INSTITUTE OF GEOLOGICAL SCIENCES
MARINE GEOLOGY UNIT
Internal Report No 82/8

CRUISE REPORT ON LEG 4 OF WHITETHORN CRUISE 82/WH/Ø5

13 - 26 May 1982

by

N G T Fannin

82/8

26 May 1982

1. Personnel

N G T Fannin	IGS	MGLU	Party Chief
D Evans	IGS	MGLU	Day Geologist
D Long	IGS	EGU	Night Geologist
H S Robertson	IGS	MGLU	Navigation
G Tulloch	IGS	MGLU	Day Laboratory
J McGuigan	IGS	MGLU	Night Laboratory
J Pheasant	IGS	MGLU	Technical Officer
W Lonie	IGS	MGLU	Deck Operations
A Davies	IGS	ACU	Geochemist

2. Area

Rona sheet - 59^{o} -06^{o}. (Figure 1)

3. Objectives

This leg continued the work of Legs 2 and 3 obtaining sea bed samples and sediment cores of the area. The data will be used to prepare the reconnaissance geology maps of sea bed sediments and Quaternary deposits.

4. Equipment

The equipment available included a shipek grab, sediment and rock gravity corer and a six metre vibrocorer.

5. Weather

The weather throughout the leg was very good and it was only in the last two days, when swell conditions deteriorated, when it was not possible to anchor the ship to vibrocore. Apart therefore from ship and equipment down time (see appendix) the sampling work was uninterrupted throughout the leg.

6. Results

A summary ships log is given in Appendix A, a time analysis station record in Appendix B and a cruise abstract in Appendix C.

During this leg almost all the initially planned gravity core and vibrocore sites were completed though in most cases core penetration was low. Altogether 194 grab and gravity core stations and 45 vibrocorer stations were occupied. Above the 200m isobath the shelf is covered by a thin layer of shelly and pebbly sand with scattered boulders and gravelly patches. Cobbles and pebbles are commonly almost completely encrusted indicating considerable bottom sediment transport even, of the coarse fraction. Beneath this cover stiff and often sandy and very overconsolidated grey, or locally derived red tills are most common. Significant penetration of this material either with gravity corer or vibrocorer was rare. Less commonly cores up to 6m long were obtained of soft sandy clays, silts and loose sands. The environmental setting of these sediments is not known but it seems likely by analogy with the Foula area that they occupy relative topographic lows in the glaciated terrain.

In areas of rock outcrop no certain in situ bedrock was recovered but fragments of biotite gneiss obtained are similar to samples obtained using the six metre rock drill during leg 3.

A number of gravity cores were also obtained from deeper water at the top of the continental slope in the north western part of the area. These samples indicate that coarse seabed sediments persist to depths of at least 900m with encrusted pebbles up to cobble grade. Below this depth the sediment is of a fine sand underlain by soft sandy clays with pebbles

and sand lenses. A graph showing gravity core penetration v water depth is given in figure 2 indicating that significant gravity coring penetration is not achieved above 450m. These data suggest that there is a requirement to vibrocore therefore to this order of depth though trials should be conducted first using triggered gravity cores with and without pistons.

Sampling in deeper water is time consuming and in 1000m of water practice suggests that running and recovering the gravity corer takes approximately 15 minutes and the shipek about 30 minutes. Current conditions are strong, even in such deep water, and streaming of the shipek in particular was a significant problem. Clearly if using a triggered corer it would be of considerable benefit to use the shipek grab as the trigger weight both in terms of saving time on station and ensuring that the gravity core and grab samples are taken at the same place. There are other advantages in using a triggered corer. Considerable inaccuracy in the gravity corer winch depth meter was recorded, most of which probably occurs during the first pay out and the cummulative error in pay out and recovery may be as high as 13%. This inaccuracy is increased by stretching in the braided nylon rope which on present evidence is of the order 10-15%. The continued inaccuracies therefore of meter error and stretch make it difficult to assess when the corer is near the seabed and almost impossible to ensure that the corer is allowed to free fall from a reasonable height. Figures for coring times and echosounder and meter depths at thirteen stations are given in Table 1.

7. Equipment Performance

1. Shipek grab - this equipment again performed without significant problems. Two grabs were however damaged by crashing on the ship's side during recovery in significant swell conditions.

2. Gravity corer - this equipment also functioned satisfactorily. Three 1.3m x 0.1m barrels and two rock barrels were damaged. A 3m x 0.1m barrel, made up on board, was operated successfully and without difficulty from the gravity core trough with a maximum core recovery of 2.6m. It should be noted however that constant attention to the state of roughness of the gravity core trough flare bell and retaining ring is required and these should be regularly ground down to remove rough and sharp edges caused by the gravity core crashing during recovery. During this leg abrasion on the braided nylon rope has seriously damaged the lower 100m of the rope which had to be cut away.

3. Vibrocorer - this equipment also functioned satisfactorily though in many cases penetration was poor and at times no penetration was achieved at all. This was usually in areas of dense pebbly sand overlying over-consolidated sandy and stoney till. During the trip some problems were encountered with the penetrometer and retraction system, probably due to water ingress at cable joints and on one occasion to the penetrometer control pot. These problems were however overcome.

8. Ship performance

On the whole the ship performed well despite a number of difficulties. A few hours after sailing the automatic steering gear failed and all of the sampling work was done while the ship was controlled by hand steering. During the cruise two of the anchor winches (port bow and starboard quarter) also failed (see appendix A) but apart from short down time periods these losses did not interfere with the programme. A number of other ship problems developed and although potentially serious, again apart from relatively short down time interludes these did not significantly affect the programme.

FIGURE 1

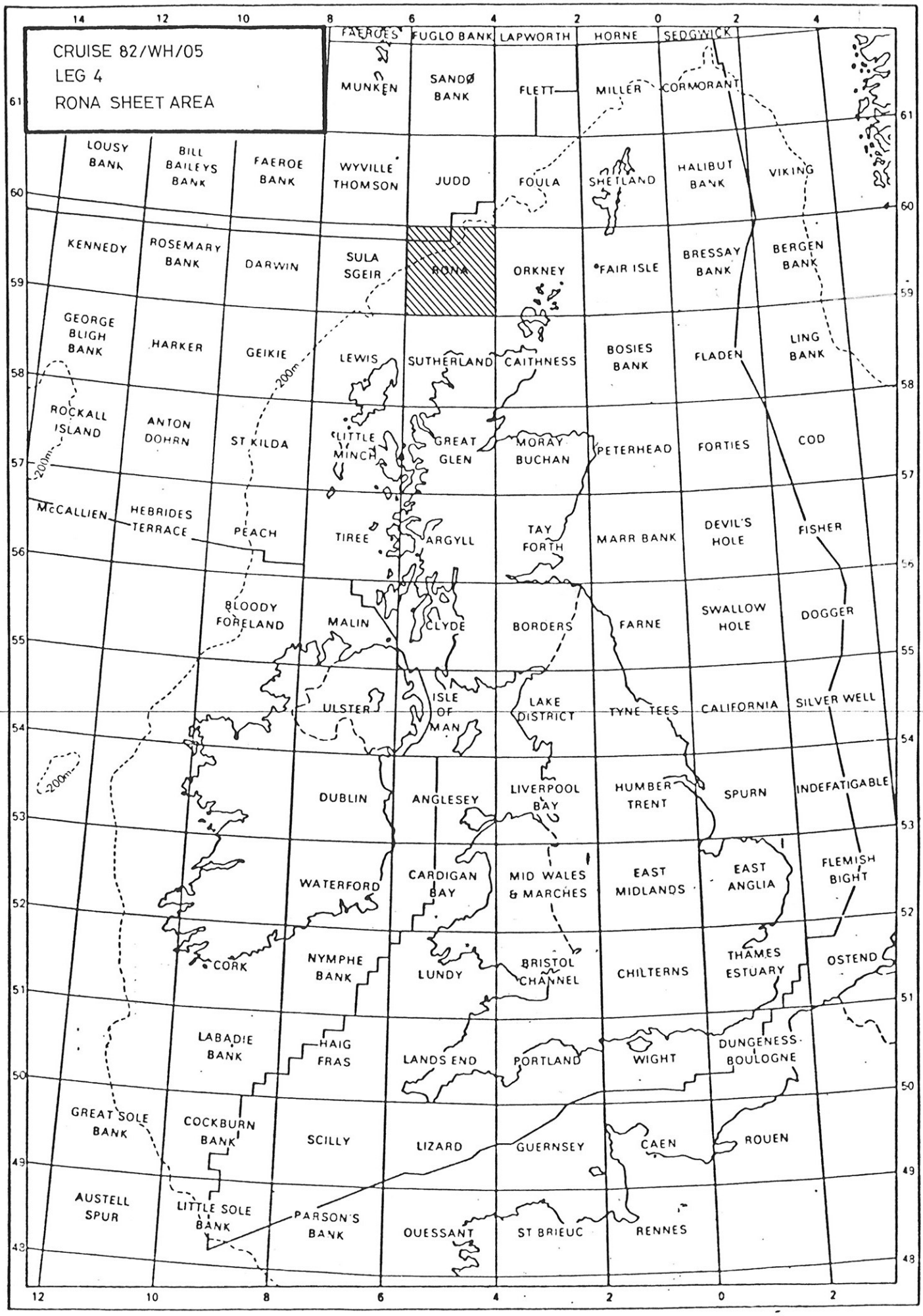
CRUISE 82/WH/05
LEG 4
RONA SHEET AREA
FAEROES
FUGLO BANK
LAPWORTH
HORNE
SEDGWICK
MUNKEN
SANDØ BANK
FLETT
MILLER
CORMORANT
LOUSY BANK
BILL BAILEYS BANK
FAEROE BANK
WYVILLE THOMSON
JUDD
FOULA
SHETLAND
HALIBUT BANK
VIKING
KENNEDY
ROSEMARY BANK
DARWIN
SULA SGEIR
RONA
ORKNEY
FAIR ISLE
BRESSAY BANK
BERGEN BANK
GEORGE BLIGH BANK
HARKER
GEIKIE
LEWIS
SUTHERLAND
CAITHNESS
BOSIES BANK
FLADEN
LING BANK
ROCKALL ISLAND
ANTON DOHRN
ST KILDA
LITTLE MINCH
GREAT GLEN
MORAY BUCHAN
PETERHEAD
FORTIES
COD
McCALLIEN
HEBRIDES TERRACE
PEACH
TIREE
ARGYLL
TAY FORTH
MARR BANK
DEVIL'S HOLE
FISHER
BLOODY FORELAND
MALIN
CLYDE
BORDERS
FARNE
SWALLOW HOLE
DOGGER
ULSTER
ISLE OF MAN
LAKE DISTRICT
TYNE TEES
CALIFORNIA
SILVER WELL
DUBLIN
ANGLESEY
LIVERPOOL BAY
HUMBER TRENT
SPURN
INDEFATIGABLE
WATERFORD
CARDIGAN BAY
MID WALES & MARCHES
EAST MIDLANDS
EAST ANGLIA
FLEMISH BIGHT
CORK
NYMPHE BANK
LUNDY
BRISTOL CHANNEL
CHILTERNS
THAMES ESTUARY
OSTEND
LABADIE BANK
HAIG FRAS
LANDS END
PORTLAND
WIGHT
DUNGENESS BOULOGNE
GREAT SOLE BANK
COCKBURN BANK
SCILLY
LIZARD
GUERNSEY
CAEN
ROUEN
AUSTELL SPUR
LITTLE SOLE BANK
PARSON'S BANK
OUESSANT
ST BRIEUC
RENNES
200m
14
12
10
8
6
4
2
0
2
4
61
60
59
58
57
56
55
54
53
52
51
50
49
48

FIGURE 2

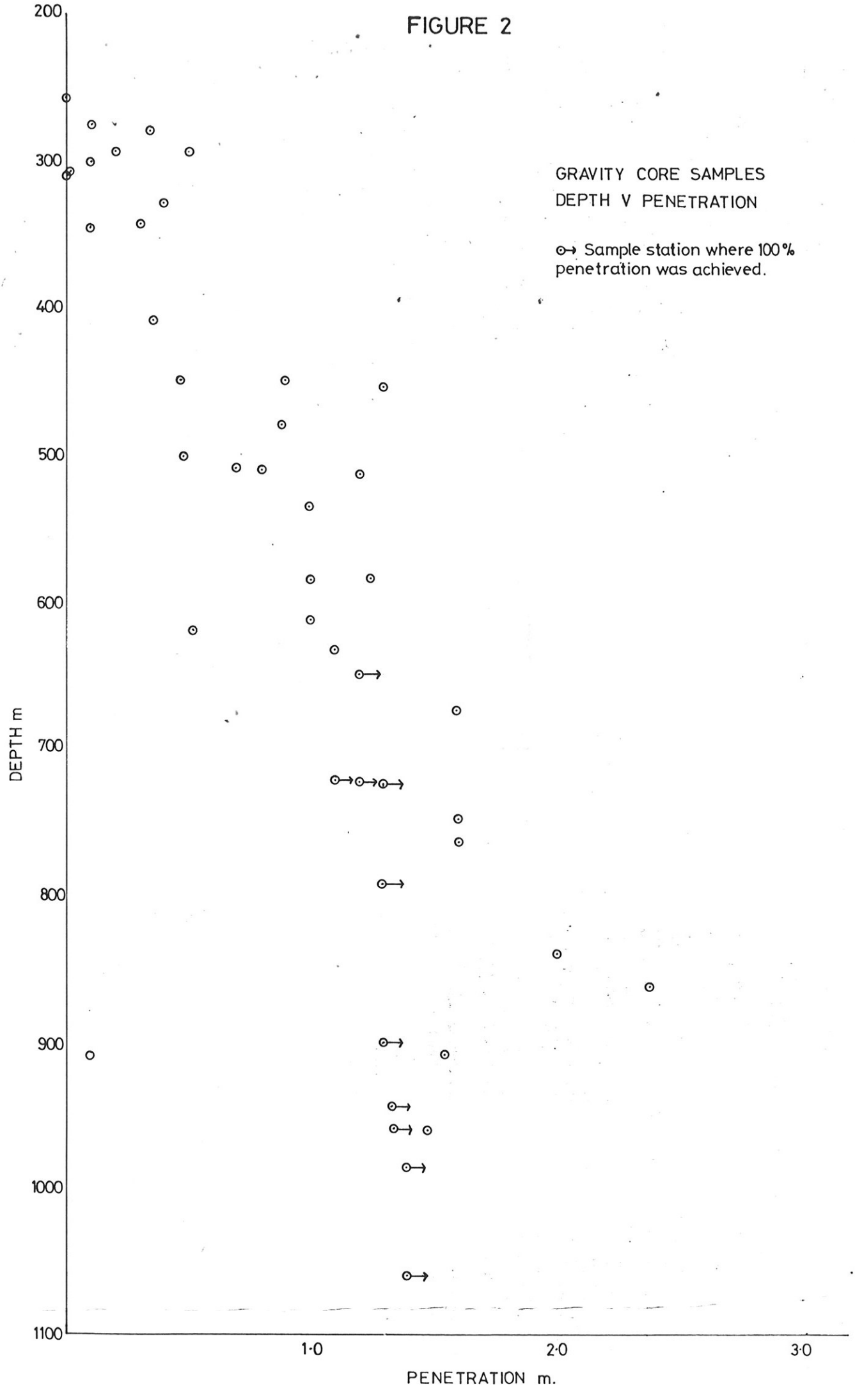
GRAVITY CORE SAMPLES
DEPTH V PENETRATION
⊙→ Sample station where 100% penetration was achieved.
DEPTH m
200
300
400
500
600
700
800
900
1000
1100
1·0
2·0
3·0
PENETRATION m.

TABLE 1

STATION NO	ECHO SOUNDER DEPTH UNCORRECTED AT 1500m/sec	CORRECTED CARTER CORRECTED AT 1500m/sec	METER READINGS ON BOTTOM	METER READINGS ON RETURN TO SURFACE	WINCH TIMES DOWN MINS/SECS	UP MINS/SECS
273	632	630	587	977 (-23)	-	-
274 (1)	724	722	668	962 (-38)	3m 37secs	7m 28secs
274 (2)	720	718	662	958 (-42)	3m 20secs	7m 06secs
275	648	646	516	885 (-115)	2m 59secs	6m 55secs
276	676	674	602	945 (-55)	2m 57secs	7m 10secs
277	764	762	705	962 (-38)	3m 33secs	8m 12secs
278	840	837	754	931 (-69)	Total 14m 08secs	
279	904	901	783	902 (-98)	5m 20secs	10m 23secs
280	960	957	890	945 (-55)	5m 00secs	9m 00secs
281	892	889	828	964 (-36)	4m 00secs	12m 00secs
282	748	746	707	977 (-23)	3m 45secs	12m 12secs
283	864	861	815	978 (-22)	4m 20secs	10m 50secs
284			673	981 (-19)	3m 20secs	8m 05secs

GRAVITY CORER RATES PAY OUT ≃ 240m/min (100m in 25 secs)

TAKE UP ≃ 103m/min (100m in 58 secs)

APPENDIX A

SUMMARY SHIPS LOG

SUMMARY SHIPS LOG

Thurs 13 May

0000-1800	Alongside at Scrabster for port call
1800-2230	Cast off and steam to Rona work area
2230-2400	Gravity coring
2130 (note)	Auto pilot fails. Ship maneouvered by hand steering for the rest of the leg.

Fri 14 May

0000-0600	Gravity coring
0600-1715	Vibrocoring
1715-1815	Stern anchor power pack fails - continue gravity coring
1815-2210	Power pack repaired - resume vibrocoring
2210-2400	Gravity coring

Sat 15 May

0000-0630	Gravity coring
0630-2300	Vibrocoring
2300-2400	Gravity coring

Sun 16 May

0000-0600	Gravity coring
0600-2030	Vibrocoring
2030-2400	Gravity coring

Mon 17 May

0000-0640	Gravity coring
0640-1030	Vibrocoring
1030-1500	Starboard stern anchor winch fails. Standing by.
1500-2150	Winch repaired - resume vibrocoring
2150-2400	Gravity coring

Tues 18 May

0000-0630	Gravity coring
0630-2130	Vibrocoring
2130-2400	Gravity coring

Wed 19 May

0000-2400	Gravity coring including deep water sites

Thurs 20 May

0000-0800	Gravity coring
0800-1630	Vibrocoring
1630-2230	Checking retract system and repairs to vibrocorer while working
2230-2350	Vibrocoring
2350-2400	Gravity coring

Fri 21 May

0000-0715	Gravity coring
0715-0930	Repairing vibrocorer
0930-1230	Continue vibrocoring
1230-1715	Stand by during repairs to the vibrocorer
1715-2130	Vibrocoring
2130-2400	Gravity coring

Sat 22 May

0000-0700	Gravity coring
0700-2115	Vibrocoring
2115-2400	Gravity coring,

Sun 23 May

0000-0715	Gravity coring
0715-2215	Vibrocoring
2215-2400	Gravity coring

Mon 24 May

0000-2400	Gravity coring - weather marginal with heavy westerly swell

Tues 25 May

0000-1245	Gravity coring
1245-1345	Standing by for repairs on main engine fuel pump
1345-1430	Gravity coring
1430-2400	Steam for Aberdeen port call

Wed 26 May

0000-0640	Steaming to Aberdeen port call
0640-2400	Alongside in Aberdeen for port call

APPENDIX B

SHIP: WHITETHORN DATES: 13-26 May LEG NO: 4 SHEET NOS:

	DATE	13	14	15	16	17	18	19	20	21	22	23	24	25	26	TOTALS
Working Time	In Port	18														18.0
	On Passage	4.5												19.9		14.0
	Traversing	1.3	12.3	10.8	10.2	9.5	11.9	11.1	9.9	9.9	11.9	11.4	18.4	10.4		139.0
	Anchoring	-	3.5	6.2	5.5	4.2	7.5	-	4.0	3.2	4.9	6.7	-	-		43.9
	On Station	0.2	7.4	7.0	8.3	6.3	6.4	12.9	9.1	5.3	6.2	5.9	5.6	3.1		83.7
Down Time	Weather															
	SHIP															
	Propulsion													1.0		1.0
	Power Supply															
	Anchoring		0.8			4.0										4.8
	Handling Systems															
	IGS															
	Camera															
	Grab															
	Gravity Corer															
	Vibrocorer								1.0	5.6	1.0					7.6
	Rock Drill															
	Other															
	Winches															
	Power Cables															
No of Stations	Grab	2	12	13	17	15	13	20	14	14	17	15	28	14		194
	Rock Corer													2		2
	Sediment Corer	2	6	7	12	11	7	21	9	11	12	9	28	12		147
	Vibrocorer	-	5	6	5	4	6	-	5	3	5	6	-	-		45
	Drill															
	Other															

Complete to nearest 0.1 hour (6 min)

REMARKS

APPENDIX C

IGS MARINE GEOLOGY UNIT — CRUISE REPORT SHEET

CRUISE NO. 82WH05 (6) LEG 04 (8) DATES: FROM 13052 (14) TO 26052 (20)

CRUISE AREA: RONA SHEET +59-06 (60)

PERSONNEL

Senior Scientist	NGT FANNIN (16)	Maint. Techn.	W LONIE (16)
Day Geologist	D EVANS (32)	Night Deck	J McGUIGAN (32)
Day Laboratory	G TULLOCH (48)	Night Lab	D LONG (48)
Surveyor	HS ROBERTSON (64)	Geochemist	A DAVIS (64)
Deck Technian	J PHEASANT (80)	Other	(80)

SUMMARY ACCOUNT

VERY GOOD WEATHER AND ONLY MINOR SHIP AN (40)
D EQUIPMENT DOWNTIME CORE RECOVERY (80)
POOR IN VERY HARD SEDIMENTS (40)
(80)

TIME ANALYSIS (PERCENTAGES)

WORKING TIME					DOWN TIME											
						SHIP				IGS						
IN PORT	ON PASSAG	TRAN-FERING	ANCH-ORING	ON STATION	WEA-THER	PROJ	POWER	ANCHOR	DECK	GS	FAM G	GRAV C	VE	DRILL	WINCH	OTHER
06	04	45	14	27	00	01	00	02	00	00	00	00	02	00	00	00

(34)

OTHER EQUIPMENT TYPE (44)

RESULTS

EQUIPMENT	SHIPEK G	CAMERA G	CS	CR	VE ANCHO	VE UNANCHO	DRILL	OTHER
	194	000	147	002	045	000	000	000

(68)

OTHER EQUIPMENT for A/A) (78) Enter 'A' if 'OTHER' is anchored ( ) (79)

EQUIPMENT PERFORMANCE

Shipek grab	SATISFACTORY TWO GRABS DAMAGED (40)
Camera grab	(80)
Gravity corer	SATISFACTORY SUCCESSFUL 3M CORING (40)
Vibrocorer	SATISFACTORY A FEW PENTR/RETRACT PROBS (80)
Drills	(40)
Winches	TWO ANCHOR WINCHES FAILED (80)
Other	(40)
Ship	SEVERAL PROBLEMS CAUSING MINOR DELAYS (80)

GEOLOGICAL SUMMARY

SEABED SEDIMENT IS LARGELY SHELLY AND PE (40)
BBLY SANDS UP TO PEBBLE GRADE OVERLYING (80)
STIFF SANDY AND STONEY OVERCONSOLIDATED (40)
TILLS RARELY ? FILLING HOLLOWS - SOFT (80)
CLAYS SILTS AND LOOSE SANDS AT LEAST 6M (40)
THICK IN DEEP WATER PEBBLY SANDS OCCUR (80)

OTHER COMMENTS

DOWN TO 9000M BELOW THIS ARE VERY SOFT (40)
CLAYS WITH SAND LENSES AND PEBBLES (80)
(40)

INSTITUTE OF GEOLOGICAL SCIENCES MARINE GEOLOGY UNIT

CRUISE REPORT ON LEG 4 OF WHITETHORN

CRUISE NO 82/WH/ 5 13- 5-1982 TO 26- 5-1982

SENIOR SCIENTIST: N FANNIN AREA OF STUDY: RONA SHEET +59 -Ø6

PERSONNEL:

SENIOR SCIENTIST: N FANNIN
DAY GEOLOGIST: D EVANS
DAY LABORATORY: G TULLOCH
SURVEYOR: H ROBERTSON
DECK ENGINEER: J PHEASANT
MAINTENANCE ENG: W LONIE
NIGHT GEOLOGIST: J MCGUIGAN
NIGHT LABORATORY: D LONG
GEOCHEMIST: A DAVIS
OTHER:

SUMMARY ACCOUNT OF LEG 4:

VERY GOOD WEATHER AND ONLY MINOR SHIP AN D EQUIPMENT DOWNTIME CORE RECOVERY POOR IN VERY HARD SEDIMENTS

TIME ANALYSIS (PERCENTAGES):

	IN PORT:	6%
WORKING TIME:	ON PASSAGE:	4%
	TRAVERSING:	45%
	ANCHORING:	14%
	ON STATION:	27%
DOWN TIME:	WEATHER:	Ø%
SHIP:	PROPULSION:	1%
	POWER:	Ø%
	ANCHORS:	2%
	DECK:	Ø%
IGS:	SHIPEK GRAB:	Ø%
	CAMERA GRAB:	Ø%
	GRAV CORER:	Ø%
	VIBROCORER:	2%
	ROCK DRILL:	Ø%
	WINCHES:	Ø%

RESULTS (NUMBER OF STATIONS):

SHIPEK GRAB:	194	
CAMERA GRAB:	Ø	
SED CORER:	147	
ROCK CORER:	2	
VIBROCORER:	45	ANCHORED
	Ø	UNANCHORED
ROCK DRILL:	Ø	

EQUIPMENT PERFORMANCE:

SHIPEK GRAB: SATISFACTORY TWO GRABS DAMAGED
CAMERA GRAB:
GRAVITY CORER: SATISFACTORY SUCCESSFUL 3M CORING
VIBROCORER: SATISFACTORY A FEW PENTR/RETRACT PROBS
DRILLS:
WINCHES: TWO ANCHOR WINCHES FAILED
SHIP: SEVERAL PROBLEMS CAUSING MINOR DELAYS

GEOLOGICAL SUMMARY:

SEABED SEDIMENT IS LARGELY SHELLY AND PEBBLY SANDS UP TO PEBBLE GRADE OVERLYING STIFF SANDY AND STONEY OVERCONSOLIDATED TILLS RARELY ? FILLING HOLLOWS - SOFT CLAYS SILTS AND LOOSE SANDS AT LEAST 6M THICK IN DEEP WATER PEBBLY SANDS OCCUR

ADDITIONAL REMARKS:

DOWN TO 9ØØM BELOW THIS ARE VERY SOFT CLAYS WITH SAND LENSES AND PEBBLES