INSTITUTE OF GEOLOGICAL SCIENCES
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CRUISE REPORT ON THE SIXTH LEG OF

WHITETHORN CRUISE NUMBER 81/WH/08

11th - 24th June 1981

No. 81/8

by

J. Alan Fyfe

CONTENTS

1. Introduction

The aim of the cruise was to carry out a preliminary shallow sampling survey on the Fladen sheet (for location see Fig. 1) as part of the I.G.S. regional mapping programme. A 6-metre vibrocorer was employed at intersections of proposed geophysics lines (to be run by M.G.U. in July and August 1981 - see Appendix II) and a 1.5 metre gravity sediment corer at intermediate locations on these proposed lines. In addition we carried out a close-spaced gravity corer survey across a trench in the northeast corner of the Bosies Bank sheet (see Fig. 1).

The weather was poor during the first week of the cruise and this together with difficulties in anchoring caused delays and some lack of recovery. However in the second week, working on the western part of the sheet, the weather improved and recovery was good. A survey log is presented in Appendix I while time utilisation analyses are shown in Table I.

2. Personnel

J A Fyfe	IGS	MGLU	Senior Geologist
G K Lott	IGS	MGLU	Day Geologist
C Graham	IGS	MGLU	Surveyor
M Parkin	IGS	MGLU	Day Laboratory Assistant
W Lonie	IGS	MGLU	Deck Operations Technical Officer
P J Wiggins	IGS	MGLU	Maintenance Technical Officer
N A Ruckley	IGS	MGLU	Night Geologist
A Britten	IGS	MGLU	Night Deck Operations
B Tait	IGS	GCU	Geochemist

3. Equipment

The following IGS equipment was employed during the cruise:

20 foot vibrocore system

5 foot gravity sediment corer (4") including winch

Shipek grab and winch

Other IGS equipment on board but not used during this cruise included:

20 foot vibrocorer, back-up

5 foot gravity sediment corer (NX) system

gravity rock coring system

Shipek grabs, back-up

1 metre rock-drills (2)

4. Ship's Performance

The ship was generally well-suited to the work over most of the area but in the northeast part of the sheet severe problems were encountered in anchoring. It appears that the Bruce anchors are unable to hold in ground where a thin (0.1m - 5m) substrate of soft mud overlies firm to stiff overconsolidated clay. This was compounded by the presence of strong winds when we were working in this area. In addition, during non-anchored operations, the inability of some officers of the watch to keep the bows into the wind while holding station led to hazardous working conditions and uncomfortable rolling of the ship.

Problems were encountered with the tugger winch used for bowsing the vibrocorer and the gravity corer. Its action was unpredictable and after operation was prone to slackening off. It is understood that the winch is to be inspected and repaired in Leith.

5. IGS Equipment Performance

(a) Vibrocore system

The vibrocorer worked well in all ground with an average recovery of 4.6m. In soft plastic clay, the penetration rate was around 1 min/metre but was naturally slower in the overconsolidated clay- ca. 10 mins/metre. A bar graph of core lengths recovered is shown in Fig. 2a.

During the first week, a problem was encountered with the retraction system and two barrels were bent through ca 70°. The fault was quickly diagnosed and corrected, after which the system worked well for the remainder of the cruise.

(b) Gravity core system

The gravity sediment corer fitted with a 4" barrel worked well in all ground. Even in overconsolidated clay, effective penetration up to 0.2m was possible. A bar graph of core lengths recovered is shown in Fig. 2b.

(c) Shipek grab system

The Shipek grab was effective for sampling soft plastic mud but in areas of fine sand cover sometimes gave poor recovery.

(d) Core cutting facilities

The Makita Router worked well in the constructed Dexion frame but in poor weather was open to rain or salt spray. Deck Operations personnel preferred this system to the 7" disc grinder used before the Dexion frame was modified for the new router.

6. Geological Results

During this leg 149 stations were occupied as follows:

Sheet Number	Total stations	Shipek	Gravity Corer	Vibrocorer
58/00	142	142	99	43
58/-02	7	7	7	-

Shipek grab samples of surface sediments suggest a broad subdivision into two areas, one dominated by sediments of muddy sand, with shell debris and benthonic microfauna, e.g. echinoids and wormtubes, and the other by mud in which microfauna are rare with the exception of small 'ragworms'. A common feature of the muds, however, is a consistent white speckled appearance due to an abundance of planktonic foraminifera.

The majority of vibrocores comprised up to 6 metres of muddy sediment in which two distinct types can be tentatively recognised. The first and most common is a soft grey-green mud, probably the most recent phase of deposition and invariably overlying a similar more compacted grey-green mud, slightly calcareous with distinctive dark carbonaceous streaking. Occasionally this ?carbonaceous material developed into organic-rich lenses and laminae up to 40mm thick (58/00/120). The second mud type encountered was a grey firm to stiff silty mud with occasional dropstones, possibly the oldest sediments penetrated so far in the area and probably late Pleistocene fluvio-glacial deposits.

(G.K. Lott 23.6.81)

7. Conclusions

1. The main objective of the cruise - preliminary sampling of the Fladen sheet - was achieved despite poor weather and anchoring difficulties.

2. Poor weather resulted in the loss of around 42 hours working time.

3. Anchoring difficulties were twofold:-

   a) the inability of anchors to hold in soft sediment in moderate-strong winds.

   b) the inability of anchors to hold in ground where firm over-consolidated clay is overlain by a thin soft mud substrate.

   Re-anchoring resulted in the loss of around 10 hours working time.

4. Station-holding at night was not entirely satisfactory. In moderate and strong winds it is both hazardous and uncomfortable to allow the ship to broach while on station.

5. The crew were willing and helpful. In particular, the night seaman who assisted with priming the gravity core barrel and packing the samples away after examination in the lab, is worthy of commendation.

6. IGS personnel were well pleased with the catering on this leg.

8. Recommendations

1. No-anchor mode vibrocoring should be considered for the northeastern part of the Fladen sheet, where anchor holding is poor and much time is wasted by repeated anchoring attempts.

2. The officer of the night watch should be experienced and proficient at keeping the ship's head to wind.

3. The survey completed here should be considered only as a preliminary reconnaissance. Further stations should be planned after completion of the Shackleton geophysics cruises.

IGURE 1 : LOCATION MAP FOR WHITETHORN LEG 6 1981

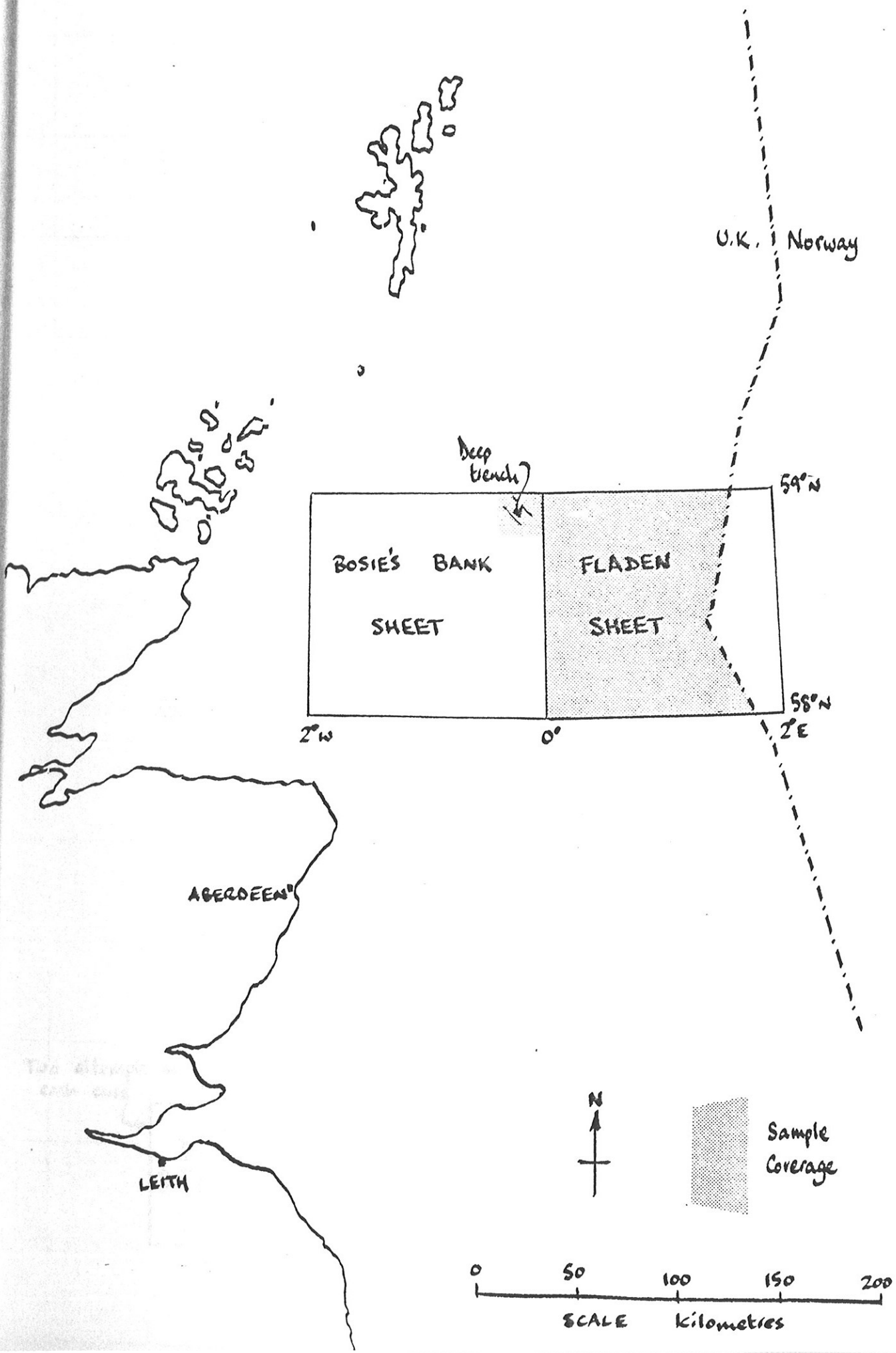


FIGURE 2 : BAR GRAPHS OF RECOVERY IN VIBROCORES AND GRAVITY SEDIMENT CORES 11th - 24th JUNE 1981.

FIG 2a : RECOVERY IN 42 VIBROCORES

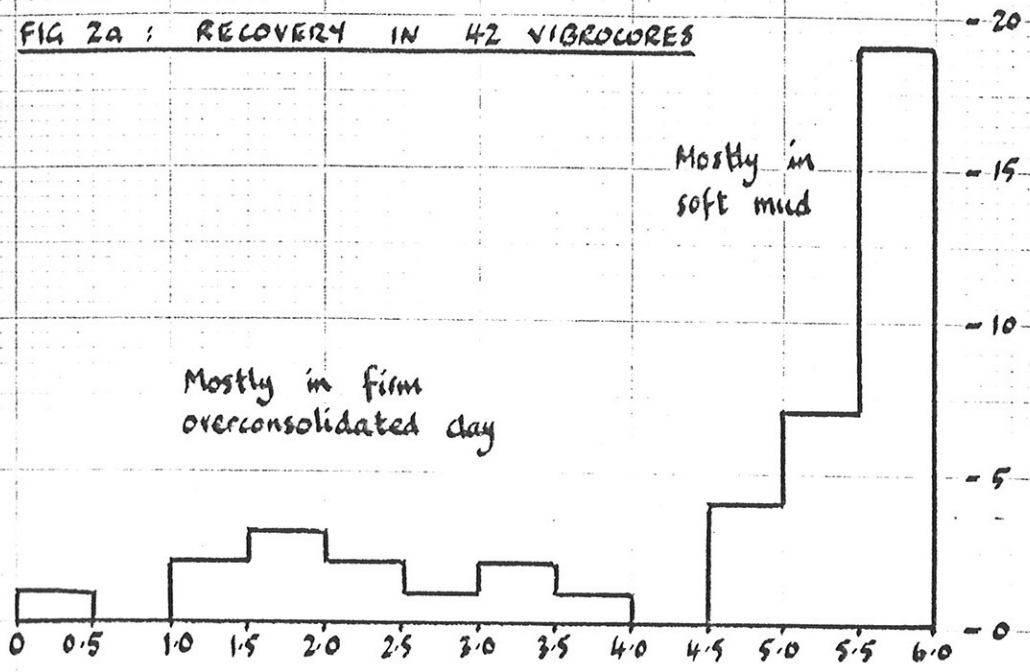
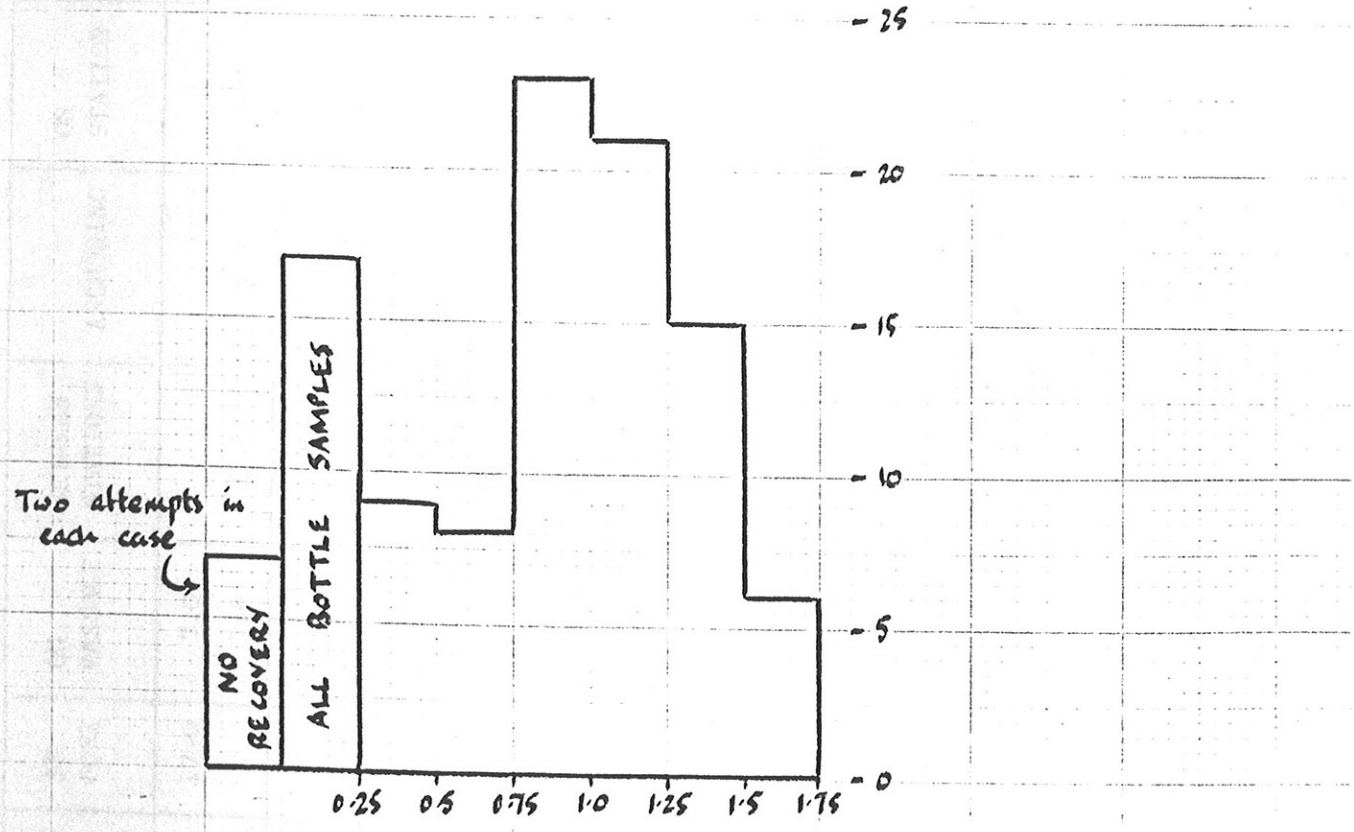


FIG 2b : RECOVERY IN 106 GRAVITY CORES



DATE June	IN PORT	ON PASSAGE	BETWEEN STATIONS	ANCHORING	ON STATION	DOWNTIME			NO.V/E STATIONS	NO.GS/CS STATIONS	REMARKS
						WEATHER	EQUIP'T	SHIP			
11	17.0	7.0									
12		7.6	6.7	4.8	4.9				5	2	
13			9.8	4.1	5.2	4.9			3	11	
14			11.8	4.9	4.0		2.2	1.1	4	7	
15			13.5	4.7	5.3			0.5	4	15	
16			13.1		3.4	7.5			-	16	
17			4.4		2.0	17.6			-	6	
18			6.2	2.7	3.6	11.5			4	2	
19			12.3	4.2	7.5				6	9	
20			11.1	5.5	7.4				6	9	
21			10.6	6.4	7.0				6	7	
22			11.0	5.5	7.5				6	11	
23		12.7	8.9		2.4				-	11	
24	17.3	6.7									
TOTAL	34.3	34.0	119.4	42.8	60.2	41.5	2.2	1.6	43	106	
%	10.2	10.1	35.5	12.7	17.9	12.4	0.7	0.5			

APPENDIX I

SURVEY LOG

SURVEY LOG

Thurs 11 June

0000	In Aberdeen: routine port call
1645	Steam to Fladen area: 58°N, 1°E

Fri 12 June

0000	Steaming to Fladen area
0740	On location for first vibrocore station, recovery 5.25m
1020	On location for second vibrocore station, recovery 5.37m
1245	On location for third vibrocore station. Bent barrel caused by drifting on ship on anchors. Recovery 1.73m
1525	On location for fourth vibrocore station, recovery 5.9m.
1835	On location for fifth vibrocore station. Ship drifting on anchors while coring - recover vibrocorer.
1920	Re-anchor on same site, recovery 2.3m
2145	Begin night sampling programme, two sites occupied.

Sat 13 June

0000	Continue night sampling programme. Nine sites occupied
0805	On location for first vibrocore station, recovery 0.4m. Shoe sample consists of stiff clay, clearly preventing penetration.
1100	Winds increase to gale force 8. Abandon sampling.
1600	On location for second vibrocore station, recovery 2.0m stiff clay.
1910	On location for third vibrocore station, recovery 1.52m; stiff clay.
2155	Begin night sampling programme, two sites occupied.

Sun 14 June

0000	Continue night sampling programme, seven sites occupied.
0740	On lcoation for first vibrocore station. Stern anchors fouled.
0930	Anchors relayed. Deploy vibrocorer, recovery 5.91m.

Sun 14 June (Cont'd)

1210	On location for second vibrocore station. Cable tension proves ship drifting while at anchor. Barrel bent, recovery 4.54m.
1505	On location for third vibrocore station. Difficulty with anchoring. Reanchor. No retraction. Barrel bent and lost in cutting operation
1925	On location for fourth vibrocore station. No retraction. Barrel bent on pulling from seabed but saved during cutting operation, recovery 4.0m.
2040	Working on retraction system. Maintain position at anchor.
2215	Lower vibrocorer for second attempt, recovery 1.55m.
2300	Weigh anchors - fouled on trawl cable.

Mon 15 June

0030	Begin night sampling programme. Six sites occupied.
0735	On location for first vibrocore station, recovery 2.51m.
1045	On location for second vibrocore station, recovery 1.7m.
1245	On location for third vibrocore station, recovery 3.27m. coring for 20mins in firm, overconsolidated clay.
1548	On location for fourth vibrocore station but anchors not holding after second anchoring attempt. Gravity cores(2) taken.
1733	On location for fifth vibrocore station but again anchors not holding. Gravity core taken.
1956	Begin gravity core/grab sampling programme to include several proposed vibrocore stations in northeast Fladen area. Seven sites occupied.

Tues 16 June

0000	Wind increasing to force 4/5 northerly. Continue night sampling programme. Six sites occupied.
0800	On location for first vibrocore site but wind increased to force 8 gale. Anchoring and station holding impossible.
1500	Winds decreased to force 6/7. Begin gravity coring on vibrocore sites in north of Fladen NW sheet. Three sites occupied.
1815	Sail for Bosie's Bank sheet to sample across a trench in northeast corner of sheet.

Tues 16 June (Cont'd)

2030	Begin trench profile gravity core programme.
2300	Complete programme - 7 sites occupied - steam for Fladen NW sheet.

Wed 17 June

0015	Begin routine night sampling programme. Six sites occupied.
0630	On location for first vibrocore station but wind increasing to gale force 8 makes operation dangerous. Wait on weather.

Thurs 18 June

0000	Waiting on weather.
1130	Wind decreased to force 6. Begin gravity coring one site occupied.
1350	On location for first vibrocore station, recovery 1.47m.
1630	On location for second vibrocore station, recovery 4.66m.
1855	On location for third vibrocore station, recovery 5.9m.
2100	On location for fourth vibrocore station, recovery 5.62m.
2247	Begin night sampling programme, one site occupied.

Fri 19 June

0000	Continue night sampling programme, seven sites occupied.
0735	On location for first vibrocorer station, recovery 3.34m.
1020	On location for second vibrocorer station, recovery 1.20m.
1350	On location for third vibrocorer station, recovery 5.20m.
1610	On location for fourth vibrocorer station, recovery 5.89m.
1830	On location for fifth vibrocorer station, recovery 5.58m.
2035	On location for sixth vibrocorer station, recovery 5.95m.
2242	Begin night sampling programme, two sites occupied.

Sat 20 June

0000	Continue night sampling programme, seven sites occupied.
0720	On location for first vibrocore station, recovery 5.95m.
1014	On location for second vibrocore station, anchors not holding, reanchor, recovery 5.79m.
1300	On location for third vibrocore station, recovery 5.95m.
1500	On location for fourth vibrocore station, recovery 5.60m.
1705	On location for fifth vibrocore station, recovery 4.86m.
1925	On lcoation for sixth vibrocore station, wind increasing, cable tension as ship yawing through 30° arc, recovery 5.72m.
2145	Begin night sampling programme, two sites occupied.

Sun 21 June

0000	Continue night sampling programme, six sites occupied.
0830	On location for first vibrocore station, recovery 5.97m.
1126	On location for second vibrocore station, stern anchor winch losing hydraulic oil - repaired.
1230	Vibrocorer deployed, recovery 5.50m.
1350	On location for third vibrocore station, recovery 5.72m.
1620	On location for fourth vibrocore station, recovery 5.93m.
1815	On location for fifth vibrocore station, recovery 5.77m.
2020	On location for sixth vibrocore station, forward anchor not holding: anchors relayed, recovery 5.96m.
2329	Begin night sampling programme, one site occupied.

Mon 22 June

0000	Continue night sampling programme, eight sites occupied.
0805	On location for first vibrocore station, anchors not holding, recovery 5.88m.
1110	On location for second vibrocore station, recovery 5.96m.
1335	On location for third vibrocore station, recovery 5.54m.
1530	On location for fourth vibrocore station, recovery 4.66m.

Mon 22 June (Cont'd)

1730	On location for fifth vibrocore station, recovery 5.30m.
1945	On location for sixth vibrocore station, recovery 5.34m.
2116	Begin night sampling programme, three sites occupied.

Tues 23 June

0000	Continue night sampling programme, seven sites occupied.
0800	Continue gravity coring on vibrocore sites to complete Fladen sheet, four sites occupied.
1100	Steam for Leith, routine port call.

Wed 24 June

0000	Steaming for Leith.
0645	Berth in Leith.

APPENDIX II

PROPOSED GEOPHYSICS LINES FOR MGU

PROJECT 81/04 (FORTIES - FLADEN)

SHACKLETON LEGS 5 AND 6

PRIORITY 1 LINE COORDINATES:

N-S Lines

56°58'N 00°01'E	59°02'N 00°10'E
56°58'N 00°24'E	59°02'N 00°24'E
56°58'N 00°50'E	59°02'N 00°50'E
56°58'N 01°12.5'E	59°02'N 01°12.5'E
56°58'N 01°28'E	59°02'N 01°28'E
56°58'N 01°50'E	58°02.5'N 01°50'E
56°58'N 02°09'E	57°32.0'N 02°09.0'E

E-W Lines

57°51'N 00°02'W	57°51'N 01°59'E
58°02.1'N 00°01.7'W	58°02.1'N 01°50.5'E
58°08.1'N 00°02.4'W	58°08.1'N 01°45.2'E
58°13.1'N 00°02.3'W	58°13.1'N 01°40.5'E
58°18.4'N 00°02.2'W	58°18.4'N 01°35.5'E
58°24.0'N 00°02.5'W	58°24.0'N 01°30.5'E
58°29.2'N 00°01.9'W	58°29.2'N 01°29.6'E
58°34.7'N 00°02.2'W	58°34.7'N 01°31.0'E
58°40.1'N 00°03.1'W	58°40.1'N 01°32.5'E
58°45.6'N 00°02.4'W	58°45.6'N 01°34.0'E