

IGS CONTINENTAL SHELF UNIT II  
The Firth of Clyde and Malin Sea  
Cruise Report M V Whitethorn 27 Feb/4 April  
1973  
Cruise 73/WH/01

by

C E DEEGAN

Copyright is reserved for the contents of this report, no part of which may be reproduced without permission of the Director of the Institute of Geological Sciences.

Report dated 25th May 1973

Institute of Geological Sciences  
Continental Shelf Unit II  
West Granton Road, Edinburgh EH5 1JA

Phone No: 031-552-4232

## INTRODUCTION

This was the first cruise of the 1973 field season and was run in three legs, commencing from the Tyne and terminating in the Clyde and Malin Sea area. During the first and the third legs weather conditions were very poor but an amelioration during the second leg permitted five borehole sites to be occupied (Fig 1 and Appendix 1).

During the second leg additional personnel on board were Lt Cmdr T McAndrew of the Hydrographic Dept (for four days) and M D Brasier (IGS Palaeontology Dept, Leeds), and during the third leg P Collins (IGS Engineering Geology Unit) joined to carry out engineering tests at sea on fresh sediment cores. Personnel details are given in Appendix 2.

Position fixing throughout the cruise was by Decca RM 729 Alpine Radar Ranger (for boreholes) and Main Chain Decca for standard sampling and geophysical traversing.

## OBJECTIVES

The primary objective was to complete the remaining borehole sites in the Firth of Clyde and to attempt to drill on new positions in the Malin Sea. Standby work involved standard sampling in the Malin Sea and additional geophysical traversing. During leg three a close sampling grid in the Clyde was undertaken to provide argillaceous samples for on-board engineering tests.

The following cruise sheets (Fig 1) are being prepared for circulation.

55N 05W  
55N 06W  
55N 07W  
55.5N 05W  
55.5N 06W  
55.5N 07W

## CRUISE SUMMARY

Tues 27 Feb	Depart Tyne. Bunkering and steaming towards the Pentland Firth.
Wed 28 Feb	Steaming around to the west coast.
Thur 1 March	Steaming around to the west coast.
Fri 2 March	Steaming, then at anchor in Red Bay due to weather conditions.
Sat 3 March	Anchored followed by standard sampling.

Sun	4 March	Standard sampling. An attempt was made to moor up on site 21 but deteriorating weather prevented this.
Mon	5 March	Standard sampling.
Tues	6 March	Standard sampling then at anchor in Brodick Bay.
Wed	7 March	At anchor in Brodick Bay then steaming to Greenock for port call.
Thur	8 March	In dock at Greenock.
Fri	9 March	In dock at Greenock then steaming to site 21 and mooring up. Commenced drilling on site.
Sat	10 March	Drilling on site 21 (BH 73/1).
Sun	11 March	Completing BH 73/1 then at anchor in Brodick Bay due to dense fog. T McAndrew ashore.
Mon	12 March	At anchor in Brodick Bay, then steaming to site 25. Mooring up and drilling on site 25 (BH 73/2).
Tues	13 March	Completing BH 73/2 then geophysical traversing.
Wed	14 March	Geophysical traversing then mooring up on site 168. Commenced drilling on site 168 (BH 73/3).
Thur	15 March	Drilling on BH 73/3.
Fri	16 March	Completing BH 73 /3. Steaming to site 175 and mooring up. Commenced drilling on site 175 (BH 73/4).
Sat	17 March	Drilling on BH 73/4.
Sun	18 March	Completing BH 73/4 followed by routine sampling.
Mon	19 March	Steaming to site 26. Mooring up and drilling on site 26 (BH 73/5).
Tues	20 March	Drilling on BH 73/5.
Wed	21 March	Completing BH 73/5 then steaming to Ardrossan for port call.
Thur	22 March	In port in Ardrossan.
Fri	23 March	In port in Ardrossan then routine sampling and traversing. Anchored in Brodick Bay overnight due to weather.
Sat	24 March	Anchored in Brodick Bay followed by routine sampling and traversing. Anchored in Brodick Bay overnight due to weather.
Sun	25 March	Anchored in Brodick Bay followed by routine sampling and traversing.
Mon	26 March	Routine sampling in the Malin Sea.
Tues	27 March	Steaming and then sheltering in Port Stewart Bay. Standing

by to assist the M V Olga which ran aground on Islay.

Wed 28 March Standing by assisting the M V Olga. Standard sampling in the Malin Sea.

Thur 29 March Geophysical traversing, then anchored in Brodick Bay.

Fri 30 March Anchored at Brodick Bay followed by geophysical traversing.

Sat 31 March Geophysical traversing, then at anchor in Brodick Bay.

Sun 1 April Anchored in Brodick Bay, then geophysical traversing.

Mon 2 April Geophysical traversing. Attempted to moor up on site 12 but prevented by weather.

Tues 3 April Geophysical traversing, then standing by off Brodick due to bad weather.

Wed 4 April Standing by due to weather, then geophysical traversing. Steaming to Greenock for port call.

#### SUMMARY OF WORK

1. Five borehole sites were successfully occupied (Appendix 1).
2. During the standard sampling operations 151 stations were occupied with the following equipment:

Shipek grab	94 stations
Gravity corer	143 stations
Vibrocorer	1 station

3. Approximately 800 km of geophysics traverse lines were run mainly using an E G and G sparker with a Giffit recorder. An ORE pinger and Atlas echo sounder were also utilised.

#### EQUIPMENT PERFORMANCE

##### 1. Drilling

The wire line gear in general proved very effective and the provision of an inner wire line string has overcome the problem of having to abandon a hole if the bit becomes blocked by a cobble. However, some difficulty was experienced with the latches on the core barrels resulting in considerable time loss on one site. These latches will not function properly unless they are accurately constructed and scrupulously maintained.

On borehole 73/4 one of the joints in the drill string backscrewed, apparently because it had not been torqued up correctly, and this resulted in a considerable loss of equipment. Some of the inner wire line gear was also lost on Borehole 73/3 due to jamming at the bottom of the hole. All attempts to free it ~~being~~ were

unsuccessful. The programme was not seriously affected by these losses. The use of power tongs instead of a power swivel was an improvement as the power swivel used in 1972 appeared to be slightly underpowered.

## 2. Routine sampling equipment

The gravity corers and Shipek grab worked satisfactorily throughout the cruise. There was little opportunity to use the vibrocorer on the first and third legs because of the weather conditions, and on the second leg the ship was mainly drilling. However, when it was used some difficulty was encountered with mechanical strain and earth leakage at the joint immediately above the pot. There was not sufficient operational time on this cruise to fully resolve this problem.

## 3. ORE Pinger

This was used in conjunction with the sparker and gave quite acceptable results. However, it was noted that the overload light came on at an operating power of greater than 2.5 KV. This was subsequently traced to a short circuit under load in the cable to the winch.

## 4. Sparker

During legs 1 and 2 a sparker on loan from RVB (using a 3 candle array) was used and performed satisfactorily. For leg 3 a new IGS sparker was on board (using a multi-electrode array). The trigger and capacitor banks were located in a hut on the stern deck of the vessel and during one period of very bad weather water leaked through the roof of the hut onto the terminals at the top of the trigger bank. This caused a short circuit and arcing between one terminal and the chassis of the trigger bank. This was repaired by removing the terminal plate and cutting away the carbon path of the arcing. On reassembly and drying out the equipment worked well. The possibility of a recurrence has been removed by relocating the trigger and capacitor banks in the Wimpey engine hold.

Chaffing of the wires against the frame occurred on the output side of the IGS (Leeds) generator. This was repaired temporarily and later rectified by insertion of a plug at this point.

The restriction of having only one scale control on the Ciffit recorder when

when operating in the dual channel mode was an inconvenience, but in future cruises this will be overcome by the use of an additional recorder unit.

5. Alpine PRA

This worked well throughout the cruise.

6. Engineering Geology acoustic velocity testing equipment

The purpose of this equipment is to test for acoustic differences along sediment cores without removing the latter from their plastic liners. A movable transducer and receiver are mounted either side of the core and acoustic travel times are recorded at various positions along the length of the core. It appears almost certain that there is a relationship between travel times and lithology. Results are at present being evaluated by the Engineering Geology Unit.

C E Deegan

Senior Scientist

24th May 1973

APPENDIX 1

BOREHOLE SUMMARY LOGS

Ages are given for strata are provisional field suggestions pending completion of palaeontological and petrographical work.

Borehole 73/1 (Planned site 21)

9 $\frac{3}{4}$  km E of Holy Island, Arran  
Main Chain Decca 3B position

Red D 14.55  
Purple I 52.25

Water depth 84 m

DRIFT

- |    |   |         |
|----|---|---------|
| 1. | Dark grey, soft, calcareous silty clays | 37.00 m |
| 2. | Brown sandy boulder clay                | 13.00 m |

? NEW RED SANDSTONE

- |    |  |         |
|----|--|---------|
| 3. | Soft, red, micaceous silty marl with green reduction spots | 10.00 m |
|----|--|---------|

Total depth 60.00 m

Borehole 73/2 (Planned site 25)

12 $\frac{1}{2}$  km W of Turnberry Point  
Main Chain Decca 3B position

Red D 20.85  
Purple G 55.35

Water depth 54 m

DRIFT

- |    |                        |         |
|----|------------------------|---------|
| 1. | Soft, grey silty clays | 24.14 m |
| 2. | Sandy boulder clay     | 4.16 m  |

? NEW RED SANDSTONE OR BARREN RED MEASURES

- |    |   |         |
|----|---|---------|
| 3. | White and purple mottled sandstones with purple micaceous marl partings | 16.12 m |
|----|---|---------|

Total depth 44.42 m

Borehole 73/3 (Planned site 168)

11 $\frac{1}{4}$  km WNW of Machrihanish Bay.  
Main Chain Decca 3B position

Red G 15.5  
Purple H 53.45

Water depth 80 m

DRIFT

- |    |                  |        |
|----|------------------|--------|
| 1. | Sand             | 8.44 m |
| 2. | Red boulder clay | 5.06 m |

? CARBONIFEROUS

- |    |                                       |        |
|----|---------------------------------------|--------|
| 3. | Soft, coarse, white friable sandstone | 4.35 m |
|----|---------------------------------------|--------|

Total depth	17.85 m
-------------	---------

Borehole 73/4 (Planned site 175)

12 $\frac{1}{2}$  km W of Gigha Island

Main Chain Decca 3B position

Red G 15.91

Purple H 79.50

Water depth 84 m

DRIFT

- |    |                    |        |
|----|--------------------|--------|
| 1. | Muddy sand         | 4.50 m |
| 2. | Stiff boulder clay | 2.00 m |

? NEW RED SANDSTONE

- |    |   |        |
|----|---|--------|
| 3. | Purple and white mottled conglomerate and sandstone | 2.77 m |
|----|---|--------|

Total depth	9.27 m
-------------	--------

Borehole 73/5 (Planned site 26)

7 km WNW of Turnberry Point

Main Chain Decca 3B position

Red D 13.00

Purple G 60.75

Water depth 66 m

DRIFT

- |    |  |         |
|----|--|---------|
| 1. | Silty clays  | 17.00 m |
| 2. | Boulder clay   | 6.60 m  |
| 3. | Red sandstone (boulder)                                | 0.52 m  |
| 4. | Boulder clay with some indurated and stiff clay layers | 6.88 m  |

CARBONIFEROUS

- |    |                                       |        |
|----|---------------------------------------|--------|
| 5. | Coal, indurated, with pyrites streaks | 0.20 m |
| 6. | Friable grey sandstone                | 0.60 m |

Total depth	31.80 m
-------------	---------



The occurrence of red marl in Borehole 73/1 suggests an extension of the New Red Sandstone of Arran as far as this vicinity. This region of the Clyde however is complicated by the intersection of NE-SW faults and NW-SE faults and probably the contact with Ayrshire Carboniferous lies near this borehole.

The red beds of Borehole 73/2 could be either of New Red Sandstone or Barron Red Measures age. The latter suggestion would be in keeping with geophysical evidence and is supported by the occurrence of coal in Borehole 73/5 to the east north east. The sparker records in this region are equivocal, with poor resolution, but are more typical of Upper Palaeozoic than Mesozoic sediments.

The white friable sandstone of Borehole 73/3 closely resembles a Carboniferous gannister and if this is the case would indicate a seaward extension of the Machrihanish Coalfield.

The red beds of Borehole 73/4 could well be near the feather-edge of the New Red Sandstone. There is a well defined sedimentary sequence almost certainly of NRS age extending into the vicinity from the North Channel. This interpretation would be consistent with the presence of two small outliers of red sandstone on the western coast of Kintyre which, although originally mapped as Old Red Sandstone, are more probably New Red Sandstone. The New Red Sandstone appears to be feathering out against what was probably an ancient land surface of older, predominantly Dalradian rocks.

Borehole 73/5 recovered coal and sandstone suggestive of high horizons in the Carboniferous. This would indicate an extension of the Ayrshire Coalfield further south than was originally anticipated, but this is not at variance with the gravity data. The drift sequence is of interest here and the stiff clays associated with the boulder clay require further study.

APPENDIX 2

MOVEMENT OF PERSONNEL

Cruise Period	J A Chesher*	C E Deegan*	T McAndrew/	M Brasier**	P Collins//	H Robertson
Leg 1 27 Feb-8 March	X					X
Leg 2 9 March-22 March		X	X for 4 days	X		
Leg 3 23 March-4 April		X			X	

- \* Continental Shelf Unit II, Edinburgh
- / Hydrographic Dept, MOD
- \*\* IGS Paleontology Department (Leeds)
- // IGS Engineering Geology Unit (Exhibition Road)

AREA OF CRUISE 73/WH/01



