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I.O.S.

RRS CHALLENGER

CRUISE 6/84

31 AUGUST – 16 SEPTEMBER 1984

MOORING RECOVERY IN FAEROE-SHETLAND CHANNEL AND MOORING DEPLOYMENT AND ASSOCIATED WORK ON PORCUPINE SLOPE

CRUISE REPORT NO. 167
1984

NATURAL ENVIRONMENT RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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INSTITUTE OF OCEANOGRAPHIC SCIENCES

WORMLEY

RRS CHALLENGER

Cruise 6/84

31 August - 16 September 1984

Mooring recovery in Faeroe-Shetland Channel and mooring deployment and associated work on Porcupine Slope

Principal Scientist

S.A. Thorpe

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Contents

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CRUISE OBJECTIVES

1. Recover 6 moorings from west Shetland slope.
2. (a) Deploy high resolution resistance thermometer chain (BERTHA) at foot of Porcupine Bank.
   (b) Set 4 moorings in the area.
   (c) CTD survey across the continental slope between 1000 and 4500m contours.
3. Recover a Bathysnap from the Porcupine Seabight.
4. Deploy inverted echo sounder (ARIES) near the UK data buoy DB2.

NARRATIVE

Sailed Dunstaffnage 1050 31/8, making passage through the Sound of Mull and the Minsh (see fig. 1 for cruise track; subsequent dates are September). A short circuit in the CTD wire was eventually found in the outboard 235 m of cable which was cut off in sections whilst locating the break. Following overnight tests of the CTD winch to 1000 m and of the towed inverted side-scan sonar, attempts were made in daylight on 3rd to recover six moorings between 60° 42.0'N, 03° 06.0'W and 61° 01.1'N, 03° 29.5'N in calm conditions. Four of the six were recovered (see Table 1 and p.7) but no response could be obtained from the other two.

Return passage through the Minsh to 55° 39'N, 09° 52'W (C, fig. 1) was aided by a Northerly fresh to strong breeze. On arrival at 0853/4 a successful trial CTD cast (stn. 1; see CTD station list) was made and 9 releases were tested to 1000 m. Departed 1700/4 towards the site of the observations on the western slope of the Porcupine Sea Bank (fig. 2).

On arrival at the site area a CTD cast (stn. 2) was begun at 0944 whilst awaiting a satellite fix. A dhan buoy carrying radar reflector, acoustic transponder and flashing light was deployed at 50° 34.5'N, 14° 37.95'W to aid subsequent navigation. Two moorings (373 and 374) were laid on 6/9, the former being the central and principal mooring of the array, and the latter was the resistance thermometer array 'BERTHA' (for mooring details, see Table 2). Further CTD casts were made during the night of 6-7, and moorings 375, 376 and 377 were deployed in good weather on 7th.

A CTD section (Stns. 6-11) were made across the slope beginning 1648/7 and ending 1051/8, with stations at nominal 4 mile separation between 50° 22.6'N 14° 43.3'W and 50° 36.1'N and 14° 20.2'W. Some difficulty was found in positioning the stations because of infrequent satellite fixes and two additional stations (12, 13) were made on 8th to provide an adequate CTD coverage of the section.

The dhan buoy was located using the acoustic transponder at 1848/8, and found to be in its correct position. It was seen to be lying on its side, presumably because of drag in the increasing wind, and could not be seen on radar.

The first CTD section was repeated, 0004 to 1715/9, after some $2^{1}/2$ tidal periods to provide a data set from which the internal tides might be partially removed by averaging. Gales forecast on 8th fortunately did not arrive and work continued with little difficulty in winds at times reaching 30 knots.

A similar strategy was adopted of repeated CTD stations between 50° 43.7'N 14° 35.7'W and 50° 30.5'N 14° 59.1'W from 2119/9 to 0756/11 (stns. 20-31), and an additional station (32) was completed at 1220/11, extending the line to the SW.

Checks on the command pingers of moorings 375 and 374 (BERTHA) and on the dhan buoy were then attempted on 11th. Mooring 375 responded readily. No sign could be found of the dhan buoy however, despite an intensive search, and it is presumed lost. The command pinger on 374 was switched on only after two passes had been made and, in view of this, it was decided to recover BERTHA at once, a day earlier than intended. Recovery was effected at 1946/11. A leak was subsequently detected in the cable and plans to redeploy were consequently abandoned.

Two further CTD sections, stations 33-39 between 2236/11 and 1802/12 and stations 40-46 between 0114 and 2102/13 (see fig. 2), were made, completing work at the slope site.

The position of Bathysnap (49° 07.2'N, 14° 08.7'W) was reached at 0400/14 and transmissions to the command pinger continued from 0334 to 0655 whilst a thorough survey was made out to 2 miles radius of the position, but regretably with no response. Search was reluctantly abandoned at 0656 and course set for the DB2 position (48° 44.2'N 08° 57.85'W).

ARIES was deployed at 0952/15, 1.64 miles from DB2 (see Table 3),

following a one and a half hr. survey to find a suitable depth. After completing a CTD (stn. 47), course was set for Falmouth in good weather.

Docked Falmouth 0800/16.

INDIVIDUAL PROJECT REPORTS

Recovery of moorings between 60° 42.0'N, 03° 06.0'W and 61° 01.1'N. 03 29.5'W.

A. Mooring Recovery

Attempts were made to recover Dr. Gould's moorings 357, 358, 359, 360, 361 and 372 in calm conditions with excellent visibility on 2/9.

Moorings 361, 359, 358, 372 were recovered in that order. All were in good condition except for some minor corrosion of the chains and were recovered intact. 5 bottles of biological specimens were collected for Plymouth Polytechnic from the surfaces of floatation buoys or current meter fins, but only two of the wooden blocks attached near the current meters for collection of biological specimens were found to be in place when the moorings were recovered.

Moorings 360 and 357 could not be located. Transmission to command pinger on 360 was continued intermittently for 92 mins, and release frequency was transmitted for 22 mins, near the last known position of the mooring but with no success. The position of mooring 357 is only just outside the 2 mile safety zone surrounding the exploration platform 'Dyvi Omega'. Operations were reported to be in hand to move the platform. Challenger manoeuvred just outside the safety zone transmitting to the command pinger intermittently for 35 mins making a close pass by the reported position of the mooring without any response being obtained.

B. Data return; preliminary analysis of tapes - see table 1.

Neil Brown CTD, recording and analysis (C.H. Clayson, J. Crease, D. Edge) (For station list and other information, see table 1).

Recording and analysis was by digi-data logger and BBC micro, with screen plots and hard copy printer of temperature and salinity profiles. Preliminary comparison with rosette sampler temperature and salinity values suggests that the CTD maintained calibration well during the cruise.

Releases and acoustic tests (D. Edge)

1. Wire tests were made on 9 command release units and on 2 British Antarctic Survey net monitors. All proved successful apart from one in which a release cable was found to be open circuit.

2. A beacon unit attached to the CTD flooded due to a split 'O' ring seal.

3. Command deck units and Mufax (PDS) performed well.

4. A transponder (T5(HP4)) was lost with the dhan buoy.

5. During deployment of mooring 373 the release fired the pyros during deployment after the release unit had touched the vessel's stern.

6. The mechanical release opened during deployment of ARIES, mooring 378, dropping the anchor chain as it was being lowered overside. (The release was brought back to the IOS for examination and was subsequently found to be defective).

BERTHA - Benthic Resistance Thermometer Array (C.H. Clayson)

Mooring 374 deployed 2223/6 Sept; recovered 1946/11 Sept.
Position 50 33.18'N, 14° 40.9'W. Water depth 3311 m.

Bertha is a vertical array of resistance thermometers with high resolution (better than 0.5 milli deg K) and 0.1 Hz sampling frequency, designed to examine the variation in temperature structure in the benthic boundary layer, from which may be inferred the nature of the processes which are important, their time scales and structure.

Of the 11 temperature sensors available, two were removed before deployment because of diagnosed faults and two developed faults during deployment. Preliminary examination of the data indicates that the remaining seven sensors at 20, 30, 50, 60, 70, 90, 140 m all operated normally with no obvious noise spikes or drift, although the pressure sensor failed part-way through the 6865 min. period of deployment at the sea bed possibly because of a leak in the cable. Oscillations of approximately tidal period are apparent in the last 2.5 days of the record, with all sensors eventually responding. A bottom mixed layer appears to exist up to at least 30 m, sometimes to 50 m, during the first $1^{1}/2$ days. Jumps in temperature occur over periods of 20 s, suggesting the presence of well-defined mixed layers adjacent to that at the bottom.

ARIES - Automatically Recording Inverted Echo Sounder (A.J. Hall)

Mooring 378 deployed 0952/15 September

Position 48° 43.25'N, 08° 55.84'W . Water depth 167 m.

ARIES is a mooring carrying an upward-pointing 248 KHz sonar designed to receive acoustic returns from the sub-surface clouds of bubbles produced by breaking wind-waves. The data can be used to infer the vertical eddy diffusion coefficient of momentum near the sea surface. It is arranged to operate for two $1^{1}/_{2}$ hour periods per day.

Its deployment near DB2 will allow comparison with wind and temperature data from the buoy provided by the Met. Office with permission from UKOOA.

Thermometers (J.A. Moorey)

On stations 1, 2, 7, 32, 39 and 46 an NIO water bottle carrying one protected thermometer, one unprotected thermometer (stns. 1 and 2) or a second protected thermometer, and a protected thermometer enclosed within a steel tube to protect it from external pressure, was attached above the CTD at the request of Dr. P. Saunders IOS who is investigating the accuracy and reliability of thermometer readings. Unfortunately the messengers released to trigger the bottle on stations 32 and 46 were hung up by marine organisms on the wire.

Some difficulty was encountered in deploying and recovering the CTD and rosette sampler because of the restrictions of platform area and overhead obstructions:

Station 4. The thermometer frame of Niskin bottle 1 caught the ship's rail when deploying the CTD. The frame boss and frame were wrenched from the bottle but remained attached by the lanyard and elastic. The Protected thermometers 3483 and 3484 were undamaged, the Unprotected U6191 had its outer glass shell broken, but main and auxiliary are intact. We have spare glass shells at I.O.S.

Station 13. Thermometer frame 1 hit the ship's rail when bringing the CTD inboard. The protected 3461 was broken beyond repair, protected 3484 and unprotected U3247 were undamaged.

Station 22. Thermometer frame 5 caught on the awning over the winch when deploying CTD. The frame and all three thermometers were broken beyond repair. These were protected 2871 and 2875 and unprotected U3247.

Summary

Broken beyond repair:- 2871, 2875, 3461, U3247
Damaged but repairable at I.O.S. U6191

Towed inverted side-scan sonar (A.J. Hall)

This instrument is used to obtain echoes from subsurface bubble clouds when towed from a ship going ahead at 3-5 knots.

This instrument was tested by a lowering over the stern A frame on 2/9. Towing trials on 4/9 proved unsuccessful owing to a broken lead within the (unopened) underwater electronics tube. Further trials on 9/9 demonstrated that the fish could be deployed and recovered safely on the stern A frame in rough conditions. The electronics tube was however flooded and no data were obtained.

CTD Station List

Stn No.	Time	Date	Lat.	Long.	Depth	Close Aprch	Samples T	S	P
1	0943	4/9	55 40.8N	09 52.0W	1939	49	6	6	3
2	1044	6/9	50 35.6N	14 45.1W	3319	18	3	5	2
3	1847	6/9	50 33.0N	14 41.2W	3302	10	2	5	2
4	0112	7/9	50 31.1N	14 38.7W	3387	9	1	4	1
5	0525	7/9	50 28.3N	14 36.2W	3368	10	2	5	2
6	1808	7/9	50 22.7N	14 43.2W	3760	16	3	5	1
7	2151	7/9	50 26.6N	14 42.4W	3598	18	3	5	1
8	0149	8/9	50 27.6N	14 39.8W	3535	21	3	5	1
9	0459	8/9	50 29.8N	14 36.6W	2509	23	3	5	1
10	0746	8/9	50 32.5N	14 25.2W	1871	23	2	3	1
11	1003	8/9	50 35.8N	14 21.0W	1436	22	2	3	1
12	1406	8/9	50 28.0N	14 35.1W	3319	21	3	5	3
13	2145	8/9	50 23.5N	14 40.5W	3616	20	2	4	2
14	0130	9/9	50 22.7N	14 48.4W	3846	22	2	4	2
15	0520	9/9	50 25.4N	14 40.6W	3625	18	2	2	2
16	0912	9/9	50 28.1N	14 33.2W	3339	15	2	4	2
17	1152	9/9	50 29.6N	14 29.2W	2335	13	2	4	2
18	1432	9/9	50 33.3N	14 24.3W	1699	26	1	3	1
19	1637	9/9	50 35.8N	14 21.6W	1452	19	1	3	1
20	2141	9/9	50 43.6N	14 39.0W	1420	20	1	3	1
21	2333	9/9	50 41.2N	14 40.5W	1661	18	1	3	1
22	0205	10/9	50 38.6N	14 45.3W	3016	10	1	4	1
23	0510	10/9	50 35.6N	14 50.5W	3435	10	1	4	1
24	0829	10/9	50 33.1N	14 57.1W	3707	17	1	4	1
25	1201	10/9	50 30.1N	14 59.6W	3867	20	2	4	2
26	1631	10/9	50 43.8N	14 35.7W	1268	20	0	3	1
27	1803	10/9	50 41.1N	14 40.8W	1687	22	0	0	0
28	2002	10/9	50 37.3N	14 44.0W	2962	20	2	4	2
29	2319	10/9	50 35.2N	14 50.3W	3483	18	1	4	2
30	0251	11/9	50 32.8N	14 57.3W	3725	22	2	4	2
31	0642	11/9	50 30.6N	14 59.4W	3841	16	2	4	2
32	1057	11/9	50 24.4N	15 10.4W	4091	20	2	4	2
33	2310	11/9	50 50.3N	14 39.9W	1306	22	1	3	1
34	0103	12/9	50 48.3N	14 45.7W	1634	20	1	3	1
35	0309	12/9	50 46.1N	14 51.5W	2649	10	2	3	2
36	0532	12/9	50 44.8N	14 56.9W	3082	10	1	4	1
37	0855	12/9	50 42.3N	15 02.4W	3327	18	2	4	2
38	1142	12/9	50 41.1N	15 07.2W	3595	23	2	4	2
39	1612	12/9	50 36.2N	15 19.2W	4070	10	2	3	1
40	0154	13/9	50 32.4N	14 14.6W	1539	20	1	3	1
41	0406	13/9	50 28.8N	14 16.6W	1886	18	1	3	1
42	0645	13/9	50 25.7N	14 19.0W	2845	20	2	4	2
43	0930	13/9	50 22.7N	14 20.7W	3472	20	2	4	2
44	1218	13/9	50 17.7N	14 25.4W	3747	15	2	4	2
45	1508	13/9	50 14.2N	14 28.1W	3899	20	2	4	2
46	1924	13/9	50 06.2N	14 33.3W	4070	20	2	4	2
47	1027	15/9	48 45.6N	8 55.6W	161	32	0	1	0

TABLE 1

Moorings in Faeroe Shetland Channel

Mooring	Latitude	Longitude	Water	Date	Instr.	Depth	Data
361	61 01.1N	03 29.5W	1103	0611/2/9/84	A6222	98	
				0624	A3630	399	
				0637	A6221	700	
				0648	A6224	1051	
360	*				A 469		
	*				A3728		
	*				A2452		
	*				A1078		
359	60 53.3N	03 16.3W	697	1015/2/9/84	A 280	92	
				1028	A 421	294	
				1033	A1260	496	
				1038	A1259	645	
358	60 50.0N	03 12.5W	605	1138/2/9/84	A2107	101	
				1153	A3727	353	
				1216	A3726	554	
357	+				A3725		
	+				A156		
	+				A155		
372	60 41.9N	03 05.6W	396	1536/2/9/84	A7643	93	
				1542	A7644	194	
				1546	A7645	345	

* Mooring 360 was searched for downslope and along contour for some 90 minutes. Report from previous cruise reported weak signal.

+ Mooring 357 was not seen. It was 2.2 mls from exploration rig Dyvi Omega as was mooring 356. This prevented any dragging operations.

T/C 35803 recorded for about 80 days with dropouts
C/M 35904 rotor stalled much of time
C/M 36101 has some dropouts for first two months
C/M 36102 data was unreadable
C/M 36104 has two short periods of dropouts
C/M 37202 had not recorded.

TABLE 2

Moorings on Porcupine Slope

Mooring No	Latitude	Longitude	Water Depth m	Date laid	Date recv'd	Instr. No.	Instr. Height m
Dhan	50 34.50N	14 37.95W	3173	6/9/84			
373	50 33.35N	14 41.36W	3314	6/9/84		A5608	501
						A3950	301
						A3277	151
						VO673	90
						VO668	70
						VO629	50
						VO627	30
						VO429	10
374	50 33.18N	14 40.90W	3311	6/9/84	11/9/84	Therm. Chain	5-145
375	50 32.3N	14 43.3W	3567	7/9/84		A6597	503
						V0155	321
						A1139	302
						VO156	281
						A2108	152
						V0130	50
376	50 35.64N	14 44.84W	3294	7/9/84		A5607	500
						A3561	300
						A3560	150
						V0132	49
377	50 29.64N	14 37.19W	3314	7/9/84		A6596	500
						A4388	300
						A4387	150

TABLE 3

ARIES Mooring

378	48 43.25N	08 55.84W	167	15/8/84		ARIES	127.5

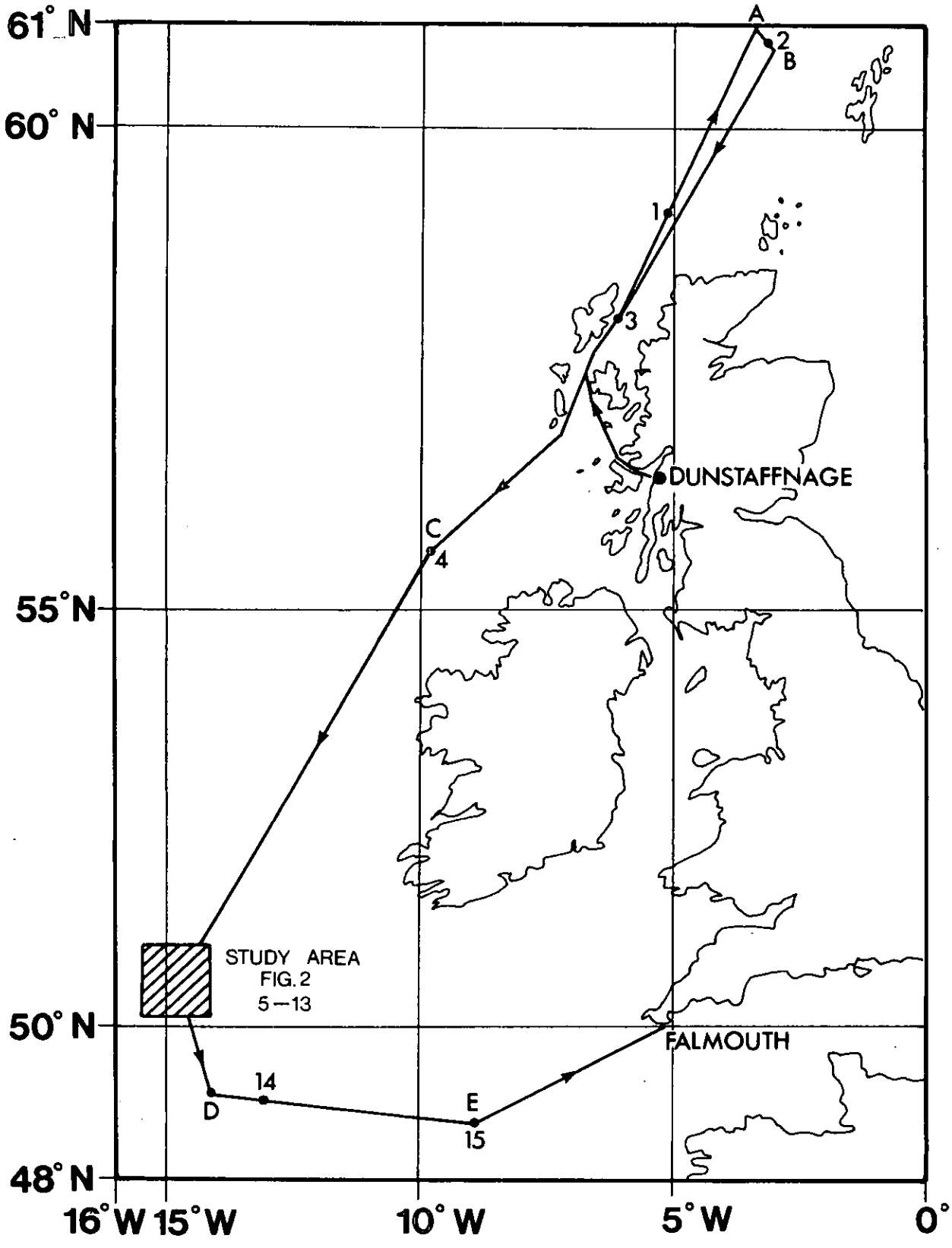

Fig. 1 CHALLENGER CRUISE 6/84. NOON-DAY POSITIONS (1100 GMT) SEPTEMBER 1984.

A–B Line of moorings 357–361, 372.

C Position of release trials; CTD STD STN. 1.

D Bathysnap

E DB2; Aries mooring 378; CTD STN 47.

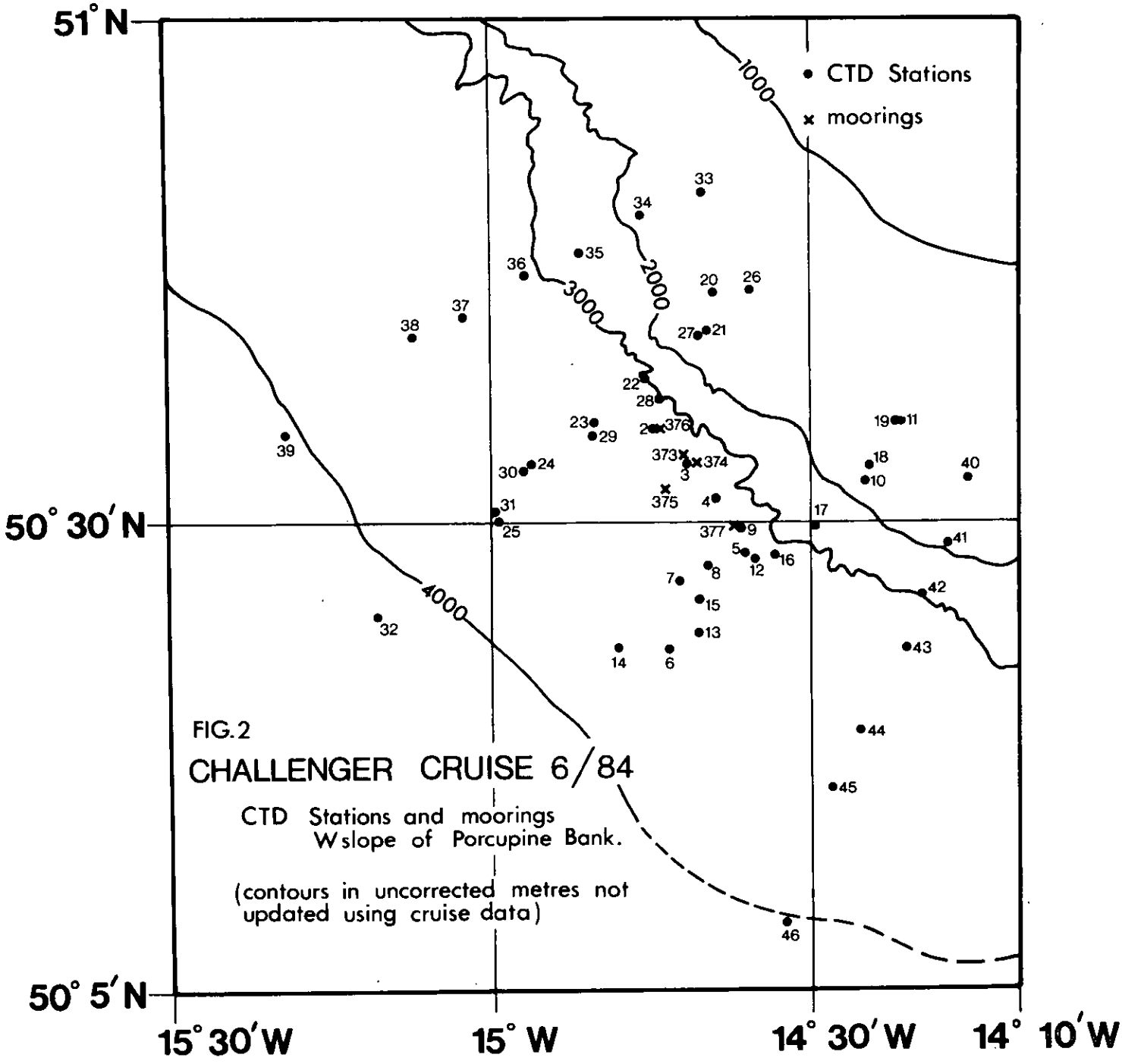

FIG. 2

CHALLENGER CRUISE 6/84

CTD Stations and moorings
W slope of Porcupine Bank.

(contours in uncorrected metres not updated using cruise data)