I.O.S.

# R.R.S. DISCOVERY CRUISE 59

1 – 19 FEBRUARY 1974

# INSTRUMENT AND HARDWARE TRIALS IN THE BAY OF BISCAY

CRUISE REPORT NO. 14

1974

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

# R.R.S. DISCOVERY

# CRUISE 59

1st - 19th February 1974

## Instrument and Hardware Trials

## in the Bay of Biscay

Cruise Report No. 14
1974

Institute of Oceanographic Sciences,
Wormley, Godalming, Surrey.

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## Dates

| | | |
|---|---|---|
| Depart Barry, South Wales | 1st February 1974 | 10.00 hours |
| Arrive Barry | 19th February 1974 | 15.30 hours |

## Scientific Personnel
(All I.O.S. Wormley)

R. Bentley

E. Darlington

D.I. Gaunt

D. Grohmann

M.J. Harris

P. Hartland

B.S. McCartney (Principal Scientist)

M.J. Morgan

G.R.J. Phillips

J. Sherwood

N.D. Smith

R. Spencer

A.J.R. Voss

I. Waddington

R.F. Wallace

## Ship's Officers

| | |
|---|---|
| G.L. Howe | Master |
| P. MacDermott | Chief Officer |
| A.G. Marsh | Second Officer |
| S.P. Tilbury | Third Officer |
| R.I. Hammerton | Radio Officer |
| C.S. Storrier | Chief Engineer |
| J.R. Curran | Second Engineer |
| M. Hutchinson | Third Engineer |
| G. Batten | Fourth Engineer |
| P.G. Ditchburn | Fifth Engineer |
| J.P. Roberts | Chief Electrician |
| G. Davies | Extra Fourth Engineer |

## SUMMARY OF OBJECTIVES

The main purpose of the cruise was to test under realistic open ocean conditions a number of new or modified instruments and their associated hardware. Opportunity would also be taken to lay a mooring with one current meter on the shelf, a mooring with two current meters in deeper water and a deep sea tide gauge. All three units will be recovered in late March on a cruise of RRS John Murray.

The principal instruments and hardware to be tested were new acoustic command electronics, acoustic beacons, acoustic transducers, acoustic telemeters, new mooring hardware including double pyro-releases and cable-cutter mechanisms to replace explosive bolts in mooring releases, and the deep sea tide gauge prior to its deployment. An important aspect of the hardware trials was the evaluation of the double barrel winch and large A frame on the foredeck for the laying and recovery of moorings.

A full calibration exercise on the EM logs relative to a shallow drogue and to a towed log was planned. Also some measurements were required on the noise spectrum levels of the I.O.S. seismic reflection hydrophone streamed at a range of speeds.

Simultaneously with the above work, or as convenient, the shipboard computer system would be under development, and also provide as far as possible routine logging, navigational data and plotting. An interface for the Plessey/Sippican X-BT would be built and tested.

If enough time were available a modified grapnel would be used to attempt recovery of a French deep sea tide gauge and a Canadian shallow water tide gauge. An MS47 Transit sonar on loan from the Instrument Pool would be used to search for the remains of the Canadian Tide Gauge.

## NARRATIVE

The ship left Barry on the morning of February 1st and after swinging the compass in Barry Roads, proceeded down the Bristol Channel. The P.E.S. fish fitted with the new titanium head transducers and the transit sonar transducer were both deployed during the afternoon, and later the first attempt was made to measure directivity on a single element of the echo-sounder. Four runs were made to check the alignment of the e/m log heads. By late evening the weather had deteriorated and progress was delayed by head winds. This gale was the first of a succession which were to hamper us on this cruise, as Fig. 1 of the windspeed throughout the cruise shows. Passage and overside work were hindered during more than 36% of the time, there were ten periods of Gale Force 8 or higher winds, and there were only three periods of Force 4 or less winds.

By the morning of 3rd the ship had reached the first mooring position; after some tests of the acoustic command receivers overside on a wire and after taking a velocimeter profile, a dual purpose mooring was laid including command release and pinger, three experimental command pingers, cylindrical subsurface buoy, 100 m of rope and a surface dahn buoy with radar transponder. This mooring, as all the others during the cruise, was laid from the forward deck as part of an investigation in mooring methods. Tests of the experimental command pingers were not very successful but the mooring was left down to act as radar navigational reference for an echo-sounder survey during the night. A second attempt at measuring P.E.S. transducer directivity was successful. Radar range to the buoy was about 7 miles during a box survey to find a suitable position for current meter mooring No. 165, Fig. 2 and Fig. 3. A dahn buoy reference was first placed near the selected position and then the previous experimental mooring released and recovered before laying the current meter mooring on the afternoon of the 4th. The reference dahn buoy was recovered last. The ship then headed to deeper water.

During the 5th overside tests on wires were made in deep water with varying success of the following equipments; biological net telemeter (calibrating relative to the TSD), new command pingers, deep sea tide gauge and guillotine wire-cutters. A similar programme of work for the 6th was prevented by the heavy weather, though modifications and preparations of gear were made in the laboratories and workshop. A wave recording showed a wave of 40 ft. peak to trough with many waves over 35 ft.

Overnight and during the 7th February acoustic and other tests on wires were more successful and by evening the modified command pingers were believed to be acceptable for use on a deep mooring, in an experiment designed to measure the performance of different pinger transducers. This mooring was laid at a depth of 1988 m during the 8th after an echo-sounder survey. Two problems occurred during laying the mooring, the first was due to a leak in an electrical lead and the second occurred when the buoyant polypropelene rope, joining a surface dahn with radar transponder to the sub-surface buoy, fouled on the strut of the starboard electromagnetic log. Although the log still functioned, the strut was bent since it could not be retracted, and subsequent work used the port log only. Instead of the radar dahn, an acoustic transponder was fitted beneath the sub-surface float to provide ranges to the ship. Acoustic ranging on the experimental transducers commenced, but high noise levels and severe weather caused these to be postponed until the morning of the 10th. A sound velocimeter profile was obtained to 2000 m during rough seas but aeration prevented any data until the instrument reached 20 m depth; the computed wave analysis at this time indicated waves with a significant height of 6.8 meters and 8.5 seconds period. The series of tests on the guillotine wire cutter were successfully completed.

During the 10th ranging measurements on the command pingers were possible by slowly steaming into wind, towards and past the mooring position and then slowly drifting back on it again. The weather on the 11th was too rough even for this, and the port I.O.S. anemometer gave up the unequal struggle, disintegrating completely. Due to shortage of time, the mooring was then successfully released and recovered during the abated weather on 12th; then a further test of the deep sea tide gauge to 2000 m on the main warp was partly successful. Overnight an unsuccessful drag for a lost Canadian tide gauge was made, using the main warp and a grapple having an indicating acoustic pinger.

By the evening of 13th February the ship was in position and laid the current meter mooring No. 167 for Dr. Gould. This was followed by a final test on the warp of the tide gauge and then course was set for its lay position, Fig. 2. The gauge was laid by midday on 14th. There was too much aeration for the transit sonar to work, when searching for the Canadian Tide Gauge, so a grab and hookfish was prepared, but the conditions did not improve and by 16th the drag was abandoned. Later the first trial XBT's were deployed and successfully logged by the computer. An experimental mooring was then laid in 200 m with acoustic command release, experimental command pingers and with a sub-surface float, in order to examine the acoustic performance of the pingers in shallow water. The rather ineffective performance was confirmed by early morning on the 16th and the mooring was released and recovered after dawn.

The P.E.S. towed fish fitted with an electromagnetic log spar was put out from the starboard boom on 17th, and then a dahn buoy with a parachute drogue at 5 m depth and acoustic transponder at 10 m depth was deployed. Both these were for calibrations of the ships log. Data from the port, starboard and fish units were logged by the computer along with gyro headings, whilst the radar and acoustic ranges from the drogue were logged manually. Runs were made into and with the wind at 8 kts and across the wind at 6, 4, 2 and 8 kts. The port fish with spar was recovered and despite losing the radar reflector, the drogue and transponder were recovered.

During passage back to Barry on 18th the I.O.S. 200 ft. hydrophone array was towed with 500 yds. cable at 2, 4, 6 and 8 kts., whilst noise spectrum measurements were taken. The vessel docked at Barry on the afternoon of 19th February, with a rather weary complement due to the weather, but nevertheless a good deal of useful work completed.

## PROJECT REPORTS

### 1. Deployment and Recovery of Mooring Systems from Foredeck

Following mechanical losses of moorings due to the use of the main trawl winch, and the difficulty of the bridge to observe wires aft, Dr. Swallow asked for a mooring system to be fitted to the forward deck of Discovery. During 1972-73 the forward "A" frame was modified to give increased height, and new hydraulics fitted. The double barrel capstan was used on various ships during 1972-73 and modifications carried out to improve its performance.

The system was fitted at Barry immediately prior to sailing.

Although the wire lead through the sheaves was not ideal there was not time to carry out modifications. During the course of the cruise three shallow moorings using cylindrical sub-surface buoys and two deeper moorings (2000 metres) using four foot diameter spheres were laid.

No serious problems were encountered with the handling of equipment. A more detailed report of handling gear forward is being prepared.

D.I. Gaunt

### 2. Double Pyro-release

Four moorings each employing the double pyro-release were laid, two in 2000 metres depth and two in 200 metres. The deep mooring anchors weighed 1600 lbs. and the system was used under bad weather conditions approaching a force 6 wind speed with a short steep sea and a large swell.

An acoustic release was modified to provide two separate firing channels, allowing either one of the pyro release to be fired. No serious problems were encountered during laying and all moorings were recovered each requiring only a single pyro-release.

In view of the result of these tests, and the successful use by Dr. Thorpe on the Loch Ness moorings this system will be used for all continental shelf moorings from April 1974.

D.I. Gaunt

### 3. Guillotine Wire Cutter

Current meter mooring systems used by I.O.S. Wormley have used an explosive bolt release system; although this device has given 100% results, it is potentially dangerous. To overcome the hazard to personnel involved in its use and to widen the numbers of users, a new hydrostatically balanced guillotine cutter was designed.

Firing tests carried out at 4000 and 3000 metres on the hydrographic wire were successful, and with a 200 lb. load the 8 mm diameter galvanised steel wire was cut cleanly. Tests at 2000 and 50 metres also successfully cut the wire, though the piston electrical lead plug showed axial and shear cracks.

Re-loading of the cutter presented no difficulties, and the principle of the cutting system has been proved.

D.I. Gaunt

## 4. Attempted recovery of French and Canadian Tide Gauges

Attempts were made to recover the French tide gauge in 2000 metres of water using a modified active grapnel. Use was made of the VDU to facilitate accurate navigation across the tide gauge ground line. Weather conditions were not favourable and the ship had to steam at 4 knots to maintain steerage. Two passes were made over the ground line with the grapnels at 200-500 metres off the bottom. During the second turn the grapnel dragged on the bottom and the active arms operated, as indicated by the double pulse trace on the Mufax.

Although the results were negative, experience was gained both by the ship's officers and scientists in the practical use of the VDU system.

Weather conditions at the Canadian (A2) area prevented use of the side-scan sonar aeration being too great. A four prong grapnel originally made to recover the D.S.T.G. was modified to indicate when a warp entered the prongs. Active arms were fitted, and wired to alter a pinger from single to double pulse operation.

A drag system was prepared using the "Hook Fish" but again weather conditions prevented its use.

## 5. Acoustic Checks and Deployment of Deep Sea Tide Gauge Capsule

The previous time the deep sea tide gauge was layed trouble was experienced with the operation of the acoustic telemetering systems. It was thought that the problem was due to the positioning of the scrolls relative to the sphere and so several tests were performed to help to evaluate the problem.

The instrument electronics were first re-aligned to ensure optimum performance. New transmit and receive scrolls were used with a previously known good history of operation. The sphere and electronics were lowered down to 2000 metres in 4000 metres total depth, on the main trawl warp with approximately 800 lb. of ballast chain. Attempts to operate the equipment failed. The receive scrolls were then used on a release system that was known to operate at 4000 metres depth, and it operated successfully. The release was then fixed to the tide gauge frame, but with the scrolls mounted at their correct distance relative to the sphere. The operating sensitivity was reduced. Further tests with the tide gauge acoustics were carried out, operating at different depths. The acoustic electronics receive sensitivity was changed. Also many different scroll arrangements relative to the sphere were made. These tests improved the system to a point where it was safe to deply the gauge; however further acoustic trials are required under controlled conditions to observe the effect of the sphere on the signal reception through the scrolls.

The tide gauge was then laid at position $47^{o}27'$N; $8^{o}26'$W in a depth of 2200 metres. The data from this position is required for an evaluation of the gauge, compared with two similar devices laid and recovered last November/December 1973. This intercalibration exercise is organised by UNESCO Working Group 27 on tidal measurements.

R. Spencer

## 6. Sub-surface Moorings

Five sub-surface moorings were laid using acoustic releases and command beacons. Three of the moorings were shallow in 200 metres and others were deeper in 2000 metres. All of the acoustic release and command beacon systems used on these moorings were fire tested on a vertical wire at least to the depth they were going to be used. None of these instruments failed on the wire test. Moorings B, C, and E, were subsequently recovered. The release on these three moorings was modified to provide two channels for firing either of the pyro releases in the new double pyro release system.

The only malfunction occurred on the first time of laying mooring 'C'. The electrical cable connecting the beacon to the release was flooded, causing the beacon to operate at low level. This cable was replaced before the mooring was relaid.

The majority of these moorings were recovered in rough weather with wind speeds in excess of 30 knots and some wave heights between 20 and 30 feet crest to trough.

An acoustic release was used to test out a wire cutting method of release for sub-surface moorings. This guillotine cutter was tested using a modified release at depths varying from 50 to 4000 metres. The acoustic release operated correctly on all five tests.

M.J. Harris

## 7. Acoustic Transponder

This was the transponder designed by Mr. Tucker using a scroll transducer. On mooring 'C' the transponder was at a depth of 137 metres and 190 metres on mooring 'E'. The transponder was put on the moorings to obtain the ship's range from the mooring whilst measuring the transmission power from the four new types of command beacon. The gated non-listening time of the transponder was reduced from 1.8 secs to 0.2 secs to enable the transponder to trigger off the command beacons and the echo-sounder during its duty cycle.

The maximum range obtained was 2850 metres on mooring 'C'. This was not really good enough for the job in hand as a range of 5 km. was required. It was though that the transponder was replying at a range greater than 3000 metres but that the signal-to-noise level on reception was the limiting factor. With better weather this range may well have been greater.

The transponder was partially flooded on mooring 'E'. The damage was repaired and the transponder used on a reference drogue for calibrating the ship's E.M. log. With the transponder at a depth of 10 metres, ranges of 2 km. were obtained.

M.J. Harris

## 8. Precision Beacon

A type H beacon with crystal controlled CMOS electronics and cylindrical end cap transducer was used when dragging for lost tide gauges. The beacon was connected to an active grapnel to telemeter the operation of the grapnel's jaws to the ship by means of an additional pulse. A range of 4800 metres was obtained, but at times the signal-to-noise level was poor. The switching operation of the beacon worked successfully.

M.J. Harris

## 9. Transducer Directivity: P.E.S. Fish

The directivity of a single element in the P.E.S. Mk III "fish" was measured using a calibrated hydrophone and calibrated B and K equipment. The hydrophone was lowered over the ship's port side and positioned at various bearings and constant distances from the P.E.S. transducer. Three tones, 9, 10 and 11 KHz were transmitted from the single element and directivity patterns were obtained for these frequencies. On average there was a 15 db drop in sensitivity from the vertical to the horizontal bearing. These results were important as they were required later in the cruise for calculating the sensitivity and directivity of the new beacons.

M.J. Harris

## 10. Ship-Board Release Command Equipment

Apart from a wiring fault in a junction box of the P.E.S. system there was no trouble with the ship-board equipment. The V.C.O. in the acoustic command transmitter was a distinct improvement over the original subcarrier oscillator, as was the crystal oscillator for the helix motor drive of the P.E.S. Mk III mufax.

M.J. Harris

## 11. Experimental Acoustic Command System

The detailed objectives of these tests were -

(i) To compare four types of acoustic transducer used as transceivers in $\delta$ f.m. command systems in terms of sensitivity and directivity.

(ii) Evaluation of a new (Mk IV) system of command electronics designed to have the same operating characteristics as the previous system, but being easier to align and maintain.

(iii) Evaluation of a precision timed acoustic beacon as a means of remote instrument location.

On the way to the work area five experimental (Mk IV) and several standard (Mk III) command units were powered up and checked. The first wire test to 180 metres successfully tested the standard release and command units to be used on the first mooring. The next three lowerings to the same depth were to test the Mk IV units, but all failed to operate. The first mooring was quickly laid as other instruments were to be tested. One Mk IV system was included to test it in the absence of ship's noise. This system again failed to operate.

Tests were carried out on the remaining Mk IV units by lowering to a depth of 10 metres and observing selected monitoring points in the laboratory using a connecting electrical cable. The results of these tests suggested the cause to be a breakthrough of second harmonics to the coincidence filter system caused by multiple path interference in the water. To remove the harmonics a filter with a low Q (9) was introduced. In addition, to cope with signal dropout caused by interference, the coincidence count required was reduced.

The weather and equipment was ready for fresh wire tests on the 7th. These were carried out to 4000 metres. The cylindrical end cap style transducer was the only unsuccessful unit, due it was thought to its high Q relative to the others. Extensive tests were carried out at this depth to determine power levels required for switching. A mooring was then laid in 1980 metres with the Mk IV's and Mk III grouped at 1960 metres.

Directivity and sensitivity runs were made across the mooring on three successive nights. The weather ranged from wind force 6 to 11 and sea state 4 to 7. Directivity was determined by observing the signal amplitude of pulses transmitted from the units at the transducer resonant frequency (10 kHz). These were received on the single element of the P.E.S. fish and due to variations caused by surging of the fish the level taken was the average maximum angular range at which the system would switch.

These tests were repeated on a shallow water mooring with the instruments at 180 metres. This occupied a day and provided valuable supplementary results and information.

The precision timed beacon (type H) which is an integral part of the Mk IV command system proved a time saving, easy, and accurate method of mooring location.

G.R.J. Phillips

## 12. Bio-Net Telemeter

The cruise was an opportunity to test the prototype of a new delay circuit, which had been developed primarily for use as a Biological Telemeter.

The potential advantages of this all CMOS circuit incorporating the use of Up/Down counters compared with the delays used in the past are:

(i) the much greater ease of setting up;

(ii) a considerable easing of pickup problems and

(iii) a reduction in the number of different voltage power supply levels, with a consequent power supply simplification.

The main purpose of the testing was to discover whether any unforeseen problems would occur when the telemeter was deployed in the marine environment, and it was also hoped to check the laboratory calibration against the T.S.D.

Four complete dips were made, two for each calibrated range of the depth telemeter, and the circuit worked satisfactorily in that no difficulties were experienced. However in the matter of calibration against the T.S.D. some problems were encountered. The T.S.D. calibration was not available, and there was some trouble with the T.S.D. computer inerface, but once this latter problem was overcome, computer runs were obtained of the dips for subsequent comparison at the laboratory with the figures obtained from the Mufax records.

The T.S.D. cable had been taped in so many places where the strands of the wire had parted that it proved impossible for the messenger to fire a bottom bottle to obtain a more absolute calibration. A check of the T.S.D. chart rolls against the Mufax records however bore very close comparison and would seem to justify the construction of a full scale Net Monitor - hopefully in time for use on the next Biological cruise. (Late March '74).

E. Darlington

13. Data Processing

(i) Checking out of new system software developed since Summer 1973.

(a) The paper tape assembler was not available.

(b) New version of CAMAC.

The Executive was rebuilt before sailing using the new BOM without utilities, and CAMAC included in this. The CAMAC software functioned satisfactorily. The error massage "hex words" are not meaningful at present.

(c) Modifications for CAMAC LUNs as follows:

| | |
|---|---|
| BOM: | new PAPEB and EBASC |
| MFIO: | changes in use of FIO table |
| COMPILER: | *IOCS(CAMAC) |
| Builder: | Changes to avoid use of executive PAPTN |

All these modifications were satisfactory. The Alphanumeric terminal was available as a Fortran type device on both read and write and in the short time before the ANT broke down proved very useful. The ANT was used for the display of oceanographic data (ODLPI) and source program listing (SLIV).

The following system bugs were also noted:

(d) D56 error during *SRFLE M gives bad output message

(e) LUN 3 does not work from a process program but is satisfactory from a batch coreload.

(f) The compiler will not accept more than 79 characters/line on a paper tape input. (Gives storage protect errors).

(g) The compiler checks for END followed by line feed and will not accept other ways of terminating the line.

(h) Inter-file SRFLE M function where file 2 is not large enough gives a wait followed by an op code error.

(ii) Testing of updated applications software.

(a) The new satellite programs were not available.

(b) Sampling of both EM logs with easy change over of which is used.

This has been implemented by providing 2 Inskel Common locations (LOGF and LOGS) which contain the Data Path numbers for the F/A and S/P EM log components. Change over is simply a matter of 'CHINKing' these variables. The inclusion of a suitable #SET OPTIONS parameter would be desirable.

The derived velocities north and east are stored in CDAT as indicated by the appropriate Data Paths. Since the navigation programs always use Data Path 7 and 8 (port log) a modification will be required. This can be done by ensuring that use of either logs leads to storing data in the same CDAT locations.

(c) Sampling of the EM log head currents, correction for any deviation from 5 volts and an alarm if variation of more than 0.1 volts occurs. The head currents will be sampled once every 2 mins but not stored in CDAT.

An INSKEL COMMON variable ILOGH has been provided which should be set to the address of the analogue point connected to the EM log reference voltage. The customer elements give a 100:1 reduction. Program DFLT2 converts the digital value to volts (multiplies by 0.305194*10E-3) and prints a warning if necessary. If checking is selected, the calibration constants for the logs are then adjusted accordingly. If checking is suppressed the reference is assumed to be 5 volts.

The references voltages throughout the calibration trials were recorded. It is important that these recorded values are included in the calibration calculation.

(iii) Commissioning the extended CAMAC system

A two-crate CAMAC system was set up, the second crate being on the long branch cable destined for the plotting office. No problems were encountered during the short period of the test.

(iv) Calibration of EM Logs

During the major Log calibration trials (b) below the ship towed a fish fitted with a calibrated EM Log. The computer recorded port, starboard and fish logs and saved the following one second data:

Forward/aft components for each log
Port/Starboard components for each log
Head currents for each log
Digital Gyro
Analogue Gyro

(a) Head alignment check

This experiment was upset by the heavy weather. The limitation seemed to be the necessity of keeping the ship dead into wind. During the outward passage down the British Channel 3 runs were made. Later a further 2 runs were made with the wind astern. In all cases the difference in alignment between the port and starboard logs was close to 3.1 degrees and suggested that the logs were in fact "pigeon toed" by this amount. An estimate of by how much each log was out was not possible under the conditions. No difference was observed after the bending of the starboard log. Runs were also made with the wind on each quarter to deliberately cause sideways drift. Again the "pigeon toed" effect was observed. One run was also made ahead into the wind but only 2-3 knots could be maintained. In this case the "pigeon toed" effect was much smaller (0.96) which could be due to a change in the net flow of the water. This would suggest an increase in outward flow as the ship crashed onto the seas.

Detailed results are available.

(b) Full Calibration

A brief inspection of the results indicate that the present calibration exagerates sideways movement and may slightly underestimate forward movement. The port log data has been plotted out in full (together with the reduced data) to summarized the ships movement during the runs. Examination of the one second data shows occasional "spikes to zero" at the end of a two minute period. This is due to "short" 2 minute periods and will be discussed below. A disk error (Modul O - 4 check) was subsequently discovered on sector /25D6. The sector has been patched to correct the error. Subsequent examination has shewn that sectors /25D4 and /25D6 contain bad header information (1st 4 words of certain records). Data affected are

| DAY | TIME | DATA PATHS |
|---|---|---|
| 48 | 1843 | 30, 35 |
| 48 | 1844 | 8, 30, 34 |

The results from this experiment will be evaluated in the laboratory, with the aim of installing the calibrations for Cruise 61.

(v) Enhancement of the live Track-plot facility and its use during sonar ranging trials and dragging.

The live track plot and computer DR was much used by both the ship's officers and scientific staff. The absence of a display on the bridge meant, however, that the Bridge often maintained its own manual plot of the computer derived positions. The accuracy of the DR was quite good, particularly considering the provisional Log calibration. Some concern was expressed at the "large" corrections being made for satellites but these were only in the order of about 1/2 a mile, which after 2 hours without a fix is to be expected from current alone. Large scale plots can lead to over-confidence in the position. The currents observed were not always in agreement with published tables, but may be due in part to the log miscalibration.

The live track plot facilities were enhanced by provision of a program to allow easy setting up of a track specification and by extention to allow drawing of straight lines between fixed points.

The use of the Alpha Numeric Terminal to allow users to specify their own plot was not possible due to the break down of that unit.

(vi) Provision of such other facilities (such as navigation) as are required for the other parts of the cruise programme.

(vii) Training of computer personnel.

(viii) Development of the XBT System.

An XBT system was carried on this cruise. The data acquisition software was devloped and the necessary hardware modifications made in preparation for cruises 63-66. Some difficulties were experienced with the sea return. A good electrical contact on to the ship is essential. The XBT recorder was modified by RVB before we sailed to provide the necessary extra signals for the computer interface. It is important that this unit or a similarly modified one is used when operated in conjunction with the computer.

(ix) General

A number of bugs were traced and fixed during the cruise. The source of the data spikes was traced to 2 minute periods with less than 119 samples. The digital filter used was invalid in such cases and was returning a value of zero. It has now been arranged that 2 minute periods with 59-118 samples use the shorter filter (minimum 59 samples). A diagnostic has also been inserted which prints the number of samples if less than 120. This was only done towards the end of the day but it seems that 119 sample blocks occur approximately every 10 minutes and samples with even less every few hours. The 118 sample blocks can be caused by quite a variety of conditions, but EAC messages seem particularly significant. Excessive mask time in EAC is a possible cause. It is hoped further observations on the next cruise will assist in the tracing of this error.

(x) Hardware Performance

All IBM equipment functioned very reliably with the exception of the 1816 typewriter. This jammed on one occasion and was down for several hours. The difficulties associated with on line testing of this caused several small gaps in data.

Other notable failures were:

a. Alphanumeric terminal - a fault on the memory board developed early in the cruise. The lack of an extender card was probably the main reason for not being able to locate the problem and the terminal was out of use for the rest of the cruise.

b. Paper tape punch - blown capacitor on one of the mechanical units.

c. Paper tape reader - dry joint caused intermitted failures.

d. T.S.D. The basic interface appeared to work well but there was no documentation at all on board. This presented problems with the wiring of the 'interrupt inhibit' circuit, and this had to be by-passed for this cruise.

A.J.R. Voss

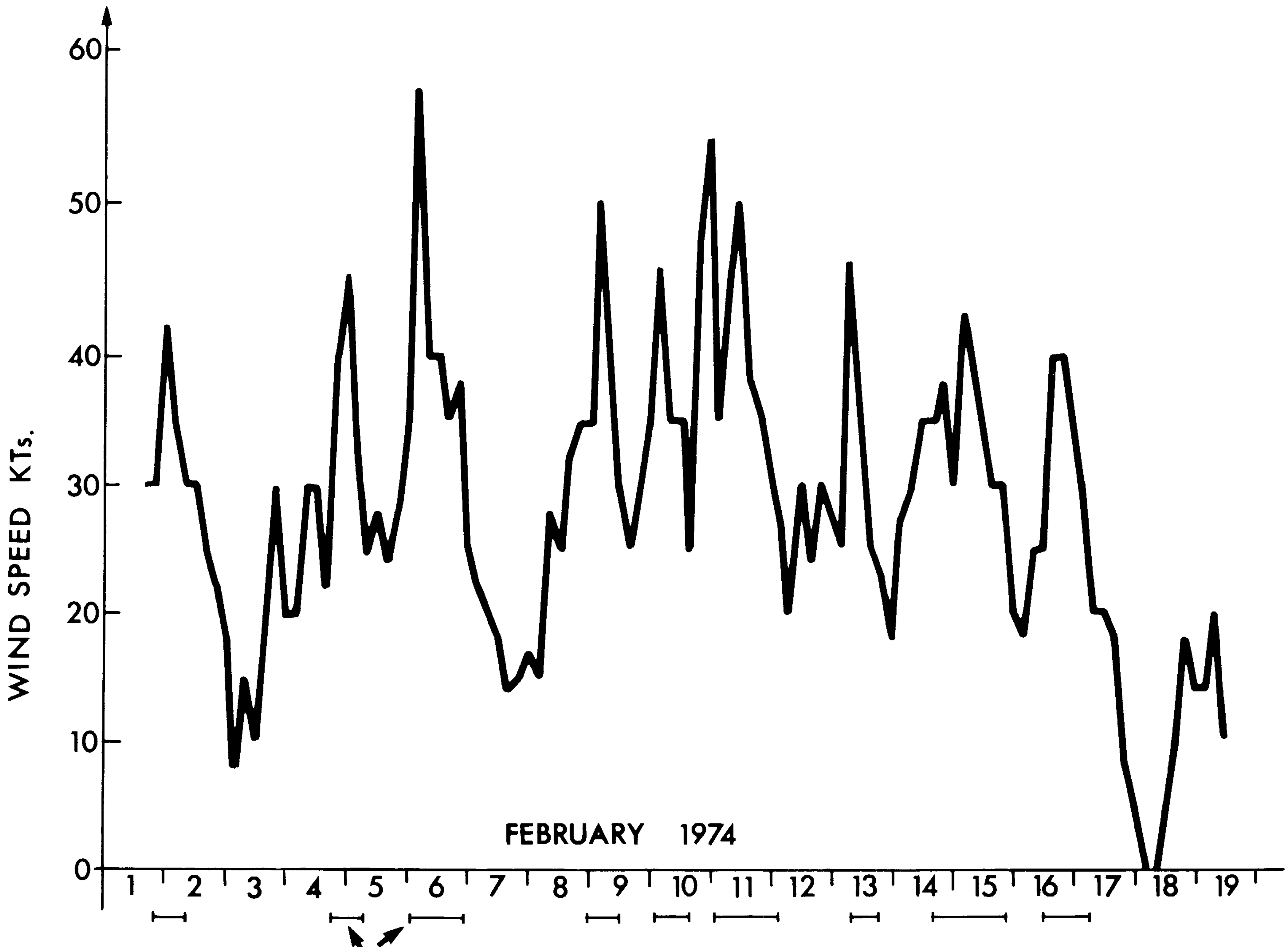
## ACKNOWLEDGEMENTS

It is a pleasure to thank the Master, Officers and Crew in all departments for their untiring efforts and assistance throughout a cruise of appalling weather. Written thanks in such circumstances seem somewhat inadequate, but are nevertheless most sincere.

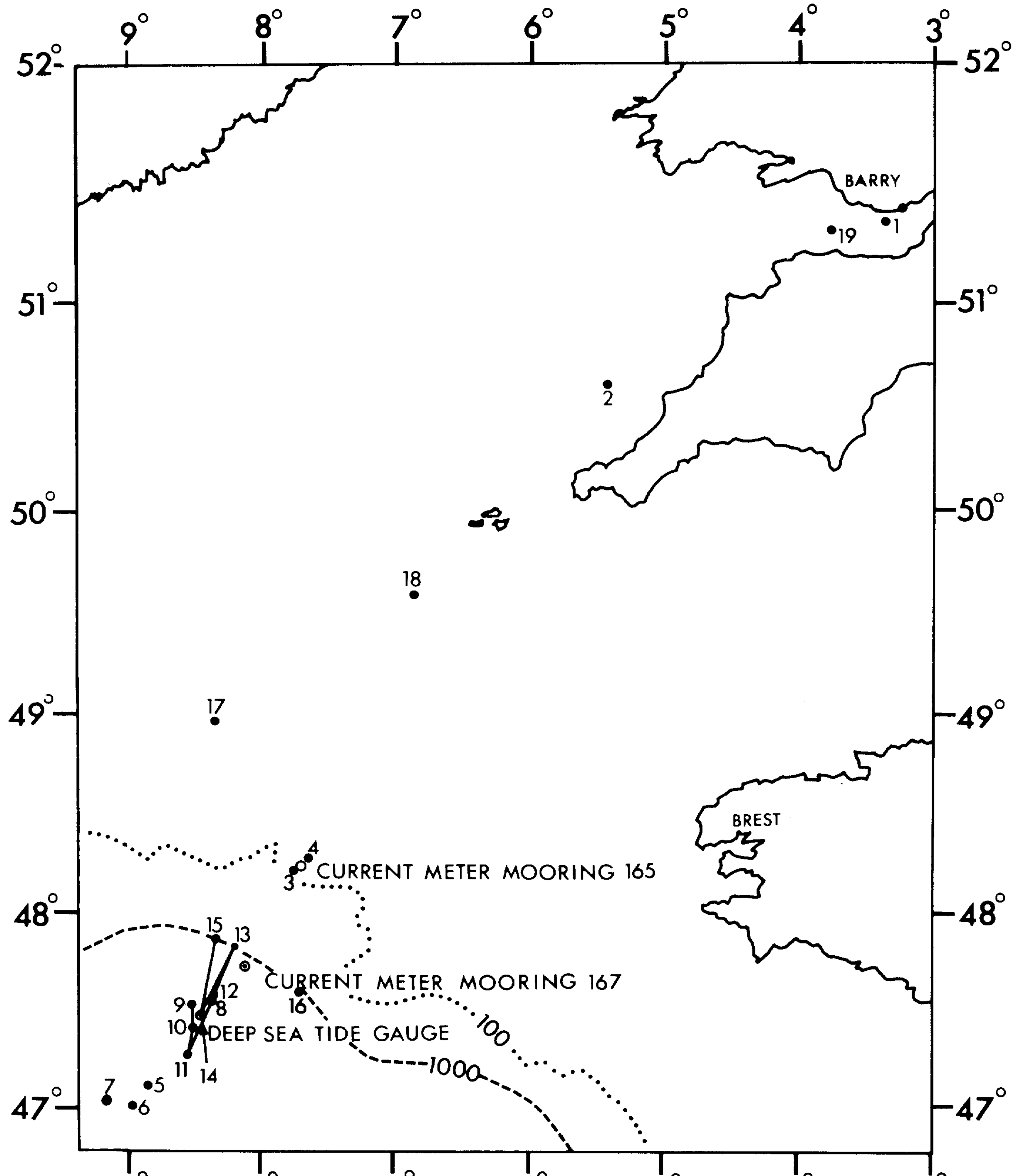
Assistance from the R.V.B., I.O.S. (Barry) and the Wormley Ship Liaison Group before and after the cruise is also gratefully acknowledged.

## LIST OF STATIONS

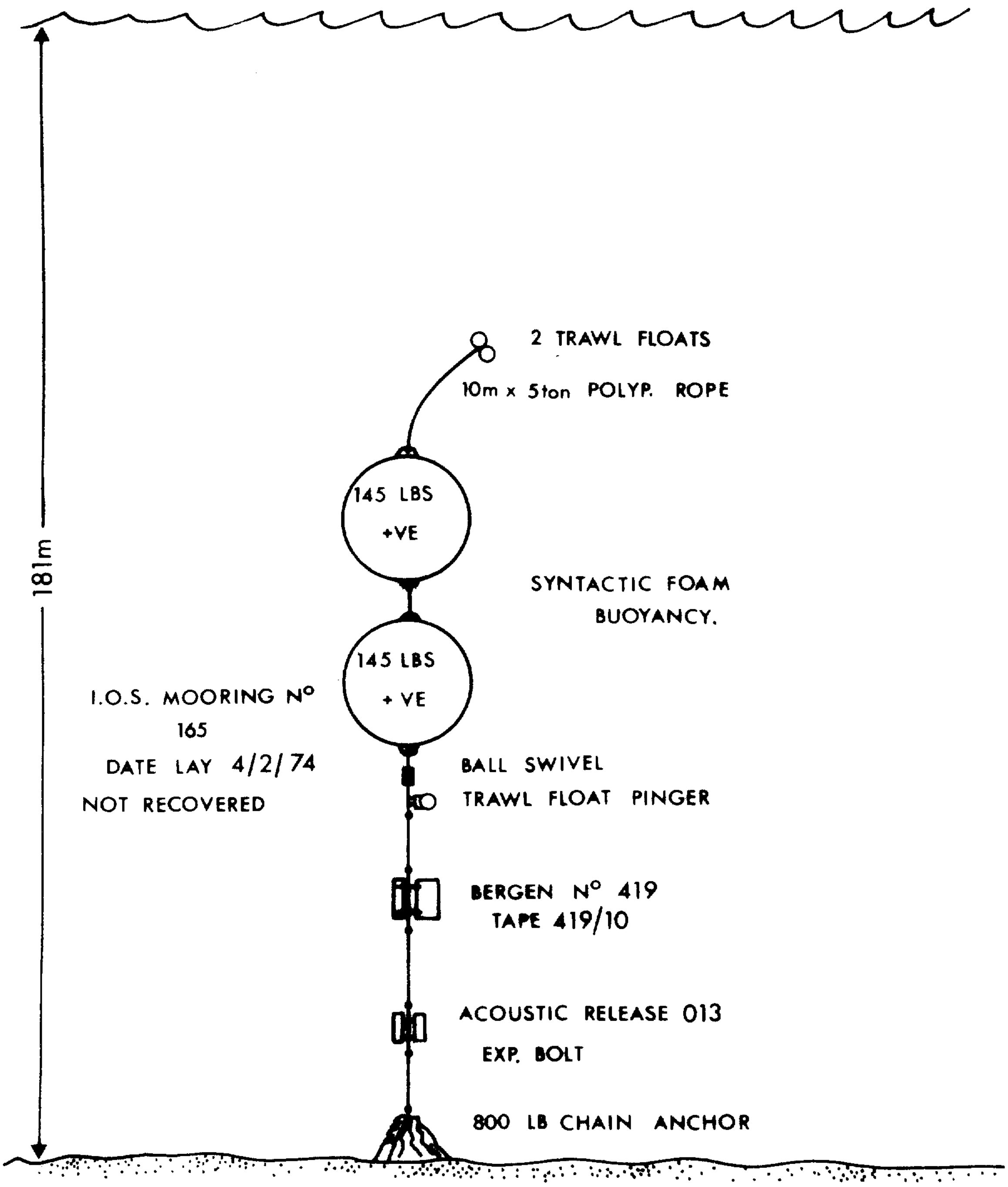
| STN | DATE 1974 | LAT.N | LONG.W | GEAR |
|---|---|---|---|---|
| 8473 | Feb 3 | 48°10'.0 | 7°49'.8 | Mk IV Command Rx to 175 m |
| 8474 | Feb 3 | 48°11'.8 | 7°47'.6 | Velocimeter to 180 m |
| 8475 | Feb 3 | 48°14'.8 | 7°42'.8 | Lay Expl Mooring with Radar Dahn |
| 8476 | Feb 4 | 48°13'.0 | 7°45'.6 | Laid Mooring No. 165 |
| 8477 | Feb 5 | 47°10'.4 | 8°50'.4 | Bio Telemeter with T.S.D. to 2,200 m |
| 8478 | Feb 5 | 47°7'.8 | 8°48'.8 | Deep Sea Tide Gauge Test to 2000 m |
| 8479 | Feb 7 | 46°59'.4 | 9°20'.3 | Bio Telemeter with T.S.D. to 1,200 m |
| 8480 | Feb 9 | 47°30'.0 | 8°38'.8 | Velocimeter to 2000 m |
| 8481 | Feb 13 | 47°43'.1 | 8°6'.0 | Laid Mooring No. 167 |
| 8482 | Feb 14 | 47°27'.6 | 8°37'.5 | Laid Deep Sea Tide Gauge |
| 8483 | Feb 15 | 47°50'.0 | 7°41'.6 | XBT Nos. 1-4 |


WIND SPEED KTs.
60
50
40
30
20
10
0
FEBRUARY 1974
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
PERIODS DURING WHICH WEATHER RESTRICTED WORK

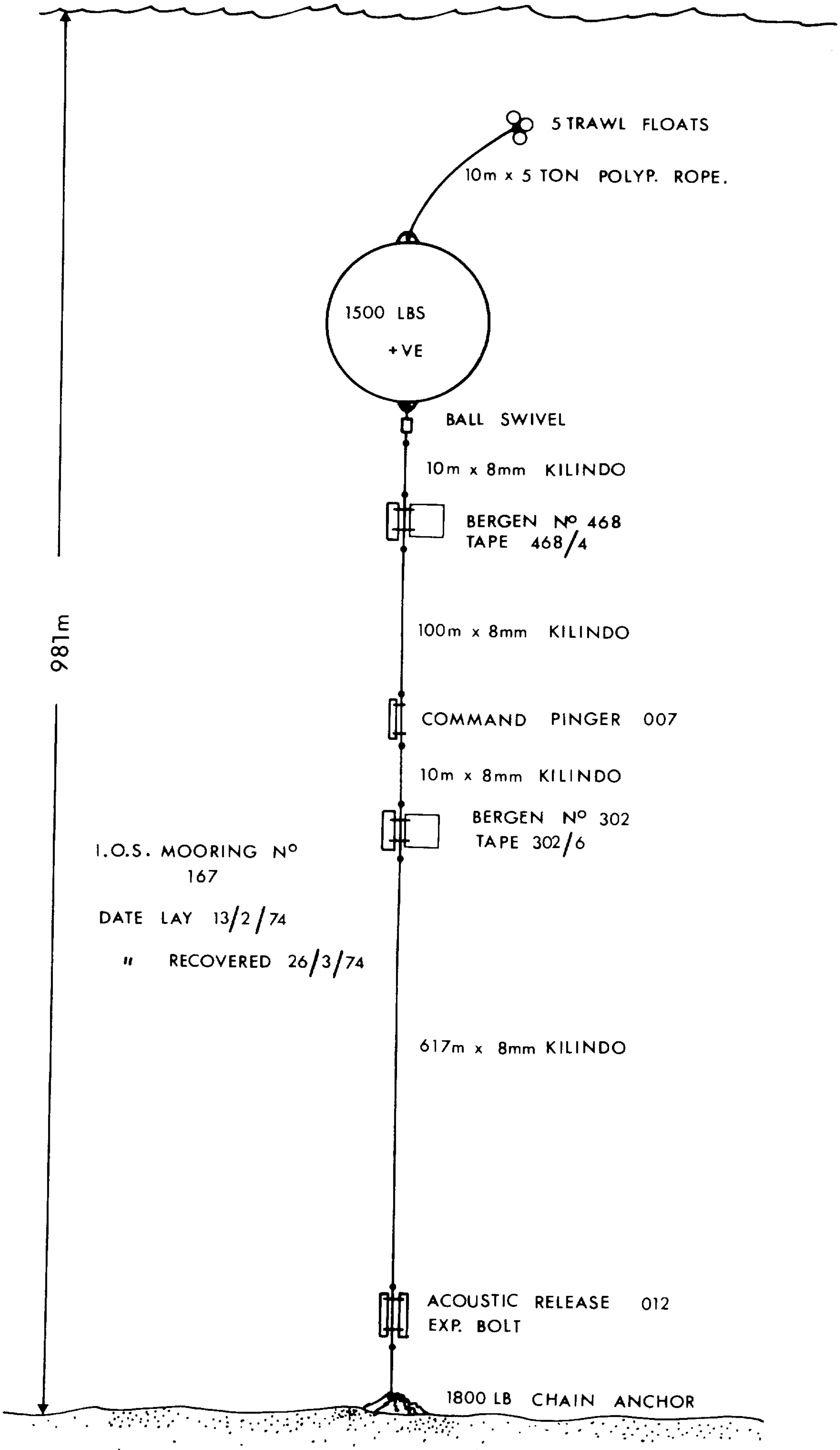
(FIG. 1)




Noon Positions R.R.S DISCOVERY February 1974 FIG.(2)




SHELF MOORING FIG.(3)




1000m MOORING FIG.(4)