

ANNEX IV

## THE ROYAL SOCIETY

UNITED KINGDOM IIOE PROGRAMMESNEWSLETTER NO.1, MAY 1963HMS OWEN - Work completed, November 1961 to December 1962.

At the present time HMS Owen is in the middle of her second geophysical reconnaissance cruise in the Arabian Sea. The ship is equipped with a precision echo sounder, a nuclear precision magnetometer and an Askania sea gravimeter. Continuous measurements of depth, magnetic field strength, and gravity, were made along all tracks during both cruises, with the following exceptions: magnetic field was not measured on the track through the Maldives from latitude 3°N southwards to Addu Atoll, nor on the north-westerly track into Karachi; gravity was not measured on the track from Karachi to Aden, nor on the track from Lamu (north of Mombasa) to the Seychelles which passes through (1°S, 50°E); neither gravity nor magnetics were measured on the track from the Seychelles to Mombasa passing through (6°S, 48°E). Measurements were virtually continuous on all other tracks. Connexions to land gravity survey networks were made at all ports. Geophysical observations made in addition to these routine measurements of depth, magnetic field and gravity are mentioned in the summary of cruises which follows:

(a) OWEN - first cruise 1961-62

(Throughout this cruise samples of surface water were collected every four hours for the Fisheries Research Laboratory at Lowestoft).

Aden (8.11.61) - Lamu (16.11.61 - 11.12.61) - Seychelles (15.12.61) - 19.12.61) - Mombasa (23.12.61 - 8.1.62) - Aldabra Atoll - Agalega Atoll - Bombay (25.1.62).

Scientific  
Personnel

D.H. Matthews, Ph.D., Dept. Geodesy and Geophysics, Cambridge.  
B.D. Loncarevic, Ph.D., " " " " "  
J.A. Grant " " " " "

In addition to the measurements made on passage specimens of granite for  $K^{40}:A^{40}$  dating were collected in the Seychelles, and a land gravity survey was made on Aldabra Atoll using a Worden Master gravimeter.

Bombay (29.1.62) - Addu Atoll (5.2.62 - 13.2.62) - Mauritius (19.2.62 - 22.2.62) - Tromelin Is. - Agalega - Aldabra - Seychelles - (3.3.62 - 11.3.62) - Mombasa (15.3.62).

Scientific  
Personnel

T.F. Gaskell, Ph.D, British Petroleum Ltd.  
B.D. Loncarevic. Ph.D, Dept. Geodesy & Geophysics, Cambridge.  
J. Beaumont, M.A. " " " "  
J.A. Grant " " " "

Orientated specimens of basalt and dolerite for palaeomagnetic work were collected at Mauritius and from dykes in the Seychelles. A basalt beach boulder was collected on Tromelin Is. Bottom samples were taken with a small grab in the lagoon of Addu Atoll and on the Seychelles Bank for Professor J.H. Taylor, London University. Land gravity surveys were made at Addu Atoll and on Mahé Is. (Seychelles). Six days were spent on a broad survey of the northern part of the Seychelles Bank.

Mombasa (12.4.62) - Seychelles (16.4.62 - 17.4.62) - Karachi  
(26.4.62 - 28.4.62) - Aden (4.5.62).

<u>Scientific</u>	B.C. Browne, M.A., Dept. Geodesy & Geophysics, Cambridge.
<u>Personnel</u>	L.H. Flavill           "           "           "           "
	J.A. Grant           "           "           "           "

Short cores were taken at (14°39'S, 63°49'E) and at (02°55'N, 56°35'E).

(b) OWEN - second cruise 1962-63

Aden (1.11.62) - Bombay (27.11.62-30.11.62) - Seychelles (6.12.62-10.12.62)  
- Mombasa (18.12.62).

<u>Scientific</u>	D.H. Matthews, Ph.D., Dept. Geodesy & Geophysics, Cambridge
<u>Personnel</u>	C.S. Mason, M.A.           "           "           "           "
	A.K. Wheatley           "           "           "           "

The usual measurements of depth, magnetic field strength and gravity, were made on passage and in the course of two detailed surveys on the Carlsberg Ridge. Buoys containing recording magnetometers were anchored in both survey areas and at (8°N 57°E) in order to observe the diurnal variation of magnetic field whilst the ship was working near the buoy. Similar recording magnetometers were operated at the R.A.F. School, Khormaksar (Aden) and at the Seychelles College, Port Victoria by Lt.Cdr. Clay, R.N. (ret'd) and by Rev. Brother Mark respectively. The two detailed surveys on the Carlsberg Ridge and the tracks near (8°N 57°E) and between the Seychelles and Lamu (Kenya), were intended as reconnaissance of areas designated for bottom sampling and seismic refraction studies during the cruise of RRS Discovery, August - November 1963.

Plans for the second half of this cruise (Mombasa (c. 6.4.63) - Karachi (c.28.4.63) - Aden (c. 16.5.63)) include a survey of the northern end of the Carlsberg Ridge between (8°N 59°E), Socotra and the entrance to the Gulf of Aden.

Data Reduction

Depths corrected from Matthews' Tables have been plotted at ten minute intervals along the ship's tracks on British Admiralty One Million Series Oceanic Plotting Sheets. Copies may be obtained on application to the Hydrographer of the Navy, Admiralty, Whitehall, London, S.W.1.

Geophysical results are being worked up in Cambridge. Reduction of seagravimeter and towed magnetometer records taken on the Owen 1961-62 cruise is complete. A map, based upon observations obtained from HMS Owen, HMS Dalrymple and U.S. Project Magnet, showing the regional magnetic field in the Arabian Sea has been prepared and privately circulated. Further copies are available. A cruise report for the voyage of HMS Owen 1961-62 is being prepared at the Admiralty Hydrographic Department for publication in August 1963. The volume will contain a summary of instrumental details and profiles of total field magnetic anomaly, free-air gravity anomaly, and bathymetry, plotted with a horizontal scale of 1:100,000. Reduction of Owen 1962-63 data is not complete.

Dr. A.S. Laughton, National Institute of Oceanography, Wormley, Surrey, has drawn tentative bathymetric contour charts on the basis of sounding information collected by the Admiralty Hydrographic Department on One Million Series Plotting Sheets. The contoured sheets cover most of the area between Agalega Atoll, the Murray Ridge and the coast of Africa. The sheets have been circulated privately.

Papers are in press discussing the northern end of the Carlsberg Ridge and the Amirantes Trench. A 16 mm coloured cine film has been made to illustrate the cruise of HMS Owen 1961-62.

#### Publications

Miller, J.A. and Mudie, J.B. 1961. Potassium - Argon Age Determinations on Granite from the island of Mahé in the Seychelles Archipelago. Nature 192, 1174-75.

Loncarevic, B.D. and Matthews, D.H. 1962. Geophysical Reconnaissance of the Arabian Sea. New Scientist 14 513-515.

#### Unpublished Report

Loncarevic, B.D. 1963. Gravity measurements Indian Ocean 1961-62

23 pp. text and gravity base station location diagrams. Ca 300 pp. calculated gravity observations.

(A copy of this unpublished gravity report of HMS Owen 1961-62 cruise is available on loan from the Royal Society. The corrected gravity values of this cruise will be published shortly in the form of profiles by the Hydrographic Department of the Admiralty together with bathymetric and magnetic profiles.)

HMS DALRYMPLE - 1962-63 cruise

P. Barker and F. Dewes of the Applied Geophysics Department, Imperial College, accompanied HMS Dalrymple on her voyage to and from the Persian Gulf and during her stay there, the total period extending from September 1962 to March 1963.

A proton magnetometer was towed for over 10,000 miles, all but 800 of which were in the Indian Ocean. The instrument worked well throughout the investigation, the records obtained being almost continuous. The magnetometer work was carried out during the passage across the Indian Ocean and a detailed study was made of the John Murray Ridge. A series of lines with a spacing of approximately 10 miles, representing over 4,000 miles in all, was steamed across this feature. The results of this survey will, it is hoped, provide valuable data on the composition and origin of this Ridge. Conclusions must await the reduction and interpretation of the results. All that it is possible to say at present is that only rarely are there anomalies large enough to be even suggestive of oceanic basalt. The ridge does not seem to be of the straightforward mid-oceanic type. Records will be combined with those obtained in 1961/62 by HMS Dalrymple and other ships. Reduction of the data will be carried out on the University of London 'Mercury' computer.

Another party of Geophysicists from Imperial College comprising D. Taylor Smith, D. Jenkinson, P.A. Mark and F. Dewes continued the 'sparker' (continuous stratigraphic profile) traverses commenced in the Southern Gulf during the 1961/62 cruise. However, due to boat engine trouble and adverse weather conditions only a comparatively small number of traverses were run.

A party of Sedimentologists (G. Evans, D.J. Shearman, C.G.St.G. Kendall, D.J.J. Kinsman and Sir P. Skipwith) from Imperial College carried out a sedimentological and submarine geological survey of the Trucial Coast in the S.W. Gulf, from September 1962 to May 1963. This work was a continuation of that commenced the previous season.

The coastal belt consists of a complex of small dune-capped islands, lagoons, tidal deltas, reefs, mangrove swamps and alga flats. A large variety of carbonate sediments is forming here, including reef limestones, oolites, skeletal calcarenites, pelletoid calcarenites and calcilulites. The coastal complex is bounded to landward by wide saline flats - Sabka - which are the site of extensive evaporite deposition. An interesting suite of evaporite minerals forms in this environment, including halite, gypsum, anhydrite, dolomite and celestite. These minerals are partly formed by the evaporation of waters drawn up through the sediments of these flats from the lagoons to seaward, and probably partly by the replacement of earlier carbonate sediment by these solutions.

During HMS Dalrymple's survey work in the Persian Gulf a series of twenty bottom sampling stations were occupied. Cores and grab samples were taken at each station. These bottom sediment samples, together with those collected by HMS Dalrymple during her 1961/62 cruise provide a fairly good cover of the southern part and of the western part of the northern Persian Gulf. The samples and their macrofauna and microfauna are currently under investigation.

Publications

Resulting from the 1961/62 cruise. R. Curtis, G. Evans, D.J.J. Kinsman, D.J. Shearman, Association of Dolomite and Anhydrite in the Recent Sediments of the Persian Gulf. Nature, Vol. 197, No. 4868, pp. 679-680 Feb. 16, 1963.

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May 1963.

THE ROYAL SOCIETY

UNITED KINGDOM IIOE PROGRAMMES

NEWSLETTER NO.2 MAY 1963

RRS DISCOVERY - See pp.9 - 10 for revised programme for IIOE.

First cruise: May-August 1962 - South Arabian Coast upwelling.

For details of scientific programmes see booklet entitled British National Committee for Oceanic Research, United Kingdom Scientific Programme during the International Indian Ocean Expedition 1961-64 published by the Royal Society in September 1962.

Second cruise: August to December 1962  
Geophysical cruise

During the last three months of 1963 RRS Discovery will be working in the Arabian Sea on geological and geophysical programmes arranged jointly by the National Institute of Oceanography and the Department of Geodesy and Geophysics, Cambridge. The work will include some two-ship seismic exploration in company with HMS Owen between the Kenya coast and the Seychelles bank. The provisional programme is as follows:-

August 23: sail from Aden to the northern area of the Carlsberg Ridge where dredging, photography and heat flow measurements will be carried out. Similar measurements will then be made in the area which has been surveyed to the south west in the foothills of the ridge and thence a track will be laid to Mombasa with regular heat flow measurements and a diversion for a magnetic survey of the Seychelles northern boundary fault. The ship will reach Mombasa on September 11th.

RRS Discovery will leave Mombasa to load explosives on September 14th and will undertake short single ship seismic operations between the Kenya coast and the Seychelles and long single ship seismic lines in a flat area of the Indian Ocean to the north east of the Seychelles. Heat flow measurements will be made on

passage and in the areas of the seismic investigations. The ship will reach the Seychelles on October 2nd.

It is proposed that RRS Discovery will leave Port Victoria on October 5th and will collect bottom samples and dredge hauls from the Seychelles bank and from its slopes. RRS Discovery will rendezvous with HMS Owen on October 17th near 7°N 47°E for two-ship seismic work on the way into Mombasa, where she will arrive on October 21st.

The ship will sail on October 24th for further two-ship seismic work in the same area and thence will steam for Aden via the Carlsberg Ridge. The ship is expected to reach Aden on November 15th and on November 18th will sail for U.K.

Three days have been allowed for heat flow measurements across the Red Sea on the return voyage.

Throughout the cruise opportunities will be taken for extending the magnetic and topographic surveys of the Arabian Sea, for bottom photography, coring and experiments with a sea-bottom seismograph. The gravity meter at present in the Indian Ocean will by then be in use in the Atlantic.

The Senior Scientist from August until the ship returns in December will be Dr. M.N. Hill. It is expected that the scientists aboard concerned with the geological and geophysical work will number about 15. Amongst these will be Dr. A.S. Laughton and Mr. J. Jopling from N.I.O. and Mr. J.C. Cleverly, Mr. D. Davies, Mr. T.J.G. Francis, Dr. D.H. Matthews, Mr. J.M. Shorthouse and Mr. J.E. Sclater from the Department of Geodesy and Geophysics.

#### HMS OWEN

HMS Owen will rendezvous with RRS Discovery on October 17th for two-ship seismic work between the position 7°N 47°E and Mombasa. The ship will be at Mombasa. The ship will be at Mombasa from October 21st to 24th, where all remaining depth charges will be loaded and used with RRS Discovery as the receiving ship between Mombasa and the Seychelles bank. It is hoped that in all five long seismic profiles can be obtained in the area. HMS Owen will return to Mombasa on about November 5th, when her part of the geological and geophysical programme of IIOE will be complete.

#### Tide Gauges

The automatic tide gauges installed by HMS Owen during her 1961/62 cruise at Gan and Seychelles will continue to be operated until the end of 1964.

The gauge installed by HMS Dalrymple in October 1961 has become inoperative due to movements of sand banks.

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28 May 1963

