R.R.S. SHACKLETON 2/83

CRUISE REPORT

Department of Geology,
Imperial College.

Leg 1 Gibraltar - Dakar

Leg 2 Dakar - Dakar

24th January - 17th March, 1983

1. Objectives

The main purpose of the Imperial College cruise SHACKLETON 2/83 was to collect material for geochemical investigations from equatorial Atlantic fracture zones.

Our specific objectives were :-

1. To look for hydrothermal deposits, particularly sulphides, in the fracture zones and at fracture zone-ridge-crest intersections.

2. To collect sediment samples from the fracture zones in order to assess the relative importance of hydrogenous, diagenetic and hydrothermal processes in controlling sediment composition in different areas of the fracture zones.

3. To collect sediment samples from several traverses across the mid-Atlantic Ridge between fracture zones in order to investigate whether hydrothermal activity exists at the ridge crest and to characterise element dispersion away from any such centres of activity.

4. To collect samples of ferromanganese encrustations from fracture zone walls in order to assess the influence on their composition in different areas of hydrogenous and hydrothermal element supply.

We envisaged that most of our sampling would be in the Romanche and Chain Fracture Zones and along the adjoining sections of the mid-Atlantic Ridge in the area between about $1^{o}N$-$2^{o}S$, 13^{o}-$19^{o}W$. We proposed to study the Romanche Fracture Zone in greatest detail because much of the necessary background work had already been done by other expeditions to the area and there were indications that hydrothermal deposits may exist there.

Shortly before our departure, and partly as a result of the previous logistic difficulties experienced with the SHACKLETON, it was agreed with Dr. J. Jones of University College that we would undertake geophysical survey work whilst underway from and in our working areas.

2. Narrative

2.1. Cruise 2/83/Leg 1

2.1.1. Preliminaries

The personnel for Shackleton cruise 2/83 (S.A. Moorby, J. Heeley, R. Hodkinson from Imperial College, R. Gilmore from University College)

joined the ship in Gibraltar on Monday, 24th January. On Tuesday, 25th January, we were joined by E. Odada of the Kenya Marine Research Institute, who was joining the cruise to gain seagoing experience before coming to study at Imperial College.

The R.V.S. support personnel, S. Smith and R. Lee, were already on board and a third technician, C. Paulson, joined the ship on Tuesday, 25th January.

All equipment required for the cruise was already on board, except for one case of our own, containing stationery, sample bags and equipment for smear slide work. This was originally shipped to Dakar and was thought to be still there. Its contents were not vital however and the cruise programme was not affected in any way by its absence.

We departed Gibraltar, approximately as scheduled, at 10.00 a.m. (GMT) on 26th January 1983.

2.1.2 Geophysical survey

We agreed to run underway geophysical surveying for Dr. J. Jones of University College along two lines down to our working area (see Map and Appendix 2). The start of the first line was about 6 days steaming from Gibraltar. During the passage, time was lost due to the illness of one of the ship's crew (see Section 4). We approached the start of the line ($16^{o}00'N$, $21^{o}40'W$) on Wednesday, 2nd February, during the morning the magnetometer was streamed and the PES and gravimeter run-up. The line was reached and readings started at 12.30 GMT. Readings were taken every 10 minutes of gravity, magnetics and bathymetry and continuous chart recordings were obtained. We reached the end of the first line ($8^{o}15'N$, $23^{o}10'W$) at 14.20 GMT on Friday, 4th February and altered course onto the second line which was to take us directly to our own working area (see Map).

During the cruise up to this point, navigation had been by the Microtechnica Sirius gyrocompass, but at 14.20 GMT on 5th February this went down and we were forced to switch over to the Arma-Brown gyro. Because of the violent course change which occurred when the Sirius gyro went down we had to steam back up the line to recover our position at 14.30 GMT, re-running the line from that point. Further problems occurrred during this line when the PES went down at 06.40 GMT on 6th February.

Because it was not possible to estimate how long repairs would take, and because of the amount of time already lost, it was decided to continue with the survey line, doing without the bathymetry which, since we were steaming across the Sierra Leone Basin, was extremely flat. The fault proved to be particularly difficult to locate and was not repaired until 16.50 GMT on the 6th February. The end of the geophysical survey line was reached at 21.40 GMT on 7th February, at which point the magnetometer was pulled in and we altered course for the Chain Fracture Zone - mid-Atlantic Ridge intersection.

2.1.3 Geological sampling

2.1.3.1 Chain F.Z. - M.A.R. intersection ($1^{o}20'S$-$1^{o}45'S$, $15^{o}40'W$-$16^{o}05'W$)

We planned to spend several days at the Chain F.Z. - M.A.R. intersection, carrying out a detailed bathymetric survey and obtaining samples by gravity coring. We reached the area at 05.00 GMT on 8th February and began a series of north-south traverses of the area at 4 mile intervals. Upon completion of the third line, we broke off to carry out 2 gravity core stations on the north and south sides of the fracture zone floor (SH2/83/1 and 2), approximately 2 miles apart. These stations were occupied between 16.00 and 22.20 GMT on 8th February and both were successful (see Appendix 1). Because of suspected overpenetration of the corer, the weight of the core bomb was reduced. After completion of station SH2/83/2 we continued to run the north-south lines, completing them at 08.15 on 9th February. We then commenced steaming east-west lines at 4 mile intervals. When three such lines had been completed, we were able to delineate the junction of the M.A.R. and the fracture zone sufficiently well to be able to carry out 3 stations in the axial rift near this junction (Stations SH2/83/3A and 5). These stations were occupied between 13.00 GMT on 9th February and 00.30 on 10th February. We then resumed steaming the east-west traverses but problems developed with the satellite navigation system in the early hours of 10th February resulting in the accumulation of a substantial error in our DR position. This meant that we needed to steam an extra east-west line in order to firmly establish the bathymetry of the fracture zone floor. During the 10th February, we occupied 4 gravity core stations on the fracture zone floor near the junction with the M.A.R. (Stations SH2/83/6 to 9, see Appendix 1). Some problems with overpenetration still seemed to be occurring, the top sediment being lost at Station SH2/83/6. After this station therefore we reduced further the weight of the gravity corer, leaving only 3 lead weights on the bomb, and this seemed to solve the problem. Stations

SH2/8/6 to 9 were occupied between 11.30 GMT on 10th February and 01.45 on 11th February. In the absence of clear visual evidence of metal enrichment in any of the cores, we decided to leave the area and steam north to the M.A.R.

2.1.3.2. Mid-Atlantic Ridge traverses

The next part of the cruise programme involved the sampling of the M.A.R. along 3 traverses, at about $1^{o}S$, $0^{o}30'S$ and $0^{o}S$. The first of these traverses, at $1^{o}S$, was carried out between 06.00 and 08.00 GMT on 11th February. We steamed back along the line and obtained a gravity core from a small deep just to the east of the axial rift (Station SH2/83/10). An attempt to obtain a gravity core from the flanks of the axial rift (Station 11) was unsuccessful as was the attempt at the centre of the rift valley floor (Station 12). In both cases damage to the core cutter indicated that the corer had hit rock. We therefore decided to pipe dredge the rift valley at the site of Station 12, (Station 12A) obtaining a large haul of fresh and altered basalt fragments. The final station on this traverse (Station 13) was a successful attempt to obtain a gravity core from the western flanks of the rift valley. Stations 10 to 13 were occupied between 08.20 on 11th February and 00.16 on 12th February, after which we steamed north to start the next traverse at $0^{o}30'S$. This was run between 04.00 and 07.00 GMT on 12th February, we then returned along the line and sampled the rift valley at 3 sites. At the first station (Station 14) we lost time when the gravity corer was lost at the surface (see Section 3.3), however the station was successfully re-occupied and a 1 metre core obtained. Because the sediment cover appeared to be thin or absent on the rift valley at the $1^{o}S$ traverse, we decided to pipe dredge the rift valley on the traverse at $0^{o}30'S$. and Stations 15 and 16 were thus pipe dredge stations in the rift valley. At both stations carbonate ooze was recovered, although there were numerous admixed fragments of basalt in the sediment at Station 15. Stations 14 to 16 were occupied between 08.00 and 23.00 GMT on 12th February after which we steamed to the start of the third traverse at $0^{o}05'S$.

A west-east line across the M.A.R. was steamed at $0^{o}05'S$ between 03.00 and 05.50 on the 13th February. Time was lost during this traverse because we had to slow to 4 knots whilst a fault on the PES was investigated. Partly because of the poor quality of the PES record on the traverse, it proved impossible to identify unequivocally the axial rift and we therefore steamed back across The M.A.R. along the equator. Although the PES performed well during this crossing, the topography was confused and the axial rift

was not identified. Accordingly a third traverse was steamed at 0°05'N, between 10.50 and 12.15 GMT on 13th February. The axial rift was clearly identified on this traverse and we carried out 3 gravity core stations in the feature (Stations 17,18 and 19) between 12.50 and 21.00 GMT on 13th February. All 3 stations were successful.

2.1.3.3. Romanche F.Z. - M.A.R. intersection (0°10'N-0°35'N, 16°15'-16°40'W

The final objective of the first part of the cruise was to carry out a detailed bathymetric survey of the Romanche F.Z. - M.A.R. intersection, ready for a detailed sampling operation in this area during the second part of the cruise. This survey commenced at 22.15 GMT on 13th February and finished at 05.50 on 16th February. The magnetometer was also streamed and run during this survey. We ran lines north-south, then east-west, at 3 mile intervals. Between 06.15 and 07.45 GMT on 14th February we had further problems with the PES recorder. Because the magnetometer was streamed we were unable to heave to and so had to steam round in a tight circle at 4 knots until the repairs were completed. A prolonged gap between satellite fixes after this problem resulted in an error of some 5 miles accruing in our DR position by 14.30 GMT on 15th February. Because of this we had to revise the remaining east-west lines. One box core station (Station 20) was carried out on the fracture zone floor, between 15.10 and 21.20 GMT on 15th February. Approximately 3 hours were lost at the beginning of this station when the winch broke down. The box core was successful and seven mini cores of clay-carbonate were obtained. At 05.50 GMT on 16th February we broke off to return to Dakar.

2.1.4. Passage to Dakar

During our passage to Dakar, we carried out a gravity magnetic and PES survey for J. Jones of University College, from leaving our working area at 0°27'N, 16°12'W at 06.00 on 16th February until reaching the 200 mile limit, south of Dakar, at 08.35 GMT on 17th February, at 8°00'N, 16°28'W.

2.2. Cruise 2/83/Leg 2

2.2.1. Preliminaries

There were few scientific personnel changes between Legs 1 and 2. R. Gilmore and S. Smith left the ship and D. Cronan (Imperial College), J. Strangward, T. Probert and K. Robertson (RVS) joined.

We departed Dakar at 13.00 GMT on 23rd February for the first working area, the mid-Atlantic Ridge - Romanche Fracture Zone intersection.

2.2.2. Geophysical Survey

Once outside the 200 mile limit, we streamed the PES fish, magnetometer and switched on the gravity meter in order to run a geophysical line for J. Jones. Although the shortest route to our first working area was back along our previous track into Dakar, we took a different course in order to avoid duplicating tracks, resulting in some loss of station time (Appendix 2).

2.2.3. Geological Sampling

2.2.3.1. Mid-Atlantic Ridge - Romanche Fracture Zone intersection

Using the bathymetric map produced on Leg 1 of the MAR-RFZ intersection, we occupied a number of stations in the area (SH2/83/21 - SH2/83/35, Appendix 1). These were sited in three situations. First along the axial rift of the MAR up to the fracture zone, second a traverse across the MAR just south of the intersection, and third along the easternmost end of the active transform itself, to include a mound like feature in the centre of the fracture zone which was thought to be possibly volcanic in origin. Recovery was generally good. This work occupied us from 16.05 GMT on 27th February until 07.15 GMT on 2nd March.

2.2.3.2. Romanche Fracture Zone

At 14.52 GMT on 2nd March we commenced a line of stations along the Romanche Fracture Zone moving from east to west in to progressively deeper water. In each case, an attempt was made to core in the centre of the fracture zone. Between stations we ran bathymetric profiles at right angles to the trend of the fracture zone in order to define more clearly the topography of its floor and to select sites suitable for coring.

The first of the R.F.Z. stations (SH2/83/36) had to be aborted owing to severe winch problems which, for a time, looked as if they would jeopardise the rest of the cruise. However, the corer was recovered at slow speed, and repairs were made to the winch. Thereafter, however, we were restricted to using the winch at only 40m/min in order to avoid a repeat of the problem, and this severely reduced the amount of time available for subsequent station work and resulted in the abandonment of proposed stations at the western end of the active transform.

The Romanche Fracture Zone sampling occupied us from 14.52 GMT on 2nd March until 19.35 GMT on 8th March. During this period, we occupied stations SH2/83/36 to SH2/83/47, which included a station in 7770m water depth near the Vema Depth (SH2/83/46). This appears to be Shackleton's deepest station. Core recoveries were generally good (Appendix 1). One pipe dredge station SH2/83/47, which was aimed at retrieving sulphides from a position previously occupied by Bonatti et al, 1976, recovered only mud.

2.2.3.3. Southern Wall of RFZ and MAR traverse to the south of the RFZ

After completing the Romanche Fracture Zone floor work, we attempted a rock dredge station on the southern wall of the fracture zone in order to obtain manganese crusts and rocks for comparison with those collected from the northern wall (Zone Romancha) by the French. The station (SH2/83/48) was successful, and we obtained a large haul of rocks, coral fragments, and 4 pieces of manganese crust (Appendix 1).

Thereafter, we steamed further to the south, ($0^{o}38.5'S$, $18^{o}23.7'W$) to commence a line of cores across the MAR parallel to the trend of the RFZ. Magnetics and gravity were run between stations on this line for J. Jones. This work commenced at 06.23GMT on 9th March and was completed at 17.20 GMT on 11th March. Six gravity core stations were occupied, (SH2/83/49 - SH2/83/55) all of which were successful (Appendix 1).

2.2.3.4. Inactive part of Romanche Fracture Zone

In order to complete the RFZ sampling, it was decided to take a line of cores in the inactive part of the transform to the east of the RFZ/MAR intersection. Part of the rationale for this was to compare the sediments which would presumably not be subject to volcanic influences with those from the active part of the transform which might be subject to such influence. Further, the AABW which flows from west to east along the bottom of the F.Z. might transport fine particulates deriving from the MAR/RFZ intersection or further west. Accordingly, stations SH2/83/56 - SH2/83/58 were planned at approximately equal intervals from the intersection. These stations commenced at 22.27 GMT on 11th March and were completed at 17.03 GMT on 12th March. Good cores were recovered at station 56 and 57, but at station 58 the fracture zone pinched out to a very narrow valley and only a few mg. of sediment was recovered on the side of the catcher. Possibly enhanced bottom water flow through the narrows is sweeping it clear of sediment.

2.2.3.5. Final stations

Before breaking off the scientific operations to sail to Dakar, two more stations were occupied. Station SH2/83/59 was a rock dredge on the north wall of the RFZ/MAR intersection designed to obtain rocks and manganese crusts for comparison with those obtained by the French from the north wall in the 'Zone Romancha'. A good haul was obtained, (Appendix 1). Station SH2/83/60 was a box core station in deep water to the north of the RFZ designed to obtain a bulk sample for both control and comparative purposes. A good core was obtained (Appendix 1).

2.2.4. Passage to Dakar

Station work was broken off at 09.55 GMT on 13th March and Dakar was reached at 11.13 GMT on 17th March.

3. Instrument Performance

Generally speaking, all the equipment used performed adequately but some time was lost due to instrument breakdowns, as mentioned above and detailed below.

3.1. Gyrocompasses

We lost approximately 1 hour on 5th February when the failure of the Sirius gyrocompass necessitated the re-steaming of part of the geophysical survey line.

3.2. P.E.S. recorder

Throughout much of the first leg of the cruise the PES recorder caused problems. The lack of a spare recorder on board meant that we lost about 10 hours bathymetry on 6th February when the recorder broke down whilst steaming to our working area and undertaking geophysical work. Later on in the cruise an intermittent fault developed which proved to be very elusive. Because bathymetry was vital to us during this part of the cruise, we had to slow down or heave to whilst this fault was investigated and we lost about 3.5 hours in total before the fault was rectified on 15th February.

3.3. Loss of gravity corer

The gravity corer was lost at the start of Station SH2/83/14 at 08.10 GMT on 12th February when the winch operator operated the winch controls incorrectly, causing the corer to be raised up to the block instead of lowered down through the water. The pennant parted in the winch room resulting in the loss of the corer. About 3 hours were lost whilst a new pennant and gravity corer were attached to the main warp and the block in the main 'A' frame was replaced.

3.4. Main winch failure

At about 15.30 GMT on 15th February, during Station SH2/83/20, the coupling between the hydraulic motor and the gearbox on the main winch began to disintegrate. Approximately 500 metres of wire were out and this was pulled in slowly, and the coupling repaired, before the station was resumed. About 3 hours were lost.

3.4.1. Main Winch Failure

During station 36 on 2nd March, the main winch underwent excessive vibration and the station was aborted. Examination of the winch revealed severe wear on the teeth, which for a while made it look as if we would not be able to use it again. However, repairs were carried out and a gravity corer which had been let out to 2700 m was recovered slowly. Thereafter, the winch could not be used at speeds of greater than 40m/min, resulting in a considerable reduction in the number of stations that we were able to occupy during the remainder of the cruise.

4. Lost time

In addition to the time lost due to instrument failure, described above, we lost time during our passage from Gibraltar on the 31st January and 1st February, due to the sudden illness of one of the stewards. In order to obtain medical assistance we steamed off our course to rendezvous with the Russian fish factory ship VIKTOR KINGISEPP. Thereafter we had to proceed to Nouadhibou in Mauritania to disembark the steward. A total of 28 hours was lost.

Appendix 1

Details of stations occupied

Date	Station No.	Type	Position	Depth (m)	Recovered
8/2/83	SH2/83/1	Gravity core	1°48.2'S 15°50.6'W	4519	1.97m. carbonate ooze
"	SH2/83/2	" "	1°50.0'S 15°49.3'W	4478	1.84m. carbonate ooze and core cutter sample
9/2/83	SH2/83/3	" "	1°24.9'S 15°55.6'W	4637	1.61m. carbonate ooze and core catcher sample
"	SH2/83/4	" "	1°27.3'S 15°54.8'W	4565	1.98m. carbonate ooze and core catcher sample
"	SH2/83/5	" "	1°29.2'S 15°53.2'W	4657	16cm. carbonate ooze with basalt frags. in catcher.
10/2/83	SH2/83/6	" "	1°31.9'S 15°58.1'W	4698	1.97m. carbonate ooze and core cutter sample
"	SH2/83/7	" "	1°32.2'S 15°57.3'W	4842	1.97m. carbonate ooze and core catcher sample
"	SH2/83/8	" "	1°29.4'S 15°55.0'W	4632	1.42m. carbonate ooze and core cutter sample
10 & 11/2/83	SH2/83/9	" "	1°33.2'S 15°53.4'W	4668	1.32m. carbonate ooze
11/2/83	SH2/83/10	" "	1°02.4'S 15°54.8'W	3993	1.32m. carbonate ooze
"	SH2/83/11	" "	1°03.1'S 15°57.6'W	3958	No core, cutter dented.
"	SH2/83/12	" "	1°03.9'S 15°58.9'W	4000	No core, cutter dented.
"	SH2/83/12A	Pipe dredge	1°04.2'S 15°58.6'W	3900-4000	Gravel sized fragments of fresh and altered basalt.
11/2/83	SH2/83/13	Gravity core	1°06.2'S 16°00.4'W	3587	1.79m. carbonate ooze
12/2/83	SH2/83/14	" "	0°31.8'S 16°00'W	3841	0.96m. carbonate ooze.
12/2/83	SH2/83/15	Pipe dredge	0°33.2'S 16°00.7'W	3917	Carbonate ooze and some basalt fragments
12/2/83	SH2/83/16	" "	0°32.6'S 16°02.2'W	4116	Carbonate ooze, no coarse fraction

Date	Station No.	Type	Position	Depth (m)	Recovered
13/2/83	SH2/83/17	Gravity core	0°07.7'N 16°17.2'W	3648	1.70m. carbonate ooze
"	SH2/83/18	" "	0°08.0'N 16°18.5'W	4024	0.32m. carbonate ooze and indurated cutter and catcher samples.
"	SH2/83/19	" "	0°06.5'N 16°18.1'W	3567	1.69m. carbonate ooze
15/2/83	SH2/83/20	Box corer	0°21.7'N 16°26.8'W	5627	7 minicores (<35cm) of grey clay-carbonate
27/2/83	SH2/83/21	Gravity core	0°24.6'N 16°14.5'W	5300	1.47m of buff ooze grading down to grey ooze.
27/2/83	SH2/83/22	" "	0°24.0'N 16°17.1'W	5606	1.5m. of calc ooze
28/2/83	SH2/83/23	" "	0°24.07'N 16°20.06'W	5610	1.32m. of calc ooze
28/2/83	SH2/83/24	" "	0°22.7'N 16°22.9'W	5622	1.57cm of calc ooze
18/2/83	SH2/83/25	Rock dredge	0°20.6'N 16°29.4'W	5202-4934	Empty
1/3/83	SH2/83/26	Gravity Core	0°08.9'N 16°12.8'W	3730	1.64m of buff calc ooze
1/3/83	SH2/83/27	" "	0°08.7'N 16°14.7'W	3587	1.49m of calc ooze
1/3/83	SH2/83/28	" "	0°08.4'N 16°17'W	3629	1.04m. of calc ooze
1/3/83	SH2/83/29	" "	0°08.9'N 16°20.1'W	3568	1.64m. of buff ooze
1/3/83	SH2/83/30	" "	0°08.8'N 16°23.1'W	3437	1.47m. of calc ooze
1/3/83	SH2/83/31	" "	0°08.6'N 16°25.4'W	3346	1.62m of calc ooze
1/3/83	SH2/83/32	" "	0°10.07'N 16°18.3'W	4299	1.50m. of calc ooze
1/3/83	SH2/83/33	Rock dredge	0°13.7'N 16°18' W	4192	Two pieces of indurated calc ooze
2/3/83	SH2/83/34	Gravity core	0°19.5'N 16°20.0'W	4744	1.75m of calc ooze
2/3/83	SH2/83/35	Pipe dredge	0°21' N 16°30' W	4700-5000	Two small pieces of Mn crust

Date	Station No.	Type	Position	Depth (m)	Recovered
2/3/83	SH2/83/36	Gravity core			Station aborted
21/3/83	SH2/83/37	" "	0°21.1'N 16°29' W	5409	1.8m of calc ooze
2/3/83	SH2/83/38	" "	0°18.7'N 16°40.2'W	5006	1.91cm of buff ooze
4/3/83	SH2/83/39	" "	0°18.4'N 16°54.8'W	5637	0.72m of brown ooze
4/3/83	SH2/83/40	" "	0°9.1'N 17°11.5'W	6391	1.45m dark grey clay
5/3/83	SH2/83/41	" "	0°07.6'N 17°21.9'W	6471	1.84cm dark grey/black clay
5/3/83	SH2/83/42	" "	0°03.5'N 17°39.2'W	5730	Few rock fragments
6/3/83	SH2/83/43	" "	0°05.2'S 17°45.9'W	6508	1.9m grey/black clay
6/3/83	SH2/83/44	" "	0°07.8'S 17°56.2'W	6523	1.53m of dark grey clay
8/3/83	SH2/83/45	" "	0°10.5'S 18°10.6'W	7393	1.7m of dark grey clay
7/3/83	SH2/83/46	" "	0°15.0'S 18°34.2'W	7721	1.31m brown/black clay
8/3/83	SH2/83/47	Pipe dredge	0°11.08'S 18°12.2W	7320	Brown mud
8/3/83	SH2/83/48	Rock dredge	0°22.7'S 18°24.7'W	2739-2850	Large haul of mixed rocks
9/3/83	SH2/83/49	Gravity core	0°38.5'S 18°23.7'W	4255	1.44m of calc ooze
9/3/83	SH2/83/50	" "	0°29.0'S 17°51.2'W	3760	1.67m of beige calc ooze
9/3/83	SH2/83/51	" "	0°20.5'S 17°19.7'W	3638	1.71m pale brown/grey calc ooze
10/3/83	SH2/83/52	" "	0°09.5'S 16°39.5'W	2760	1.74m of beige calc ooze
10/3/83	SH2/83/53	" "	0°01.9'N 16°03.0'W	3597	1.35cm buff/grey-green calc ooze
11/3/83	SH2/83/54	" "	0°10.8'N 15°31.6'W	3440	1.55m core of calc ooze
11/3/83	SH2/83/55	" "	0°20.8'N 15°05.1'W	3993	1.52m of buff calc ooze

Date	Station No.	Type	Position	Depth (m)	Recovered
11/3/83	SH2/83/56	Gravity core	0°35.7'N 15°35.8'W	4831	1.05m of buff/grey calc ooze
12/3/83	SH2/83/57	" "	0°31.4'N 15°45.8'W	4811	0.81m of buff/grey ooze
12/3/83	SH2/83/58	" "	0°29.0'N 16°00.2'W	4878	A few mg. of foram sand
12/3/83	SH2/83/59	Rock dredge	0°33.1'N 16°20.9'W	1869	Mixed haul of rocks and Mn crusts
13/3/83	SH2/83/60	Box core	1°14.8'N 16°20.1'W	5424	¾ full box of brown/grey ooze

Appendix 2

Geophysical lines run for Dr. J. Jones, University College, London

Line 1	$16^{\circ}00'N$ $21^{\circ}40'W$	to	$8^{\circ}15'N$ $23^{\circ}10'W$		
	12.30 on 2/2/83		14.20 on 4/2/83		
Line 2	$8^{\circ}15'N$ $23^{\circ}10'W$	to	$0^{\circ}35'N$ $16^{\circ}13'W$		
	14.20 on 4/2/83		21.40 on 7/2/83		
Line 3	$0^{\circ}27'N$ $16^{\circ}12'W$	to	$8^{\circ}00'N$ $16^{\circ}28'W$		
	05.50 on 16/2/83		08.30 on 18/2/83		
Line 4	$7^{\circ}48'N$ $16^{\circ}59.5W$	to	$0^{\circ}16.0'N$ $16^{\circ}52.3'W$	to	$0^{\circ}25.1'N$ $16^{\circ}12.9'W$
	09.00 on 25/2/83		10.25 on 27/2/83		15.28 on 27/2/83
Line 5	$0^{\circ}8.7'S$ $16^{\circ}39.1'W$	to	$0^{\circ}20.8'N$ $15^{\circ}05'W$		
	17.37 on 10/3/83		13.57 on 11/3/83		

Appendix 3

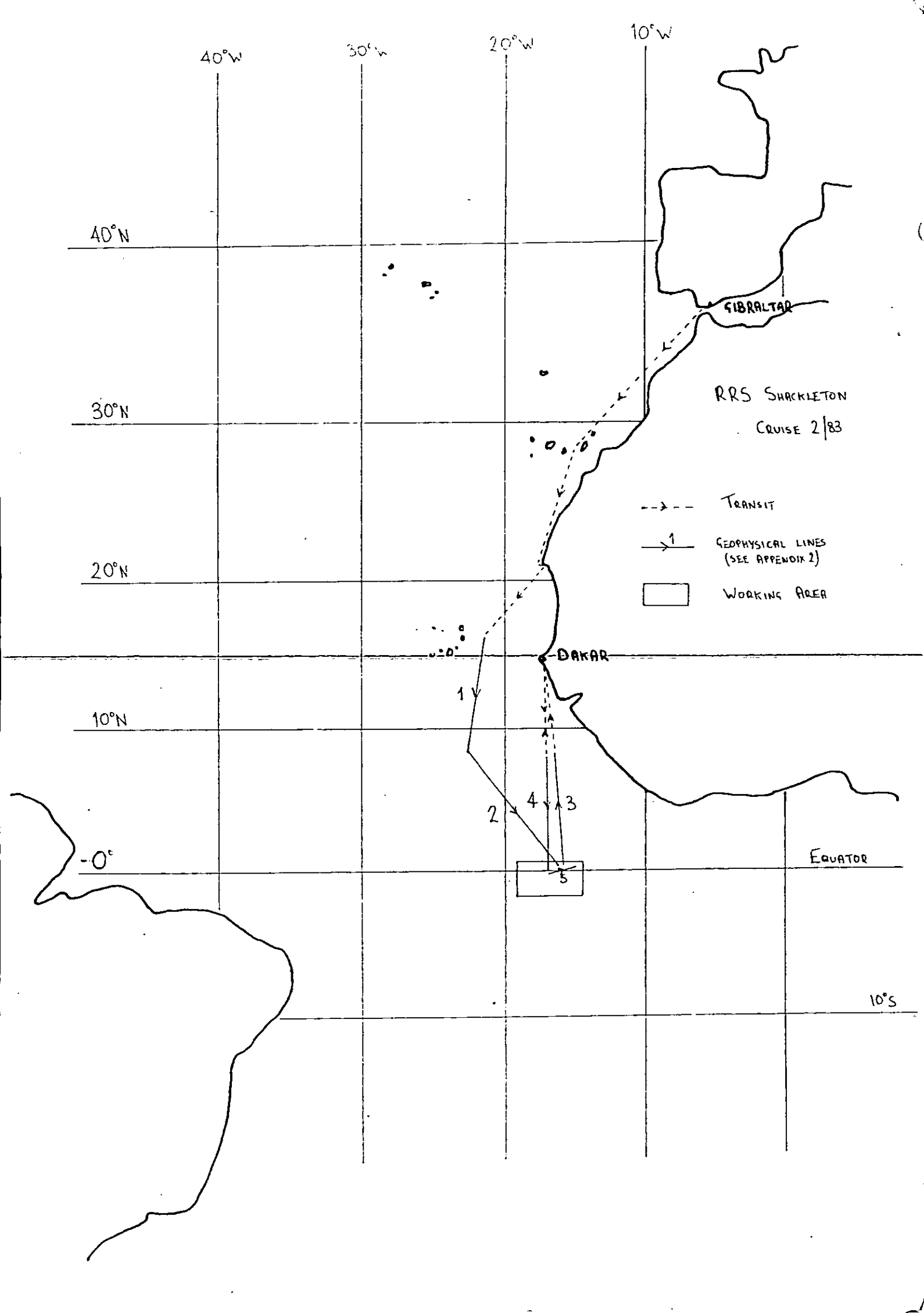
Scientific Personnal

Leg 1

S. Moorby	Imperial College	P.S.O.
R. Hodkinson	" "	
J. Heeley	" "	
E. Odada	" "	
R. Gilmore	University College	
S. Smith	R.V.S.	
R. Lee	R.V.S.	
C. Paulson	R.V.S.	

Leg 2

D. Cronan	Imperial College	P.S.O.
S. Moorby	" "	
R. Hodkinson	" "	
J. Heeley	" "	
E. Odada	" "	
R. Lee	R.V.S.	
T. Probert	R.V.S.	
J. Strangward	R.V.S.	
K. Robertson	R.V.S.	


40°W
30°W
20°W
10°W
40°N
30°N
20°N
10°N
0°
10°S
GIBRALTAR
DAKAR
EQUATOR
RRS SHACKLETON
CRUISE 2/83
TRANSIT
1
GEOPHYSICAL LINES
(SEE APPENDIX 2)
WORKING AREA
1
2
3
4
5