

NATIONAL INSTITUTE OF OCEANOGRAPHY
Wormley, Godalming, Surrey.

"DISCOVERY" CRUISE 17 REPORT

(3rd June - 8th July 1967)

INSTRUMENT TRIALS AND OCEANOGRAPHIC OBSERVATIONS

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REPORT OF DISCOVERY CRUISE 17

Duration June 3rd - July 8th, 1967

Area N.E. Atlantic

Scientific Staff

Both legs of cruise

J. Crease	}	Principal scientist
D. I. Gaunt		
M. J. Harris	}	N.I.O.
N. D. Smith		
Mrs. P. Edwards		
R. MacAlpine		
A. J. Woods		Kelvin-Hughes

First leg

M. J. Tucker	}	N.I.O.
N. Kenyon		
C. Folland		
M. McCartney		
R. Clements		
Lt. Cdr. R. H. Woods		Hydrographic Department
R. Priestly		Fisheries Laboratory, Aberdeen
J. Fillingham	}	Vickers Ltd.
C. A. C. Andrew		
C. Rolleston		Plessey Co.

Second leg

D. E. Cartwright	}	N.I.O.
S. Rusby		
R. Edge		
J. A. Ewing		
A. Dyer	}	Southampton University
K. Massie		
R. Sen-Gupta		Göteborg, Sweden
W. K. Calvert	}	Vickers Ltd.
T. A. Bowman		

Principal Objects

1. Trials of Pop-up buoy systems
2. Current and hydrographic observations in Faeroe Bank Channel
3. Measurements of directional wave spectra using cloverleaf buoy.
4. Stability and acoustic tests of model GLORIA.

Narrative

Departure - we cleared Millbay dock at 1435 and anchored in the Sound to put the new Asdic transducer down. A check with the D.R.C.M. suggested that the new EM log was 1 kt out of calibration. After several runs over the D/G range we put the P.D.R. fish over and proceeded to the measured mile. Several runs before nightfall indicated that the log was indeed 1 kt. out. This is the full limit of the zero adjustment so there is now nothing in hand if further adjustment is required.

Pop-up buoy systems - (Gaunt, Harris, MacAlpine, Clements)

Four pop-up buoys were laid as follows

- a) In position $47^{\circ}32.3'N$, $18^{\circ}22.1'W$ on a 2000m. plateau on the north west slopes of the Bay of Biscay. This buoy system using stainless steel warp in nine 200m. lengths carried 10 specimens of a new warp which Vickers Ltd. have under test. No other instruments apart from pop-up firing and pinger equipment were used. Buoyancy was provided by three of our cylindrical buoys. The anchor was 1400 lbs.

The initial lay on 6th June ended when a shackle joining two lengths of wire got under another turn on the winch and parted the cable. This resulted in loss of anchor chain, acoustic release and one length of cable.

A second attempt to lay on 7th June was successful. Each length of 200m. was separately tensioned over the port side gallows and then rewound onto main winch drum and finally incorporated into the mooring on the starboard side. The position of the buoy relative to a dhan and to the French and S.W. British Decca chains was established and a useful box survey of the topography within 10' is available.

The buoy was revisited after 4 weeks on the 5th July and the pinger unit switched on at the first attempt. Buoyancy and position appeared to have been maintained so the pinger was switched off and the buoy left for recovery later in the year as planned.

- b) Pop-up beacon system. This system, consisting of a pop-up release unit, pinger and second transponding pinger 200m. above the first at the end of an electric cable, was first laid on 8th June, but we got into difficulties in handling the gear as end units were integral with the cable. We recovered the gear and made another attempt on the 11th June, this time lowering the equipment to just below the surface and then letting it free-fall (200 lb. anchor). Buoyancy was provided by deep-sea trawl floats understood (though

not tested by us) to be good to 1000 fathoms. The glass spheres (Joblings) that we had intended to use had shown small leaks while under test a few days before. All was going well until the trawl floats commenced imploding at a minimum depth of 400 fathoms. The acoustic release unit was fired successfully but apparently all buoyancy had gone. The two pingers indicated that they were separated by approximately 50m. in a depth of 2000m. Two drags over the area which came as close as the ship could be steered to their position were unsuccessful.

- c) Faeroe Bank channel moorings. Two identical systems (apart from certain mooring fittings) were laid on 13th and 14th June along the axis of the channel in a depth of 800m. Each had two cylindrical buoys, 600m. of stainless warp and three current meters at 10m. (Braincon), 240m. (Bergen) and 440m. (Braincon) above the bottom with anchors of 1000 lb. The buoys carried a flashing light, temperature-depth recorder and radio beacon.

On return to the area on 27th June, signals were heard on the automatic D/F equipment associated with the radio beacon and one buoy was found on the surface several miles downstream of the laying area. However it was still moored and had dragged up the side of the channel into shallower water. The pop-up release was fired successfully and the buoy recovered after some excitement with the buoy under the ship and near the propeller.

The second system was located in its correct position later the same evening but by the morning the weather had deteriorated badly and no attempt was made to recover it until the 30th June when the weather improved for a short while. This operation went off successfully.

All current meters appeared to be operating properly; a temperature-depth record was obtained from the second buoy but the first recorder was lost during recovery while the buoy was under the ship.

Detailed observations of corrosion, wear and performance have been made by Gaunt and Harris and will be incorporated into a report by them.

In conclusion, this cruise has established the effectiveness of the pop-up system as developed by Gaunt and Harris as a reliable method of mooring and of the acoustic link as a highly efficient device with applications beyond the pop-up system itself.

Wave Recording - (Cartwright, Ewing, Smith)

On 20th June contact was made with 'Weather Adviser' on station 'India'. Comparative measurements were made of the waves as measured by the weather ship's S.B.W.R., Discovery's S.B.W.R. and the cloverleaf directional wave-recording buoy built by N. D. Smith. The ships were 1 mile apart. From 22nd to 25th June the cloverleaf buoy was launched at 6 hourly intervals for durations of half-an-hour at a position 130' south of 'India'. The weather became very calm on the 24th but waves began to develop to a height of about 7 feet by the end of the observations.

Finally three long series of S.B.W.R. observations each of about 7 hours duration were obtained while the ship was hove to in a steady force 8 on the 28th and 29th June; 35 feet waves were recorded.

GLORIA (Rusby, Smith, Edge)

The one-third scale model of GLORIA, now fitted with yaw stabilisation equipment, was towed for 19 hours on 26th/27th June at a depth of 400 feet. It was established after experiment that both the long and short period oscillations of the 'fish' could be considerably reduced by the servo controlled rudder. Results were sufficient to indicate the stabilisation requirements for the full scale 'fish'.

On the 6th July the model was towed for a further 11 hours to measure flow noise and cavitation round a single stack of the proposed transducer. Observations were made at depths of 50, 150 and 250 feet and only terminated when the accelerometer broke under heavy loading of 1 kw. output power.

Asdic Survey (Tucker, Kenyon)

The pillars of the hull-mounted transducer have been extended in an attempt to combat problems of aeration. This appears to have been successful, useful records being obtained at speeds up to $10\frac{1}{2}$ kts. in calm weather. The passage from the Bay of Biscay to the Faeroes was arranged to keep close to the edge of the shelf thus providing a useful track in an area previously unsurveyed by the Asdic. A further record was obtained on passage into Stornoway.

Precision Echo Sounder

This was run at all times either on the towed fish or hull transducer. The southward track to the Bay of Biscay was planned to fill in gaps in existing surveys. One towed echo-sounder was lost when it struck a log while the ship was on passage to Stornoway.

Temperature - Salinity - Depth Recorder (Crease)

The new TSD recorder (Bissett-Berman) was in use on many occasions (see station list). It performed very well, being close to calibration and giving no trouble in use except for a significant shift in zero of the strain gauge transducer after leaving Stornoway. This was easily corrected. Unfortunately the instrument was lost before its main observational programme in the Faeroe Bank channel had been started (the loss is reported on separately). Only two sections of 5 lowerings each across the Faeroe Bank channel were carried out; the majority of the other observations were repeated casts through the seasonal thermocline in association with current meter observations in the intervals between cloverleaf wave recording. Dyer (Southampton University) is examining these as part of an M.Sc. Dissertation.

Other observations

Carruthers' Fisa current meters were used successfully in the Faeroe Bank channel and Bay of Biscay.

Digital recordings at a high sampling rate were taken of the following meteorological variables - wet and dry bulb temperatures, incident and net radiation, and component wind speeds. These will provide information on sampling requirements when introducing a data logging system to the ship.

The NIO E.M. log developed a fault after working satisfactorily for a few days and although analogue records were obtained there are no digital records.

Hydrographic Stations at Weather Ship 'India'

Three hydrographic stations were made at approximately 10 miles, 5 miles and 1 mile from 'Weather Adviser' which made simultaneous observations. 'Weather Adviser' transferred one set of samples to Discovery for immediate analysis, retaining the other set for normal processing through their organisation.

CRUISE 17 STATION LIST

STATIONS 6279 - 6346

Abbreviations:

AR	acoustic release
BCM	bergen current meter
BT	bathymograph
C	cloverleaf wave recording buoy
D	Decca
DB	dhan buoy
D/G	de-gaussing
DRCM	direct-reading current meter
E.M.	electro-magnetic
E/S	echo-sounding
EQ.	equipment
GLORIA	geological long range inclined asdic
IN	inboard
L	Loran
NN	neuston net with water temperature probe, towed at 4 knots
m.	metres
OUT	outboard
PISA	"pisa" bottom current indicator
P-U-B	pop-up-buoy
R	radar bearing on dhan buoy
REL.	released
SBWR	shipborne wave recorder
TP	transponding pinger
TRANS.	transmitter
TSD	temperature-salinity-depth probe (BISSETT-BERMAN)

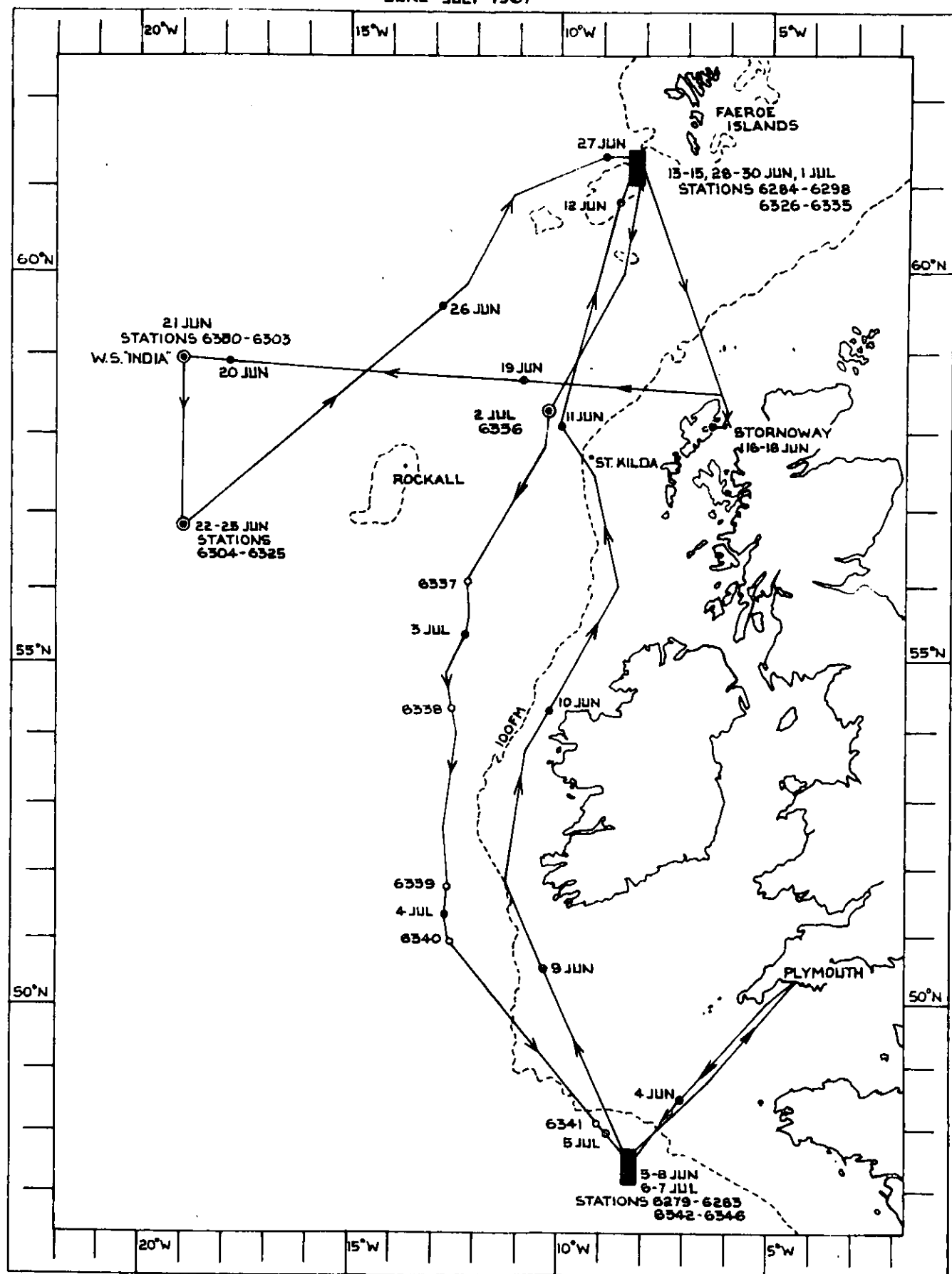
STATION NO.	DATE 1967	TIME BST	POSITION		FIX	CORR. DEPTH m.	GEAR USED
			°N'	°W'			
	3/6	1435					Left Millbay
	3/6	1833 1910					4 runs over D/G range
	3/6	2030 2200					5 runs over measured mile
	3/6	2240					Set course for Bay of Biscay
	4/6	1848					Arrived at position 47°32'N, 08°17.5'W
6279	4/6	2000	47 30.4	08 20.5	D	2057	DB 1 out
6280	4/6	2034 2400	47 29.7	08 24.3	D	2046-2067	EQ. Tests
6281	5/6	2120 2335	47 28.2	08 21.3	D	2151	WB
6282	NOT USED						
	6/6	0904 1135				2147	Vicker's gear out, lost
	6/6	2000	47 29	08 21	R		BTs (frequent)
	7/6	to 0430					
	7/6	0935 1933					P-U-B 1 (Vickers') out
	7/6	1933	47 32.3	08 22.1	D	1991	P-U-B 1 position
	8/6	0200 0800					DRCM (10m)
6283	8/6	1345 1405	47 29	08 15	R	2233	Beacon P-U-B
	8/6	1635				(2057)	DB 1 in
	8/6	1648					Set Course for Faroe Bank Channel
	11/6	1306					Arrived at position 58°13'N, 10°10'W
	11/6	1347	58 13	10 10	D	(1800)	DB 2 out
	11/6	1430	58 14	10 10	D		Beacon P-U-B out, lost
	11/6	2012 2253					Dredging for gear
	11/6	2310	58 15	10 05	D		DB 2 in
	12/6	1442					Arrived Faroe Bank Channel
	12/6	1525	61 23.7	08 14.5	D	808	DB 3 out
6284	12/6	1600 1730	61 23.5	08 13.5	D	805	WB
	12/6	1940 2040					AR tests
6285	12/6	2115 2224	61 23.9	08 13.4	D	796	TSD
6285	12/6	2250	61 24.0	08 14.1	D	808	BCM, DRCM
	13/6	to 0140					
	13/6	1145	61 21.4	08 09.1	D	(827)	P-U-B 2 out
6286	13/6	1926 2210	61 22.3	08 10.7	D	814	BCM, DRCM
6287	14/6	0945 1039	61 25.7	08 14.8	D	728	TSD
	14/6	1242	61 25.7	08 15.4	D		P-U-B 3 out
6288	14/6	2015 2056	61 23.7	08 07.1	D	768	TSD
6289	14/6	2115 2200	61 23.1	08 08.5	D	801	TSD
6290	14/6	2225 2314	61 22.1	08 09.7	D	817	TSD
6291	14/6	2339	61 21.5	08 11.1	D	812	TSD
	15/6	to 0036					

STATION NO.	DATE 1967	TIME BST	POSITION		FIX	CORR. DEPTH m.	GEAR USED
			°N'	°W'			
6292	15/6	0102 0156	61 20.7	08 11.9	D	803	TSD
6293	15/6	0251 0327	61 23.1	08 22.3	D	593	TSD
6294	15/6	0350 0432	61 23.9	08 19.8	D	823	TSD
6295	15/6	0500 0549	61 25.1	08 18.2	D	817	TSD
6296	15/6	0615 0655	61 26.1	08 16.3	D	757	TSD
6297	15/6	0721 0758	61 27.1	08 14.3	D	849	TSD
6298	15/6	0903 1034	61 25.7	08 19.9	D	816	WB
	15/6	1110					DB 3 in
	15/6	1115					Set Course for Stornoway
6299	NOT USED						
	15/6	1554					E/S Fish Lost (1061)
	15/6	1710 1806					(1004) TP tests
	16/6	1020					Arrived Stornoway
	18/6	1400					Left Stornoway
							Set course for Weather Station "India"
	20/6	1600					Arrived "India". Dinghy from W. Adviser for WBs.
6300	20/6	1845 2007	58 58.0	18 58.7	L	1775	WB (both ships)
6301	20/6	2025 2101	58 58.0	18 59.3	L	1817	C 1
6302	21/6	0900 1056	58 58.5	19 22.9	L	2410	WB (both ships)
6303	21/6	1305 1410	58 58.7	19 07.3	L	2146	WB (both ships)
	21/6	1520					Dinghy from W. Adviser with water samples and S.B.W.R. records
	21/6	1625					Set course to southward for C. recording
	22/6	0753	56 46.7	18 59.3	L	(1336)	DB 4 out
	22/6	0925 0945	56 46.7	18 59.3	L	(1336)	BCM
6304	22/6	1117 1156	56 46.7	18 59.3	L	(1336)	C 2
	22/6	1313 1554	56 44.5	18 53.8	L	(1336)	BCM
6305	22/6	1638 1724	56 44.1	18 53.5	L	1297	C 3
6306	22/6	1915 2017	56 45.3	18 58.0	L	1317	TSD, BCM, DRCM
6307	22/6	2154 2210	56 45.4	18 55.6	R	1311	TSD
6308	22/6	2230 2315	56 45.2	18 54.5	R	1310	C 4
6309	23/6	0030 0400	56 45.9	18 57.8	R	1319	TSD, BCM, DRCM
6310	23/6	0430 0530	56 45.2	18 57.7	R	1315	C 5
6311	23/6	0536 1012	56 45.1	18 56.5	R		TSD, BCM
6312	23/6	1035 1145	56 45.3	18 55.8	R		C 6
6313	23/6	1150 1416	56 45.3	18 55.8	R		TSD, BCM
6314	23/6	1416 1550	56 45.3	18 55.8	R	1315	WB
6315	23/6	1630 1717	56 44.6	18 55.8	R	1311	C 7

STATION NO.	DATE 1967	TIME BST	POSITION		FIX	CORR DEPTH m.	GEAR USED
			°N'	°W'			
	23/6	1747	56 46.0	18 58.0	R		TP out
	23/6	2200					TP in
6316	23/6	2230 2312	56 44.9	18 54.9	R	1310	C 8
	23/6	2326					TP out
6317	24/6	0245 0353	56 44.5	18 56.1	R	1315	TSD, BCM
6318	24/6	1030 1124	56 43.4	18 50.3	R	1297	C 9
	24/6	1150					TP in
6319	24/6	1335 1608	56 46.4	18 58.0	R	1297	TSDM BCM
6320	24/6	1630 1722	56 45.7	18 58.3	R	1297	C 10
6321	24/6	1730 2140	56 45.3	18 58.0	R	1322	TSD, BCM
	24/6	2140					TSD lost
	24/6	2200	56 46.2	18 57.8	R	(1336)	TP out
	24/6	2220					TP in
6322	24/6	2230 2346	56 46.1	18 57.8	R	1322	C 11
6323	25/6	0053 0130	56 44.5	18 58.7	R	1324	BCM
6324	25/6	0430 0524	56 42.2	19 01.1	R	1322	C 12
6325	25/6	1030 1128	56 45.8	19 00.2	R	1315	C 13
	25/6	1147				(1336)	DB 4 in
	25/6	1200	Set course for Faroe Bank Channel				
	26/6	1047 2000				1263-1103	Gloria trials
	26/6	2200				1170	Gloria trials
	27/6	to 0757				-107	
	27/6	1445	61 28.2	08 22.6	D	(807)	P-U-B 2 Rel.
	27/6	1900					P-U-B 2 in
	28/6	1750					SBWR 1
	29/6	to 0128					
	29/6	0210 0955					SBWR 2
	29/6	1230 1900	61 07.0	08 22.0	D		SBWR 3
	30/6	1010					P-U-B 3 in
6326	30/6	1130 1257	61 25.9	08 14.1	D	742	WB
6327	30/6	1537 1702	61 25.1	08 16.5	D	799	WB
6328	30/6	1810 2020	61 26.5	08 12.7	D	647	BCM, DRCM
6329	30/6	2036 2300	61 25.3	08 14.5	D	728	BCM, DRCM
6330	30/6	2320 2400	61 24.7	08 15.1	D	724	BCM, DRCM
6331	1/7	0033 0315	61 25.7	08 18.1	D	799	BCM, DRCM
6332	1/7	0343 0633	61 24.7	08 17.8	D	823	BCM, DRCM
6333	1/7	0710 0920	61 23.2	08 18.7	D	666-323	BCM, DRCM
6334	1/7	1030 1204	61 19.1	08 03.6	D	834	WB
6335	1/7	1242 1352	61 18.4	08 06.2	D	823	WB

STATION NO.	DATE 1967	TIME BST	POSITION		FIX	CORR. DEPTH m.	GEAR USED
			°N'	°W'			
6335	1/7	1407 1436	61 18.6	08 05.5	D	838	PISA
	1/7	1448	Set course for Bay of Biscay				
6336	2/7	1116 1319	58 20.6	10 25.3	D	1877	WB
6337	3/7	0512 0814	56 06	12 09	D	2708	WB
6338	3/7	1735 1946	54 26	12 34	D	2949	WB
6338	3/7	1952 2016	54 25	12 33	D	2949	NN
6339	4/7	1020 1045	51 42	12 38	D	1339-1400	NN
6340	4/7	1453 1635	50 53	12 38	D	2110	WB
6341	5/7	1038 1100	48 05	09 00	D	2244-2376	NN
6342	5/7	1410 1455	47 33.0	08 30.3	D	2074-2113	NN
	5/7	1712	47 32.4	08 22.0	D	(2000)	Fix on P-U-B 1
6343	5/7	1720 2015	47 28.5	08 29.3	D	2000-2398	NN
6344	5/7	2145	47 17.6	08 47.4	D	4329	WB
	6/7	to 0033					
6344	6/7	0052 0155	47 21.9	08 39.4	D	4298-3276	NN
6345	6/7	0425 0515	47 29.1	08 24.2	D	2128	PISA (Abyssal)
6346	6/7	0734 1000	47 28.9	08 30.7	D	2156-2214	4.4158 Mc. Trans. tests
	6/7	1344				2117-	Gloria Trials
	7/7	to 0052				4744	
	7/7	0335	Set course for Plymouth				
	8/7	1800	Docked Millbay				

TRACK CHART OF DISCOVERY CRUISE 17
JUNE-JULY 1967



• NOON POSITIONS

◦ STATION POSITIONS