9/49/72

R. R. S. Shackleton Cruise 2/72

Report of Proceedings

Geophysical and Geological work in the vicinity of the Horseshoe Seamounts, 400 miles west of Gibraltar.

Cambridge & East Anglia Universities

Scientific personnel came from the Universities of Cambridge and East Anglia. Our objectives were to make gravity measurements extending the crustal structure information obtained by seismic refraction shooting in Researcher last year, to make self potential measurements on the deep-sea floor as a step towards developing this prospecting technique, and to sample hard rocks exposed in the area. 2,000 miles of gravity traverse and survey and sampling operations in three areas were planned: Gettysburg Bank, Ampere Bank and Volta Seamount. The ship sailed from Gibraltar on 15th June, one day later than planned because the previous leg had been extended, and $2\frac{1}{2}$ more days were lost when we returned to Gibraltar to land an injured scientist on June 24. The cruise ended on July 5 in Gibraltar. The weather was fair throughout; no gales blew. For the first week the wind speed did not exceed 15 knots but for the remainder of the cruise it blew a steady 20 - 25 knots from the north. On two days the wind reached 30 knots and slightly impeded our work. Wind speeds in excess of 20 knots involved running the main (diesel) engine continuously at very low speeds to keep the ship on station, and the Chief Engineer has reported damage due to this. In calm weather it is possible to keep the ship on station using the bow thruster alone, sparing the main engine.

$3\frac{1}{2}$ days lost involved cutting the planned program by a quarter but the remainder was achieved. We collected 1560 miles of gravity traverse, much of it of high quality, made 4 self-potential stations (3 got records), made 26 dredge stations (19 recovered rocks), took 25 short cores (22 got rocks) and made 8 nit-net stations of which 7 were successful (catching tar) and one unsuccessful (losing bucket). The nit-net stations are for a Canadian program run by B. I. O.

(d) Scientific equipment

The Barringo magnetometer, Kelvin Hughes MS 38 P. D. R. and Satellite navigator gave no trouble at all. The inboard transducer of the P. D. R. is quiter than the outboard fish except when the ship is rolling, when cavitation makes it unusable, or when the bow thruster is in use.

Derek Lewis, the R. V. B. technician, worked continuously on the two Plessey pingers and the one U. M. E. L. pinger from June 14 - 22nd. None of

them could be persuaded to maintain a stable rate; there were 3 failures when in the water and inumerable failures in the lab. When Lewis became ill we did not persist, although effective pingers would undoubtedly have improved our dredge success rate.

We have experienced difficulties with the display unit of the lab radar. There is a variable disagreement between the range rings and the range strobe which amounts to 3 cables in the 6 mile range. We have prepared a table of corrections, which vary between + 0.3 and 0.0 miles. More seriously, the compass repeater has followed the gyro erratically throughout the voyage. It has been necessary to fit up the ship's head marker before each fix, and the resulting errors have made it difficult to use the radar for dredging which was its primary requirement. In order to ensure that the ship's speed never exceeds $\frac{3}{4}$ knot it is necessary to take fixes at ten minute intervals having a relative accuracy of 0.1 miles. Using the transponder buoy this can easily be done at a range of 12 miles involving a relative bearing accuracy of $\frac{1}{2}$ degree. Examination on 21 June led me to believe that this was part of a larger problem of ship's gyro voltage supplies. The power supplies for the Microtecnica System are provided by two EC14 rotary converters, the repeater converter and the gyro converter. Like the lab radar, the other compass repeator fed from the repeater converter are also sluggish whereas those fed from the gyro converter are hyperactive. Both converters are intended to produce 115 V 400 hz, but the repeater converter actually produces 104 V on load and 135 V off load whilst the gyro converter produces 120 V on load. As the converters are still under guarantee the ship's staff were unwilling to adjust them. It seems likely that there is no reason to look further for the source of the lab radar compass trouble (nor for the similar failure of the two course recorders on board). Mr Spurloch had this problem in hand when I left Gibraltar on July 6. The lab radar failed on July 2nd due to arcing inside the transceiver box but this was easily repaired.

The e/m log is wrongly sited so that it must be retracted before anything can be lowered over the A-frame. It has to be got in and out laboriously by hand and is frequently not out during station work at all. The log should be moved away from the A-frame, and until this can be done an electric pump should be fitted to facilitate getting it in and out. The log failed on 1 July but was repaired on 3 July. Two rectifying diodes had blown in one of the Robund power packs.

Dredging has been carried out with the wire over the A-frame. Starboard side. Wire angles have to be measured from the deck; it is impossible to estimate them from the Bridge. The ship was hove-to with the wind fine on the starboard bow, and kept going slowly ahead (wire angle 15° aft) or dropping slowly astern (wire angle 15° forward). The ship was moved either with limited pitch on the propellor or with the bow thruster alone. Reference has already been made to the Chief Engineer's difficulties in this context. The corer was handled similarly.

The Nit-Net was streamed at 5 knots from a davit built by the crew and attached to the break of the forecastle, starboard side. All these operations went very smoothly.

One dredge was lost, but not the chain. It was necessary to buy further short lengths of old chain cable to moor dan buoy.

The gravimeter loaned by the Hydrographic Department has produced good records throughout the voyage and has given no cause for alarm apart from minor troubles with its automatic servo system. The Cambridge cross-coupling computer has also produced a plausible record throughout. We experienced difficulty keeping the Cambridge gyro platform sufficiently stable during the final four days of the voyage.

(e) The dials indicating the amount of wire paid out by the main winch, the rate of paying out and the tension have given trouble. Acting on the advice of the previous senior scientist we installed a mechanical counter to record turns of the meter sheave in the lower hold, and we made a test lowering in deep water on leaving Gibraltar. After adjustment the present state is as follows. The dynanometer (tension) appears remarkable accurate. The wire out dial records accurately at and only at speeds of paying out or heaving in of 60m/min; at higher speeds it is a few percent in error paying out and up to 57% in error heaving in. Marks have been put on the wire. The rate meter is substantially correct. The Lebus laying sheave works well until 5000m has been paid out. The winch is particularly well suited to free fall coring, attaining a rate of fall of about 180 m/min after 100 m of fall. This appears to be the terminal velocity of our Cambridge corers.

Difficulties with main engines have already been referred to. Failure of rectifying diodes on the excitor unit of one of the alternators restriced us to $\frac{1}{2}$ power on the bow thruster towards the end of the voyage. We had two short interruptions of rectified A. C. power to the gravimeter, neither of which appeared to damage the platform gyro.

The excessive vibration reported in the laboratories by a previous Scientific party did not recover on this voyage.

(f) Shackleton has an excellent crew who can really be left to handle all Scientific overside gear - an unusual thing in NERC ships. The officers have been friendly and have played a more considerable part in navigating the ship than has been my experience during the past four years aboard NERC ships. Continuing rancour between the middle echelons of the marine and scientific sides of the RVB is clearly reflected in the attitudes of ship's officers less senior than the Captain and Chief Engineer, and it adds considerably to the strain on the scientist responsible for carrying out the ship's scientific program.

Nevertheless the voyage has been successful and we are thoroughly grateful to the Captain, Chief Engineer, Officers and crew of the ship and to those who laboured

to sail her from Barry and to assist us before sailing from Gibraltar.

D. H. Matthews
Senior Scientist at Gibraltar
6 July 1972