INSTITUTE OF GEOLOGICAL SCIENCES
CONTINENTAL SHELF UNIT NORTH

Report No, 76/ 7

CHALLENGER CRUISE

76/CH/06

1 - 16 May, 1976

by

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Report dated 9th September 1976

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Challenger Cruise Report

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INTRODUCTION

The report concerns a 15 day cruise aboard RRS Challenger from 1st to 16th May, 1976. The primary object of the cruise was to sample rock outcrop employing the IGS/BAC Consub system, with the 1m 'Midi'drill as a backup. Other intended forms of sampling included gravity coring (solid and sediment) and grabbing, while Consub sites could be investigated using either the pinger, PDR or echosounder,

Navigation was generally by Main Chain Decca, normally supported by Radar fixes and the ship's Satellite Navigation System, The Decca was predicatably found to be unreliable in many of the coastal areas studied.

PERSONNEL

D.A. Ardus	IGS	CSUN	Senior Scientist
D. Evans	IGS	CSUN	
J. McGuigan	IGS	CSUN	
C. Graham	IGS	CSUN	
A. Fyfe	IGS	CSUN	
P.J. Wiggins	IGS	CSUN	
R.A.E. Beasant	BAC		
J. Burnett	BAC		
P. Smith	BAC		
C. Davies	BAC		
R. Tuson	Vickers Oceanics (to 12th May)		

EQUIPMENT EMPLOYED

Consub System

1m 'Midi' drill system

Gravity Corer (Sediment barrels and Rock barrels)

Shipek grab

Day grab

EDO Western Pinger

Kelvin Hughes PDR

Atlas Echosounder

CRUISE DIARY (Abridged)

Thursday	April 29		Mobilisation, Aberdeen
Friday	April 30		Mobilisation, Aberdeen
Saturday	May 1		Mobilisation, Aberdeen
		1715	Depart Aberdeen, steam for Orkneys
Sunday	May 2	0815	Sampling and geophysics in North Sound Orkney, preparations on Consub continue
		2100	Consub launched in North Sound (SU76-1)
		2210	Consub retrieved
		2315	Geophysics
Monday	May 3	0715	End Geophysics
		0946	Consub dive (SU76-2), North Sound, Orkney
		1425	Consub retrieved
		1530	Grab sampling
		2230	End sampling, begin geophysics
Tuesday	May 4	0455	Poor weather ends geophysics, standing by in North Sound
		1035	Start on grabbing line to Shetland
		2145	End sampling off Mousa, geophysics
Wednesday	May 5	0900	End geophysics
		1021	Consub launched (SU76-3) in Mousa Bay
		1415	Consub recovered. D.A. Ardus put ashore to collect equipment and liaise with J.E. Wright.
		1520	Steam for Lerwick to pick up D.A. Ardus, core liner and tubing(which had not arrived).
		2014	Begin sampling (rock coring) to South of Bressay after going alongside at Lerwick.
		2215	End sampling, geophysics

Thursday	May 6	0630	End Geophysics
		0927	Consub dive (SU76-4) begins, East of Noss
		1134	Consub retrieved, steam to next site, then grabbing due to Consub downtime.
		1905	Consub launched (SU76-5)
		2202	Consub retrieved
		2230	Gravity coring
		2350	Geophysics
Friday	May 7	0530	Geophysics abandoned due to weather
		1125	At anchor off Dales Voe, Shetland. Consub preparations continue.
		1315	Consub off deck, dive (SU76-6)
		1555	Consub recovered
		1848	Consub launched, dive (SU76-7)
		2204	Consub recovered. Remain at anchor awaiting improvement in weather.
Saturday	May 8	1020	Consub launched at site SU76-8, NE of Noss.
		1218	Dive completed
		1330	Consub dive SU76-9 begins, but abandoned due to faulty pan and tilt. Standby for repair.
		1538	Consub launched (SU76-9)
		1847	Consub recovered, gravity coring in N entrance to Lerwick Harbour, weather poor.
		2400	End sampling in sheltered water, standby on weather.
Sunday	May 9	0950	Consub launched (SU76-10), 20 miles NE of Noss.
		1156	Consub on deck. Modifications to drill begin. Work on assembling 'Midi' drill begins.
		2000	Midi drill launched.
		2150	Midi drill recovered, steam for W. Orkney.
Monday	May 10	1005	Midi drill launched at North Shoal, West of Orkneys, but unsuccessful
		1145	Midi drill launched
		1335	Midi drill recovered, steam for site west of Hoy.
		1756	On site, Consub launched, SU76-11
		2000	Consub recovered, steam for Minch site.
Tuesday	May 11	1223	Consub launched after brief PDR traverse, dive SU76-12
		2055	Consub recovered, steam for Tiree to land Dick Tuson.
Wednesday	May 12	0912	Steaming for Blackstones Bank after landing Dick Tuson.
		1300	Swell and wind (5-6) too strong at site, steam to site SE of Ross of Mull.
		1600	This site too exposed in freshening wind, proceed to site of Loch Buie, Mull
		1830	Too windy at Loch Buie, aim to sample in Loch Linnhe. Wind getting up to 60kn.
		2045	Sampling impossible, standby for weather improvement.

Thursday	May 13	0827	Consub launched, dive SU76-13, SE of Ross of Mull,
		1158	Consub recovered, steam for Blackstones.
		1515	On site, but Consub non-operational,
		1935	Consub launched, site SU76-14.
		2134	Consub on deck, steam for Giant's Causeway.
Friday	May 14	0530	Begin geopgysics off Portrush
		1033	Consub launched off Giant's Causeway (SU76-15)
		1135	Consub recovered, steam to site of Mull of Oa,
		1400	On site, but tides too strong, steam to site off Bellochantuy, West of Kintyre.
		1825	Consub launched (SU76-16) abandoned due to compass fault.
		1945	Consub recovered, begin sampling,
Saturday	May 15	0420	End sampling, steam to North of Islay.
		0800	Begin sampling, including Midi drill (unsuccessful)
		1530	Consub launched (SU76-17)
		1745	Consub recovered, head for Scalasaig Shoal, East of Colonsay,
		1954	Consub launched (SU76-18)
		2230	Consub recovered, steam for Kilbrannan Sound,
Sunday	May 16	0915	Consub launched on Erins Bank, Kilbrannan Sound (SU76-19),
		1051	Consub recovered, steam for Ardrossan.
		1330	Alongside at Ardrossan, demobilisation
		2200	Demobilisation completed.

EQUIPMENT PERFORMANCE

(i) Consub system

The time utilization breakdown shows that the Consub system was non-operational for 43% of the cruise. Although this percentage would be considerably less if the hours of darkness were excluded from the total available time, much time was lost due to breakdown. Causes of downtime were varied, but major problems resulted from water leakage into the junction box and malfunctioning of the rock drill.

Submersible deployment and recovery was satisfactory as was the handling of Consub on the seabed, although very strong tides in the Malin Sea caused severe problems. The scientific programme was however affected by the limitations of the drilling capacity of Consub, particularly with loss of core from the barrel after successful drilling.

TABLE I : TIME UTILIZATION ANALYSIS, "CHALLENGER" APRIL 1976.

ATE, APRIL	ON PASSAGE	PROFILING	SAMPLING	CONSUB DEPLOYED	CONSUB ON STATION	DELAYS, INCL. WEATHER	TOTAL TIME	CONSUB DOWNTIME	OTHER MAJOR CAUSES OF DELAY + COMMENTS
1	6·5	-	-	-	-	-	6·5	6·5	Leave Aberdeen
2	8·3	2·6	0·5	1·2	2·4	10·2	24·0	21·0	Weather + initial setup of Consub
3	-	8·1	9·0	4·8	6·3	0·6	24·0	9·0	Weather
4	-	7·2	11·2	-	-	5·6	24·0	24·0	
5	4·9	10·8	2·0	3·9	6·3	-	24·0	5·1	Call at Lerwick
6	6·2	6·7	3·5	4·1	6·0	1·6	24·0	6·4	
7	8·1	5·5	-	6·0	6·7	3·7	24·0	2·0	
8	1·5	-	5·0	5·5	9·4	8·1	24·0	8·5	Weather
9	4·1	-	1·8	2·1	2·8	15·1	24·0	12·6	Midi drill assembled.
10	17·1	-	2·6	2·1	2·6	1·7	24·0	12·0	
11	13·1	2·0	-	8·4	8·7	0·2	24·0	-	
12	15·3	-	-	-	0·7	8·0	24·0	-	Weather + call at Tiree
13	12·8	0·5	-	5·5	6·6	4·1	24·0	6·3	
14	11·0	4·4	1·8	2·8	4·7	2·1	24·0	6·3	
15	6·2	-	7·0	4·5	7·1	3·7	24·0	15·8	
16	10·7	-	-	1·7	2·3	-	13·0	-	Arrive Ardrossan
TOTALS	125·8	47·8	44·4	52·6	72·6	64·7	355·5	135·5	TOTALS
%	35·4	13·4	12·5	14·8	20·4	18·2	-	38·1	% OF TOTAL TIME

(ii) Midi Drill

The Midi drill was successfull on the first site west of Orkney where good core was recovered, but later in the cruise suffered a bearing failure. The handling of the Midi drill from Challenger was good, and the Spirotechnique TV system proved most satisfactory.

(iii) Other sampling

(a) Coring. Gravity coring was moderately successful, but its usefulness was limited by the lack of a core trough which made core handling hazardous even in good weather conditions. Furthermore, the problem of poorly fitting liner tubing restricted sediment coring,

(b) Grabbing, The shipek grab operated well, despite the loss of one grab when the winch broke down, the grab being pulled along a rocky bottom before becoming fast and breaking. The Day grab proved to be non-operational.

(iv) Geophysics

The EDO Western system worked satisfactorily but the generally sandy bottom conditions did not allow for good penetration. The forward towing boom however was most unsatisfactory and the towing speed of 3.5 knots placed considerable limitation on the value of the instrument. The results deteriorated markedly in a moderate sea.

The PDR operated well and the Atlas echosounder proved useful later in the cruise after repair.

BRIEF RESUMÉ OF GEOLOGICAL RESULTS

A East of Shetland (see Fig. 1)

This area proved to be the most successful geologically, although failure of the Consub drill core retention prevented the recovery of some samples. The extent of the Old Red Sandstoneoff Bressay remains problematical but samples obtained should help improve future seismic interpretations of this area.

Sediment samples from this area were almost all of shelly sand or gravel.

B North West Orkney (see Fig. II)

The Consub exercises in the North Sound were of little geological value, being used primarily to establish operations procedures in a sheltered area. No rock cores were recovered and no Old Red Sandstone outcrop was found. The sediment was shelly sand and gravel, often in the form of large ripples up to 1.5m in amplitude.

The 'Midi' drill site at the North Shoal retrieved a schistose rock whose affinities are as yet uncertain. Further indentification of this sample should provide useful data concerning the basement geology of this area.

C Minch (see Fig. III)

The ?Carboniferous outcrop was not found, but a gabbro sample was drilled from a well defined pinnacle, probably a large sill. The sample was taken at the end of a successful eight hour traverse with the ship and vehicle travelling in tandem over a pre-planned course.

D Hebrides/Malin Sea (see Fig. III)

Unfortunately the weather allowed only one restricted dive at the Blackstones Bank, which did not locate outcrop as the ship lost station. Dives south-east of the Ross of Mull and off Scalasaig were successful and retrieved samples from outcrop. The latter is a Tertiary quartz dolerite, the former has not presently been identified.

Dives in the Malin Sea proved untenable due to the tidal conditions encountered. Useful sediment sampling was carried out in the Sound of Jura and North of Islay.

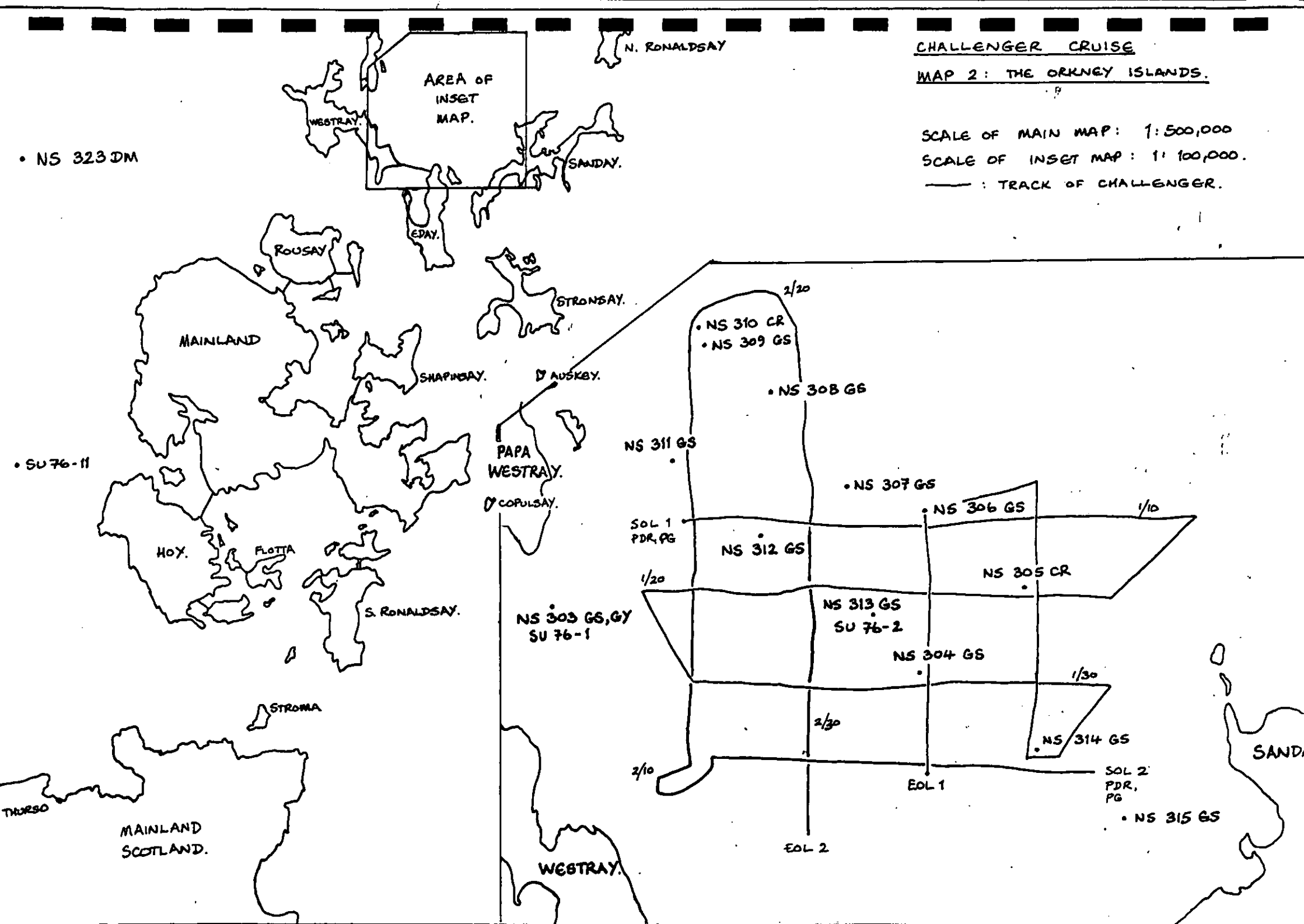
E Clyde (see Fig, III)

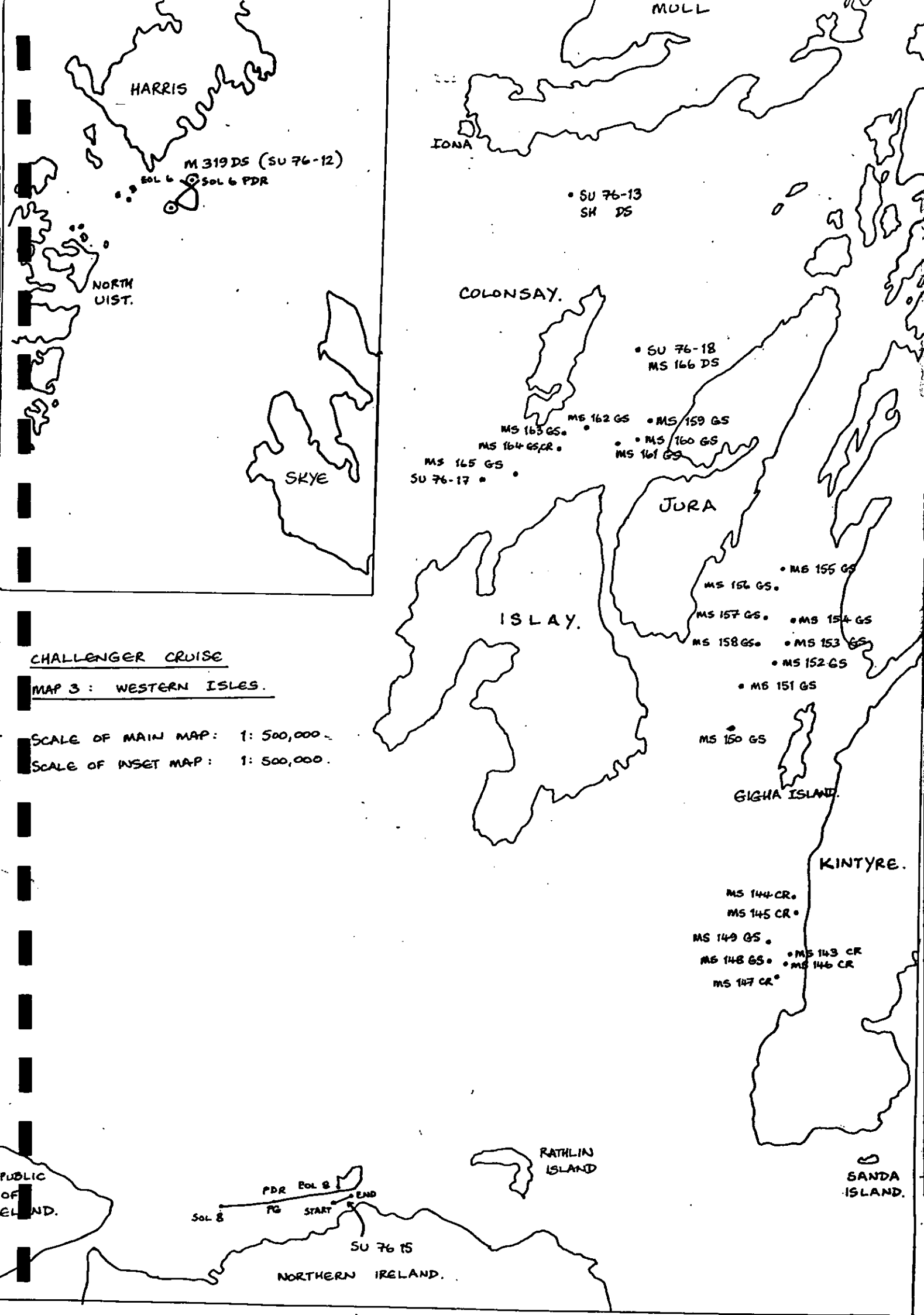
Rock outcrop was identified at Erins Bank , Kilbrannan Sound, although the core drilled was not retained,

CONCLUSIONS

The scientific programme was severely affected by the changeable weather encountered during the cruise which prevented work on most sites. The work was also adversely affected by the poor recovery of the Consub rock drill as well as the technical problems encountered with the submersible.

Future cruises with Consub should have useful backup projects to allow good use to be made of the vessel in bad weather and when tidal conditions impose limitations on vehicle operations.


CHALLENGER CRUISE
MAP 2 : THE ORKNEY ISLANDS.
SCALE OF MAIN MAP : 1:500,000
SCALE OF INSET MAP : 1: 100,000.
—— : TRACK OF CHALLENGER.
AREA OF INSET MAP.
N. RONALDSAY
WESTRAY.
SANDAY.
EDAY.
ROUSAY
STRONSAY.
MAINLAND
SHAPINSAY.
AUSKBY.
PAPA WESTRAY.
COPULSAY.
HOY.
FLOTTA
S. RONALDSAY.
STROMA
THURSO
MAINLAND SCOTLAND.
WESTRAY.
• NS 323 DM
• SU 76-11
NS 303 GS, GY
SU 76-1
2/20
• NS 310 CR
• NS 309 GS
• NS 308 GS
NS 311 GS
• NS 307 GS
• NS 306 GS
1/10
SOL 1
PDR, PG
NS 312 GS
1/20
NS 305 CR
NS 313 GS
SU 76-2
NS 304 GS
1/30
2/30
NS 314 GS
2/10
EOL 1
SOL 2
PDR,
PG
• NS 315 GS
EOL 2
SAND



CHALLENGER CRUISE

MAP 3 : WESTERN ISLES.

SCALE OF MAIN MAP: 1: 500,000

SCALE OF INSET MAP: 1: 500,000.