9/24/69

Report on Liverpool University Cruise (LUDO 10) in R.R.S. "John Murray, 5 June - 21 June, 1969.

Liverpool University, Department of Oceanography

Mediterranean

1. Scientific Personnel

Dr. R. I. Tait
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Mr. N. Lynn
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2. Objectives of the Cruise

(i) Phase I

To study, over a period of 3-4 days, the changes in the temperature and salinity structure of the immediate surface layer in relation to certain meteorological parameters.

(ii) Phase II

To continue the departmental study into the large scale layering structure of the Mediterranean water, by working a pattern of hydrographic stations in the region west and south of Cape St. Vincent.

A track chart covering both phases of the cruise is attached.

3. Equipment

For both phases of the programme the main instrument used was a Bisset-Berman Salinity Temperature Depth Sound-Velocity (S.T.D.S/V.) probe. In Phase I the probe was used in conjunction with the Liverpool Air-Sea-Interaction (A.S.I.) buoy. For meteorological measurements the ship-board equipment was supplemented with recording solarimeter and radiation balance meters. An anemometer was also fitted.

4. Narrative

The University personnel and equipment were embarked in R.R.S. "John Murray" at Barry on 5th June. Unpacking and siting of equipment in the laboratory proceeded throughout the day. Some 3,000 metres of the Liverpool S.T.D. cable was wound onto the slip-ring winch drum which was loaded to maximum capacity. The cable was cut at this point and the surplus left ashore on the storage drum. The anemometer solarimeter and radiation balance meters were fitted to the ship. The ship sailed at 14.00 on 6th June. The day was spent setting-up, securing and testing equipment. Most of the available laboratory space was occupied and the siting of all the apparatus associated with the S.T.D.S/V. system posed special problems. Some reinforcement of the laboratory bench was required to take the weight of this equipment.

The ship reached Station A (see attached chart) at 0600 on 11th June. The weather was fine and the sea slight. The programme started with the laying of a Dan buoy on 2650m of wire. The Liverpool Air-Sea-Interaction (A.S.I.) buoy was then launched and attached to the marker Dan buoy by 25 fathoms of polypropelene line. (The A.S.I. buoy carried thermistor chains for temperature measurement in the water down to 15 meters as well as units for air temperature, humidity and wind speed. All sensors are sampled digitally every 10 minutes and the readings recorded on the buoy as well as being passed to the ship by means of a 27 Mc/s radio link). The signals received from the buoy indicated that it was operating correctly. A parachute drogue buoy for surface layer current measurement was then launched in a position 1 mile east of Station A. A Radar plot of the marker buoy and the drogue buoy was started, together with a full met. log based on half-hourly observations.

Before lowering the S.T.D. probe it was decided to test the winch system by lowering an equivalent weight on the wire. This proved a wise precaution as trouble was experienced with both the winch and cable run. As regards communication, it was necessary for the winch-driver to wear two head-sets, one for contact with the winch-room and the other (installed by Liverpool) for the command link between laboratory and winch driver. This was at best a clumsy solution to the problem. A permanent 3-way system instead of the existing 2-way link is vital for all work involving control of any lowering device from the laboratory.

The snags with the winch system were resolved after some 3 hours work and a successful T.S.D.S/V. cast was then made to a depth of 1000 metres. Phase I was ready to start. However, by this time the signals from the A.S.I. buoy indicated that all was not well and it was decided to recover the buoy and investigate. The buoy was recovered without damage, but on examination was found to be leaking. The batteries were ruined but fortunately none of the electrical equipment had suffered. As some time would be required to investigate and rectify the buoy failure it was decided to postpone Phase I and proceed directly with Phase II. Both Dan and drogue buoys were therefore recovered and the ship proceeded to Station 1 which was reached at 1830 hrs.

Work on Phase II proceeded smoothly over the following days with few problems. The PDR was run continuously for this phase. Whenever possible, S.T.D. probe dips were made to 2000m or to within 25 metres of the bottom for the shallower casts. The probe equipment worked well and many excellent temperature, salinity and sound velocity traces were obtained. The associated digital logging apparatus appeared to be satisfactory. The output from this unit is on 5 hole paper tape and occasional checks on the teleprinter indicated that all was well with this rather complex equipment. Troubles which did occur were only of a superficial nature mainly concerned with the mechanical side of the winch or the console-winch-lab communication system. These problems, although small in themselves, were treated seriously as they could well have led to the loss of the S.T.D. probe.

Phase II continued for 4½ days. The weather throughout was good with the wind not exceeding force 4 and only a moderate swell. No difficulty was experienced in operating the probe under these conditions. The last station (No. 36) was finished early on the morning of the 16th and the ship then proceeded to station B for a second attempt at Phase I.

The Dan mooring and A.S.I. buoy were laid as before and the ship then proceeded to steam a diamond shaped figure-of-eight pattern around the buoy making T.S.D.S/V. casts to 100 metres depth at the corners and central (buoy) position. Each circuit consisted of 8 stations at approximately 1 mile intervals and took about 4½ hours to complete. A continuous plot was kept on the laboratory Radar. Unfortunately, the automatic radar plotter was not functioning reliably and this instrument could not be used.

The work continued along these lines until the morning of the 20th June. Twenty circuits had by then been completed. On 3 occasions during this time parachute drogues were launched at nominal depths of 20 metres. Radar tracking of these drogues proved difficult because of inadequate reflectors which were improvised on board from sheet Aluminium. (Liverpool had asked for 6 radar reflectors to be provided. These were brought on board at Barry but for some unknown reason were inadvertently offloaded before the ship sailed). However, reliable current estimates were made from two of the drogues.

As a precaution against the accidental loss of the A.S.I. buoy and its self-recorded data, all buoy transmissions were recorded on board. The buoy did, in fact, break loose from the Dan mooring during the night of 19-20 June. Its loss was first reported at 0300 on 20th. Radar conditions were poor and the buoy could not be located. Phase I was terminated at this point. Radio transmissions from the buoy were still being received. A search was started at first light on a sector determined by the known wind and current velocity and aided later by a makeshift D.F. aerial erected on the after A-frame. The A.S.I. buoy was finally located (in a position approximately 5 miles from the Dan buoy) after 5 hours intensive searching. Both buoys were recovered by 1200 hrs. This completed the scientific work on the cruise and the ship set course for Gibraltar. All the afternoon and evening was spent dismantling and packing the equipment. Eighteen cases were stowed in the Gravimeter room and 6 large cases prepared for storage in Gibraltar. The John Murray arrived at Gibraltar on the morning of the 21st June. All Liverpool personnel flew back to U.K. on the 22nd.

5. General comments

The weather throughout was good. No time was lost and all the work proposed was completed. Phase I was conducted under ideal conditions with clear skies for the most part and varying sea conditions. The solarimeter and radiation balance meters worked well and good direct and integrated analogue records were obtained from these instruments. After its initial failure, the A.S.I. buoy worked well and as the solar heating was appreciable some valuable records of temperature changes in the surface layer were obtained.

The S.T.D.S/V. probe was the main instrument used on Phase II. Apart from some instability in the sound-velocity sensor at depths below 1500 metres (probably due to low temperatures) the probe and its associated equipment worked well for the whole of the cruise.

Mention has already been made of some of the difficulties encountered with the operation of the probe winch. An additional problem was the necessity of having the Paxman auxiliary diesel engine running while the winch was in operation. This greatly added to the noise fatigue experienced by all on board, particularly on the 4 days of Phase I when the engine was running continuously. It is strongly recommended that some attempt be made to reduce the considerable noise and vibration output from this machine.

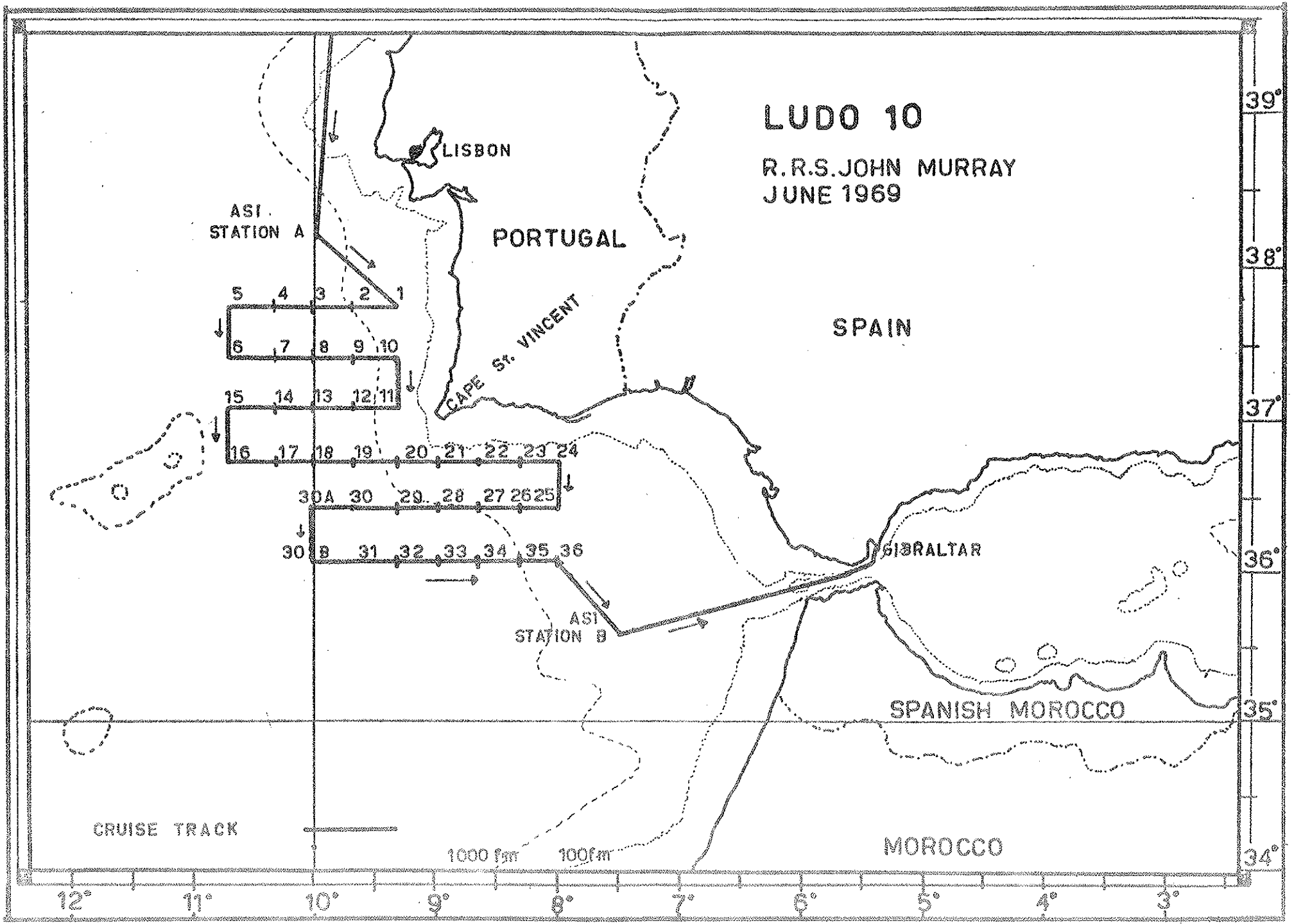
With regard to other scientific equipment on board, the senior Liverpool technician, Mr. N. Mathers, has prepared a report concerning certain

items, a copy of which is attached.

It is much regretted that the T.S.D.S/V. system could not be left set up on board for use by Southampton University. The directive to do so did not reach the ship until arrival at Gibraltar by which time all the equipment had been dismantled and packed. There was neither time nor man-power available to unpack, re-assemble, set up and service the equipment before the ship sailed.

The Liverpool University team wish to acknowledge with gratitude the willing co-operation given throughout the cruise by the Master and Officers of R.R.S. "John Murray". In particular their assistance in keeping a detailed half-hourly met. log for the whole of Phase I was much appreciated.

R. I. Tait


LUDO 10
R.R.S. JOHN MURRAY
JUNE 1969
LISBON
PORTUGAL
SPAIN
ASI STATION A
ASI STATION B
CAPE St. VINCENT
GIBRALTAR
SPANISH MOROCCO
MOROCCO
CRUISE TRACK
1000 fm
100 fm
5 4 3 2 1
6 7 8 9 10
15 14 13 12 11
16 17 18 19 20 21 22 23 24
30A 30 29 28 27 26 25
30 B 31 32 33 34 35 36
39°
38°
37°
36°
35°
34°
12°
11°
10°
9°
8°
7°
6°
5°
4°
3°

REPORT ON ELECTRONIC EQUIPMENT

1. Decca Radar

This worked excellently during the whole voyage but the plotting unit clock would not always start when the button was pushed. The centre mark on the plotter was erratic and occasionally when plotting ranges around the mid scale the typewriter belt was very jittery and did not always repeat correct range indication. The range readings also did not seem to agree with the range dial on the main radar.

2. Kelvin Hughes E/Sounder

The 20 Fathom markers were erratic and the stop button sometimes did not stop the chart running. Very good results were obtained otherwise.

3. Mufax Recorder

A very low output on writing stylus which was traced to internal short in MR 10 (Fig. 5 CCT. DIA) power amplifier rectifier. A temporary repair was made using four semiconductors in a bridge network. A new jack plug was also fitted to the input lead.

Using our Eddystone receiver we picked up signals from ROTA (5.42 MC/S) and got fairly good weather maps. However, this recorder should be fed from an F.M. signal source such as the Marconi 'Forecaster' receiver to get really readab[illegible] maps.

4. Winch Intercomm System

This gave quite a bit of trouble throughout the voyage due to a broken plug on the winch console and it is suggested that a more reliable plug such as the brass Plessey type is used as white metal tends to crumble away under salt water conditions on deck. It would also be advantageous if a connection could be made through to the laboratory somewhere on the starboard side so linking laboratory, winch and brakeman together as is required when using S.T.D. equipment.

5. Digital Clock

No handbook was available on board for this equipment and so it was placed in its rack and not used during the voyage.