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PRELIMINARY REPORT

OF AN

UNDERWATER GRAVITY SURVEY

CAPE ARNHEM TO DARWIN

1958

by

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CONTENTS

	<u>Page</u>
ABSTRACT	1
1. INTRODUCTION	1
2. FIELD WORK	1
3. RESULTS	1

TABLES

1. Gravity Values, Arafura Sea
2. Gravity Values, Van Diemens Gulf

ABSTRACT

An underwater gravity survey carried out along the north coast of Australia, between Cape Arnhem and Darwin, showed that the Bouguer Anomaly at every station was positive and generally in the range +10 to +60 milligals.

1. INTRODUCTION

During July and August, 1958, the Bureau of Mineral Resources, Geology and Geophysics used a "North American" underwater gravity meter installed in M.V. Kano to establish gravity stations along a regional off-shore traverse from Cape Arnhem to Darwin, and to carry out a more detailed survey in Van Diemen's Gulf. The equipment was operated by S. Waterlander, geophysicist.

Along the regional traverse stations were established at approximately 20 mile intervals, and in Van Diemen's Gulf a station interval of approximately 5 miles was used.

2. FIELD WORK

The regional traverse between Cape Arnhem and Darwin was part of a longer traverse, which was tied to a previously established gravity station at Normanton and to Darwin pendulum station.

The survey in Van Diemen's Gulf was tied to Darwin pendulum station and to a gravity station at Snake Bay airstrip.

For the regional traverse station positions were determined by using a station pointer and/or compass bearings to landmarks. No correction was applied for the state of the tide and, in the calculation of anomalies, values were reduced to actual sea-level. Within the accuracy of the survey this may be taken as mean sea level.

During the survey in Van Diemen's Gulf most station positions were determined by using a station pointer and/or compass bearings, but a few stations were out of sight of land and their position had to be determined by dead reckoning. Tidal corrections have been applied and all anomalies have been reduced to mean sea level.

For both surveys a density of 1.03 gm/cm^3 has been taken for sea-water, and 2.67 gm/cm^3 as the average rock density.

3. RESULTS

The station locations are shown on the attached plate, and the gravity information for each station is shown in the accompanying table.

The average Bouguer anomaly along this coast is approximately +30 milligals. However the station anomalies range from +10 to +55 milligals approximately.

Near the Liverpool River (stations 67 and 68) and in Van Diemen Gulf (stations 157 and 176) the anomaly is approximately +10 milligals.

Near Elcho Island, along the north coast of Coburg Peninsula and north-east coast of Melville Island the anomaly is greater than +50 milligals.

The anomalies in Van Diemen Gulf are generally lower than those along the regional traverse from Cape Arnhem to Darwin.

TABLE 1

Area: Arafura SeaTraverse: Cape Arnhem - DarwinDate of Survey: June, July 1958Meter: North American Marine Gravity MeterSensitivity: 0.12665 mgal/per div.Datum: Darwin P.S. M.S.L.Density 267

Station	Latitude	Longitude	Depth	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Bouguer Anomaly
58	12° 18.0'	136° 55.4'	30.5	978,303.57	978,282.73	-2.07	+18.77	+0.64	+19.4
✓59	10.3'	47.3'	28.2	304.81	277.96	-1.91	+24.94	+0.59	+25.5
✓60	11° 52.0'	32.9'	79.1	295.41	266.79	-5.36	+23.26	+1.66	+24.9
✓61	12° 01.5'	10.2'	17.6	297.17	272.56	-1.19	+23.42	+0.37	+23.8
✓62	11° 44.8'	135° 50.8'	46.1	299.32	262.47	-3.12	+33.73	+0.96	+34.7
✓63	56.0'	34.5'	70.5	324.55	269.20	-4.78	+50.57	+1.48	+52.0
✓64	12° 05.2'	135° 23.3'	21.7	331.12	274.81	-1.47	+54.84	+0.45	+55.3
✓65	11° 59.5'	03.2'	84.4	313.51	271.33	-5.72	+36.46	+1.77	+38.2
✓66	53.5'	134° 41.0'	42.0	289.66	267.69	-2.85	+19.12	+0.88	+20.0
✓67	59.5'	19.1'	24.9	282.57	271.33	-1.69	+9.55	+0.52	+10.1
✓68	45.3'	00.6'	64.0	276.69	262.76	-4.34	+9.59	+1.34	+10.9
✓69	40.2'	133° 41.7'	52.2	281.41	259.73	-3.54	+18.14	+1.09	+19.2
70	36.5'	22.1'	23.9	284.18	257.54	-1.62	+25.02	+0.50	+25.5
71	23.4'	06.6'	115.5	299.40	249.86	-7.83	+41.71	+2.42	+44.1
72	11.1'	132° 51.3'	134.0	284.01	242.79	-9.08	+32.14	+2.80	+34.9
73	10° 56.8'	36.3'	52.4	288.95	234.71	-3.55	+50.69	+1.10	+51.8
74	11° 01.1'	28.4'	60.0	294.57	237.13	-4.07	+53.37	+1.26	+54.6
75	04.4'	09.0'	80.0	299.39	238.99	-5.42	+54.98	+1.67	+56.6
76	08.3'	131° 50.0'	139.4	309.27	241.19	-9.45	+58.63	+2.92	+61.5
77	30.5'	30.2'	36.0	296.87	254.01	-2.44	+40.42	+0.75	+41.2
79	12° 06.7'	00.7'	54.3	321.50	275.74	-3.68	+42.08	+1.14	+43.2
80	28.5'	130° 50.5'	46.1	319.35	289.33	-3.12	+26.90	+0.96	+27.9

TABLE 2.

Area: Van Diemen's Gulf

Date of Survey: August, 1958

Meter: Nth. American Marine Gravity Meter

Sensitivity: 0.12665 mgal/per div.

Datum: Darwin P.S. M.S.L.

Density: 2.67

Station	Latitude	Longitude	Depth	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Bouguer Anomaly
153	12°02.6'	131°17.2'	35.6	978,299.66	978,273.23	-2.41	+24.02	+0.75	+24.8
154	05.9'	20.2'	46.5	298.66	275.24	-3.15	+20.27	+0.97	+21.2
155	07.2'	23.3'	30.1	299.85	276.04	-2.04	+21.77	+0.63	+22.4
156	06.6'	27.9'	42.0	288.75	275.68	-2.85	+10.22	+0.88	+11.1
157	06.0'	32.6'	35.8	286.19	275.31	-2.43	+8.45	+0.75	+9.2
158	05.4'	37.3'	49.5	291.24	274.94	-3.35	+12.95	+1.04	+14.0
159	04.9'	42.0'	41.2	297.59	274.63	-2.79	+20.17	+0.86	+21.0
160	04.3'	46.6'	34.8	292.61	274.26	-2.36	+15.99	+0.73	+16.7
161	03.8'	51.3'	57.4	290.53	273.96	-3.89	+12.68	+1.20	+13.9
162	03.2'	55.9'	52.2	296.85	273.59	-3.54	+19.72	+1.09	+20.8
163	02.7'	132°00.7'	80.0	308.41	273.29	-5.42	+29.70	+1.67	+31.4
164	02.1'	05.7'	51.4	304.67	272.92	-3.48	+28.27	+1.08	+29.4
165	11°59.8'	09.8'	62.6	304.42	271.51	-4.24	+28.67	+1.31	+30.0
166	57.6'	13.7'	28.2	303.62	270.17	-1.91	+31.54	+0.59	+32.1
167	57.2'	19.4'	26.6	298.31	269.93	-1.80	+26.58	+0.56	+27.1
168	56.2'	26.3'	47.2	291.40	269.32	-3.20	+18.88	+0.99	+19.9
169	51.6'	24.3'	84.8	290.99	266.54	-5.75	+18.70	+1.77	+20.5
170	48.4'	22.5'	89.7	290.81	264.62	-6.08	+20.11	+1.88	+22.0
171	43.4'	18.8'	119.6	292.93	261.63	-8.11	+23.19	+2.50	+25.7
172	38.0'	18.3'	27.7	279.33	258.42	-1.88	+19.03	+0.58	+19.6
173	38.6'	12.2'	72.1	286.59	258.77	-4.89	+22.93	+1.51	+24.4
174	39.2'	07.2'	51.0	283.29	259.13	-3.46	+20.70	+1.07	+21.8
175	36.0'	04.1'	113.1	280.61	257.24	-7.66	+15.71	+2.37	+18.1
176	31.0'	00.2'	114.6	269.40	254.30	-7.77	+7.33	+2.40	+9.7
177	28.4'	131°57.5'	50.6	267.35	252.77	-3.43	+11.15	+1.06	+12.2

TABLE 2 (CONTD.)

Station	Latitude	Longitude	Depth	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Bouguer Anomaly
178	11°25.2'	131°52.9'	135.6	978,284.47	978,250.91	-9.19	+24.37	+2.84	+27.2
179	21.4'	48.4'	60.3	289.89	248.70	-4.09	+37.1	+1.26	+38.4
180	19.8'	47.3'	67.5	291.66	247.78	-4.57	+39.31	+1.41	+40.7
181	22.8'	29.9'	61.6	301.78	249.51	-4.17	+48.10	+1.29	+49.4
182	17.6'	27.7'	59.7	303.01	246.52	-4.05	+52.44	+1.25	+53.7
183	14.3'	24.2'	54.4	300.25	244.62	-3.69	+51.94	+1.14	+53.1
184	12.7'	18.7'	35.3	297.06	243.70	-2.39	+50.97	+0.74	+51.7
185	11.2'	15.3'	89.3	297.22	242.85	-6.05	+48.32	+1.87	+50.2
186	13.0'	10.3'	44.8	294.28	243.87	-3.04	+47.37	+0.94	+48.3
187	15.2'	05.7'	42.3	287.05	245.14	-2.87	+39.04	+0.89	+39.9
188	19.7'	01.3'	19.9	285.64	247.72	-1.35	+36.57	+0.42	+37.0
189	17.6'	130°56.4'	32.2	287.71	246.52	-2.18	+39.01	+0.67	+39.7
190	18.2'	51.3'	33.2	292.36	246.86	-2.25	+43.25	+0.69	+43.9
191	21.2'	44.5'	41.4	291.84	248.59	-2.81	+40.44	+0.87	+41.3
192	24.0'	41.3'	16.3	289.20	250.21	-1.10	+37.89	+0.34	+38.2

