

*Storm - Master*

INSTITUTE OF  
**OCEANOGRAPHY**

THE UNIVERSITY OF  
BRITISH COLUMBIA



DATA REPORT 31

Chile 70 Cruise



UNIVERSITY OF BRITISH COLUMBIA

INSTITUTE OF OCEANOGRAPHY

DATA REPORT 31

Chile 70 Cruise

The following assistance is gratefully acknowledged

- |   |                         |
|---|-------------------------|
| National Research Council                         | - research grant        |
| Bedford Institute                                 | - use of C.S.S. Hudson  |
| Marine Sciences Branch                            |                         |
| Department of Energy, Mines,<br>and Resources     |                         |
| The Master, Officers and Crew<br>of C.S.S. Hudson | - for their cooperation |

JANUARY 1971

## INTRODUCTION

The data represented in this report were collected during a five week cruise (Chile 70, I.O.U.B.C. Cruise 70/13) in Chilean water as Phase V of the HUDSON 70 Round-the-Americas Expedition organized by the Atlantic Oceanographic Laboratory, Bedford Institute, Dartmouth, N.S. of the Marine Sciences Branch, Department of Energy, Mines and Resources.

The station positions occupied are given with the station data and are indicated approximately on the outline chart on pages v. The temperature, salinity, oxygen content and  $\sigma_t$  are tabulated for observed depths. The temperatures tabulated to hundredths of a degree were measured with reversing thermometers, while those to tenths were read with a bucket thermometer (surface) or bathythermograph (subsurface). The salinity was estimated using an Auto-Lab Inductively Coupled Salinometer (Extended Range Model). The salinities reported were estimated from the measured conductivity ratios using International Oceanographic Tables published jointly by N.I.O. and UNESCO, 1966. The salinometer has a reported accuracy of approximately 0.003 ‰ in the salinity range above 28 ‰ and an accuracy of approximately 0.02 ‰ below 28 ‰. The oxygen content was measured on shipboard by Winkler's method as recommended by Carritt, D.E. and Carpenter, J.H., J. Mar. Res. 24; 286-318, 1966. Depths were determined from wire length, wire angle and unprotected thermometer depth measurements.

Measurements of nutrient concentrations were also made by I.W. Duedall using a Technicon Autoanalyser. These will be reported in the consolidated data report for the Hudson 70 Expedition, by the Bedford Institute.

In the meteorological observations, the cloud amount is expressed in eighths and the wind speed in knots.

Numbers in brackets after the Institute station identification are CSS Hudson consecutive station numbers.

## PERSONNEL

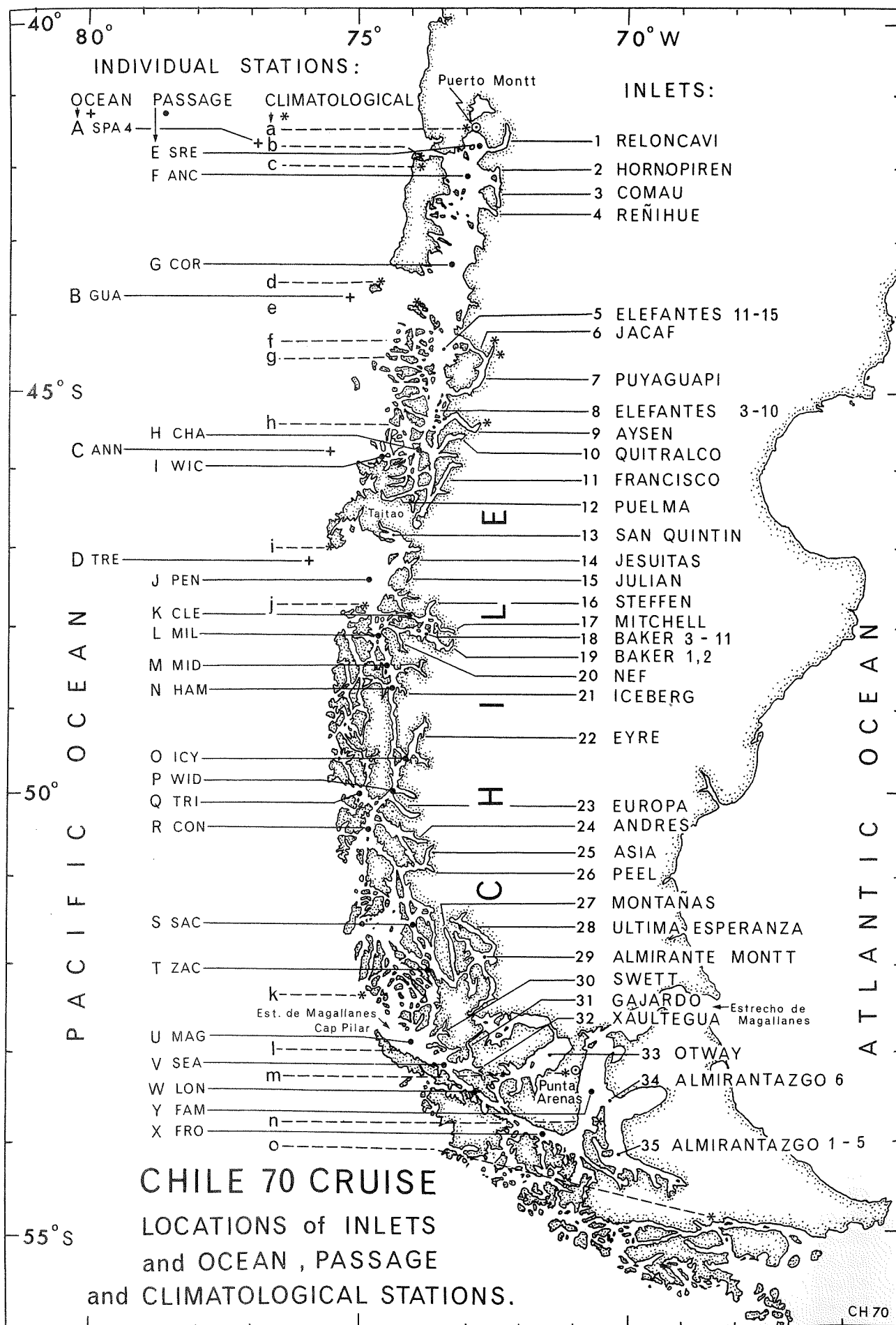
## SCIENTIFIC

G.L. Pickard	Univ. of British Columbia, Chief Scientist
B. McK. Bary	" " " , Deputy Chief Scientist
M.P. Storm	" " "
D. English	" " "
W.V. Burt	Oregon State University
G.S. Pond	" " "
R.G.B. Brown	Canadian Wildlife Service
I.W. Duedall	Marine Ecology Laboratory, F.R.B.
P. Wadhams	Atlantic Oceanographic Laboratory, M.S.B.
D. Winters	" " "
H. Henderson	" " "
J. Pilote	" " "
H. Inostroza	Univ. of Concepcion, Chile
L. Chuecas	" " "
R. Ahumada	" " "
R. Montaner	Inst. Hydrografico, Armada de Chile
B. Uccelletti	" " " "
F. Rey	Univ. of Chile at Valparaiso
N. Silva	Catholic University, Valparaiso

## SHIP

Capt. D.W. Butler	Master
F. Maugher	Chief Officer
R. Gould	Navigator
S. Lambert	Chief Engineer
J. Avery	Bosun

Lt. Espinoza, Armada de Chile, Pilot



195

Chile 70

BS

196

38

Stn: COR 2 (224) Cloud: -  
 Lat: 43° 18.4 ' S Wind: -  
 Long: 73° 17.6 ' W Sea: 0 m  
 Time: 1705 GMT Air, Dry: - °C  
 Date: 26 Mar 1970 Air, Wet: - °C  
 Depth 102 fm Baro: - mb  
 187 m Secchi: 12.5 m  
 Chart 716 Wire Angle: 1 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	12.2	32.788	5.25	24.86
5	11.95	32.777	5.23	24.89
10	11.87	32.779	5.25	24.91
15	11.69	32.866	5.09	25.01
20	11.52	33.010	4.93	25.16
30	11.10	33.271	4.62	25.43
50	11.02	33.326	4.56	25.49
75	10.46	33.540	4.01	25.75
100	10.17	33.640	3.77	25.88
150	9.98	33.709	3.63	25.97

Stn: COR 3 (225) Cloud: As 8  
 Lat: 43° 00.3 ' S Wind: 140 - 3  
 Long: 73° 01.3 ' W Sea: 0 m  
 Time: 2108 GMT Air, Dry: 11.9 °C  
 Date: 26 Mar 1970 Air, Wet: 10.4 °C  
 Depth 109 fm Baro: 1016 mb  
 199 m Secchi: 11 m  
 Chart 716 Wire Angle: 3 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	11.7	33.197	4.82	25.27
5	11.43	33.162	4.76	25.29
10	11.26	33.211	4.69	25.36
15	11.21	33.247	4.60	25.40
20	11.17	33.263	4.55	25.41
30	11.13	33.274	4.53	25.43
50	11.08	33.296	4.50	25.46
75	11.03	33.314	4.43	25.48
100	10.96	33.330	4.32	25.50
150	10.93	33.360	4.30	25.53
175	10.91	33.373	4.23	25.55

BS 197

Stn: CHU (226) Cloud: Ac 7  
 Lat: 42° 27.0 ' S Wind: 0  
 Long: 72° 58.6 ' W Sea: 0 m  
 Time: 0100 GMT Air, Dry: 15.2 °C  
 Date: 27 Mar 1970 Air, Wet: 13.2 °C  
 Depth 160 fm Baro: 1017 mb  
 293 m Secchi: - m  
 Chart 709 Wire Angle: 4 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	13.0	31.841	6.81	23.97
2	12.96	31.775	7.34	23.93
5	12.95	31.776	7.28	23.93
10	12.88	31.789	7.18	23.95
15	12.76	31.834	6.89	24.01
20	12.71	31.905	6.53	24.08
30	12.60	32.062	5.97	24.22
50	12.09	32.568	4.93	24.71
75	11.83	32.709	4.68	24.86
100	11.76	32.848	4.63	24.99
150	11.70	32.935	4.67	25.06
200	11.70	32.968	4.72	25.09
275	11.71	32.979	4.89	25.10

201

Stn: REN 1 (230) Cloud: Sc 3  
 Lat: 42° 34.4 ' S Wind: 140 - 12  
 Long: 72° 33.2 ' W Sea: 0 m  
 Time: 0839 GMT Air, Dry: 10.3 °C  
 Date: 27 Mar 1970 Air, Wet: 9.5 °C  
 Depth 114 fm Baro: 1011 mb  
 208 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	13.10	29.407	6.56	22.08
I 2	12.80	30.990	5.69	23.35
5	12.38	31.921	5.06	24.15
10	11.86	32.246	4.44	24.50
II 15	11.46	32.343	4.17	24.65
20	11.20	32.370	4.02	24.72
30	10.99	32.377	3.98	24.76
50	10.84	32.455	4.12	24.84
75	10.60	32.508	4.20	24.93
100	10.69	32.586	4.22	24.97
150	10.80	32.683	4.35	25.03



BS 200

Chile 70

42°

199

39

Stn: REN 2 (229) Cloud: Sc 4  
 Lat: 42° 32.5 ' S Wind: 120 - 20  
 Long: 72° 37.4 ' W Sea: 0 m  
 Time: 0637 GMT Air, Dry: 12.4 °C  
 Date: 27 Mar 1970 Air, Wet: 11.3 °C  
 Depth 143 fm Baro: 1012 mb  
 261 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	13.4	28.442	6.92	21.28
I 2	13.22	31.175	6.35	23.42
5	13.10	31.591	6.16	23.76
10	12.03	32.256	4.69	24.48
II 15	11.88	32.310	4.53	24.55
20	11.76	32.339	4.31	24.59
30	11.42	32.431	4.15	24.72
50	11.14	32.495	4.17	24.82
75	11.10	32.591	4.25	24.91
100	11.37	32.717	4.29	24.96
150	10.95	32.728	4.33	25.04
200	10.87	32.784	4.36	25.10

Stn: REN 3 (228) Cloud: As 6  
 Lat: 42° 30.0 ' S Wind: 140 - 15  
 Long: 72° 42.8 ' W Sea: 0 m  
 Time: 0506 GMT Air, Dry: 15.2 °C  
 Date: 27 Mar 1970 Air, Wet: 12.1 °C  
 Depth 148 fm Baro: 1013 mb  
 271 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	13.4	30.810	7.47	23.10
I 2	12.85	31.531	6.59	23.76
5	12.54	31.955	5.73	24.15
10	12.16	32.240	4.90	24.44
II 15	12.04	32.289	4.76	24.50
20	11.86	32.376	4.52	24.60
30	11.58	32.525	4.29	24.77
40	11.52	32.544	4.29	24.79
III 75	11.35	32.638	4.25	24.90
100	11.35	32.745	4.28	24.98
150	11.38	32.838	4.31	25.05
200	10.96	32.804	4.35	25.09
250	11.11	32.946	4.20	25.18

198

Stn: REN 4 (227) Cloud: As 6  
 Lat: 42° 28.3 ' S Wind: 0  
 Long: 72° 48.6 ' W Sea: 0 m  
 Time: 0347 GMT Air, Dry: 15.4 °C  
 Date: 27 Mar 1970 Air, Wet: 12.2 °C  
 Depth 123 fm Baro: 1014 mb  
 225 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	13.3	31.254	6.83	23.46
2	13.20	31.157	7.49	23.41
5	12.91	31.751	7.10	23.92
10	12.68	32.012	5.87	24.16
15	12.07	32.240	4.95	24.46
20	11.80	32.386	4.52	24.62
30	11.57	32.489	4.34	24.74
50	11.54	32.561	4.36	24.80
75	11.40	32.657	4.29	24.90
100	11.40	32.695	4.27	24.93
150	11.52	-	4.33	-
200	11.33	32.945	4.32	25.14

206

Stn: COM 1 (235) Cloud: Cc 7  
 Lat: 42° 27.8 ' S Wind: 360 - 20  
 Long: 72° 29.0 ' W Sea: 0.5 m  
 Time: 2123 GMT Air, Dry: 18.7 °C  
 Date: 27 Mar 1970 Air, Wet: 14.9 °C  
 Depth 138 fm Baro: 1007 mb  
 252 m Secchi: 4.5 m  
 Chart 709 Wire Angle: 4 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	15.2	28.041	7.64	20.61
2	14.32	30.655	8.22	22.79
5	13.52	31.617	8.09	23.70
10	12.82	31.850	7.70	24.01
15	11.52	32.077	5.41	24.43
20	10.99	32.165	3.59	24.59
30	10.79	32.251	3.89	24.70
50	10.75	32.383	4.25	24.81
75	10.82	32.525	4.24	24.90
100	10.95	32.645	4.05	24.97
150	10.96	32.759	3.92	25.06
200	10.75	32.767	4.24	25.10

BS 205

Chile 70

204

40

Stn: COM 2 (234) Cloud: Cc 6  
 Lat: 42° 23.5 ' S Wind: 300 - 15  
 Long: 72° 28.8 ' W Sea: 0.4 m  
 Time: 1833 GMT Air, Dry: 15.1 °C  
 Date: 27 Mar 1970 Air, Wet: 13.2 °C  
 Depth 237 fm Baro: 1007 mb  
 433 m Secchi: - m  
 Chart 709 Wire Angle: 10 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	14.8	30.175	8.00	22.33
5	14.71	30.992	8.47	22.97
10	13.06	31.823	7.81	23.95
15	12.04	32.074	6.48	24.33
20	11.26	32.135	4.07	24.52
30	10.84	32.232	3.76	24.67
50	10.75	32.380	4.23	24.80
75	10.76	32.516	4.30	24.91
100	10.83	32.616	4.15	24.97
150	10.95	32.752	3.97	25.06
200	10.73	32.754	4.30	25.10
300	10.69	32.839	4.19	25.17
400	10.88	32.971	3.66	25.24

Stn: COM 3 (233) Cloud: Cc 5  
 Lat: 42° 19.1 ' S Wind: 360 - 18  
 Long: 72° 31.3 ' W Sea: 0.2 m  
 Time: 1713 GMT Air, Dry: 15.1 °C  
 Date: 27 Mar 1970 Air, Wet: 13.2 °C  
 Depth 258 fm Baro: 1008 mb  
 472 m Secchi: 7.5 m  
 Chart 709 Wire Angle: 4 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	14.8	29.010	8.03	21.43
2	13.95	31.068	7.69	23.19
5	13.41	31.583	8.49	23.69
10	12.94	31.902	7.86	24.03
15	11.97	32.069	6.70	24.34
20	11.32	32.173	3.85	24.54
30	10.89	32.266	3.78	24.69
50	10.81	32.395	4.11	24.80
75	10.77	32.527	4.31	24.91
100	10.83	32.610	4.08	24.97
150	10.81	32.701	4.20	25.04
200	10.73	32.747	4.36	25.09
300	10.66	32.829	4.41	25.17
400	10.89	32.975	3.69	25.24

BS 203

Stn: COM 4 (232) Cloud: Ci 5  
 Lat: 42° 11.5 ' S Wind: 100 - 5  
 Long: 72° 32.3 ' W Sea: 0.1 m  
 Time: 1358 GMT Air, Dry: 14.2 °C  
 Date: 27 Mar 1970 Air, Wet: 11.9 °C  
 Depth 260 fm Baro: 1009 mb  
 476 m Secchi: 8.5 m  
 Chart 709 Wire Angle: 5 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	14.5	26.904	7.10	19.88
5	14.11	31.277	8.00	23.32
10	12.83	31.868	7.02	24.02
15	12.15	32.091	5.14	24.33
20	11.66	32.226	4.30	24.52
30	11.08	32.284	3.78	24.67
50	10.83	32.425	4.09	24.82
75	10.85	32.562	4.12	24.93
100	10.86	32.610	4.08	24.96
150	10.83	32.702	4.11	25.04
200	10.79	32.763	4.35	25.09
300	10.64	32.823	4.46	25.17
400	10.81	32.942	3.99	25.23

202

Stn: COM 5 (231) Cloud: Ci 4  
 Lat: 42° 10.1 ' S Wind: 0  
 Long: 72° 41.5 ' W Sea: 0 m  
 Time: 1224 GMT Air, Dry: 14.5 °C  
 Date: 27 Mar 1970 Air, Wet: 12.0 °C  
 Depth 185 fm Baro: 1009 mb  
 338 m Secchi: 8.5 m  
 Chart 709 Wire Angle: 5 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	14.4	29.558	6.87	21.93
2	13.96	30.586	7.75	22.81
5	13.94	30.924	7.92	23.08
10	12.58	31.905	5.92	24.10
15	11.95	32.204	4.57	24.45
20	11.76	32.290	4.28	24.55
30	11.53	32.494	4.18	24.75
50	11.41	32.589	4.20	24.85
75	11.35	32.669	4.20	24.92
100	10.98	32.662	4.10	24.98
150	11.07	32.759	4.20	25.04
200	11.01	32.817	4.32	25.10
300	10.75	32.855	4.30	25.17



207  
 Stn: HOR 1 (236) Cloud: Ac 7  
 Lat: 42° 06.8 ' S Wind: 020 - 6  
 Long: 72° 29.5 ' W Sea: 0 m  
 Time: 2353 GMT Air, Dry: 15.5 °C  
 Date: 27 Mar 1970 Air, Wet: 14.6 °C  
 Depth 61 fm Baro: 1008 mb  
 112 m Secchi: - m  
 Chart 709 Wire Angle: 5 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	15.5	29.035	7.71	21.30
2	14.50	31.163	8.27	23.15
5	13.77	31.558	8.17	23.60
10	13.07	31.848	7.42	23.96
15	12.07	32.101	4.55	24.35
20	11.58	32.183	4.01	24.50
30	11.10	32.294	3.72	24.68
50	10.78	32.413	3.62	24.82
75	10.74	32.513	4.00	24.91
100	10.84	32.608	4.16	24.96

208  
 Stn: HOR 2 (237) Cloud: Ac 7  
 Lat: 42° 03.5 ' S Wind: 020 - 4  
 Long: 72° 28.3 ' W Sea: - m  
 Time: 0100 GMT Air, Dry: 15.3 °C  
 Date: 28 Mar 1970 Air, Wet: 14.2 °C  
 Depth 87 fm Baro: 1008 mb  
 159 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	14.8	21.280	-	15.51
2	14.42	31.165	8.17	23.16
5	13.91	31.290	8.02	23.37
10	12.90	31.880	7.06	24.02
15	12.12	32.140	4.34	24.37
20	11.41	32.222	3.68	24.56
30	10.99	32.303	3.50	24.70
50	10.75	32.414	3.43	24.83
75	10.66	32.514	3.40	24.92
100	10.62	32.576	3.54	24.98
150	10.66	32.630	3.45	25.01

209  
 Stn: HOR 3 (238) Cloud: Cu 1  
 Lat: 41° 59.7 ' S Wind: 0  
 Long: 72° 30.4 ' W Sea: - m  
 Time: 0318 GMT Air, Dry: 14.3 °C  
 Date: 28 Mar 1970 Air, Wet: 14.2 °C  
 Depth 92 fm Baro: 1007 mb  
 168 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	15.7	23.661	6.98	17.15
2	13.99	30.025	7.25	22.38
5	13.30	31.364	7.42	23.54
10	13.08	31.690	6.72	23.84
15	12.42	32.086	4.90	24.27
20	11.73	32.251	4.05	24.53
30	11.12	32.319	3.65	24.69
50	10.82	32.419	3.53	24.82
75	10.74	32.520	3.88	24.91
100	10.64	32.575	3.75	24.97
150	10.59	32.675	4.11	25.06

210  
 Stn: HOR 4 (239) Cloud: St 8  
 Lat: 42° 03.3 ' S Wind: 0  
 Long: 72° 32.1 ' W Sea: - m  
 Time: 0430 GMT Air, Dry: 13.8 °C  
 Date: 28 Mar 1970 Air, Wet: 13.8 °C  
 Depth 128 fm Baro: 1005 mb  
 234 m Secchi: - m  
 Chart 709 Wire Angle: 0 °

Depth m	T °C	S ‰	O <sub>2</sub> ml/l	σ <sub>t</sub>
0	15.1	29.918	7.01	22.07
2	15.04	30.748	8.23	22.71
5	13.97	31.456	7.80	23.48
10	12.45	31.995	5.31	24.20
15	12.17	32.145	4.72	24.36
20	11.95	32.262	4.33	24.50
30	11.48	32.344	3.91	24.65
50	10.95	32.416	3.68	24.80
75	10.73	32.523	3.72	24.92
100	10.69	32.577	3.74	24.97
150	10.64	32.683	4.18	25.06
200	10.79	32.772	4.21	25.10