Track chart-with ROSCOP form

R.R.S. SHACKLETON Cruise 1/74

Report of Proceedings

Leg 3 11-20 June,1974

(a) Cruise objectives

The intentions during the first five days were to complete two widely-separated long profiles between Turkey and Egypt using the 160 cu.in. Bolt airgun, magnetometer and gravimeter. These lines were planned to cross the major east-west survey lines we completed on Shackleton in 1972 and thus to provide a means of correlating seismic reflection horizons between lines and to provide crossover checks of data from the complete survey. The lines were also planned to cross the previous tracks in regions of special geologic interest. Deployment of disposable sonobuoys was intended to provide important seismic velocity data needed for interpretation of all the seismic reflection profiling.

The second five days were needed for a bathymetric survey along the deep trench system south of Crete. The series of short lines were planned to fill in a 1972 survey carried out on Shackleton and answer some questions arising from the earlier work.

(b) Duration

The ship departed Famagusta, Cyprus over seven hours late at 1736 on 11th June and arrived in Iraklion, Crete at 1000 on 20th June. Sea and weather conditions were ideal until midway through the last five days of the leg when we were subjected to strong wind (gusting to 30 or 40 knots at times) and choppy seas south of Crete. The sea conditions forced us to slow the ship slightly from 10.5 knots to 9 knots.

(c) Conduct

Our late departure from Famagusta was due to equipment problems (see below) which partially affected the conduct of the cruise; however, a major change in the original cruise plans arose from the existence of a declared war zone in the Eastern Mediterranean extending south of 33°N from 29°50'E to Israel and east of 34°N everywhere else. We were not aware of this obstacle until leg 1 when other circumstances caused a slight programme revision. We were able to make only one full crossing of our 1972 survey along 29°40'E from Turkey to Egypt. A short cross line was made along 28°30'E from Egypt to 34°30'N crossing the western extremity of the 1972 survey, and another short profile was completed across the northern part of the 1972 survey just west of Cyprus along 31°30' between 34°20'N and the Turkish coast. Two profiles northeast and north of Eratosthenes seamount were carried out to complement lines completed on leg 1 south, west and east of this interesting feature. A line across the Gulf of Antalya was modified to run near the coast of Turkey for purposes of checking doubtful satellite fixes against synchronous radar fixes on the land. A disposable sonobuoy was deployed in a small basin just south of Turkey, as well as two northeast of Eratosthenes. About 815 line miles of good quality seismic reflection profiling were successfully completed as intended in the revised plans for this leg. At the same time, gravity, magnetic and bathymetric data of good quality were also obtained.

Most of the planned 600 line miles of bathymetric survey were completed during the last half of the leg. The last lines of the survey had to be replanned because bad weather decreased the amount of surveying time available; however, we are pleased with the results and satisfied that sufficient data were obtained to meet the cruise objectives.

(d,e) Equipment

Despite the alarming results obtained in monitoring vibration in the gravity lab during leg 1, the gravity measurements appear to be much better than those made in 1972 on R.R.S. Shackleton; but until the data are processed, it is impossible to say how much better the results are. There are still vibration effects visible on the analog records but they are considerably reduced in severity. The problem might be resolved by making the wooden deck in the gravity lab of solid wood well-secured directly to the steel deck plates below. The thermal stability of the gravity lab was excellent (within ± 1°C) after the installation in Famagusta of a new air-conditioning unit. The old air-conditioner had worked poorly on the earlier legs of the cruise and the compressor unit developed so serious a leak that the air-conditioner completely broke down during our port stop in Famagusta. A complete new unit had to be obtained in Nicosia after it was discovered that there were no spare parts on the ship and not even a replacement compressor unit in Famagusta. Part of the delay in departure at the beginning of leg 3 was a result of this problem. The new air conditioner blew almost a dozen fuses during the course of the cruise and had to be watched carefully. The temperature of the gravity lab is very important, especially with the newer gravity meters. There should be either sufficient spare parts for repairs or a compatible back-up unit on the ship.

The second cause of the delay of our departure from Famagusta was the Sat Nav unit for which we were awaiting spare parts. The spare parts never did arrive, thus necessitating the R.V.B. support technician to rewire a faulty lead between the receiver and the computer. During the first part of the leg, the Sat Nav worked erratically, producing fixes which at times may have been three to five miles in error. Simultaneous radar fixes on land points, when available, provided a somewhat consistent data set in marked contrast to the inconsistent data set provided by the Sat Nav. Fortunately, when we started the major southward line from Turkey to Egypt, the Sat Nav was working more consistently but without low channel. We managed to get LORAN-C working intermittently for the last half of the leg and observed the LORAN-C and the Sat Nav positions to agree within 0.5 miles in general. Later the Sat Nav functioned without high channel (but with low channel) before suddenly functioning normally. The problem was discovered to be the excessive (greater than 30^{o}C) ambient temperature inside the instrument rack which caused either high or low channel to quit, or both channels to malfunction.

During navigation checks south of Turkey, it was discovered that the Bergen Log was fouled. The Bergen Log was readjusted to be consistent with the EM log. With regard to the EM log, a motorized pump would be useful for the hydraulic system. It should be noted that the EM log is lowered into the water when it is pumped 'UP' and is retracted when it is pumped 'DOWN'.

The master timing clock continued to jump randomly and appears to have drifted slightly at certain times. It needs to be made more reliable, perhaps by incorporating optical isolation of the clock electronics from the power supply as used in the Cambridge blaster clock which no longer jumps.

The only other problems with equipment were with the Cambridge seismic reflection system. The low speed motor in the Thermionics tape recorder started to seize up and was made operational again after it was removed and its ball-bearings oiled. The trigger-hydrophone on the airgun went open-circuit after moving about 10 metres up the firing cable from the gun. The hydrophone appeared to work again after examination showed it to be physically all right but developed the same symptoms later in the cruise. When the airgun was next retrieved, the trigger hydrophone which had been securely fastened (to the clamp holding the air hose and firing cable) behind the airgun was missing. EPC triggering problems occurred from time to time near the end of the leg and were temporarily solved by very careful adjustment of the trigger level on the TVG unit.

All other equipment worked well including the compressors for the airgun and the array winch.

Leg 4 22-29 June, 1974

(a) Cruise objectives

Leg 4 involved work in the Aegean Sea by both Cambridge University and Imperial College, London. Cambridge intended to complete seismic profiling along lines supplementary to those of the 1972 Shackleton survey and complementary to the German (Meteor cruise number 33) survey earlier in 1974 in which there was Cambridge cooperation and exchange of data. The Imperial College intentions were to complete a bottom sampling programme on the volcanic arc between Thira (Santorini) and Milos. No gravity or magnetic measurements were planned because of prior agreement with the Greek government not to do so.

(b) Duration

The ship departed Iraklion at 1000 on 22 June and returned to disembark the scientific party by launch on 29 June at 1600. Perfect sea and weather conditions prevailed except for slightly choppy seas during the first couple of days.

(c) Conduct

About 800 line miles of reflection profiling were completed using the Cambridge profiling system, and another 60 miles of sparker profiling near Thira were completed as part of the Imperial College work. Three disposable sonobuoys were deployed in conjunction with the profiling. Profiles in the eastern region between Rhodes, Anafi and Karpathos showed poor penetration owing to the shallow depths, rugged topography and hard bottom. Profiles in the western part of the Cretan Basin were obtained with the 40 cu in. chamber on the airgun and a very shallow gun depth, and provided very good records. The weather was so good that considerably more profiles than planned were obtained. This work was very successful (with the qualification implied by navigation problems outlined below).

Seventeen coring stations were completed. The coring was mainly gravity cores, but four 20 foot piston cores were attempted as well as one disposable free fall corer and one short rock core. The disposable corer apparently did not trigger owing to difficulty in penetrating the hard bottom ash layer near Thira, and thus the glass-floats were not recovered. The short rock corer recovered soft brown mud only, failing to sample a dominant reflector which was observed on the reflection profiles apparently to outcrop at the edge of a plateau area, and presumed to be hard sedimentary rock. The longest piston core was obtained in the crater at Thira where about 5 metres of mixed loose pumice, ash, shards of lava, and plugs of dark mud were recovered.

(d,e) Equipment

The navigation aids, probably the single most important pieces of equipment on the ship, continued to be a major obstacle to the scientific work. The spare circuit boards requested on leg 3 for the Sat Nav did not arrive in Iraklion. The replacement Sat Nav cable which was requested on leg 2 and which did arrive in Iraklion was faulty anyway. The LORAN-C was completely inoperative and could not be repaired as there were no spares at all, no maintenance and repair manual at all, and the only operating manual available was for a different model. The LORAN-C was to be the main nav aid, providing fixes to be plotted every 10 minutes in order to maintain tight control of lines which had to be run at specific distances from lines previously completed by the German ship Meteor. The Meteor had used LORAN-C in this way and the two surveys were planned for navigational compatibility as well as profiling compatibility. Had we wanted to use the Omega, we couldn't have used it because there were no correction tables on board. Fortunately, we were normally within radar range of islands.

The coring programme was greatly hampered by equipment problems and succeeded only through the hard work and ingenuity of the bosun and his crew, and the R.V.B. and Cambridge technicians. When the corer pieces were collected for assembly on the ship, it was discovered that: a) the four holes for fixing the core barrel to the weights were incorrectly positioned, b) the hex set screws supplied had the wrong thread, c) the core cutters would not fit the tube, d) the end of the rock core barrel was slightly elliptical and not round. These defects were discovered on the previous leg and new parts were ordered with the required specifications for the core barrels on the ship. The parts which arrived in Iraklion were core cutters with the same dimensions as before and allen screws with BSF thread instead of the required Whitworth thread. The equipment should have been assembled and checked before the ship sailed.

More frequent problems with the airgun on this leg (e.g. broken nylon O-ring, broken spring and worn retainer spring assembly) and the alternate use of the 300 cu in. chamber (for sonobuoy work) and the 40 cu in. chamber (for profiling) have shown the value of having two airguns on the ship. Handling of the airguns is quick and easy with the improvements that have been made and promises to be even better with the further improvements planned. The deck crew again showed their great competence and efficiency in handling of the equipment. Triggering problems associated with the Cambridge part of the profiling system (TVG unit and EPC) persisted on this leg.

The ship's performance was good and no material defects presented themselves to hinder the programme. The ship's officers and crew are among the best I have had the pleasure of working with. In particular, the knowledge and experience of the Chief Officer and Bosun were major factors in guaranteeing the success of all operations. The ship itself is an excellent vessel for carrying out this type of work. And the food, often a source of complaint on research ships, could not be faulted.

(f) Summary of recommendations and suggestions arising from Legs 3 and 4

Several rather obvious points could be made about the presence of adequate spares and manuals and of sufficient and pertinent supplies on the ship, as well as ensuring before a cruise that all equipment works. It should never be necessary for this point to be made. The major problems encountered on this cruise with the Sat Nav (insufficient spares, spare part sent did not work), the coring gear (complete incompatibility of parts and unsatisfactory response by shore support to accommodate), and the LORAN-C (no spare parts, inadequate documentation, and nobody familiar with it) suggest this assumption is wrong or that there has been a serious (temporary?) breakdown in the scientific support service.

The following are specific recommendations dealing with problems arising during legs 3 and 4.

a) proper wooden decking be installed in the gravity lab as specified by Cambridge on all previous cruises.

b) reliable thermostatic control of temperature be available in the gravity lab (e.g. spare parts for air conditioner are needed).

c) Sat Nav needs to be kept cool when operating in warm or tropical climates.

d) the master timing clock needs to be improved or replaced.

e) a scupper is required in the starboard aft corner of the foreward wet lab (in rough weather the foreward watertight doors allow water to enter the lab but there is no way out for the water except by leaking into the accommodation below).

Some general recommendations are that:

a) there be an electric motor installed to raise and lower the EM log.

b) a copying machine would be useful especially on longer cruises.

c) there should be short sea trials during which all equipment is properly checked out in the working environment prior to longer cruises to foreign waters.

J.M. Woodside
5th August, 1974