Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory

Cruise Report

R.R.S. CHALLENGER

Cruise 14/80 Legs A and B

11 - 25th Sept. 1980.

RRS CHALLENGER, Cruise 14/80 Leg A

Duration of Cruise : 11-19th September 1980

Locality : Rockall Trough.

Participants: : Dr J.D. Gage, S.M.B.A.

Mrs Margaret Pearson, S.M.B.A.

Miss Katherine Faccenda, "

Dr A.J. Southward, M.B.A.

Dr Eve Southward, "

R.L. Barrett, "

Dr P.A. Tyler, Dept. Oceanography, Univ. Coll. Swansea

Miss Stephanie Paine " " "

Miss Sandra Lancaster, " " "

S.Smith, R.V.S.

T. Bowmer, Univ. Coll. Galway, (Irish Observer)

Aims: :

1) To obtain seasonal samples of deep-sea benthos and deep plankton at the SMBA Permanent Station and at station 'M' using the epibenthic sled, Agassiz trawl and RMT 1.
2) To obtain seabed photographs using a new towed camera sled.
3) To continue trials, and to obtain quantitative bottom samples, with the RVS box corer.

Narrative: : (all times G.M.T.).

Challenger sailed on schedule at 0930 hrs 11 Sept for the Permanent Station at 54°40'N 12°16'W. Wind and seas were initially light although visibility was poor, and weather prospects were not good. The weather

in fact very quickly deteriorated with winds reaching storm force. Challenger eventually was forced to heave to off Malin Head. Because of continuing problems with the steering gear hydraulics, which apparently had plagued the previous cruise, Challenger was forced to seek shelter in the Sound of Jura anchoring in Claggan Bay at 1700 hrs 12 Sept. The air in the system was removed and repairs made by the engineers. By morning of 13th Sept. the worst of the weather had passed and Challenger weighed anchor and resumed passage to the Permanent Station. However, progress was adversely affected by increasingly heavy weather as Challenger rounded Tory Island.

By Sunday 14th Sept., the wind had eased but sea conditions were still poor with a heavy southwest-westerly swell, against which only reduced speed was possible, and Challenger did not reach station until 1900 hrs.

Because of the heavy weather, deployment of the radar transponder buoy and of the heavy box corers was out of the question, and the opportunity was instead taken for a trial with the new M.B.A. camera sled, fitted with the IOS camera and flash. This system had been developed by Dr Southward as a result of problems encountered on Challenger's Cruise 12/79 when the cameras were used on a vertical wire.

On the first deployment of the camera sled it was discovered that the heavy swell and forward motion of the ship resulted in the sled assuming its horizontal position, with the result that the camera was activated by a tilt switch long before it reached bottom.

In order to allow modifications to be made the epibenthic sled was next deployed in order to obtain the seasonal sample required. The sled was recovered at 0136 hrs 15 Sept. with a large and apparently satisfactory sample after a short southerly tow over the ground.

A second attempt with the camera sled followed immediately, this time with an electromagnetic bottom-contact switch. The sled was recovered at

0454 hrs, but was later found to have obtained only three pictures before failing in the on-mode off the bottom. A third trial then followed that realized a good series of black and white pictures by sending the camera down free-running: 60 frames were used upon descent to 2900 m, but over 40 bottom exposures were then made as the sled was towed over the bottom.

On completion of this tow at 0800 hrs it was decided sea conditions were still too heavy for safe deployment of the box corers and Challenger then steamed slowly north in a following sea to station 'M' on 57°20'N 10°20'N.

On arrival at 0500 hrs 16th Sept. Challenger hove to for a trial with the RVS box corer which had been modified following initial trials in May on Challenger Cruise 9/80 Leg A. Although the drop in wire tension gave clear indication of bottoming of the heavy gear, the corer was recovered empty. No trace of sediment was found on the corer. Another drop followed this again being unsuccessful. It was surmised that the heavy seas and resulting surge on the wire probably were preventing the gear from operating correctly on the bottom. Even if the box corer had closed correctly after it bottomed, the core obtained may have been lost as a result of the spade swinging open again as surge periodically slackened the cable, both on the bottom and during its recovery through the water column. It was thus decided to abandon further trials with the box corer until better sea conditions prevailed.

The Agassiz trawl was then deployed for the seasonal haul required on 'M'. Because of a current meter mooring in the vicinity, Challenger shot the trawl on a southwesterly track that took the tow at least three miles clear of the reported mooring position.

The trawl was recovered at 1455 hrs with an excellent sample that provided a welcome diversion from the weather while it was being sorted

on deck. Challenger then steamed back to the same starting position for an epibenthic sled haul on the same track. The sled was recovered at 2131 hrs with a disappointingly small and washed sample. The fine-meshed plankton net (RMT 1) rigged onto the RMT 1 + 8 combination bars was then deployed for a deep plankton tow.

A good sample was recovered in heavy seas at 0024 hrs 17th Sept. and Challenger then hove to until early morning. A slight easing in the weather encouraged a resumption in work, and Challenger steamed north again in readiness for another epibenthic sled haul. This was finally recovered at 1442 hrs with an impressively large sample.

The camera sled was then deployed in order to try out a modification involving the timer normally used on the epibenthic sled. This was arranged to switch on the IOS camera after 1 hr, and a sequence of 140 colour pictures were taken along a track a little to the south of station 'M'. After its recovery at 1839 hrs, a further trial with the RVS box corer was made, this time allowing a faster payout when bottoming so that the speed of overrun would exceed that of any upward surge on the wire that otherwise might yank the gear off again. However, on recovery of the gear 2013 hrs there was again no sample. Because of some cable damage, it was decided to abandon further work on 'M' and on any other stations in this area (Box 2), and Challenger steamed for the third working area on the continental slope. However, because of the liklihood of easterlies adversely affecting Challenger's passage time to Dunstaffnage, no time was available for further work and Challenger steamed for the Firth of Lorne in an increasingly severe easterly sea, via the Sound of Mull, on 18th Sept.

As a consequence of reported damage to the pier in Dunstaffnage, a berth was arranged in Oban, Challenger berthing at Railway Pier in good

weather at 0900 hrs on 19th Sept.

J.D. Gage

Results : (see Table 1 and Figure 1 for details on ships track and stations worked).

Aim 1) Good samples were obtained on both the Permanent Station and station 'M' (Tables 2-5). This completed five years' seasonal sampling on the Permanent Station ; in future sampling will be carried out at reduced frequency. However, a seasonal programme will continue on Sta. 'M'. Selected deep-frozen material from station 'M' was later forwarded to the Radiobiological Laboratory (MAFF) at Lowestoft for analysis (Dr J. Pentreath).

J.D.Gage, P.A. Tyler

Aim 2) A combination of bad weather and lack of time prevented deployment of the close-up stereo UMEL cameras as originally hoped, but from the present results the photo-sled technique appears to be the best way of obtaining oblique bottom photographs in poor weather conditions from RRS 'Challenger', and it is anticipated that the equipment will be further improved in the future.

A.J. Southward

Aim 3) In view of the poor weather and past experience on its adverse effect on box coring in heavy seas, the lack of success was not surprising, if still not fully understood. Clearly, reasonably calm conditions, with minimal surge on the wire, are necessary for deployment of the USNEL-type box corer along with all other similar designs. However, we feel that with modification, it may be possible to latch the spade in a tightly 'closed' position, so that after

bottoming, and closure of the spade, it will not be able to swing open again as the wire tension periodically relaxes as a result of surge.

J.D. Gage, S. Smith

Table 1. Details of stations worked: Depths given corrected according to Matthews' (1939) 'Table of the Velocity of Sound in Pure Water and Sea Water'; Positions from satellite navigation (Magnavox 1107).

Operation No.	SMBA sta.No.	Gear	Date	Time on bottom (hrs G.M.T.)	Position (estimated mid-point of bottom tow where applicable)	Depth (m)	Result
(Permanent Station)							
1	-	Camera sled	14 Sept	1922-2017	54°43'N 12°11'W	2875	Tilt switch activated in midwater.
2	ES180	Epibenthic sled (ES)	14-15 Sept	2215-0023	54°42'N 12°11.5'W	2886	Good sample; bottom track ca 1 naut mile
3	-	CS	15 Sept	0323-0343	54°40'W 12°19'W	2890	Only 3 B & W pictures of bottom obtained
4	-	CS	15 Sept	0612-0636	54°37'N 12°20'W	"	>40 B & W pictures of bottom obtained
(Station 'M)							
5	-	RVS Box corer	16 Sept	0525	57°18'N 10°21'W	2173	No sample
6	-	"	16 Sept	0920	57°20'N 10°16'W	2170	No sample
7	AT 181	Agassiz trawl (T)	16 Sept	1307-1415	57°19'N 10°28'W	2220	Large sample: bottom track ca 5 naut. mile
8	ES182	ES	16 Sept	1930-2045	57°19.5'N 10°28'W	2170	Small sample ca 2.5 naut. miles bottom track.
9	RMT183	Rectangular mid-water trawl (RMT-1 only)	16-17 Sept	Fished from 2154-0019 hrs. Payout 3000 m	57°09'N 10°42'W		Satisfactory sample

Table 1 cont.

10	ES184	ES	17 Sept	1215-1400	57°14'N 10°24'W	2260	Large sample; bottom track ca 4 naut miles
11	-	CS	17 Sept	1618-1801	57°13'N 10°38'W	2280	140 colour pictures taken.
12	-	SBC	17 Sept	1938	57°14'N 10°44'W	2285	No sample

Tables 2-5. Preliminary identifications of megafauna in samples.

Table 2. Station ES 180

Porifera Hexactinellidae sp.

Sipuncula Sipunculus norvegicus Koren & Danielssen

Echiuroidea sp.

Crustacea Anomura Neolithodes grimaldii Milne-Edwards & Bouvier

Echinodermata Asteroidea Pseudarchaster cf parellii (Düben & Kören)

" Holothuroidea Benthodytes ? gigantea Verrill

Fish* Histiobranchus bathybius (Günther)

Table 3. Station AT 181

Porifera spp. (some on stones)

Actinaria Phelliactis ? robusta Carlgren

" sp.

Madreporaria Flabellum alabastrum Mosely

Caryophyllia ambrosia Alcock

Fungiacyathus marenzelleri Vaughan

Gorgonacea Acanella ? arbuscula (Johnson)

Pennatulacea sp.

Sipuncula sp. (in dead Colus shells)

Polychaeta Polynoinae Lagisca hubrechti (McIntosh)

" sp.

Echiuroidea sp.

Pycnogonida Collossendeis collosea Wilson

Crustacea Munidopsis curvirostris Whiteaves

Echinodermata Asteroidea Hymenaster membranaceus Wyville Thomson

" " gennaeus H.L.Clark

" ?Benthopecten armatus (Sladen)

" Brissingidae sp.

Tables 2-5 cont.

	"	Pseudarchaster parelii (Duben & Koren)
	"	Zoroaster fulgens Wyv. Thomson
	"	Bathybiaster vexillifer (Wyv. Thomson)
	"	Pontaster tenuispinus (Duben & Koren)
	"	Dytaster grandis Verrill
	"	Plutonaster bifrons (Wyv. Thomson)
"	Ophiuroidea	Ophiacantha bidentata (Retzius)
	"	Ophiura ljungmani (Lyman)
	"	O. irrorata Lyman var. Polycantha Mortensen
	"	Homalophiura tesselata (Verrill)
	"	Ophiomusium lymani Wyv. Thomson
"	Echinoidea	Echinus ? elegans Duben & Koren
	"	Hemiaster expergitus Loven
	"	?Phormosoma placenta Wyv. Thomson
"	Holothuroidea	Paratrochostoma ? spiniferum Heding
	"	Ypsilothuria talismani
	"	sp.
Mollusca	Gastropoda	Colus marshalli + dead shells
	"	Troschelia sp.
	"	spp.
"		Aplacophora sp.
"	Bivalvia	Malletia obtusa G.O. Sars

Fish*	Antimora rostrata Guenther	Alepocephalus spp.
	Coryphenoides guentheri (Vaillant)	Lycodes spp.
	Nematonurus armatus (Hector)	Juvenile macrourids
	Chalinura spp.	Synaphobranchus kaupi Johnson

Table 4. ES Station 182

Porifera sp.

Gorgonacea Acanella ? arbuscula (Johnson)

Echinodermata Ophiuroidea Ophiomusium lymani Wyv. Thomson

Fish* Antimora rostrata

Remainder of sample subsampled for sorting of macrofauna under microscope.

Table 5. ES Station 184

Porifera sp.

Gorgonacea Acanella ? arbuscula (Johnson)

Actinaria Phelliactis ? robusta Carlgren

Madeporaria Fungiacyathus marenzelleri Vaughan

Sipuncula sp. (from old gastropod shells)

Pycnogonida Collossendeis collosea Wilson

Gastropoda sp.

spp. dead shells

Echinodermata Asteroidea Bathybiaster vexillifer Wyv. Thomson

" Pontaster tenuispinus (Düben & Koren)

Benthopecten armatus (Sladen)

" Pseudorchaster parellii (Düben & Koren)

Plutonaster bifrons (Wyv. Thomson)

Hymenaster membranaceus Wyv. Thomson

" Ophiuroidea Ophiomusium lymani Wyv. Thomson

Echinoidea Echinus ? elegans Düben & Koren

Holothuroidea sp.

Fish* " Antimora rostrata Guenther

Remainder of sample subsampled for sorting macrofauna under microscope.

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* Fish identified by Dr. J.D.M. Gordon, SMBA.

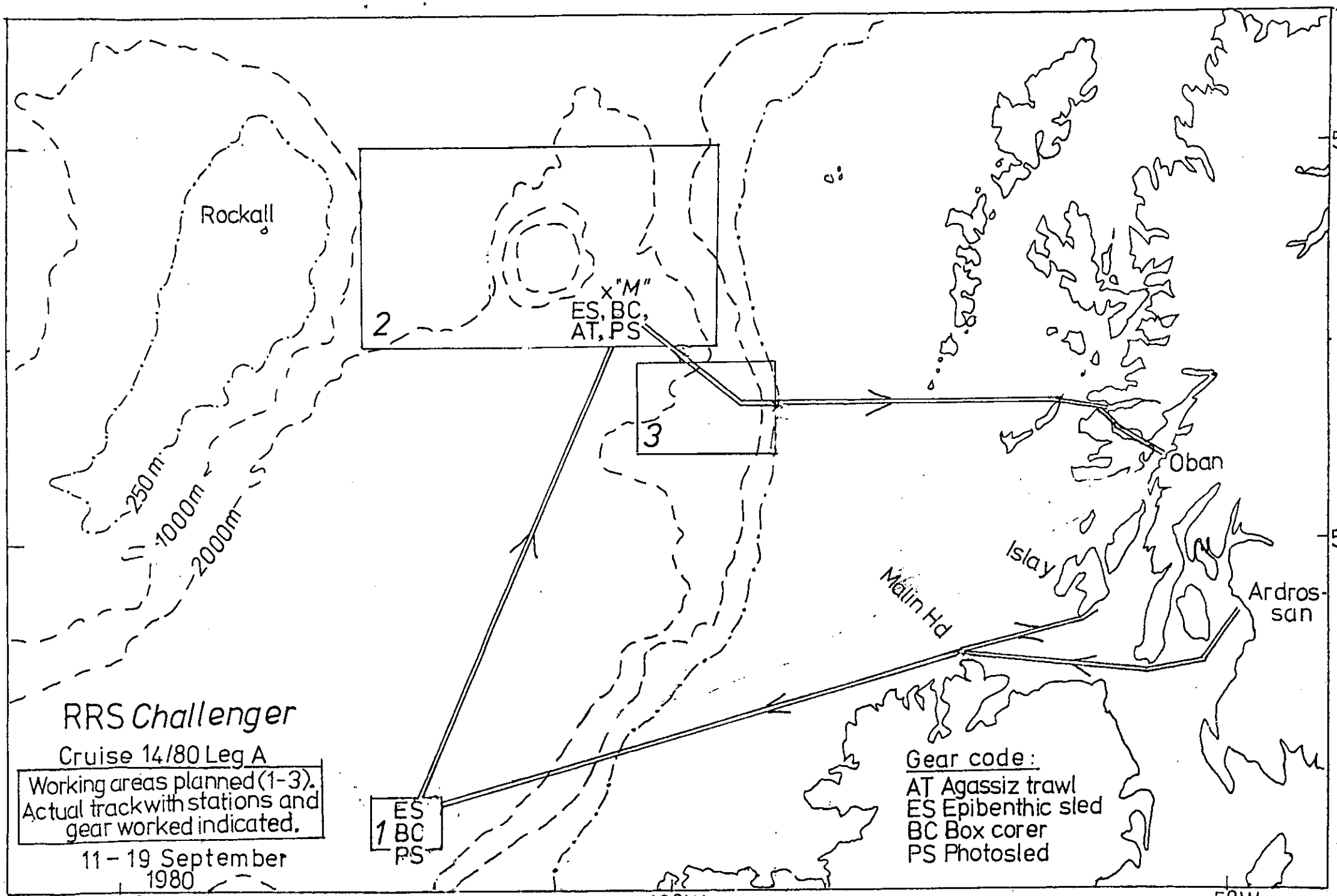

Rockall
250m
1000m
2000m
2
3
1
ES
BC
PS
x "M"
ES, BC,
AT, PS
Oban
Islay
Mull Hd
Ardros-
san
58°
56°
15°W
10°W
5°W
RRS Challenger
Cruise 14/80 Leg A
Working areas planned (1-3).
Actual track with stations and
gear worked indicated.
11 - 19 September
1980
Gear code:
AT Agassiz trawl
ES Epibenthic sled
BC Box corer
PS Photosled

Figure 1

Marine Physics Group

Dunstaffnage Marine Research Laboratory

Scottish Marine Biological Association

Cruise Report RRS Challenger Cruise 14B/80

Duration: 19th September 1980 to 25th September 1980

Locality: Scottish Continental Shelf west of South Uist

Staff: A. Edwards, SMBA
D.J. Edelsten, SMBA
M.J. Picken, SMBA
N. Robertson, SMBA
A.Pipe, University of Strathclyde
J.A. Ewing, IOS (Wormley)
K.G. Birch, IOS
E.G. Pitt, IOS (Taunton)
C. Woodley, IOS
A. Tabor, MIAS, Bidston

Aims:

1. To measure directional spectra of surface waves west of South Uist with a cloverleaf buoy. IOS.
2. To make precise echo soundings and position fixes west of South Uist. IOS.
3. To service a current meter mooring at 57°20.8'N. 7°39.5'W. SMBA.
4. To service fouling experiment moorings close to position (3). SMBA.
5. To make temperature, salinity and dissolved oxygen measurements on section $\mathcal{B}$ (Figure 2). SMBA.
6. To measure nutrient concentrations at some stations in section $\mathcal{B}$ using an autoanalyser. SMBA.

Narrative:

Sailing from Oban was delayed on the 19th by the forecast of bad weather in the proposed working area. Personnel finally joined the Challenger at 2100Z and the ship sailed at 0500Z on the 20th. The ship reached the working area at dusk and the night was passed in an echo sounding survey (aim 2) which was finished in time to reach the first fouling experiment position (aim 4) soon after daybreak. The fouling experiment with toroidal surface float was laid about 0800Z 21st September in position $57^{\circ}18.7'$N. $07^{\circ}38.7'$W. The ship then dragged for the subsurface parts of the mooring of aim 3 until about 1600Z; the search was unsuccessful, with no reply from the acoustic release mechanisms on the mooring and no grapnel contact. The remaining three hours of daylight were spent in searching for the subsurface part of the seabed fouling experiment at a nearby position (aim 4). This search was equally unsuccessful and at its end both the Gifford grapnel and the SMBA grapnel had been damaged by the rough ground over which the searches were made. Stations B1 to B5 were worked during the night of the 21st with CTD and water bottle casts (aims 5 and 6).

The B section was interrupted on the morning of the 22nd so as to test the cloverleaf directional buoy (aim 1). Stations B6 to B9 then completed section B by dusk and Challenger returned to the main working area near South Uist so as to start a line of cloverleaf stations on the morning of the 23rd.

From dawn on the 23rd until 0800Z on the 24th the cloverleaf buoy was used for aim 1. Station work was then stopped and the ship returned to Ardrossan, arriving on the morning of 25th September.

The weather was excellent throughout the cruise. Mooring and CTD work was performed in calm conditions. The cloverleaf buoy

handled well and near the end of the cruise there was sufficient swell from the west to allow useful wave measurements to be made with it.

Results:

1. Measurements of the bottom topography were made with a Precision Echo Sounder with the ship steaming at about 4 knots along the track ABCD shown in Fig. 3. The lines AB and CD lie parallel and about 3 miles distant from the main line of wave measurements. (IOS, Taunton already have made bottom measurements along the line of buoys). Wave conditions were slight during these measurements so that there is very little contamination of the bottom depth measurements due to ship motions. The following table gives details of the times and positions of these measurements.

Station	Time (GMT)	Day (September)	Position
A	2003	20	$57^{o}15{:}9$N, $7^{o}30{:}0$W
B	2308	20	$57^{o}14{:}8$N, $7^{o}54{:}0$W
C	0020	21	$57^{o}20{:}6$N, $7^{o}54{:}8$W
D	0303	21	$57^{o}21{:}8$N, $7^{o}31{:}0$W

2. The cloverleaf wave buoy was deployed at the positions shown in Fig. 3 and the following Table. (One measurement, C1, was made to test the equipment and procedure for deploying the wave buoy). The wave measurements were of 35 min. duration, care being taken to avoid situations where the ship shielded the buoy from the waves or the possibility of wave reflection off the ship's side. The wave conditions consisted of swell waves with visually observed height of about 2 m, wave period of 13 sec. propagating in an

easterly direction. Local winds were less than 10 knots from the west. All equipment functioned correctly except for a minor fault which affected one of the curvature signals.

Record	Time (BST)	Day (September)	Station
C1	1032	22	$57^{o}46'N$, $9^{o}12'W$
C2	0735	23	W
C3	1330	23	WR(0)
C4	1504	23	U
C5	1637	23	WR(M)
C6	1810	23	V
C7	2008	23	WR(I)
C8	0437	24	WR(I)
C9	0620	24	V
C10	0819	24	X

Transmissions from the waveriders were recorded with equipment on the ship simultaneously with cloverleaf buoy measurements at waverider station WR(0), WR(M) and WR(I). When the buoy was deployed at other stations the signal from the nearest waverider was usually monitored to give information on the spatial variability in wave energy. The next table sets out details of the recordings.

Waverider Record	Time (BST)	Day (September)	Waverider buoy (WR)
1	1104	21	O
2	1327	21	M
3	1551	21	I
4	0720	23	O
5	1317	23	O
6	1449	23	O
7	1532	23	M
8	1639	23	M
9	1800	23	M
10	1949	23	I
11	2043	23	M
12	0420	24	I
13	0549	24	I
14	0800	24	M

Finally the routine recording of waverider signals on a land station on South Uist was enhanced by providing measurements every 1½ hours from all three waverider stations.

3. The current meter mooring, which was a "pop up" type with remotely fired acoustic release mechanism, was not recovered and could not be found by dragging.

4. The toroidal fouling mooring was easily deployed in calm conditions. The seabed fouling experiment had previously lost its surface markers and could not be found by dragging.

5. Results of the CTD/water bottling along section B are tabulated in table 6. The CTD, which had been knocked about by bad weather on cruise 14A/80, was apparently undamaged. However, the density profile obtained at station B9 was very unstable, and this suggests that the CTD had indeed been damaged.

6. The autoanalysis of samples from stations B1 to B7 worked well. The nitrate analysis was stable but some difficulty was experienced with silicate analysis because of reagent reaction with a metal component. Two continuous analyses of surface water were made during long steams on the nights of 22nd (across the continental shelf) and the 24th (South Uist to Ardrossan).

A. EDWARDS

Table 6

Summary of CTD Station Positions 19/9/80 to 25/9/80

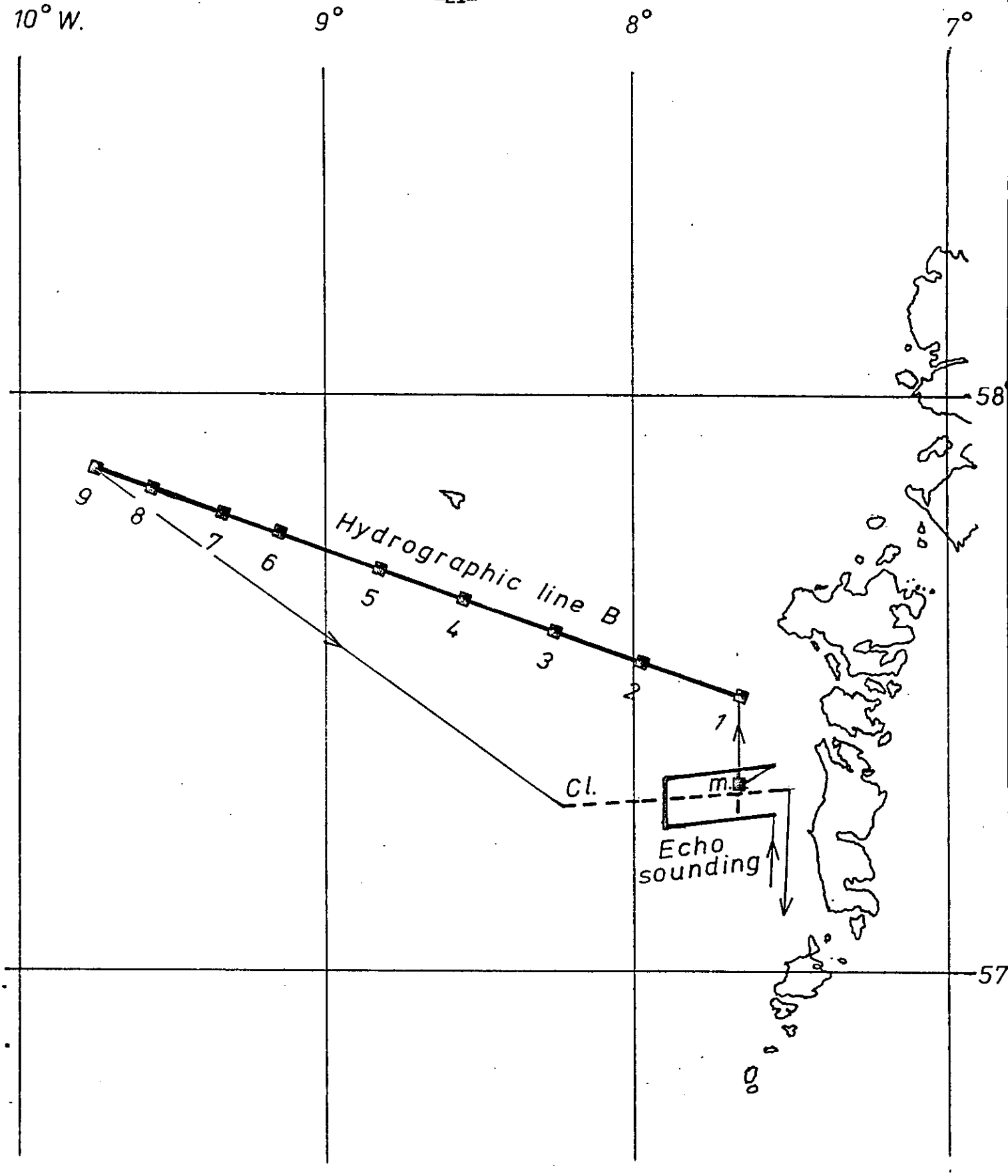
Cruise 14B/80

Time - GMT	-	Time of arrival
Station	-	Name of Station
Lat.	-	^{o}N
Long.	-	^{o}W
CTD	-	Whether or not used
Surface Salinity	-	By sample from non-toxic supply
Oxygen (O)	-	From water cast at 10, 30, 50 . . etc. m and bottom of CTD.
Nitrate (N)	-	As oxygen
Silicate (Si)	-	As oxygen
Sounding	-	Metres, from PDR (Precision Depth Recorder)
CTD Bottle Depth	-	Metres, from "wire out" measurement
Cloverleaf Buoy	-	Whether or not deployed

14B/80 CTD Stations

month 09

Time Z	Station	Lat.	Long.	CTD	Surface Salinity	O, N, Si	Sounding	CTD bottle Depth	Cloverleaf
21/030	B1	57°28'	7°40'	+	-	+	46	35	-
21/2240	B2	57°32'		+	+	+	92	84	-
22/0041	B3	57°35'	8°15'	+	+	+	130	125	-
22/0314	B4	57°39'	8°33'	+	+	+	156	150	-
22/0539	B5	57°42'	8°50'	+	+	+	155	145	-
22/0751	B6	57°46'	9°08'	+	+	+	143	135	+
22/1248	B7	57°49'	9°21'	+	+	+	225	210	-
22/1507	B8	57°53'	9°34'	+	+	-	410	400	-
22/1648	B9	57°56'	9°46'	+	+	-	1150	1100	-



Cl. - - - Cloverleaf deployments

——— Echo sounding

m. ◘ Moorings

CHALLENGER CRUISE 14B/80 19-25 Sep. 1980

Figure 2.

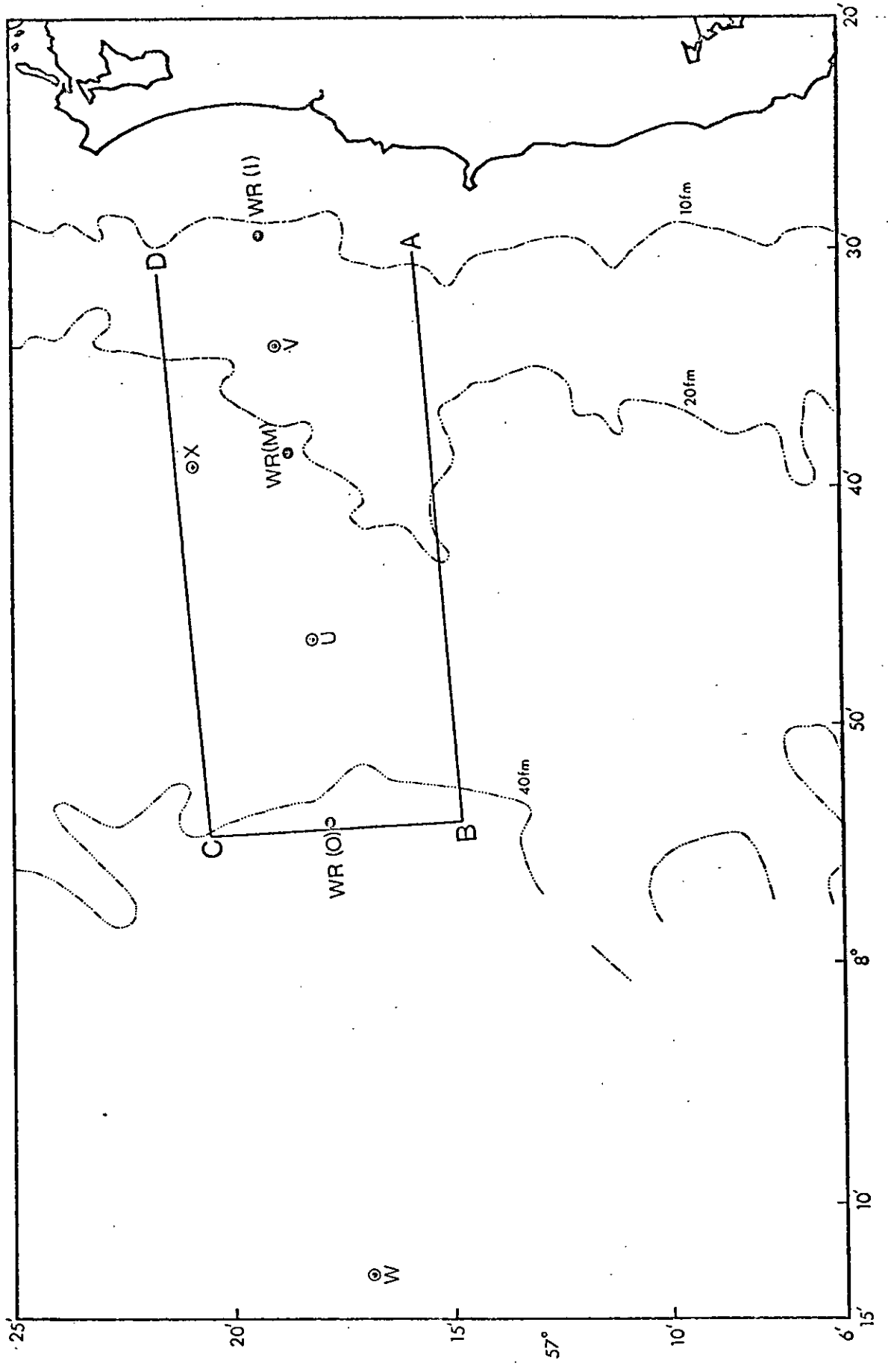

WR (I)
D
A
V
X
WR(M)
U
C
B
WR (O)
W
10fm
20fm
40fm
20'
30'
40'
50'
8°
10'
15'
25'
20'
15'
57°
10'
6'

Figure 3.