

INSTITUTE OF GEOLOGICAL SCIENCES
MARINE GEOLOGY UNIT
Internal Report No 82/7

CRUISE REPORT ON LEG 3 OF
MV WHITETHORN CRUISE 82/WH/05
29th April - 12th May 1982

by

N G T Fannin

82/7

12th May 1982

1. Personnel

N G T Fannin	IGS MGLU	Party Chief
J A Fyfe	IGS MGLU	Day Geologist
C Graham	IGS MGLU	Night Geologist
N A Ruckley	IGS MGLU	Navigator
E McElvanney	IGS MGLU	Day Laboratory
A Britten	IGS MGLU	Night Laboratory
A Bell (29 April-6 May)	IGS MGLU	Technical Officer
N Campbell (29 April-6 May)	IGS MGLU	Deck Operations
J Pheasant (6 May-12 May)	IGS MGLU	Technical Officer
P J Wiggins (6 May-12 May)	IGS MGLU	Technical Officer
W Lonie (6 May-12 May)	IGS MGLU	Deck Operations
M Stewart	ACU	Geochemical Analysis

2. Area

Rona Sheet (59°N 06°W) (Figure 1)

3. Objectives

Following on an earlier geophysics programme the present cruise (the second of four planned cruise legs in the area) was aimed at obtaining both samples and cores including rock cores. The data will be used in the preparation of the IGS bottom sediments, Quaternary and 'Solid' reconnaissance geology maps.

4. Equipment

The equipment available included a shipek grab, sediment and rock gravity cores, a vibrocorer and a six metre rock drill. The latter drill was mobilised during a mid cruise port call and replaced the vibrocorer.

The shell content of many of the sands is very high and in places exceeding ninety percent. The sands cover a grey sandy and stoney till which blankets areas of Palaeozoic and Mesozoic rocks but which disappears against blocks of crystalline basement rocks which outcrop as reefs and rock pinnacles and the islands of Sule Skerry and Rona. Substantial areas of outcrop with a patchy cover of shelly pebbly sand are associated with the islands and reefs. In other areas the till cover may be very thin, often less than five metres.

The coarseness of the sand and the stiffness of the underlying till meant that gravity core penetration rarely exceeded 0.3m but in deeper water on the continental slope core penetration in excess of 1.5m was obtained. Here the surface sands became finer down slope but at one site coarse pebbly sand was obtained from a depth of 890m.

On the slope these thin surface sands overlies poorly sorted weak sandy clays and clayey sands with scattered pebbles (? dropstones) and relatively rare shell fragments.

The two successful drill sites recovered cores of foliated biotite gneiss to the north east of Rona and on a separate reef to the north west of the island.

7. Equipment Performance

1. Shipek grab - this equipment performed without any problems though two grabs sustained minor damage on striking the hull of the ship as it rolled heavily.

2. Gravity corer - 90mm x 1.5m barrels were used at sediment sites and some cores were recovered. The poor core recovery is not unexpected however given the nature of the terrain. Six 1.3m x 0.1m barrels were damaged on impact, probably as a result of striking cobbles on the seabed. Rock barrels were used over areas of rock outcrop and in several cases may have recovered samples of in situ rock.
3. Vibrocorer - this equipment was not used during the course of the leg.
4. Six metre rock drill - the drill was brought on board as part of its proving trials where it received its initial wet tests.

During mobilisation and run up tests the main drill drive motor blew an oil seal while on the quayside. A temporary repair was effected and this kept the drill operational until the last two days of the leg when the seal failed again allowing sea water to mix with the hydraulic oil. This caused a delay and probably led to a resistor failure in the computer monitored control system. This failure forced the decision to abandon the trial at the end of the leg to allow repairs and further development to be carried out ashore.

The drill however did successfully occupy three sites, recovering core at two of them. At the third site the rock subcropped beneath a sediment cover in excess of 2.5m with coarse shell sand on the seabed. At this site drill penetration stopped and the drill drive stalled at 2.5m depth. It was not clear however whether this was due to a technical fault or to geological problems in the hole. The site was reoccupied and drilled to 1.5m when the drill was pulled off the seabed as the ship moved off station in a heavy swell. The

unsatisfactory outcome of this sequence of events leaves the question of the drill behaviour at sediment covered sites a matter still to be resolved. A diamond studded toothed bit was used at the two rock outcrop sites where core was successfully recovered and a smooth faced diamond bit at the sediment covered site. At the first site penetration was at least 0.75m in seventeen minutes with 0.45m recovery and at the second site the drill penetrated 1.5m in 8 minutes with 0.25m recovery.

Drill handling, launch and recovery systems presented no problems with the equipment handling much like the vibrocorer. An adequate core extraction system will be required in time as will a modified TV mounting point so that the seabed may be inspected prior to drilling. In this respect a combined TV signal and power/control cable would be an advantage as would an improved core retention system. The standard split ring system in the 1m drill has proved inadequate in the past and from limited experience so far it would appear that similar problems will be encountered with the 6m drill. The introduction of a spring gate assembly, perhaps electrically controlled, might go some way to reducing core loss though it has not yet been established whether all of the core drilled is being recovered from the hole prior to lift off from the seabed.

APPENDIX A

SUMMARY SHIPS LOG

Summary Ships Log

Thur 29 April

0000-2400 Mobilising at Scrabster and waiting on weather

Fri 30 April

0000-1000 Waiting on weather at Scrabster

1000-1030 Cast off and steam for Sule Skerry

1030-1400 Abandon attempt and run for shelter in Sinclair Bay

1400-2400 Anchor in Sinclair Bay waiting on weather

Sat 1 May

0000-2400 At anchor in Sinclair Bay waiting on weather

Sun 2 May

0000-0610 At anchor in Sinclair Bay waiting on weather

0610-1230 Raise anchor and steam to Sule Skerry

1230-1812 Abandon plans to sample and steam for shelter in Dunnet Bay

1812-2400 Anchored in Dunnet Bay, waiting on weather

Mon 3 May

0000-0830 At anchor in Dunnet Bay, waiting on weather

0830-1240 Raise anchor and steam to Sule Skerry

1240-1730 Gravity coring in vicinity of Sule Skerry

1730-2350 Abandon sampling and steam for Scapa Flow

2350-2400 At anchor in Scapa Flow, waiting on weather

Tues 4 May

0000-2400 At anchor in Scapa Flow, waiting on weather

Wed 5 May

0000-2400 At anchor in Scapa Flow, waiting on weather

Thurs 6 May

0000-0315 At anchor in Scapa Flow, waiting on weather

0315-0700	Raise anchor and steam to Scrabster
0700-2400	Demobilise vibrocorer and mobilise new 6m drill
<u>Fri 7 May</u>	
0000-0430	Cast off from Scrabster and steam towards Sule Skerry
0430-2400	Gravity coring and continuing drill mobilisation
<u>Sat 8 May</u>	
0000-2100	Continue gravity coring
2100-2330	Wet trials of 6m drill
2330-2400	Gravity coring
<u>Sun 9 May</u>	
0000-1230	Gravity coring
1230-1400	Selecting and anchoring on drill site
1400-1430	Drilling trial with 6m drill
1430-1600	Raise anchors, steam to next site and lay anchors
1600-1930	Drilling with 6m drill. Ship driven off site in heavy swell and drill barrel bent.
1930-2100	Raise anchors
2100-2400	Gravity coring
<u>Mon 10 May</u>	
0000-0430	Gravity coring
0430-0830	Steam towards drill site
0830-0915	Inspect drill site
0915-1115	Anchor on drill site and drill with 6m drill
1115-1300	Oil seal damage to drill - assess damage
1300-1430	Gravity coring
1430-1500	Stop ship for drill repairs
1500-2400	Gravity coring
<u>Tues 11 May</u>	
0000-0920	Gravity coring

0920-1125 Anchor for drill tests

Wed 12 May

0000-0010 Gravity coring

0010-0640 Approaching Scrabster for port call

0640-2400 Alongside Scrabster - demobilising 6m drill and remobilising
vibrocorer

APPENDIX B

CRUISE NO. 8, 2 W H 0 5 6

LEG 0 3 8

DATES: FROM 2 9 0 4 8 2 14

TO 1 2 0 5 8 2 20

CRUISE AREA R O N A + 5 9 - 0 6

PERSONNEL

Senior Scientist

N, G, T, F, A, N, N, I, N, 16

Day Geologist

J, A, F, Y, F, E, 32

Day Laboratory

E, M, c, E, L, V, A, N, N, E, Y, 48

Surveyor

N, A, R, U, C, K, L, E, Y, 64

Deck Technician

N, C, A, M, P, B, E, L, L, 80

Maint. Techn.

A, B, E, L, L, 16

Night Deck

A, B, R, I, T, T, E, N, 32

Night Lab

C, G, R, A, H, A, M, 48

Geochernist

M, S, T, E, W, A, R, T, 64

Other

, 80

SUMMARY
ACCOUNT

P O O R W E A T H E R C U R T A I L E D W O R K S I X M E T R E D
R I L L T R I A L S W E R E S U C C E S S F U L 2 C O R E S O F
B I O T I T E G N E I S S W E R E R E C O V E R E D I N M O S T A
R E A S T H I N P E B B L Y S A N D C O V E R S S T O N E Y T I L L

TIME ANALYSIS (PERCENTAGES)

WORKING TIME					DOWN TIME											
IN	ON	TRAN	ANCH	ON	WEA	SHIP				IGS						
PORT	PASS	AGING	DRING	STATION	OTHER	PROP	POWER	ANCH	DECK	GS	TAM	G	GRAV	C	VE	DRILL
1	4	8	2	2	0	1	1	0	4	2	0	1	0	0	0	0

OTHER EQUIPMENT TYPE
6 M D R I L L

RESULTS

EQUIPMENT	SHIPEK G	CAMERA G	CS	CR	VE ANCH	ME UNANCH	DRILL	OTHER
	1	0	8	8	8	8	1	4

OTHER EQUIPMENT (or A(A))
6 M D R I L LEnter 'A' if
'OTHER' is
anchored

A

EQUIPMENT PERFORMANCE

Shipek grab

S, A, T, I, S, F, A, C, T, O, R, Y, 16

Camera grab

, 32

Gravity corer

S, A, T, I, S, F, A, C, T, O, R, Y, 48

Vibrocoring

, 64

Drills

6 M, D R I L L, R E Q U I R E S, F U R T H E R, D E V E L O P M E N T, 80

Winches

S, A, T, I, S, F, A, C, T, O, R, Y, 16

Other

, 32

Ship

S, A, T, I, S, F, A, C, T, O, R, Y, 48

GEOLOGICAL
SUMMARY

S H E L F C O V E R O F P E B B L Y A N D S H E L L Y S A N D O V
E R S A N D Y A N D S T O N E Y S T I F F T O H A R D D A R K
G R E Y T I L L O U T C R O P A R E A S M A I N L Y X T A L L I N
E B A S E M E N T F O R M I S L A N D S A N D R E E F S A T T O P
O F S L O P E S O F T S A N D Y P O O R L Y S O R T E D C L A Y S
U N D E R L I E S A N D W H I C H M A Y B E P E B B L Y A T 9 0 0

OTHER
COMMENTS

M E T R E S D E P T H C O R E R E C O V E R Y P O O R O N
S H E L F B U T I M P R O V E S B E L O W 3 0 0 M

RESULTS (NUMBER OF STATIONS).

SHIPEK GRAB:	108
CAMERA GRAB:	0
SED CORER:	88
ROCK CORER:	14
VIBROCORER:	0 ANCHORED
	0 UNANCHORED
ROCK DRILL:	0
6M DRILL	3

EQUIPMENT PERFORMANCE:

SHIPEK GRAB: SATISFACTORY
CAMERA GRAB:
GRAVITY CORER: SATISFACTORY
VIBROCORER:
DRILLS: 6M DRILL REQUIRES FURTHER DEVELOPMENT
WINCHES: SATISFACTORY
6M DRILL
SHIP: SATISFACTORY

GEOLOGICAL SUMMARY:

SHELF COVER OF PEBBLY AND SHELLY SAND OVER SANDY AND STONEY STIFF TO HARD DARK GREY TILL OUTCROP AREAS MAINLY XTALLINE BASEMENT FORM ISLANDS AND REEFS AT TOP OF SLOPE SOFT SANDY POORLY SORTED CLAYS UNDERLIE SAND WHICH MAY BE PEBBLY AT 900

ADDITIONAL REMARKS:

METRES DEPTH CORE RECOVERY POOR ON SHELF BUT IMPROVES BELOW 300M

CRUISE REPORT ON LEG 3 OF WHITETHORN

CRUISE NO 82/WH/ 5

29- 4-1982 TO 12- 5-1982

SENIOR SCIENTIST: N FANNIN

AREA OF STUDY: RONA +59 -06

PERSONNEL:

SENIOR SCIENTIST: N FANNIN
DAY GEOLOGIST: A FYFE
DAY LABORATORY: E MCELVANNEY
SURVEYOR: N RUCKLEY
DECK ENGINEER: N CAMPBELL
MAINTENANCE ENG: A BELL
NIGHT GEOLOGIST: C GRAHAM
NIGHT LABORATORY: A BRITTEN
GEOCHEMIST: M STEWART
OTHER:

SUMMARY ACCOUNT OF LEG 3:

POOR WEATHER CURTAILED WORK. SIX METRE D
RILL TRIALS WERE SUCCESSFUL. 2 CORES OF
BIOTITE GNEISS WERE RECOVERED. IN MOST A
REAS THIN PEBBLY SAND COVERS STONEY TILL

TIME ANALYSIS (PERCENTAGES):

	IN PORT:	14%
WORKING TIME:	ON PASSAGE:	8%
	TRAVERSING:	22%
	ANCHORING:	1%
	ON STATION:	10%
DOWN TIME:	WEATHER:	42%
SHIP:	PROPULSION:	1%
	POWER:	0%
	ANCHORS:	0%
	DECK:	0%
IGS:	SHIPEK GRAB:	0%
	CAMERA GRAB:	0%
	GRAV CORER:	0%
	VIBROCORER:	0%
	ROCK DRILL:	0%
	WINCHES:	0%
	6M DRILL	2%