Hunter* on the eastern Australian tuna grounds in 1961
55. Investigations by F.R.V. *Weerutta* on the South Australian tuna grounds in 1961
56. Investigations by F.R.V. *Marelda* on the eastern Australian tuna grounds in 1961
57. Investigations by F.V. *Estelle Star* in Western Australian waters in 1961
58. Temperature observations from Australian tuna fishing vessels in 1961
59. Investigations by F.R.V. *Derwent Hunter* on the eastern Australian tuna grounds in 1962
60. Investigations by F.R.V. *Investigator* on the South Australian tuna grounds in 1962
61. Investigations by F.R.V. *Marelda* on the eastern Australian tuna grounds in 1962
62. Investigations by F.V. *Estelle Star* in Western Australian waters in 1962
63. Temperature and salinity observations from Australian tuna fishing vessels in 1962
64. Investigations by F.R.V. *Investigator* on the South Australian tuna grounds in 1963
65. Investigations by F.R.V. *Marelda* on the eastern Australian tuna grounds in 1963
66. Temperature and salinity observations from Australian tuna fishing vessels in 1963
67. Investigations by F.R.V. *Investigator* on the South Australian tuna grounds in 1964
68. Investigations by F.R.V. *Marelda* on the eastern Australian tuna grounds in 1964
69. Temperature and salinity observations from Australian tuna fishing vessels in 1964
70. Investigations by F.R.V. *Investigator* on the South Australian tuna grounds in 1965
71. Investigations by F.V. *Estelle Star* in South Australian and New South Wales waters in 1965
72. Investigations by F.R.V. *Marelda* on the eastern Australian tuna grounds in 1965
73. Investigations by F.V. *Degei* in Queensland waters in 1965
74. Temperature and salinity observations from Australian tuna fishing vessels in 1965
75. Investigations by F.V. *Degei* in New South Wales, South, and Western Australian waters in 1966
76. Investigations by F.V. *Estelle Star* in South and Western Australian waters in 1966
77. Temperature and salinity observations from Australian tuna fishing vessels in 1966
78. Drift bottle releases and recoveries in Bass Strait and adjacent waters, 1958–1962
79. Drift bottle releases and recoveries in Western Australia, 1956–1957
80. Investigations by F.R.V. *Lancelin* in Western Australian waters in 1963