INSTITUTE OF OCEANOGRAPHIC SCIENCES

WORMLEY

RRS CHALLENGER
Cruise 12/83
27 August - 12 September 1983

Mooring deployments and associated studies in the Faeroe-Shetland Channel

Principal Scientist

W.J. Gould

CRUISE REPORT NO. 154
1983

CONTENTS

Cruise Objectives

(1) To deploy two test moorings off Tiree for IOS Bidston.
(2) To deploy a pressure recorder in the Rockall Trough
(3) To attempt recovery of moorings lost during the winter 1982/3 CONSLEX experiment.
(4) To deploy a line of six subsurface current meter moorings in the Faeroe-Shetland Channel.
(5) To occupy CTD stations in the Faeroe-Shetland Channel.
(6) To obtain gravity cores in association with (4) and (5).

Scientific Personnel

A.J. Harrison	IOS Bidston	Left in Stornoway	31-VIII-83
D.L. Leighton	"	"	"
W.J. Gould (Pri.Sci)	IOS Wormley	Joined in	"
J.W. Cherriman	"	"	"
A.N. Cutler			
J. Loynes			
M. Sawkins			
I. Waddington			

Acknowledgements

The willing help and cooperation of the Master (J.J. Moran) his officers and crew is greatly appreciated and contributed to the success of the cruise despite the poor weather. The fishing skipper F. Dunning was of great help in planning and deploying the dragging rig and it is unfortunate that the weather did not allow the technique to be fully evaluated.

Narrative

IOS Bidston

RRS Challenger sailed from Dunstaffnage at 1500z on Saturday August 17th 1983 en route to Stations T_1 and T_2 off the northwest coast of Tiree. The PES fish was deployed at 0435z the following morning and the ship then approached T_1 to start deployment of a moored meteoroloigical buoy in 50m of water at 0500z. The deployment was completed in only 15 minutes. Deployment of an experimental mooring at T_2, within half a mile of T_1 started at 0605z and was completed by 0629z at which time the ship left the area and proceeded towards Station N at the continental shelf edge.

During this passage acoustic testing was carried out on an acoustic transponder floating 10m below the surface in 130m of water off Barra Head. A freely floating buoyancy unit with a release pinger attached and the transponder suspended 10m below was launched at 1210z, the ship then steamed away using the PES 8 element fish and Mufax to receive the signals. They were heard out to a maximum range of 1.1nm. The tests were completed by 1430z when the equipment was recovered and the ship resumed course towards station N.

The position was reached at 2230z/28th and a CTD cast to 1900m occupied followed by wire tests of three sets of acoustic releases. The wire tests were successfuly completed by 0630z/29th. A pressure recorder was then deployed at 0654z and after it had reached the sea bed (in 2019m of water) range tests were carried out on the transponder fitted to the pressure gauge. The vessel left Stn. N at 0809z and headed towards SMBA stn. A3.

The acoustic release of the mooring lost at A3 was located at 0955z and after position fixing an attempt to drag for the mooring using a single wire and Gifford grapnels was started at 1100z. After $1^{3/4}$ hrs the attempt at recovery was abandoned due to deteriorating weather and the ship proceeded to the shelter of St. Kilda.

At 0615z/30th the ship left St. Kilda for Stn. B1 but on arrival it was clear that no attempt to recover the lost mooring at that site could be made due to the poor weather and with little prospect of improvement in the next 24 hrs the ship headed for Stornoway to transfer scientific personnel.

IOS Wormley

After transfer of scientists by boat the Challenger sailed from Stornoway at 1700z/31st on passage towards the launch position of a line of six subsurface current meter moorings across the continental slope west of Shetland. Passage continued during September 1st with preparations being made for the mooring deployments. An echo sounding survey of the area around the proposed mooring sites was started at 1500z/1st, at the deepest part of the survey the ship hove to (in 1100m) between 1830 and 2100z to do wire tests of the remaining acoustic releases for the moorings. Two tests were made, each of two units, to complete the six releases required. The echo sounding runs continued until 0630z/2nd when deployment of the first mooring (the shallowest, in 400m of water) was commenced. Mooring deployments continued throughout the day (details are given in the notes on mooring operations) the last (deepest) mooring being completed by 1900z. In light of the poor weather forecast the ship ran for the shelter of St. Magnus Bay on the west coast of Shetland. During the following day Sept. 3rd the dragging rig using trawl doors was prepared and tested and an experimental CTD station worked to test the degree of interference of a 10kHz pinger with the Bissett Berman 9040 CTD unit.

The vessel sailed from St. Magnus Bay at 0400z/4th in northwest F 6-7 winds and arrived at the site of mooring F2 (a mooring lost during the winter of 1982-3) at 1230z. The acoustic release beacon was eventually turned on and two drags across its position made using a length of chain and

grapnels towed between two trawl doors. The mooring line was not retrieved but a considerable length of long line was caught on each of the two attempts. The work was suspended at 2230z and the ship remained hove to overnight.

A third dragging attempt started at 0530z/5th but in increasing crosswinds and seas the ship had insufficient power to keep the trawl open and the dragging rig was recovered at 1000z in a very tangled state. Dragging operations were abandoned and a start made on a cross-slope section of CTD stations starting on the continental shelf and spaced at 7 mile intervals. The CTDs were started at 1300Z in a W-NW F7 wind. During the section 90m of the CTD wire had to be cut off owing to its generally poor and rusty state which had resulted in strands breaking. After the 8th station of the section at 0700z weather conditions had deteriorated to a point where continuation of the section proved impossible and course was set towards shelter on the east side of the Shetlands. The ship ran before heavy seas and a NW F8-9 wind rounding Muckle Flugga at 1600z/6th. The vessel anchored on the south side of Fetlar at 1900z. By 2200z the wind had abated to 25 kts.

On the morning of September 7th the wind was still strong from the NW but passage was made through the Yell Sound past Sullom Voe between 0800 and 1200z. Despite heavy swells that had closed the oil terminal, course was set towards the northernmost of the moorings laid on this cruise with the intention of fixing the mooring positions and working CTD stations near to them. The prospect of only a brief lull in the weather precluded working the section across to the Faeroes side of the Channel. The first mooring was reached at 2030z, its position fixed and a CTD station worked 1nm to the NE of the mooring. A core was also taken at that site. Throughout the night and the forenoon of September 8th moorings were fixed, CTD stations worked and occasional cores taken. The line of CTD stations ended on the shelf edge by 1215z/8th and in view of a

forecast of easterly gales the vessel proceeded to St. Magnus Bay for shelter.

During the evening of 8th the automatic steering gear failed and hand steering had to be used for the remainder of the cruise. By 0830z/9th the weather had abated sufficiently to allow passage to be made towards the site E2 of a lost mooring. This was found and its position confirmed at 1900z/9th. Weather prospects were poor and precluded any dragging operations on the following day and so two lines of CTD stations were worked, northwestwards through E2 and then southwards on 6°W. These stations were accomplished despite strong to gale force northerly winds. The final station was completed by 1830z/10th and in view of the now heavy swell and marginal working conditions course was set for the Minch for shelter.

Passage southwards continued throughout the remainder of the 10th and 11th towards the moorings set near Tiree at the start of the cruise. These were recovered in fresh winds in the early evening of the 12th and the vessel then proceeded towards Oban. After anchoring overnight the ship berthed on the North pier at 0600z/12th, equipment was offloaded and the vessel proceeded to Dunstaffnage.

INDIVIDUAL PROJECT REPORTS

Mooring operations

Six moorings were deployed on a cross-slope section between 400 and 1100m. The moorings were deployed buoy first using the ship's auxiliary winches. Buoyancy for each was provided by a 4' dia steel sphere giving a lift of 700kg. Wire was 6mm dia. polyurethane jacketed produced by British Ropes Ltd. and with swaged steel terminations. All stainless steel/titanium/galvanised steel junctions were insulated with polythene bushes.

Acoustic releases were of IOS 200 series manufacture and employed titanium hardware. Current meters were

Aanderaa RCM 5 units with pressure transducers on the uppermost instrument of each mooring.

Navigation was by Decca North Scottish 6C main chain crossed with LORAN C (SL3006 Rate W) line. Accepted positions of each mooring are those of the closest approach to the acoustic release beacon on 7th and 8th September.

CTD Operations

CTD stations were worked using the Bidston 9040 CTD sea unit. Data for temperature, pressure and conductivity were recorded at 1 second intervals on a RAPCO data logger together with Decca coordinates during the station. The data were also plotted in real time on a Leeds and Northrup recorder.

The first CTD station (on leg 1) was worked using a 10 kHz pinger clamped to the wire immediately above the CTD but this resulted in severe spikes appearing in the data. During the time spent hove to in St. Magnus Bay another trial station was worked with the pinger hung 5m below the CTD. No spikes were seen and for all the subsequent stations this configuration was used.

Calibration data were via an NIO bottle clamped 1m above the CTD and triggered by messenger.

The stations were worked generally without difficulty despite the often severe weather. However the condition of the CTD wire was very poor. The winch driver and scientist working at the ship's side were deluged with a stream of sea water and rust. More seriously on two occasions strands in the wire broke and trapped the descending messenger. Eventually a total of 600m of wire were cut off and dumped. The remaining wire, while slightly less rusty was badly kinked (from being laid on the sea bed?) The new metering system is a great improvement on the old one.

The positions of the CTD stations worked are given in table 2.

Coring

Three cores were obtained using a 1m gravity cover. These were at the positions of CTD stations 10, 12 and 13. The first two were successful in obtaining a good length of core but the third achieved only partial penetration. Subsequent attempts to obtain cores on the upper slopes of the transect through the mooring positions were unsuccessful due to either hitting rocks on the sea bed or to the bottom being composed of sand and shingle which washed out of the corer.

Dragging Operations

It was planned to drag for the remains of two moorings E2 and F2 each in 500m of water. Both were lying on the sea bed when recovery was attempted in March 1983. Both acoustic beacons were relocated on this cruise. Three attempts were made to recover F2 using a chain and grapnels spread between trawl doors. On the first two attempts large pieces of long line were recovered. (Were these the cause of the mooring losing its buoyancy?). On the final attempt no long line was recovered and the dragging rig was badly tangled, perhaps due to having to trawl cross winch in heavy seas.

No opportunity was afforded to drag for E2 due to the continuing poor weather. Challenger does not have the power to tow such a dragging rig in anything but the lightest airs and thus, unfortunately, the recovery attempts were unsuccessful.

Navigation and echo sounding

The echo sounder was run on all passage legs off the Continental Shelf. Good results were obtained but in some of the worst weather the data were significantly affected by aeration and changes in the attitude of the fish.

Navigation was in general by means of Decca 6C or OE chain crossed with the Norwegian LORAN C lines supported by

satellite navigation.

The provision of a data logger and line printer (based on a microcomputer) would greatly reduce the work load of the deck officers in noting positions.

Table 1

MOORINGS LAID FAEROE SHETLAND CHANNEL

IOS Mooring No	Designation	Lat	Long	Water depth	Date/time in place	Instruments depths
361	F	61° 01'.1N	03° 29'.5W	1103	1829z 2-IX-83	Aa 6222 98m Aa 3630 399m Aa 6221 700m Aa 6224 1051m
360	S	60° 56'.9N	03° 21'.4W	899	1557z 1-IX-83	Aa 469 93m Aa 3728 294m Aa 2452 595m Aa 1078 847m
359	C	60° 53'.3N	03° 16'.3W	697	1333z 2-IX-83	Aa 280 92m Aa 421 294m Aa 1260 496m Aa 1259 645m
358	H	60° 50'.4N	03° 12'.5W	605	1118z 2-IX-83	Aa 2107 101m Aa 3727 353m TC 354-554m Aa 3726 554m
357	A	60° 46'.4N	03° 07'.2W	502	0907z 2-IX-83	Aa 3725 99m Aa 156 300m Aa 155 451m
356	N	60° 43'.2N	03° 03'.4W	398	0738z 2-IX-83	Aa 3622 94m Aa 420 195m Aa 1622 347m

Table 2

CTD STATIONS

Station	Date 1983	Time z	Lat. N	Long. W	Max wire out m	Water depth m	Ht.off bottom m
CTD 1	28-VIII	2342-0055/29	Decca(R)A0.26(G)E33.22(P)F533			1961	70
CTD 2	5- IX	1206-1222	61 08.5	01 29.7	164	178	5
CTD 3	5- IX	1357-1416	61 13.7	01 39.1	319	330	5
CTD 4	5- IX	1552-1625	61 19.5	01 47.9	558	569	12
CTD 5	5- IX	1803-1835	61 24.3	01 56.8	746	765	12
CTD 6	5- IX	2012-2058	61 30.0	02 06.3	1178	1206	15
CTD 7	5- IX	2221-2315	61 33.6	02 17.4	1389	1400	19
CTD 8	6- IX	0226-0322	61 38.4	02 26.5	1524	1527	7
CTD 9	6- IX	0541-0639	61 44.1	02 35.3	1570	1578	15-20
CTD 10+	7- IX	2221-2310	61 03.5	03 25.0	1127	1108	0
CTD 11	8- IX	0042-0115	60 58.1	03 19.3	929	848	10
CTD 12+	8- IX	0229-0258	60 54.4	03 14.5	725	703	7
CTD 13+	8- IX	0502-0527	60 51.7	03 10.8	618	620	10
CTD 14	8- IX	0723-0750	60 47.3	03 04.8	475	485	11
CTD 15	8- IX	0845-0904	60 44.0	03 01.4	383	394	5
CTD 16	8- IX	1030-1045	60 40.0	02 55.7	224	234	10
CTD 17	8- IX	1156-1209	60 35.4	02 50.5	166	177	7
CTD 18	9- IX	2055-2108	60 05.4	04 16.4	155	164	5
CTD 19	9- IX	2159-2212	60 08.7	04 21.5	170	182	2
CTD 20	9- IX	2309-2330	60 12.2	04 28.1	405	406	9
CTD 21	10- IX	0027-0046	60 15.8	04 35.0	597	600	7
CTD 22	10- IX	0146-0217	60 19.0	04 45.9	812	820	7
CTD 23	10- IX	0317-0349	60 22.7	04 50.2	1007	961	10
CTD 24	10- IX	0456-0529	60 26.0	04 58.5	971	956	12
CTD 25	10- IX	0927-0949	60 19.3	06 00.0	571	573	5
CTD 26	10- IX	1044-1126	60 13.4	05 58.0	966	947	7
CTD 27	10- IX	1218-1258	60 08.5	05 58.0	1163	1166	5
CTD 28	10- IX	1345-1423	60 03.4	05 58.4	1080	1092	5
CTD 29	10- IX	1558-1624	59 50.8	05 57.3	465	487	17
CTD 30	10- IX	1708-1724	59 45.3	05 58.0	301	320	16
CTD 31	10- IX	1807-1822	59 40.6	05 59.1	205	217	8

Footnote: +CORE

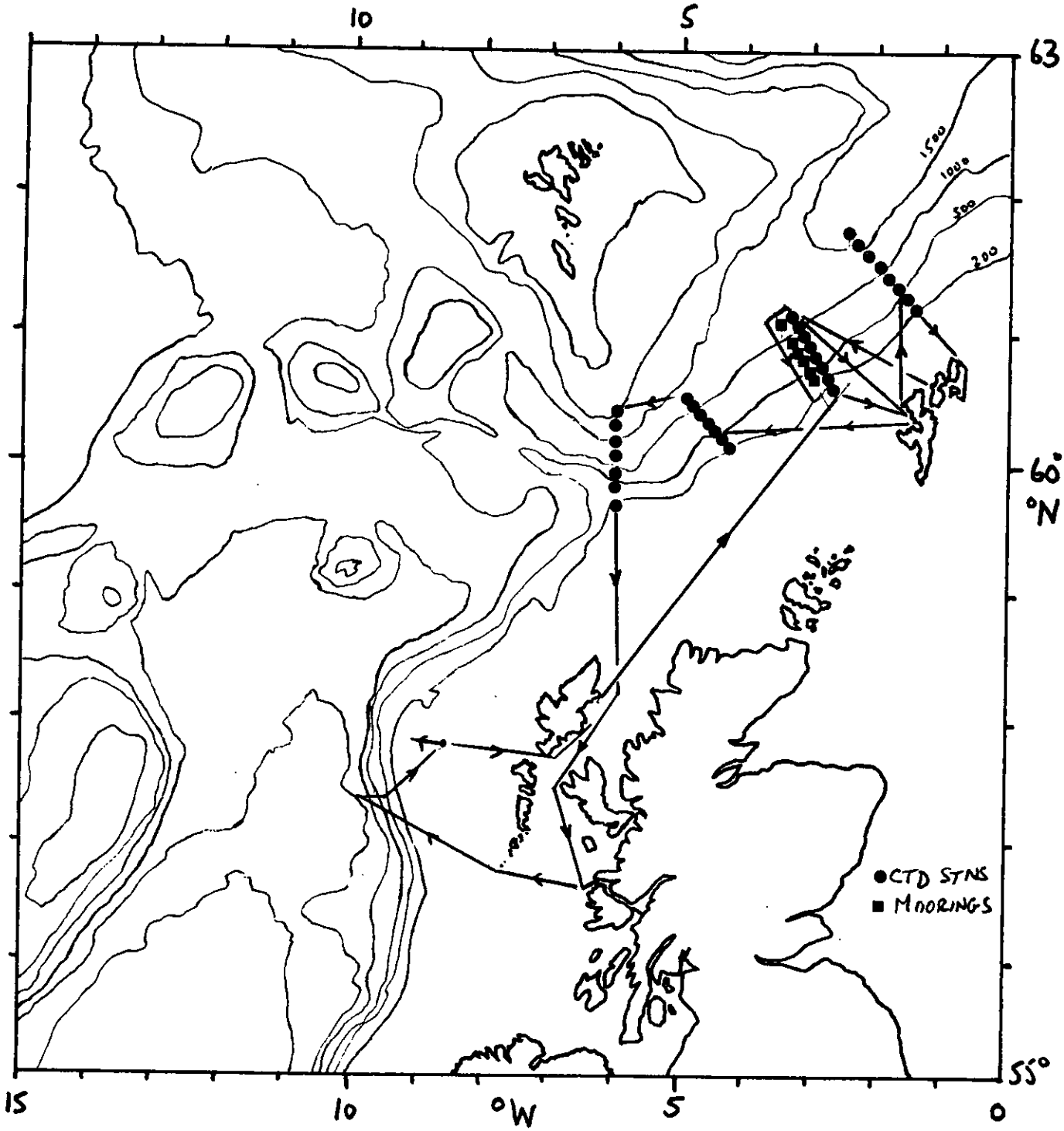

Fig 1

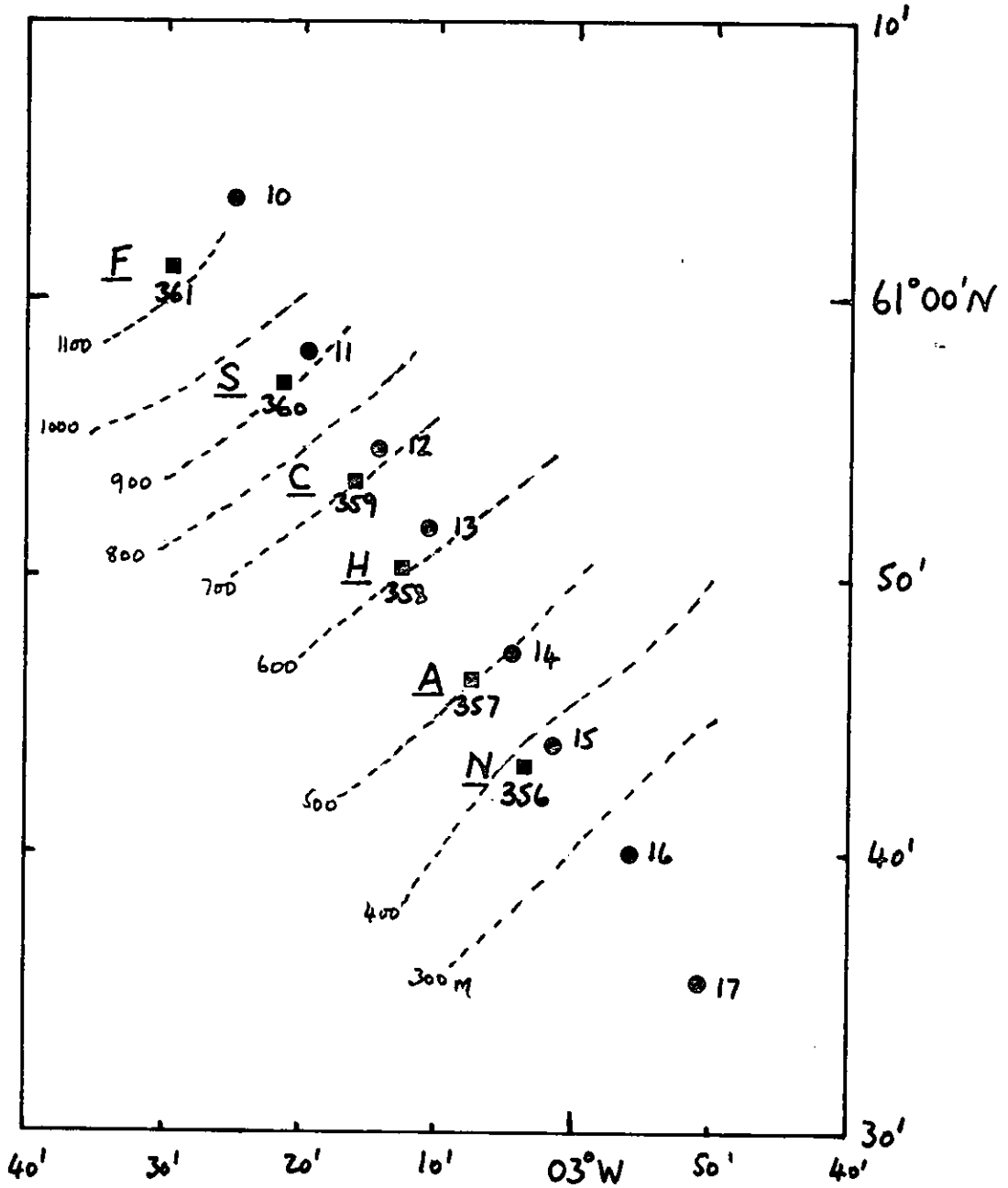
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Fig 2