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R.R.S. DISCOVERY

CRUISE 48

JULY - AUGUST 1972

Upwelling off the coast of NW Africa

N.I.O. Cruise Report Series: CR.53

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Fig. 1 Track chart for Leg 1.

Fig. 2 Station positions in Cabo Bojador area. Grid 1.

Fig. 3 Station positions in Cabo Bojador area. Grid 2.

List of Scientific Participants

1-2	Dr. M.I. Abdullah	University of Liverpool
1	Mr. R.G. Aldred	NIO
1-2	Mr. A. de C. Baker	"
1-2	Mr. L. Balmer	University of Liverpool
1-2	Mr. E.D. Barton	" "
1-2	Mr. J. Berry	NIO
1-2	Professor K.F. Bowden	University of Liverpool (Principal Scientist)
1-2	Mr. H.M. Dunlop	University of Liverpool
1	Mr. J.A. Garland	UKAEA
1-2	Mr. P. Hamilton	University of Liverpool
2	Mr. M.J. Harris	NIO
1-2	Dr. M.R. Howe	University of Liverpool
1-2	Mr. P. Hughes	" "
2	Dr. D. Johnson	University of Miami
1-2	Mr. P.D. Jones	University of Liverpool
1-2	Mr. P. Lindsay	NIO
1-2	Mr. N. Mathers	University of Liverpool
1-2	Mr. A.R. de Mesquita	University of Southampton
2	Mr. J.M.G. Moron	Instituto Español de Oceanografia, Madrid
1-2	Mr. J. Murphy	University of Liverpool
1	Mr. D.M. Shale	NIO
1	Mr. R. Spencer	"
1-2	Dr. R.I. Tait	University of Liverpool

1 Leg 1: 12-30 July
2 Leg 2: 1-22 August

Abbreviations

TSD	Temperature, salinity, depth probe
WB	7 litre NIO water bottle
CM	Current meter mooring
TG	Tide gauge
BN 2.4	Bottom net with 2.4m² mouth area
NN	Neuston net
RMT 1	Rectangular midwater trawl with a sampling area of 1m² (mesh size 0.32mm)
Grab	Shipek grab
Corer	10cm diameter stainless steel gravity corer
PCM	Profiling current meter
PD	Parachute dorgue

Aims

The primary aims of the cruise were to study the physical and chemical processes in the region of coastal upwelling off North-west Africa and to carry out a biological sampling programme in the same area.

Other objectives included laying a recording tide gauge to obtain a month's record on the Josephine Bank, studying atomospheric haze using nephelometer measurements and obtaining some deep sea cores in the Canaries Basin.

Narrative

Leg 1: left Barry, 12 July
arrived Santa Cruz de Tenerife, 30 July

Leg 2: left Santa Cruz de Tenerife, 1 August
arrived Barry, 22 August

Leg 1.

'Discovery' sailed from Barry at 0900 on 12 July. The echo-sounder fish, containing also the temperature and salinity sensors, was streamed soon after sailing and continuous records of surface temperature and salinity as well as of meteorological data, were maintained throughout the cruise. On 13 July a stop was made in deep water to make a trial lowering of the tide gauge to 150m and the TSD probe to 1,500m. Josephine Bank was reached shortly before midnight on 15 July and the NIO recording tide gauge was laid successfully, at a depth of 212m early on 16 July. In the afternoon of 17 July the ship arrived at the position (29°N 12°W approximately) where bottom net hauls were to be made to complete an earlier series. At this station also, a trial lowering was made of the TSD probe with a Rosette water sampler attached to the wire above it, to a depth of 1,000m.

On completing work in this area early on 18 July (stn 7969) a course was set towards Line 1 of the main survey of Leg 1, but running parallel to the coast and following approximately the 500m contour. Continuous records were made of surface values of silicate and nitrate, obtained by Auto-Analyzer, and of chlorophyll by fluorometer, as well as of surface temperature and salinity while on this course. On reaching Line 1 (see Fig. 1), the ship ran out to the first station (Stn 7970) and started work there early on 19 July. Ten stations were worked on this line, in depths decreasing from more than 3,000m to 44m, over a total distance of 55 miles. The spacing between stations varied from 10 miles in deep water to 5 miles over the continental slope and shelf. At each station the TSD probe with Rosette sampler was lowered to 1,000m, if the depth of water exceeded 1,000m, otherwise to within 10-20m of the bottom. At three stations on the line a cast of 7 1 water bottles was made for trace element analysis and at four stations biological sampling was carried out, using a bottom net, a RMT 1 net and a neuston net. Coring was attempted at 3 stations but without success. Grab samples were taken at the three innermost stations.

The last station on Line 1 was completed in the afternoon of 20 July and the ship then followed the 500m contour, making continuous recordings of surface conditions as before, down to Line 2. The procedure followed on Line 2 and the other lines of stations was similar to that described above. Ten stations were worked on each line, from deep water on to the continental shelf, with the spacing of stations varied to give good coverage on the continental slope. TSD and Rosette sampler dips were made at each station, nets towed at four stations on each line and water bottle casts made at selected stations. The last station on Line 5 was completed shortly before midnight on 27 July and course was set for Tenerife.

During this survey the trade winds blew consistently from a direction between N. and NE, usually 020° to 030°. Their speeed was about 20 kt on Line 1, 15-20 kt on Lines 2-4 and reached 25-30 kt at the last five stations on Line 4 and those on Line 5. The physical and chemical data, (of which some details are given later) indicated the occurrence of upwelling in all five sections.

'Discovery' entered the harbour of Santa Cruz de Tenerife at 1000 on 30 July. Several of the scientific personnel left the ship and others joined, as detailed in the List of Scientific Participants. The newcomers included Mr. Morón of the

Instituto Español de Oceanografia, Madrid who acted as the Spanish Government's observer. A number of scientists from 'Discovery' visited the Spanish research vessel, 'Cornide de Saavedra', which was also in harbour at Santa Cruz, and several of her scientific personnel returned the visit.

Leg 2.

After a preliminary study of the data obtained in Leg 1, it was decided that the area for the more concentrated study planned for Leg 2 should be that off Cabo Bojador. The effects of upwelling appeared to be as prominent there as on any of the other sections, the relatively narrow continental shelf made conditions somewhat simpler and the shorter steaming distance from Tenerife meant that a longer time could be spent in the working area.

'Discovery' sailed from Santa Cruz de Tenerife at 1125 on 1 August for the area off Cabo Bojador (see Fig. 2) and during 2 and 3 August carried out a survey based on a grid of 25 stations, covering an area 25 x 25 miles with the stations 5 miles apart. At each station the TSD probe and Rosette sampler were lowered to 500m, or to about 5m from the bottom where the depth was shallower. After completing the survey, three current meter moorings were laid, on 3-4 August. The first, CM 1, was laid in a depth of 105m with two Plessey current meters at depths of approximately 45 and 85m below the surface. The second, CM 2, in a depth of 500m, carried two Aanderaa and two Plessey meters, at depths of 60, 100, 200 and 450m while the third, CM 3, in a depth of 1,000m had three Plessey meters at 60, 100 and 350m. After laying CM 3 the ship passed over the dhan buoy acting as surface marker and the radar reflector was broken off. The buoy did not appear to be otherwise damaged and was left in position.

In the evening of 4 August a time series station (Stn 8050) was started, near CM 2. The programme consisted of TSD dips to 450m every hour, water sampling with the Rosette sampler every 4 hours and a 7 1 water bottle cast once a day. The Duing current profiler, brought by Dr. Johnson, was tested and when a suitable technique had been worked out it was included in the programme, a profile being taken every 6 hours. The programme of observations was continued for 4 days, i.e. until midnight on 8 August. On 7 August three parachute drogues were launched, at depths of 25, 100 and 300m. Owing to the choppy sea and radar clutter (wind speed about 25 kt), contact was lost with two of the drogues soon after they were launched. The third (at 300m) was kept in contact for about 15 hours, during which it moved in a southerly direction, before it went out of radar range.

At the end of the time series at CM 2, the ship moved to CM 1 where a second time series (Stn 8051) was started early on 9 August and continued for 2 days. The programme of observations was similar except that, as the depth was only 100m, TSD dips were made half-hourly and Rosette bottle samples taken every 3 hours.

On completion of this station on 11 August, the first two current moorings were lifted successfully, all the current meters apparently having recorded satisfactorily. When the position of CM 3 was reached, however, the marker buoy was missing. The pinger on the mooring started transmitting when commanded and an acoustic search, using towed hydrophones, located its position. A marker buoy was laid and a dragging operation carried out the following morning (12 August). The first haul was unsuccessful and another acoustic search had to be made to re-locate the mooring. The second dragging operation succeeded in

bringing the submerged buoy to the surface and the three current meters were recovered intact. It was disappointing to find, however, that only one had recorded satisfactorily: one of the others had leaked and in the third a loose wire had caused the clock to stop soon after the mooring was laid. The trawl wire used for dragging was found to be badly damaged in a number of places over some 4,800m of its length.

The grid of 25 stations was surveyed a second time with the TSD and Rosette sampler on 12-14 August. Throughout the observations in the Cabo Bojador area the wind continued to blow from NNE, with speeds usually between 15 and 25 kt.

Early on 14 August course was set for Josephine Bank which was reached on 17 August. No difficulty was experienced in locating the tide gauge and recovering it, in satisfactory condition. The ship set course for Barry at 1600 on 17 August but strong opposing winds (030°, 30 kt.) reduced the ship's speed considerably and a diversion of course towards the coast of Portugal was made at one stage. After rounding Cape Finisterre on 20 August, strong winds (up to 40 kt) were encountered for some hours but they moderated later in the day. The rest of the voyage was made at good speed, on three engines, and 'Discovery' arrived at Barry at 1000 on 22 August, one day later than scheduled.

Notes on observations and equipment.

Physics

The main part of the physical programme consisted of observations of the temperature, salinity and hence density off Spanish Sahara. In phase I of the cruise the temperature and salinity structure from the Canaries to Cap Blanc indicated the general features of upwelling over the continental slope and shelf. Isolines tended to be parallel to the coast with the surface density increasing in a shorewards direction. A notable feature of the experimental work was the computing facility porvided onboard 'Discovery' for the rapid processing of TSD data, whereby graphical representations of T, S, and density were available for study almost immediately after the station. This allowed us to assess quickly the results of the first survey and to ascertain the most suitable area for further observations.

On leaving Tenerife to commence phase 2, a concentrated T and S survey was made in the vicinity of Cabo Bojador. A square grid of 25 stations, each separated by 5 miles, revealed rapid changes of T and S in the off-shore direction (typically producing horizontal density gradients of 4×10^{-5} $gmcm^{-3}$ $(mile)^{-1}$. Three current meter moorings with a total of 9 current meters (7 Plessey, 2 Bergen) were laid off Cabo Bojador in 100m, 500m, 1,000m on a line outwards from the coast. The meters were in the water for approximately 7 days. A longer period of measurement, although desirable for the investigation of mesoscale processes was not possible within the framework of the cruise programme. A preliminary examination of the records shows mean water movements in the upper layer towards the SSW and at the centre station a flow in the opposite direction near the bottom (meter at 450m). Tidal streams did not seem to constitute an important part of the flow. The performance of the current meters was disappointing in that only 3 of the 7 Plessey meters functioned correctly. The 2 Bergen meter records appear to be satisfactory.

A series of TSD lowerings at hourly intervals was made at a position close to the 500m current meter morring. After 4 days the series was concluded and continued further inshore near to our 100m mooring about 5 miles

from the coast. The second time series was continued for 48 hours after which it was necessary to recover the current meter moorings. The second series has proved to be the more interesting of the two from the point of view of variability in the water column.

During this period of the cruise Dr. D. Johnson, University of Miami, operated a profiling current meter. He recorded variations of horizontal velocity with depth relative to the ship every 6 hours. The profiles showed a rather complicated structure which is proving difficult to relate to absolute velocities due to the movements of the ship during the observational period. Similar difficulties were encountered by Dr. R.I. Tait when making test runs with a profiling current meter of his own design attached to the TSD probe.

Finally the grid of stations off Cabo Bojador was repeated before the ship proceeded northwards. Comparison of the horizontal distributions obtained on the two surveys showed progressive upwelling conditions with the isopycnals tilting to produce enhanced surface gradients.

Chemistry

The chemical programme had the following objectives:

(a) Nutrient (NO_3, SiO_4, PO_4) and dissolved oxygen determinations;
(b) Trace metal distribution in the water column;
(c) The geochemistry of shelf sediments;
(d) Chlorophyll, particulate carbon, nitrogen and phosphorus, and productivity measurements.
(e) General survey of the occurrence of mercury in the surface water and in the air.

(a) Nutrients and oxygen.

The main purpose of this work was to supplement the TSD data concerning the upwelling processes in the region. All the nutrient determinations were made on membrane-filtered samples obtained from the Rosette sampler at all or some of the following depths: 0, 25, 50, 75, 100, 150, 200, 250, 300, 400, 500 and 600m. Two complete Auto-Analyzers were installed for this purpose. Approximately 2,000 samples, from the stations along the five sections of Leg 1 and the two grids and two time series stations of Leg 2, were analysed for their nitrate, silicate, and phosphate content. In addition, continuous profiling of nitrate and silicate in the surface water along the 500m contour between the Canary Islands and the first section and between the first and second sections were made using the two Auto-Analyzers. For profiling, the laboratory sea water supply was used. A continuous flow of this was debubbled and then passed through a stainless steel tube fitted with two bleeding points, from which an appropriate volume of sea water was pumped to each Auto-Analyzer for the relevant analysis.

Tests were made on board ship to ascertain the change in the nutrients when samples were stored for as long as 4 days and the effect of such storage on filtered and unfiltered samples. The results showed that although no significant changes occurred in the filtered samples some of the unfiltered samples, particularly those obtained from below 200m, underwent a change in the nutrient levels.

All the samples were, therefore, filtered and analysed not later than 24 hrs after collection. All the computations relating to the analyses were made on board ship using computer facilities.

Dissolved oxygen was determined by the Winkler method on samples collected from the Rosette sampler.

The nutrient profiles showed a stratified pattern, the values being very low in the top 100m of sections 2 and 3. Higher nutrient values were found in the top 100m at the inner stations of sections 1 and 5. The profile of section 1 showed a strong upwards swing of the isochemical lines, supporting the salinity and temperature indication of upwelling in this region. The detailed survey along grids 1 and 2 of the second leg gave further support for this and also showed the upwelling, as indicated by the very high Si, N and P values in the top 35m, to be more prominant along the north-eastern side of the grid, particularly at the coastal stations.

(b) Trace metals.

The purpose of this study was to examine the variability of Fe, Mn, Cu, Pb, Cd, Zn, Ni, and Co in the water column down to 1,600m at certain stations over the area covered by the cruise. Samples were obtained from water bottles using the 7 l bottles, except that surface samples were taken from the laboratory sea water supply.

The water was filtered as soon after collection as possible using 0.45μ pre-weighed membrane filters (pre-washed and dried to a constant weight). The filter was stored for the analysis of the suspended load and the filtrate was passed through columns of chelating resins for the separation of trace metals. The metals were eluted from the column with acid and the eluate was stored for analysis. Preparation and regeneration of the columns were carried out at sea.

(c) Shelf sediments.

Samples from the shelf sediments were obtained using the Shipek grab at selected stations situated along the continental shelf. The quantity of sample obtained varied and depended on the nature and topography of the sea bed. Sufficient quantities, however, were obtained for the geochemical and mineralogical studies.

(d) Chlorophyll, particulate carbon, nitrogen and phosphorus and Productivity studies.

The aim of this study was to examine the effect of upwelling on the plankton production along the West Africa coastal area. Semi-quantitative assessment of phytoplankton abundance was made by measuring (fluorometrically) the chlorophyll in the surface water while, at selected positions, detailed analysis of the pigment and determinations of the C, N and P content of the particulate matter and of the productivity of the water were made.

The fluorometric measurement of chlorophyll was made continuously throughout the cruise from the Bay of Biscay until the end of the cruise. A fluorometer fitted with a multi-channel, multi-range recorder was installed and the laboratory sea water supply was used for the analysis. A perspex attachment housing a thermister and a debubbling arm to remove air from the water stream prior to the fluorometric measurement was connected between the sea water supply and the fluorometer.

The chlorophyll values in the surface water off the shelf were very low but a very sharp increase in chlorophyll towards the coast was found along section 1. A more gradual increase in the chlorophyll toward the coast, however, was also observed in sections 4 and 5. In both grid 1 and 2, high chlorophyll values were found at the inner stations, the iso-lines

being more closely spaced along the north-eastern stations.

For detailed analysis of pigment and the exact in situ calibration of the fluorometer, 10 to 20 l samples of water were collected at certain intervals and when the fluorescence showed a significant change. The water was filtered through a bed of $MgCO_3$ placed on a glass fibre filter. The filtered matter was then treated with acetone in order to fix the pigment and stored in the deep-freeze under nitrogen to prevent decomposition before analysis.

At the same time as the pigment samples were obtained another 20 l of water were collected for the particulate carbon (10 l), particulate phosphorus (4 l), particulate nitrogen (250 ml), particle size analysis (500 ml) and productivity measurement (2 x 500 ml).

Samples for particulate C, N and P were obtained by filtration using appropriately treated glass fibre filters. The filtered material was then stored in the deep-freeze. Samples for particle size distribution were analysed on board ship using a Coulter counter. The productivity measurements were made on board ship using the C^{14} method under controlled temperature and artificial illumination.

(e) Mercury

Surface water samples were collected for the determination of mercury. In addition the mercury from a volume of air was extracted for the study of the distribution of mercury in air. The chemical extraction of mercury was carried out on board ship. Equipment for the estimation of mercury on board, however, did not function as expected and so the mercury samples were stored for analysis.

Biology

The sampling programme was designed to cover the entire water column as simply as possible using a bottom net, a neuston net and a $1m^2$ rectangular net (RMT 1) towed obliquely. In depths of less than 1000m the RMT 1 was fished from as close to the bottom as possible, to the surface. A pinger with an end cap transducer was mounted in a towing frame so that, when towing, it was pointing at about 12° below horizontal. This gave extremely good bottom echoes and it was usually possible to fish from 3 to 5m from the bottom. In depths greater than 1000m the RMT 1 was fished from 1000m to the surface.

With the exception of two bottom net tows at the offshore stations on lines 1 and 2 this programme was completed successfully with four sampling stations on each of the five lines between Cabo Bojador and Cabo Blanc.

Epibenthos

A total of 21 hauls were made with the bottom net (BN 2.4). The net had no further modification from that fished on previous cruises, with the exception of the pinger. This was an 'F' type, giving two pulses whilst in the hauling and paying out attitude, changing to a single pulse whilst on the bottom. This system gave excellent results, without the use of the towed hydrophone, and would appear to be the most satisfactory system so far used. On only one occasion did the bridle weak link break, although several times the bottom bar weak links parted, probably through chafing and surging whilst hauling through midwater, as indicated by the size of samples obtained. Both the tickler chain and bottom bar weak links broke on one occasion - probably due to a bottom obstruction.

Three hauls were made north east of the Canary Islands (29°N 12°W) at the beginning of the cruise at depths between 1576 and 165m; these were to complete a series of slope samples started on Cruise 45. All samples differed remarkably in volume and content.

Four sampling stations were attempted on each of the 5 lines of stations selected by L.U.D.O., and successful bottom net samples were taken at all sites with the exception of stations 7973 and 7982, the deep stations on the first two lines, where the bottom was unsuitable.

The sediment in most areas sampled was soft, ranging from fine sand to ooze, indicated by the residues or the associated fauna, ie. 50% of the samples contained fauna indicative of soft sediments - Pennatulacea and Holothuroidea. The soft sediments were dominant in the three most southerly lines of stations, although not ubiquitous. The Echinodermata was the dominant phylum (found at 60% of the stations), the most interesting specimens being a very large catch of commatulid crinoids (Stn 7977), large stirodont echinoids, asterinids and phanerozoan asteroids (7988) and many large holothurians. Other samples were dominated by corals and keratson sponges (1), pennatulids (2), mysids (1) and Munida (1). Specimens of interest occurring in other samples were brachipods, pennatulids (namely Umbellula and Veretillium), scaphopods, zoanthidians and suberitid sponges; the latter two forming commensal relationships with hermit crabs.

The fish were represented by macrurids, halosaurs and eels in the deeper catches and by small flatfish (Solea sp.) in the shallower ones. Fish of note from the shallow, shelf samples were Lophius sp., Torpedo sp. and Trachinus sp.

Specimens from certain hauls were kept alive on board ship and survivors were returned to the laboratory at N.I.O.

Plankton

Detailed analyses of the samples have not yet been made but the volumes of the RMT 1 catches were measured on board. As the hauls were made to varying depths the length of haul and thus the volume of water filter varied. In order to make a rough comparison the volumes of the catches have been standardised to a 100 minute tow. This inevitably introduces a bias since it assumes that the plankton was evenly distributed throughout the water column whereas it tends to be more abundant at the shallower depths. The depths fished with the RMT 1 were approximately 1000m, 700m, 200m and on the shelf. As might be expected the volumes of the catches per unit fishing time increased from offshore to inshore; this increase was of the order of 5 to 10 times. The only exception was the inshore station on the Cabo Blanco line which was very poor in plankton yielding only $\frac{1}{3}$ of the volumes taken at the station furthest offshore. From north to south the volumes increased between three and five times.

Neuston

Neuston samples were taken at stations on the first four lines, the NN being omitted on the fifth line due to adverse weather conditions. The 3-stage net was fished for the first time, but with little success and when the sea became too rough it was abandoned. The net turned over on one occasion, and on a second, the forward towing boom snapped.

The samples were very poor indeed for the summer months, containing only a few copepods and small fish. No indicators of tropical/subtropical neuston were seen eg. Velella, Glaucus, Physalia etc. Samples from the stations on line four were richer than on the others, one containing 3 large Belone, a species which it has been said only occurs in upwelling regions.

Coring

On line 1 three attempts were made to obtain cores using a 10cm diameter stainless steel gravity corer. These were in depths of 1970m, 1070m and 50m. On the first station the corer appeared to have turned over while free falling. On the second and third stations small quantities of shelly gravel were obtained but penetration was insufficient to get above the core catcher. On line 5 an additional 120 lbs in Lucas weights was added and a successful core was obtained in 1210m. The core was 1m long and consisted of a greenish-grey ooze; it was deep frozen for chemical analysis.

Tide gauge

It was proposed to lay a tide gauge on the Josephine seamount as part of a series of experiments in ocean tidal science. On route from Barry checks were carried out on the acoustic command systems with the gauge lowered to a depth of 100m. The capsule was then laid on the mount at 212m. It had two independent transducers for monitoring pressure. Thirty one days of record were obtained before the gauge was successfully recovered.

Studies of atmospheric haze

The aim of this programme was to elucidate the nature of the hazes which frequently reduce the visibility near the coast of N.W. Africa.

Measurements of the opitcal quality of the air (scattering coefficient) were made throughout the cruise using an integrating nephelometer. The Aitken nucleus concentration was measured using a Nolan Pollack nucleus counter whenever possible and a diffusion battery and ion separater used in conjunction with the counter to obtain an indication of the size of the particles. In addition a large paper-tape air sampler was used to obtain routine filter samples suitable for chemical analysis and occasional millipore filter samples for electron microscopy were also collected.

STATION LISTS

% Tests of Tide gauge and T.S.D.

* No water samples

* Time series Stn 8050 98 hourly dips

Stn 8051 98 half-hourly dips

STA.	DATE 1972	POSITION LATITUDE	LONGITUDE	GEAR	DEPTH	TIMES
7965	13.7	46 28.20'N	08 25.96'W	T.G.3.	150	1535-1624 %
		46 28.54'N	08 26.62'W			
		46 28.80'N	08 26.92'W	T.S.D.	1500-0	1650-1802
		46 30.09'N	08 26.82'W			
7966	16.7	36 42.48'N	14 17.14'W	T.G.3.	211	0109-0150
		36 42.16'N	14 17.35'W			
7967	17.7	29 22.41'N	12 14.43'W	T.S.D.	0-1000	1653-1815
		29 21.84'N	12 14.26'W			
		29 20.39'N	12 16.61'W	BN 2.4	1576-1539-(0)	1900-2125
		29 19.74'N	12 12.81'W			
7968	17.7	29 00.37'N	12 15.32'W	BN 2.4	500-463-(0)	2350-0053
		29 00.28'N	12 14.39'W			
7969	18.7	28 55.04'N	12 16.00'W	BN 2.4	188-165-(0)	0153-0247
		28 55.12'N	12 15.09'W			
✓7970	19.7	26 49.31'N	15 22.46'W	T.S.D.	0-1000 ✓	0100-0215
		26 49.41'N	15 22.69'W			
		26 49.39'N	15 22.74'W	W.B.	0-1200	0220-0320
		26 49.29'N	15 23.20'W			
✓7971	19.7	26 43.53'N	15 09.76'W	T.S.D.	0-~~750~~ 1000	0505-0612
		26 44.24'N	15 10.02'W			
✓7972	19.7	26 35.90'N	15 02.67'W	CORE	1970	0730-0847
		26 35.34'N	15 03.09'W			
		26 35.20'N	15 03.11'W	T.S.D.	0-~~750~~ 1000	0901-0956
		26 34.98'N	15 02.91'W			
✓7973	19.7	26 30.37'N	14 59.57'W	T.S.D.	0-1000 ✓	1212-1307
		26 30.31'N	14 59.72'W			
		26 30.35'N	14 59.78'W	W.B.	0-1200	1330-1408
		26 30.62'N	14 59.70'W			
		26 30.38'N	14 58.30'W	RMT 1	0-1000	1547-1719
		26 27.97'N	14 56.11'W			
		26 27.69'N	14 55.63'W	NN	0	1726-1738
		26 27.08'N	14 54.57'W			
✓7974	19.7	26 28.35'N	14 54.54'W	T.S.D.	0-1000✓	1810-1926
		26 28.19'N	14 55.01'W			
		26 28.14'N	14 55.10'W	CORE	1070	1938-2020
		26 28.02'N	14 55.38'W			
✓7975	19.7	26 24.66'N	14 50.08'W	T.S.D.	0-700 ✓	2138-2234
		26 24.91'N	14 50.10'W			
		26 23.64'N	14 51.10'W	BN 2.4	785-834-(0)	2302-0033
		26 25.52'N	14 50.16'W			
		26 25.21'N	14 49.78'W	RMT 1	0-729	0044-0150
		26 23.15'N	14 48.67'W			
		26 22.50'N	14 48.14'W	NN	0	0159-0211
		26 21.69'N	14 47.39'W			

STA.	DATE	POSITION LATITUDE	LONGITUDE	GEAR	DEPTH	TIMES
7976	20.7	26 21.30'N	14 46.96'W	T.S.D.	0-450	0230-0319
		26 21.36'N	14 47.08'W			
		26 21.36'N	14 47.08'W	W.B.	0-400	0320-0400
		26 21.23'N	14 47.27'W			
7977	20.7	26 17.83'N	14 42.09'W	T.S.D.	0-181	0515-0548
		26 17.58'N	14 42.21'W			
		26 16.78'N	14 42.33'W	GRAB	164	0639-0645
		26 16.69'N	14 42.30'W			
		26 14.97'N	14 43.66'W	BN 2.4	143-137-(0)	0715-0800
		26 14.50'N	14 43.23'W			
		26 14.03'N	14 43.00'W	RMT 1	0-113	0810-0818
		26 13.67'N	14 42.94'W			
		26 13.27'N	14 42.56'W	NN	0	0828-0840
		26 12.85'N	14 41.71'W			
7978	20.7	26 14.74'N	14 40.11'W	T.S.D.	0-90	0930-0936
		26 14.81'N	14 40.23'W			
		26 14.84'N	14 40.48'W	GRAB	106	0947-0952
		26 14.81'N	14 40.65'W			
7979	20.7	26 12.67'N	14 36.25'W	T.S.D.	0-35	1045-1059
		26 12.28'N	14 36.43'W			
		26 12.17'N	14 36.49'W	GRAB	52	1102-1105
		26 12.11'N	14 36.52'W			
		26 11.39'N	14 36.91'W	CORE	42	1129-1135
		26 11.27'N	14 36.96'W			
		26 10.68'N	14 37.08'W	BN 2.4	42-(0)	1211-1250
		26 10.67'N	14 36.82'W			
		26 10.60'N	14 37.16'W	RMT 1	0-38	1300-1307
		26 10.57'N	14 37.55'W			
		26 10.71'N	14 38.22'W	NN	0	1316-1328
		26 11.21'N	14 39.06'W			
7980	21.7	25 47.99'N	16 34.55'W	T.S.D.	0-1000	0144-0259
		25 48.25'N	16 35.46'W			
7981	21.7	25 41.11'N	16 27.95'W	T.S.D.	0-1000	0432-0536
		25 41.30'N	16 28.95'W			
7982	21.7	25 36.18'N	16 19.79'W	T.S.D.	0-~~1000~~ 925	0702-0804
		25 36.08'N	16 20.05'W			
		25 33.17'N	16 20.88'W	RMT 1	0-1000	0911-1044
		25 31.59'N	16 19.71'W			
		25 31.14'N	16 18.94'W	NN	0	1100-1111
		25 30.79'N	16 17.95'W			
7983	21.7	25 30.98'N	16 12.54'W	T.S.D.	0-1000	1205-1316
		25 31.48'N	16 13.30'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
7984	21.7	25 27.60'N	16 08.63'W	T.S.D.	0-876	1430-1535
		25 27.81'N	16 09.53'W			
		25 26.00'N	16 10.25'W	BN 2.4	890-811-(0)	1607-1737
		25 27.80'N	16 10.42'W			
		25 27.71'N	16 10.25'W	RMT 1	0-880	1753-1912
		25 26.13'N	16 09.47'W			
		25 25.76'N	16 09.11'W	NN	0	1919-1931
		25 24.99'N	16 08.31'W			
7985	21.7	~~25-24.17~~'N	16 06.27'W	T.S.D.	0-400	1958-2006
		~~25-24.05~~'N	16 06.46'W			
		~~25-23.96~~'N	16 06.58'W	T.S.D.	0-400	2012-2027
		25 23.92'N	16 06.87'W			
	22.7	25 23.75'N	16 04.18'W	T.S.D.	0-400	0000-0030
		25 23.94'N	16 04.65'W			
7986	22.7	25 20.92'N	15 59.47'W	T.S.D.	0-~~100~~175	0155-0218
		25 20.90'N	15 59.71'W			
		25 18.31'N	16 00.55'W	BN 2.4	183-177-(0)	0248-0340
		25 19.25'N	16 00.78'W			
		25 18.31'N	15 59.68'W	RMT 1	0-164	0425-0440
		25 18.02'N	15 59.30'W			
		25 17.71'N	15 58.41'W	NN	0	0452-0604
		25 18.83'N	15 55.03'W			
7987	22.7	25 18.92'N	15 54.89'W	T.S.D.	0-100	0543-0600
		25 18.84'N	15 55.01'W			
		25 18.82'N	15 55.16'W	GRAB	150	0618-0625
		25 18.79'N	15 55.24'W			
7988	22.7	25 14.09'N	15 47.01'W	T.S.D.	0-75	0738-0754
		25 13.97'N	15 47.19'W			
		25 13.91'N	15 47.27'W	GRAB	91	0800-0804
		25 13.87'N	15 47.32'W			
		25 13.96'N	15 47.45'W	BN 2.4	91-99-(0)	0816-0859
		25 14.79'N	15 48.11'W			
		25 14.71'N	15 47.96'W	RMT 1	0-91	0910-0919
		25 14.63'N	15 47.75'W			
		25 14.66'N	15 47.23'W	NN	0	0927-0939
		25 14.69'N	15 46.01'W			
7989	22.7	25 08.14'N	15 37.66'W	T.S.D.	0-55	1057-1110
		25 08.08'N	15 37.54'W			
		25 08.01'N	15 37.53'W	GRAB	67	1119-1121
		25 07.99'N	15 37.53'W			
7990	23.7	24 21.44'N	17 14.88'W	T.S.D.	0-~~750~~975	0020-0115
		24 21.18'N	17 14.39'W			
		24 21.12'N	17 14.21'W	W.B.	0-1200	0130-0219
		24 20.77'N	17 13.75'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
7991	23.7	24 14.55'N	17 03.83'W	T.S.D.	300-1000	0334-0448
		24 15.13'N	17 04.91'W			
		24 12.08'N	17 07.14'W	BN 2.4	1500-1520-(0)	0535-0739
		24 14.51'N	17 06.77'W			
		24 14.53'N	17 06.52'W	RMT 1	0-1020	0751-0945
		24 11.74'N	17 04.78'W			
		24 11.45'N	11 04.53'W	NN	0	0952-1004
		24 10.81'N	17 03.67'W			
7992	23.7	24 12.11'N	16 53.91'W	T.S.D.	0-1000	1111-1210
		24 12.89'N	16 55.03'W			
		24 12.96'N	16 55.10'W	W.B.	0-1000	1215-1250
		24 13.47'N	16 55.64'W			
7993	23.7	24 06.94'N	16 50.31'W	T.S.D.	0-600	1355-1444
		24 06.40'N	16 50.06'W			
		24 04.47'N	16 50.77'W	BN 2.4	696-684-(0)	1517-1634
		24 05.31'N	16 49.37'W			
		24 05.22'N	16 49.17'W	RMT 1	0-597	1647-1744
		24 03.76'N	16 47.59'W			
		24 03.55'N	16 47.34'W	NN	0	1752-1804
		24 03.21'N	16 46.32'W			
7994	23.7	24 04.03'N	16 46.38'W	T.S.D.	0-450	1846-1925
		24 03.89'N	16 46.23'W			
7995	23.7	24 03.26'N	16 43.31'W	T.S.D.	0-75	2005-2013
		24 03.20'N	16 43.33'W			
		24 03.23'N	16 43.31'W	GRAB	99	2020-2026
		24 03.26'N	16 43.29'W			
		24 03.26'N	16 43.28'W	GRAB	99	2028-2033
		24 03.28'N	16 43.26'W			
		24 07.40'N	16 42.29'W	BN 2.4	97-(0)	2041-2120
		24 03.35'N	16 43.47'W			
		24 03.27'N	16 43.48'W	RMT 1	0-97	2130-2138
		24 02.97'N	16 43.34'W			
		24 02.65'N	16 43.18'W	NN	0	2146-2158
		24 02.03'N	16 42.37'W			
7996	23.7	23 59.58'N	16 39.45'W	T.S.D.	0-50	2235-2248
		23 59.35'N	16 39.61'W			
7997	23.7	23 58.39'N	16 32.27'W	GRAB	-	2348-2351
		23 58.40'N	16 32.25'W			
	24.7	23 58.21'N	16 32.18'W	T.S.D.	0-47	0018-0028
		23 58.16'N	16 32.17'W			
7998	24.7	23 56.05'N	16 28.94'W	T.S.D.	0-49	0115-0133
		23 56.01'N	16 29.07'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
✓ 7999	24.7	23 52.49'N	16 25.58'W	GRAB	49	0216-0222
		23 52.45'N	16 25.64'W			
		23 52.41'N	16 25.70'W	T.S.D.	0-39 ✓	0228-0239
		23 52.35'N	16 25.79'W			
		23 52.45'N	16 25.84'W	BN 2.4	49-(0)	0256-0332
		23 52.92'N	16 25.71'W			
		23 52.98'N	16 25.48'W	RMT 1	0-49	0345-0351
		23 52.76'N	16 25.37'W			
		23 52.23'N	16 25.04'W	NN	0	0400-0412
		23 51.38'N	16 24.20'W			
✓ 8000	24.7	22 42.94'N	17 46.21'W	T.S.D.	0-1001 ✓	1732-1846
		22 42.39'N	17 46.05'W			
		22 41.75'N	17 46.13'W	W.B.	0-1600	1925-2006
		22 41.19'N	17 46.43'W			
✓ 8001	24.7	22 37.36'N	17 35.63'W	T.S.D.	0-1000 ✓	2145-2301
		22 37.17'N	17 36.49'W			
		22 35.17'N	17 37.03'W	BN 2.4	1457-1460-(0)	2329-0122
		22 36.22'N	17 38.03'W			
		22 36.35'N	17 37.99'W	RMT 1	0-1000	0132-0247
		22 35.85'N	17 35.98'W			
		22 35.83'N	17 35.70'W	NN	0	0255-0307
		22 35.97'N	17 34.81'W			
✓ 8002	25.7	22 35.75'N	17 25.44'W	T.S.D.	0-900 ✓	0426-0528
		22 35.38'N	17 25.72'W			
✓ 8003	25.7	22 33.40'N	17 20.59'W	T.S.D.	0-700 ✓	0629-0720
		22 33.40'N	17 20.67'W			
		22 31.00'N	17 20.61'W	BN 2.4	744-725-(0)	0752-0924
		22 33.08'N	17 20.02'W			
		22 33.11'N	17 19.61'W	RMT 1	0-655	0935-1040
		22 31.52'N	17 17.43'W			
		22 30.99'N	17 16.50'W	NN	0	1052-1104
		22 30.41'N	17 15.35'W			
✓ 8004	25.7	22 30.73'N	17 16.43'W	T.S.D.	0-~~426~~ 405	1150-1230
		22 30.45'N	17 16.25'W			
✓ 8005	25.7	22 30.04'N	17 12.29'W	T.S.D.	0-~~90~~ 75	1315-1333
		22 30.12'N	17 12.51'W			
		22 30.14'N	17 12.56'W	GRAB	107	1337-1346
		22 30.19'N	17 12.70'W			
		22 28.74'N	17 13.48'W	BN 2.4	101-(0)	1420-1500
		22 29.58'N	17 13.70'W			
		22 29.56'N	17 13.59'W	RMT 1	0-103	1507-1520
		22 29.31'N	17 13.22'W			
		22 29.17'N	17 12.79'W	NN	0	1530-1542
		22 29.13'N	17 11.66'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
✓8006	25.7	22 28.16'N	17 08.65'W	T.S.D.	0-65 ✓	1610-1624
		22 28.06'N	17 08.83'W			
✓8007	25.7	22 26.98'N	17 03.72'W	T.S.D.	0-40 ✓	1719-1730
		22 26.91'N	17 03.91'W			
		22 26.87'N	17 04.10'W	GRAB	51	1742-1746
		22 26.84'N	17 04.17'W			
✓8008	25.7	22 25.28'N	16 56.36'W	T.S.D.	0-35 ✓	1854-1904
		22 25.25'N	16 56.41'W			
		22 25.44'N	16 56.40'W	BN 2.4	49-(0)	1915-1952
		22 26.16'N	16 56.57'W			
		22 26.16'N	16 56.50'W	RMT 1	0-49	1959-2006
		22 25.98'N	16 56.32'W			
✓8009	25.7	22 21.78'N	16 51.92'W	T.S.D.	0-25 ✓	2100-2109
		22 21.73'N	16 51.94'W			
		22 21.69'N	16 51.95'W	GRAB	38	2114-2117
		22 21.64'N	16 51.98'W			
✓8010	26.7	20 48.45'N	18 23.10'W	T.S.D.	0-1000 ✓	1203-1307
		20 48.56'N	18 23.60'W			
		20 48.64'N	18 23.70'W	W.B.	0-1800	1324-1442
		20 48.76'N	18 24.25'W			
✓8011	26.7	20 47.95'N	18 12.32'W	T.S.D.	0-996 ✓	1600-1724
		20 47.34'N	18 12.44'W			
✓8012	26.7	20 46.15'N	18 00.84'W	T.S.D.	0-1000 ✓	1901-2014
		20 45.81'N	18 01.74'W			
		20 45.70'N	18 01.81'W	CORE	1210	2028-2117
		20 45.42'N	18 02.08'W			
		20 45.37'N	18 02.16'W	BN 2.4	1238-1285-(0)	2129-2308
		20 47.95'N	18 02.71'W			
		20 46.99'N	18 02.62'W	RMT 1	0-1000	2319-0053
		20 45.08'N	18 00.27'W			
✓8013	27.7	20 45.40'N	17 50.20'W	T.S.D.	0-740 ✓	0230-0334
		20 45.04'N	17 50.28'W			
		20 44.97'N	17 50.16'W	W.B.	0-600	0350-0424
		20 44.65'N	17 49.96'W			
✓8014	27.7	20 43.98'N	17 44.63'W	T.S.D.	0-~~550~~ 525	0534-0630
		20 43.44'N	17 45.56'W			
		20 43.48'N	17 45.68'W	BN 2.4	550-595-(0)	0637-0744
		20 44.12'N	17 46.52'W			
		20 44.13'N	17 46.51'W	RMT 1	0-563	0753-0847
		20 43.05'N	17 45.56'W			
✓8015	27.7	20 43.01'N	17 42.73'W	T.S.D.	0-400 ✓	0955-1027
		20 43.15'N	17 43.08'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
8016	27.7	20 48.40'N	17 19.43'W	T.S.D.	0-36	1435-1446
		20 48.40'N	17 19.57'W			
		20 48.40'N	17 19.63'W	GRAB	46	1450-1458
		20 48.44'N	17 19.74'W			
8017	27.7	20 46.27'N	17 24.26'W	T.S.D.	0-39	1548-1603
		20 46.30'N	17 24.88'W			
		20 46.28'N	17 25.04'W	GRAB	49	1610-1614
		20 46.26'N	17 25.10'W			
		20 46.42'N	17 25.24'W	BN 2.4	53-(0)	1626-1705
		20 46.95'N	17 24.97'W			
		20 47.03'N	17 24.70'W	RMT 1	0-49	1716-1721
		20 46.95'N	17 24.56'W			
8018	27.7	20 46.00'N	17 29.64'W	T.S.D.	0-55	1810-1815
		20 45.95'N	17 29.63'W			
		20 45.76'N	17 29.52'W	GRAB	60	1828-1834
		20 45.65'N	17 29.45'W			
8019	27.7	20 45.67'N	17 33.98'W	T.S.D.	0-76	1912-1922
		20 45.54'N	17 33.88'W			
		20 45.54'N	17 33.91'W	GRAB	82	1923-1927
		20 45.55'N	17 33.96'W			
8020	27.7	20 46.62'N	17 38.48'W	T.S.D.	0-166	2038-2114
		20 46.88'N	17 39.04'W			
		20 45.07'N	17 39.28'W	BN 2.4	261-297-(0)	2153-2251
		20 46.44'N	17 39.49'W			
		20 46.54'N	17 39.24'W	RMT 1	0-212	2301-2324
8021	02.8	26 25.23'N	14 54.91'W	T.S.D.	0-500	0010-0045
		26 25.33'N	14 55.02'W			
8022	02.8	26 27.26'N	14 48.36'W	T.S.D.	0-500	0145-0224
		26 27.21'N	14 48.21'W			
8023	02.8	26 23.49'N	14 44.13'W	T.S.D.	0-435	0316-0402
		26 23.80'N	14 44.06'W			
8024	02.8	26 19.28'N	14 39.66'W	T.S.D.	0-189	0500-0523
		26 19.57'N	14 39.84'W			
8025	02.8	26 15.54'N	14 37.11'W	T.S.D.	0-89	0612-0635
		26 15.61'N	14 37.34'W			
8026	02.8	26 12.08'N	14 31.99'W	T.S.D.	0-28	0722-0735 *
		26 12.16'N	14 31.78'W			
8027	02.8	26 09.05'N	14 37.71'W	T.S.D.	0-65	0825-0847 *
		26 08.95'N	14 38.45'W			

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
8028	02.8	26 12.43'N	14 43.20'W	T.S.D.	0-108	0953-1003 *
		26 12.47'N	14 43.19'W			
8029	02.8	26 16.37'N	14 45.86'W	T.S.D.	0-235	1054-1120 *
		26 16.58'N	14 45.82'W			
8030	02.8	26 20.87'N	14 48.74'W	T.S.D.	0-500	1222-1300
		26 21.09'N	14 48.34'W			
8031	02.8	26 25.14'N	14 50.98'W	T.S.D.	0-500	1350-1428
		26 25.31'N	14 50.72'W			
8032	02.8	26 21.71'N	14 56.82'W	T.S.D.	0-500	1521-1553
		26 21.57'N	14 57.77'W			
8033	02.8	26 17.35'N	14 53.97'W	T.S.D.	0-500	1640-1719
		26 17.27'N	14 53.99'W			
8034	02.8	26 12.95'N	14 50.07'W	T.S.D.	0-250	1818-1855
		26 12.91'N	14 50.22'W			
8035	02.8	26 08.53'N	14 46.11'W	T.S.D.	0-114	1950-2013
		26 08.33'N	14 46.31'W			
8036	02.8	26 05.22'N	14 41.93'W	T.S.D.	0-89	2108-2123
		26 05.17'N	14 41.97'W			
8037	02.8	26 02.02'N	14 46.37'W	T.S.D.	0-88	2210-2232
		26 01.86'N	14 46.79'W			
8038	02.8	26 06.86'N	14 50.38'W	T.S.D.	0-143	2340-2359
		26 06.84'N	14 50.51'W			
8039	03.8	26 10.78'N	14 54.89'W	T.S.D.	0-300	0108-0138
		26 10.67'N	14 55.22'W			
8040	03.8	26 14.30'N	14 58.06'W	T.S.D.	0-500	0240-0328
		26 14.39'N	14 57.54'W			
8041	03.8	26 18.32'N	15 00.55'W	T.S.D.	0-500	0420-0528
		26 16.58'N	14 47.79'W			
8042	03.8	26 14.38'N	15 06.03'W	T.S.D.	0-500	0615-0722
		26 13.35'N	15 07.62'W			
8043	03.8	26 09.74'N	15 02.45'W	T.S.D	0-390	0810-0845
		26 09.70'N	15 02.37'W			
8044	03.8	26 07.45'N	14 59.05'W	T.S.D.	0-278	0930-1003
		26 07.50'N	14 59.47'W			

DISCOVERY CRUISE 48 (NIO CRUISE REPORT NO. 53)

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES	
8045	03.8	26 03.54'N	14 54.15'W	T.S.D.	0-150	1054-1110	
		26 03.62'N	14 54.48'W				
8046	03.8	25 58.45'N	14 50.62'W	T.S.D.	0-89	1209-1226	
		25 58.58'N	14 50.96'W				
8047	03.8	26 12.70'N	14 42.32'W	C.M.	105	1518-1634	
		26 11.06'N	14 42.09'W				
8048	04.8	26 18.17'N	14 50.56'W	C.M.	504	0830-1010	
		26 18.11'N	14 50.53'W				
8049	04.8	26 23.97'N	14 56.37'W	C.M.	1000	1445-1628	
		26 23.98'N	14 56.94'W				
8050	04.8	26 20.36'N	14 49.27'W	T.S.D.	0-500	2200-	#
				P.C.M.	0-250		
				W.B.	0-500		
	09.8	26 20.51'N	14 49.70'W	P.D.	25,100,300	-0020	
8051	09.8	26 09.40'N	14 43.63'W	T.S.D.	0-100	0200-	#
	11.8	26 09.04'N	14 44.55'W	P.C.M.	0-100	-0411	
8052	12.8	26 27.61'N	14 48.87'W	T.S.D.	0-500	1938-2022	
		26 28.75'N	14 48.90'W				
8053	12.8	26 23.04'N	14 44.21'W	T.S.D.	0-400	2110-2138	
		26 22.76'N	14 44.34'W				
8054	12.8	26 18.61'N	14 40.49'W	T.S.D.	0-185	2229-2246	
		26 18.41'N	14 40.64'W				
8055	12.8	26 14.90'N	14 38.11'W	T.S.D.	0-98	2319-2333	
		26 14.61'N	14 38.29'W				
8056	13.8	26 10.83'N	14 34.29'W	T.S.D.	0-25	0010-0028	
		26 10.54'N	14 34.48'W				
8057	13.8	26 06.79'N	14 39.00'W	T.S.D.	0-43	0107-0125	
		26 06.51'N	14 39.11'W				
8058	13.8	26 10.49'N	14 43.75'W	T.S.D.	0-99	0210-0235	
		26 10.13'N	14 44.09'W				
8059	13.8	26 14.88'N	14 47.04'W	T.S.D.	0-220	0320-0359	
		26 14.63'N	14 47.45'W				
8060	13.8	26 18.20'N	14 50.67'W	T.S.D.	0-500	0506-0548	
		26 17.59'N	14 51.21'W				

STA.	DATE	POSITION LATITUDE	POSITION LONGITUDE	GEAR	DEPTH	TIMES
8061	13.8	26 22.45'N	14 52.32'W	T.S.D.	0-500	0642-0714
		26 22.70'N	14 52.18'W			
8062	13.8	26 14.74'N	14 52.57'W	T.S.D.	0-425	0810-0841
		26 14.57'N	14 52.62'W			
8063	13.8	26 13.21'N	14 48.76'W	T.S.D.	0-250	0911-0930
		26 13.16'N	14 48.85'W			
8064	13.8	26 09.58'N	14 44.61'W	T.S.D.	0-118	1006-1021
		26 09.53'N	14 44.69'W			
8065	13.8	26 05.98'N	14 40.55'W	T.S.D.	0-94	1057-1112
		26 05.97'N	14 40.58'W			
8066	13.8	26 01.68'N	14 36.16'W	T.S.D.	0-55	1151-1203
		26 01.52'N	14 36.50'W			
8067	13.8	25 57.47'N	14 42.71'W	T.S.D.	0-80	1246-1306
		25 57.31'N	14 43.35'W			
8068	13.8	26 01.01'N	14 47.97'W	T.S.D.	0-93	1345-1408
		26 00.99'N	14 48.72'W			
8069	13.8	26 04.65'N	14 53.06'W	T.S.D.	0-140	1445-1513
		26 04.48'N	14 53.71'W			
8070	13.8	26 08.32'N	14 57.74'W	T.S.D.	0-275	1610-1643
		26 08.15'N	14 58.19'W			
8071	13.8	26 12.07'N	15 02.33'W	T.S.D.	0-480	1800-1843
		26 11.76'N	15 02.95'W			
8072	13.8	26 08.12'N	15 08.31'W	T.S.D.	0-400	1922-1946
		26 07.86'N	15 08.77'W			
8073	13.8	26 05.68'N	15 01.22'W	T.S.D.	0-280	2042-2116
		26 05.41'N	15 02.15'W			
8074	13.8	26 01.23'N	14 54.00'W	T.S.D.	0-127	2220-2247
		26 01.04'N	14 54.84'W			
8075	13.8	25 59.20'N	14 51.89'W	T.S.D.	0-90	2325-2347
		25 58.95'N	14 52.30'W			
8076	14.8	25 54.85'N	14 48.77'W	T.S.D.	0-90	0024-0044
		25 54.68'N	14 48.96'W			

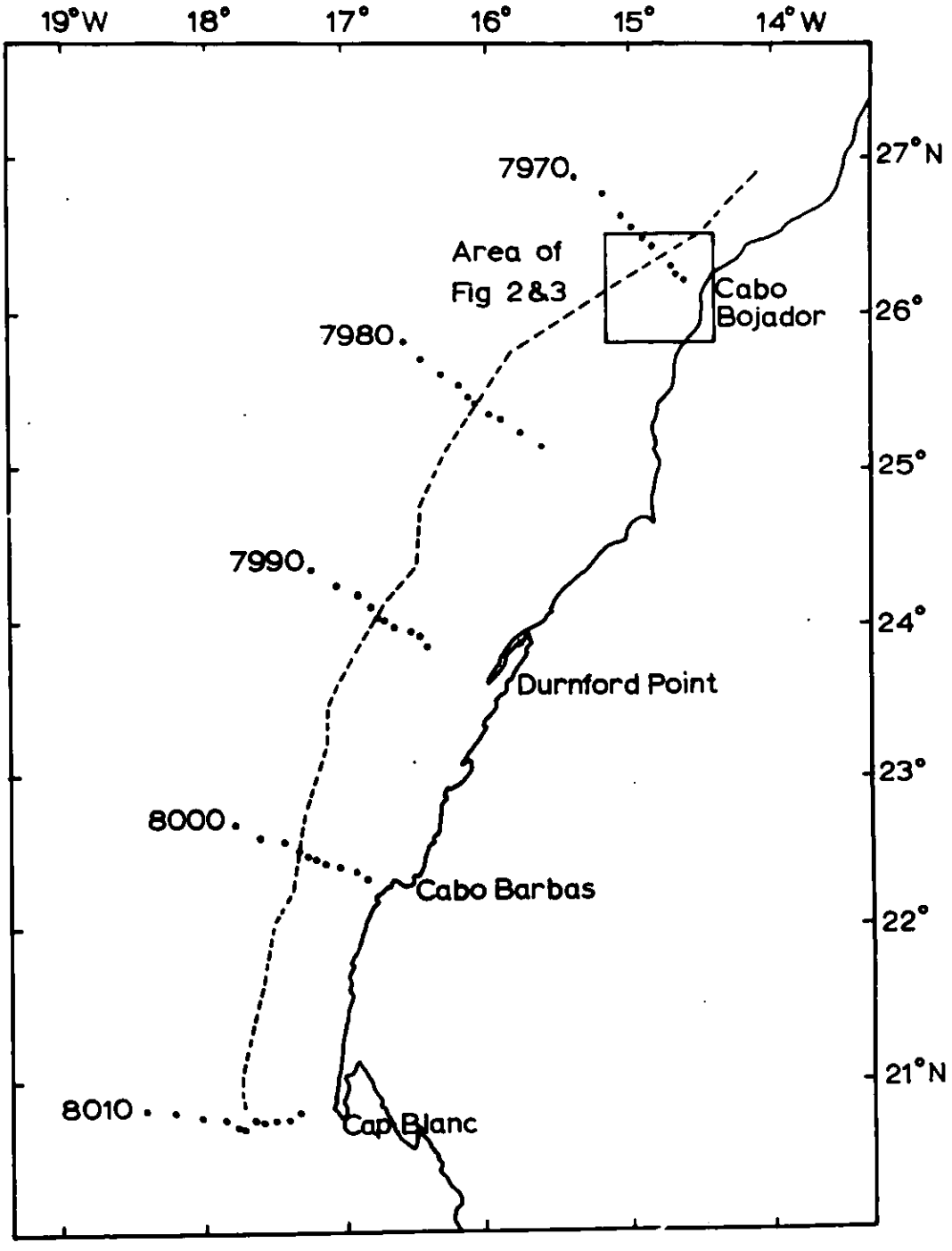

Figure 1. Track chart for Leg 1

• station positions

---- continuous records (500m contour approx)

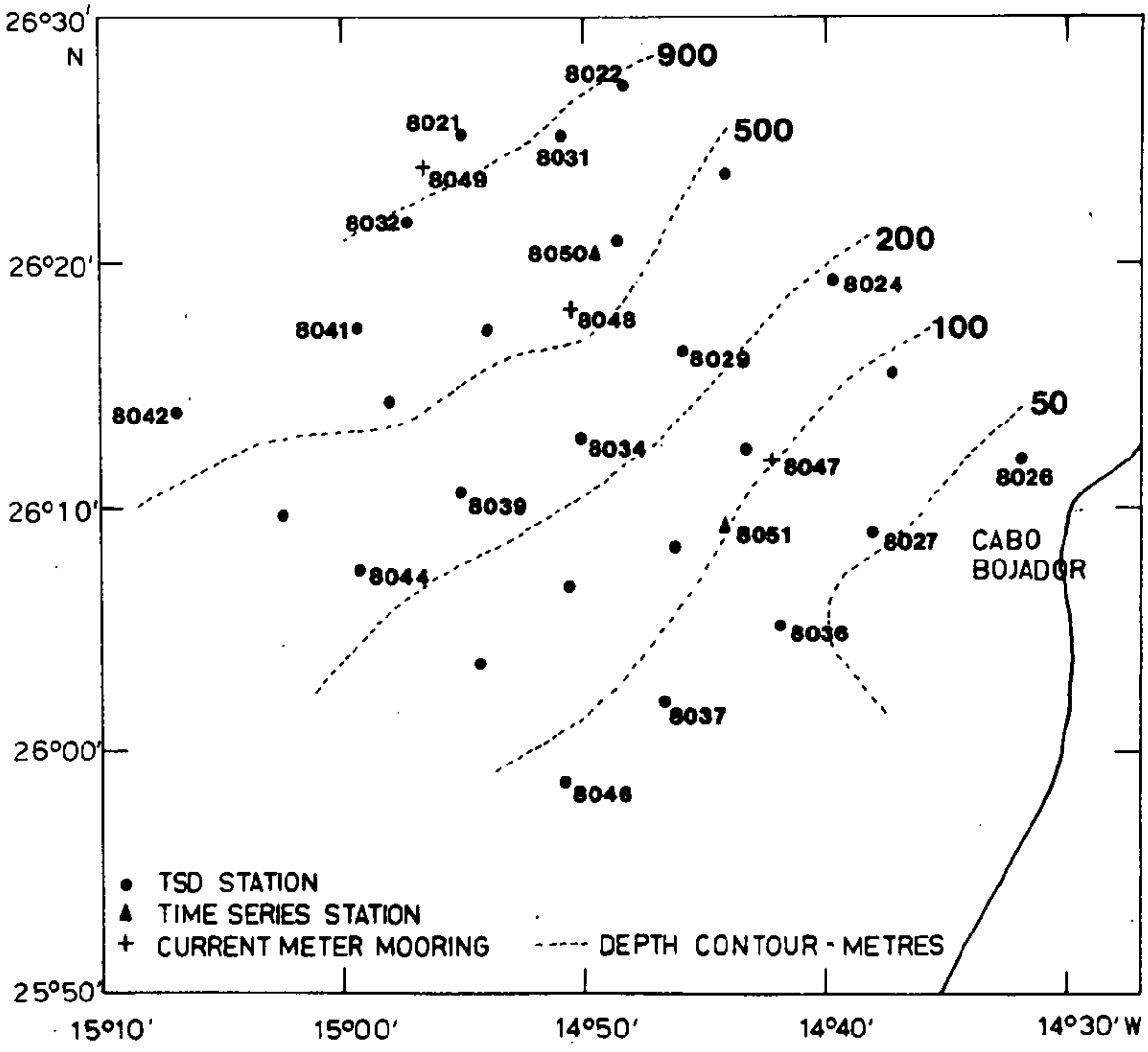

Figure 2. Station Positions Cabo Bojador Area - Grid 1

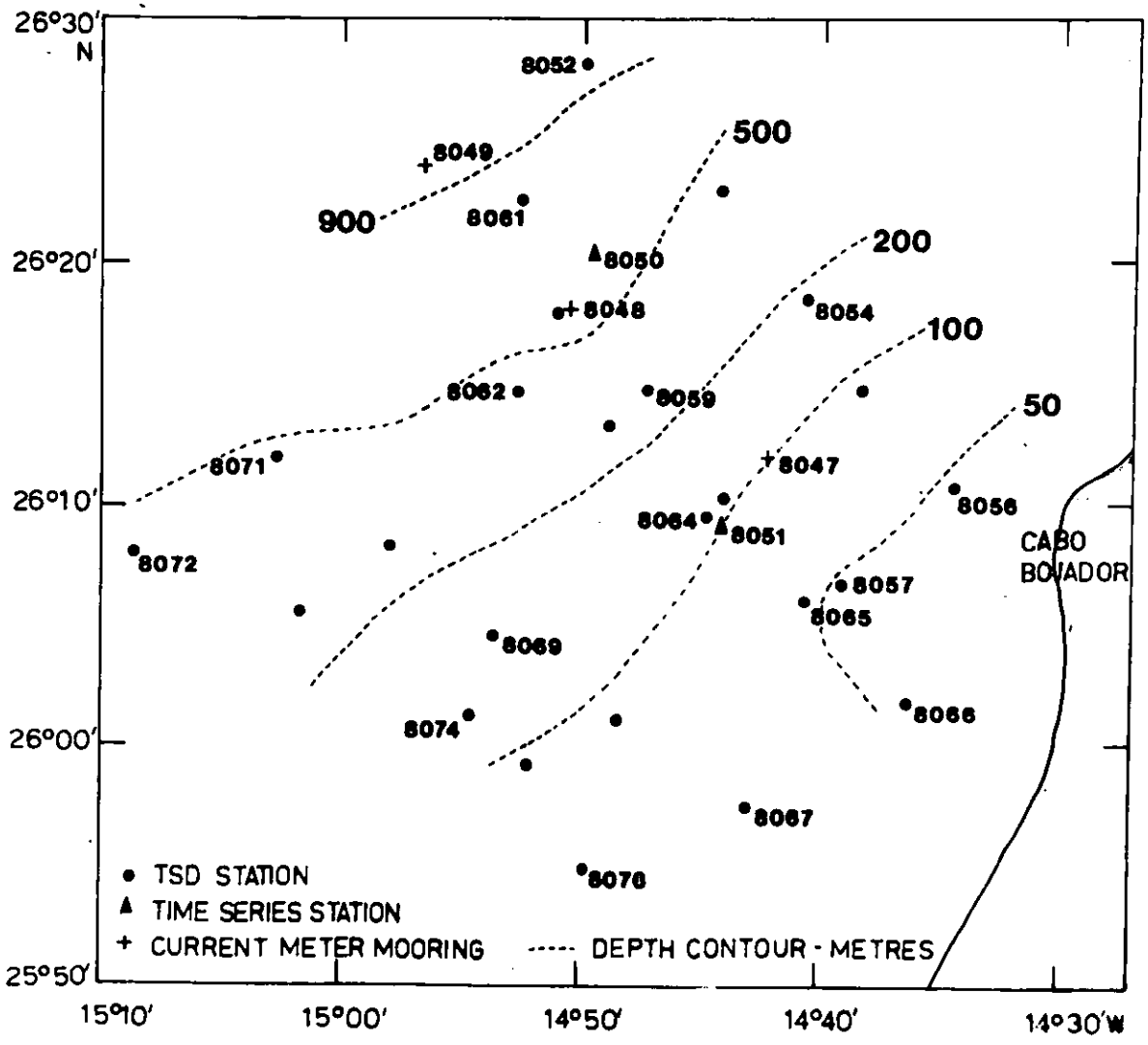

Figure 3 Station Positions Cabo Bojador Area - Grid 2