

NATIONAL INSTITUTE OF OCEANOGRAPHY

Wormley, Godalming, Surrey.

R.R.S. DISCOVERY

CRUISE 19 REPORT

SEPTEMBER - OCTOBER 1967

GEOLOGICAL INVESTIGATIONS

N.I.O. CRUISE REPORT NO. 19

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R.R.S. Discovery

Report of Cruise 19

12th September - 12th October 1967

Scientific staff

Mr. S.V. Bicknell

Mr. D.G. Bishop

Mr. G.A. Bryan

Mr. D.P.F. Chisholm (G.P.O., London) Departed at Corunna

Mr. M. Hands

Mr. N. Kenyon

Dr. B.S. McCartney Departed at Corunna

Mr. J. Reynolds (King Edward's School, Wormley)

Mr. D.G. Roberts Joined at Corunna

Mr. A.H. Stride (Principal Scientist)

Mr. A.R. Stubbs

A change of staff took place at Corunna, where the ship called between 26th and 27th September.

Purpose

- A. To obtain critical information about sand ribbons and sand patches and test out current ideas on the origin and development of the continental shelf and margin of western Europe.
- B. Survey for G.P.O. to facilitate their choice of a submarine cable route.
- C. Hydrophone and pre-amplifier trials.

Equipment used

Thumper, Air Gun, Side-Scan Asdic, Precision Depth Recorder, Corer, Shipek Grab, Varian Magnetometer, Blacker Underweigh Camera.

Projects

1. Sand ribbons of the western English Channel

Opportunity was taken to run courses parallel with sand ribbons,

so as to provide, by means of the side-scan Asdic equipment, the required information about their length, consistency and relationship to one another. The composition of the ribbons and the floor between them was well shown by means of the underweigh camera (kindly loaned by Mr. Blacker of the Lowestoft Fisheries Laboratory) which was towed a few feet above the sea floor, at speeds up to 4 knots; the findings fully confirmed previous interpretations as well as providing more precise data. The ground near to and east of Cotentin was found to be almost devoid of sand ribbons, so that reworking of older deposits had been taken to the limit thereabouts.

2. Transverse sand patches of the northern Celtic Sea

The ground south of the Irish coast, between the longitudes of Cork and Carnsore Point, was examined by side-scan Asdic to obtain more information about the true orientation and geographical limits of some sand patches thought to be elongated transverse to the relatively weak tidal currents occurring in the vicinity. The composition of the patches and intervening ground was determined by means of samples by Shipek grab and traverses with the underweigh camera. It was concluded that the sand bodies are definitely the product of the present sea, rather than predating it.

3. Bed-transport paths of the Celtic Sea and off France

Extensive traverses with the side-scan Asdic filled gaps in existing coverage. The new information has made it possible to define the limits of the sand wave zone of rapid sand transport west of Brittany, and clarified the paths elsewhere. This work was of particular importance for the ground west of France where previously there had been some doubt about the orientation of sand bodies.

4. Samples from the north-east trending ridges of the Celtic Sea

Cores and Shipek grab samples were taken from some of the large sand banks, for faunal and tectural studies, to test out the concept that these features were formed at a time of greatly lowered sea level

when the northern half of the Celtic Sea would have been an estuary with linear sand banks, resembling the Thames estuary at the present day.

5. Survey of a possible G.P.O. cable route

An echo-sounder traverse was made of the proposed route from Cornwall, past Brittany and thence down the continental slope, while on the continental shelf search was made by means of side-scan Asdic for obstacles such as ships and ragged rock outcrops and also for areas of mobile sands. In addition, an attempt was made to determine the thickness of loose material overlying the rock floor. The Thumper failed after a few hours so that the profile had to be continued by using the gear as a sparker, with a considerable loss in resolution. In spite of this, the work as a whole was of considerable value to the G.P.O.

6. Continuous reflection profiles between Iberia and Morocco

The Air Gun was used to provide geological sections of the continental slope south of Portugal where detailed hydrographic surveys had shown the presence of broad ridges. It is now seen that the latter are probably large slumps. Further profiles off Morocco and in the Alboran Sea were run to remove other possible modes of origin for the Portuguese features.

7. Magnetometer survey (D.G. Roberts)

Throughout the second leg of the cruise, from Corunna to Plymouth a direct reading Varian proton precession magnetometer was towed astern of the ship. The reading frequency was 6 seconds. There were no operational problems, although some difficulty was experienced in marrying the end of the towed cable with the inboard cable owing to corrosion of the sleeves, which necessitated sawing off the latter and using a combination of string and tape to hold the two cable ends together. The ship's tracks were chosen to supplement available data in all areas visited. Magnetometer traverses in the Straits of

Gibraltar and the Gulf of Cadiz failed to reveal any magnetic anomalies. The magnetic field over the western Portuguese shelf was generally fairly flat with local anomalies associated with known basement or igneous rock outcrops.

8. Sea-bed reverberation levels (B.S. McCartney)

Some recordings of reverberation levels from the side-scan Asdic were made in an attempt to estimate sea-bed character from reverberation levels particularly in areas without relief and, optimistically, to distinguish changes in coarseness of material. Large variations in reverberation were observed, which were partly due to beam angle effects and partly genuine changes in bottom backscattering strengths. Due to a fault on one transducer row, which had to be disconnected, the vertical beam shape was so affected that comparison of the results with those from future cruises will be difficult.

9. Hydrophone noise levels (B.S. McCartney)

In order to compare the practical achievements of acoustic systems with their estimated theoretical performance it is necessary to know the noise levels and variations in levels which may be expected at the receiving system. The major sources of noise are ship noises, flow noises and ambient noise. The latter is well documented but ship noises and flow noises for towed hydrophones from "Discovery" are not known quantitatively; calculations of levels to be expected from the small amount of data available is extremely hazardous especially at low frequencies, so the empirical approach can be justified. Various hydrophones were towed at different distances astern and different ship's speeds, whilst recording the noise levels and analysing their spectra. Over a hundred recordings were made and analysed, the results and conclusions being recorded in N.I.O. Internal Report D19.

Station List

Station number	Latitude	Longitude	Equipment used
6451	50°17'	2°03'	Towed Camera
6452	50°05'	2°40'	Towed Camera
6453	47°15'	6°10'	Gravity Corer
6454	47°32'	5°54'	Gravity Corer
6455	47°34'	5°50'	Gravity Corer
6456	47°55'	5°43'	Gravity Corer
6457	47°59'	5°41'	Gravity Corer
6458	48°12'	5°38'	Gravity Corer
6459	49°48'	5°45'	Towed Camera (failed)
6460	50°56'	7°15'	Shipek Grab
6461	51°03'	7°18'	Shipek Grab
6462	51°45'	7°15'	Shipek Grab
6463	51°36'	7°18'	Shipek Grab
6464	51°22'	7°17'	Shipek Grab and Towed Camera
6465	51°28'	7°45'	Towed Camera
6466	50°52'	8°50'	Gravity Corer
6467	50°33'	8°20'	Shipek Grab
6468	50°32.3'	8°19'	Shipek Grab
6469	50°31.7'	8°18'	Shipek Grab
6470	50°31'	8°17'	Shipek Grab

