MRS. P. EDWARDS. PG

I.O.S.

MV FARNELLA

CRUISE 6

21 – 31 JANUARY 1982

CRUISE 7

2 – 23 FEBRUARY 1982

GLORIA IN THE CARIBBEAN AND THE GULF OF MEXICO

CRUISE REPORT NO. 149

1983

INSTITUTE OF OCEANOGRAPHIC SCIENCES

NATURAL ENVIRONMENT RESEARCH COUNCIL

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INSTITUTE OF OCEANOGRAPHIC SCIENCES

WORMLEY

MV FARNELLA

Cruise 6

21 - 31 January 1982

Cruise 7

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GLORIA in the Caribbean and the Gulf of Mexico

Principal Scientists

N.H. Kenyon and L. Garrison

CRUISE REPORT NO. 149

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CONTENTS

SCIENTIFIC PERSONNEL

Leg 6

N. Kenyon	IOS	(Principal Scientist)
J. Campbell	IOS	
S. Eisner	USGS	
E. Eschowitz	USGS	
C. Flewellen	IOS	
R. Phipps	IOS	
J. Revie	IOS	
J. Weller	IOS	
E. Cooper	RVS	
A. Lewis	RVS	

Leg 7

N. Kenyon	IOS)	- Principal Scientists
L. Garrison	USGS)	
M. Ball	USGS	
D. Blackwood	USGS	
R. Bonner	IOS	
J. Campbell	IOS	
S. Eisner	USGS	
E. Eschowitz	USGS	
G. Knight	RVS	
A. Lewis	RVS	
K. Scanlon	USGS	
M. Somers	IOS	
R. Sylvester	USGS	
D. Twichell	USGS	
J. West	USGS	
S. Wolf	USGS	

ACKNOWLEDGEMENTS

In addition to the valuable assistance of the scientists and technical staff these two cruises were noteworthy for the help and co-operation of the staff of J. Marr and Sons and of Captain Roy Hadgraft and the crew of M.V. Farnella.

OBJECTIVES

Farnella Leg 6

A small amount of extra time, over and above the direct passage time, was allotted for scientific work on route from Barbados to New Orleans. It was chosen to use this time for two separate surveys. The first was a GLORIA survey of the North Caribbean Deformed Belt, which runs along the southern side of the Greater Antilles. We had obtained GLORIA data of the South Caribbean Deformed Belt during RRS Discovery Cruise 109 in 1980 and hoped to compare these two regions of supposedly compressional tectonics. The area available for work was in US waters to the south and west of Puerto Rico. This had the advantage of being on the direct route to the Gulf of Mexico. The second survey was also planned to be in United States waters, concentrating on the lower Mississippi Fan, part of an important feature that should compare with the results of GLORIA surveys already made of portions of the Nile, Orinoco and Amazon Fans.

Farnella Leg 7

Despite the large amount of data available from the Texas-Louisiana slope the active salt diapirism results in a complex topography that has not yet been satisfactorily mapped. The USGS wanted to make a morphological, and if possible, a bathymetric map of the upper slope off Texas and Louisiana. This anticipated oil exploration in deeper water than usual.

JOI Inc. had at the last minute decided to fund a small amount of additional GLORIA work over sites that had been proposed for forthcoming drilling on the Mississippi Fan.

NARRATIVE

Leg 6

Farnella sailed from Bridgetown, Barbados at 2030 GMT on the 21st January following a 6 hour delay due to non-arrival of ship's stores and refuelling and clearance problems. Passage was made at 12 knots to a launching position

just inside US waters to the southeast of St. Croix. The PES fish and the GLORIA vehicle were launched at 0330 GMT on the 23rd January. Because of the shortage of time the survey was conducted at 10 knots, and consequently the airgun hydrophone could not be used because of its tendency to twist at such speeds. At 1900 GMT on the 23rd the PES was switched off as the signal became too weak due to a corroded gland. The PES fish and GLORIA vehicle were recovered in the lee of Mona Island, west of Puerto Rico at 0900 GMT on the 24th January. Passage was made north of Dominica, Haiti and Cuba to a launch site on the United States side of the median line south of the Florida Keys where the PES, GLORIA and a 40 cu. inch airgun were deployed at 1400 GMT on the 27th January. Progress westwards towards the Campeche Escarpment was opposed by the Gulf Stream which reduced our passage over the ground to 6 knots. It was reluctantly decided to bring inboard the airgun and hydrophone at 0315 GMT on the 28th January, and the speed over the ground was increased to about 9 knots for the survey of the Mississippi Fan. Recovery of the gear took place at 2230 GMT on the 30th January in poor sea conditions. If the weather had been favourable the gear would have been recovered in the early morning of January 31st. The ship proceeded up the Mississippi River and tied up at New Orleans on the evening of the 31st January.

Leg 7

Farnella sailed with the USGS party onboard at 2300 on the 2nd February. The USGS seismic and navigation systems had been installed during the stay in port. The PES fish, GLORIA vehicle and the IOS 40 cu inch airgun were deployed at 1030 on 3rd February. Our planned survey speed of 8 knots was too fast for the USGS sparker system. The survey of the Texas-Louisiana slope was followed by two days work on the Mississippi Fan and Florida Escarpment before the gear was safely recovered at 1030 on the 23rd February, south of the Dry Tortugas. All the gear operated well with the minimum of interruption, apart from four hours lost due to a burst water pipe in the engine room, which necessitated stopping the ship. The Farnella docked at Miami on the morning of the 24th February. Approximately 4800 nm of underway data had been obtained.

N.H. Kenyon

EQUIPMENT REPORTS

Navigation

Navigation on Leg 6 was by Satnav and EM log. After the mid-cruise port call at New Orleans we had LORAN-C available, with a Northstar Receiver that displayed position in latitude and longitude. Plots of Satnav, EM log and LORAN-C were first printed on the same sheet for evaluation. The EM log was found to be giving poor positions especially near major changes in course. The final plots made were of LORAN-C, updated to reliable EM log and satellite fixes. Track plotting was on a Universal Transverse Mercator projection at a scale of 1:250,000. This proved to be a convenient scale for photography, assembling mosaics and analysis and fitted in with much of the existing USGS and proprietary data.

The LORAN position fix was printed out on the bridge and, despite strong currents, lines were held to within 1 mile.
A. Lewis

GLORIA

The same equipment set-up was used as on previous FARNELLA legs i.e. the digital correlator feeding the on-line Teledeltos recorders and Analogue FM tape-recorders via fixed gain and AGC amplifier/filters. The analogue tapes were replayed as usual on the Muirhead K300 photo facsimile machine and anamorphosed on the IOS anamorphic camera. The resultant 35 mm negatives were printed as usual. In addition to this set-up there was a digital recording system consisting of a PDP 11/04 minicomputer running a CAMAC crate, recording on 9-track 800 BPI digital tape, and outputting on-line to a Raytheon line-scan recorder, formatted to produce nearly true scale records of high quality with both side printing zero range at the centre. Several improvements and additions had been made to the acquisition program in the light of experience during earlier legs.

Three launches and recoveries were effected without mishap, none of them forced by system faults, and total downtime was negligible.

Towards the end of the leg all the digital tapes were copied at 1600 BPI on

9 track tape on the two dual standard drives incorporated in the RNB G2 computer system.

M.L. Somers

SCIENTIFIC RESULTS

North Caribbean Deformed Belt

The GLORIA coverage of the North Caribbean Deformed Belt, south of Puerto Rico, confirmed that there is a band of faulting along the base of the slope, as surmised from existing seismic profiles. The 270 mile long line was run at about 10 knots, a faster speed than is ideal to produce good quality GLORIA records.

Mississippi Fan

Three and a half days were spent on a survey of part of the deeper Mississippi Fan. A portion of this work was funded by JOI Inc to look at proposed positions for drilling and part was funded by the NERC. The data obtained from GLORIA and the 12 kHz PES was of good quality and showed that there was a single large sinuous to meandering channel following the thickest part of the youngest fan lobe. The channel was discontinuous but showed no signs of branching over the 280 km long portion that was mapped. As a result of this discovery completely new sites have been proposed for drilling and several subsequent surveys of finds from the Farnella cruises have taken place. A particularly interesting group of small dendritic channels on the flanks of the fan lobe deserves further investigation.

An important area of sliding was mapped which appears to have partially filled and blocked the main fan channel.

Reference: L.E. Garrison, N.H. Kenyon and A.H. Bouma, 1982. Channel systems and lobe construction in the Mississippi Fan. Geo-Marine Letters 2, 31-39.

Texas-Louisiana Slope

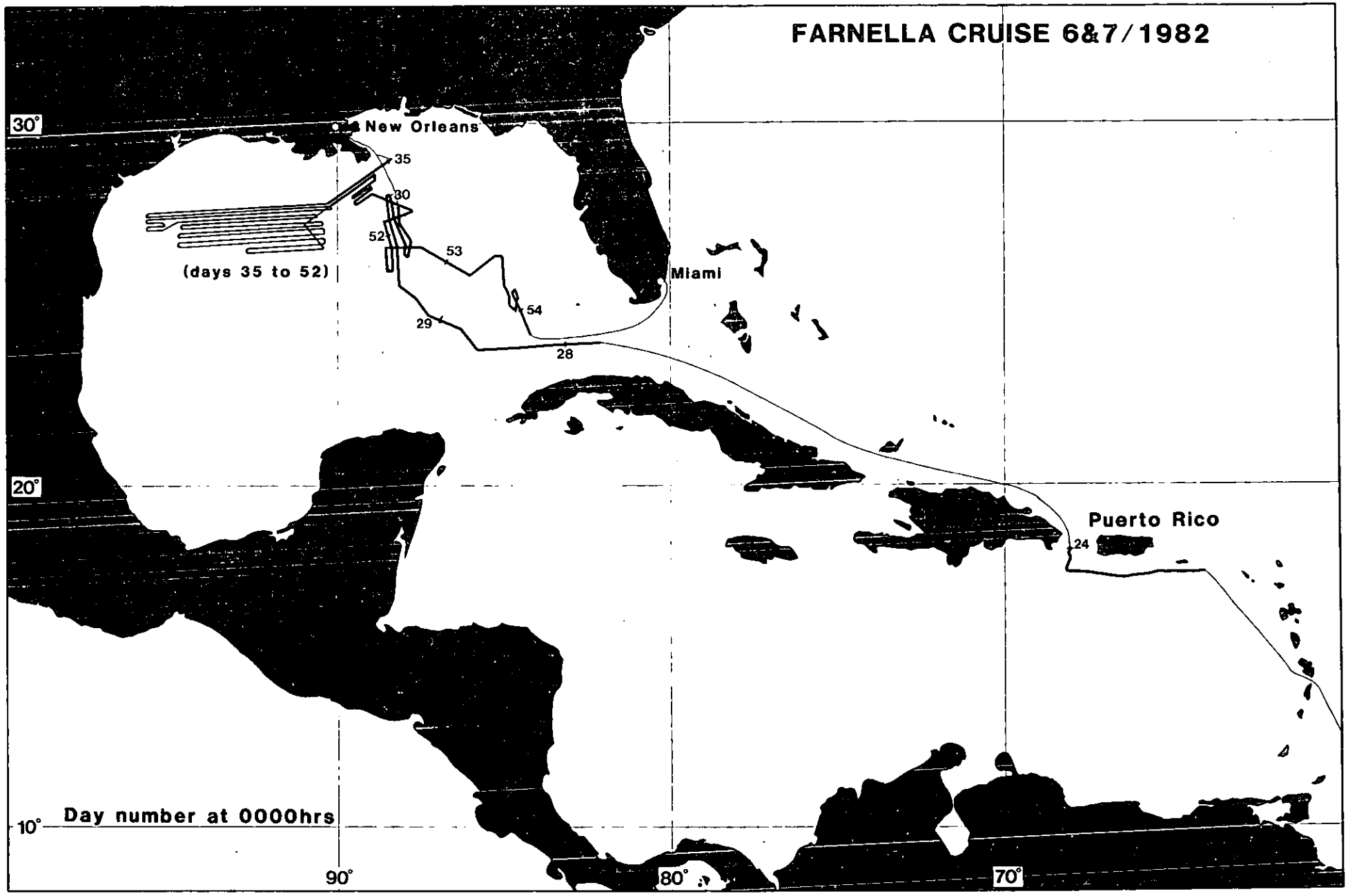
The contract between NERC and the USGS required that a survey with GLORIA side scan sonar and echo-sounder be carried out on the continental slope of

the northwest Gulf of Mexico. This survey was successfully completed, with good quality digitally recorded GLORIA data, echo-sounder records and navigational maps being provided to the USGS. Survey lines were run along the slope in as simple a way as possible, and with the minimum of overlap, in order to achieve the maximum side-scan coverage in the time available. Thanks to the accurate navigation and careful ship handling there are very few gaps in the coverage. The ranges obtained varied from about 4 km to either side near the top of the slope in about 500m of water, to about 12 km to either side near the base of the slope, in about 2000m of water. These are close to the predicted values provided for planning purposes by E. Eschowitz. The survey had to be terminated before we had mapped more than a small fraction of the Sigsbee Escarpment which is at the base of the Texas-Louisiana Slope.

Most of the features mapped by GLORIA in this area are small-scale 'textural' roughness contrasts rather than variations in slope. A possible explanation for the patches of stronger reflectivity are mud volcanoes on the tops of salt domes, deposits from debris flows or other kinds of gravity flows and roughness associated with steeper slopes. Bundles of fault traces can be distinguished but very few channels appear to be present.

The upper part of a large area of sliding, on the slope off Corpus Christie, Texas was mapped. Parts of the very steep Campeche and Florida Escarpments provided spectacular targets for GLORIA but in plotting the position of the latter account must be taken of distortions induced by the effect of very strong currents on the direction of view of the sonar array.

N.H. Kenyon


FARNELLA CRUISE 6&7/1982
30°
New Orleans
35
30
52
53
(days 35 to 52)
Miami
54
29
28
20°
Puerto Rico
24
Day number at 0000hrs
10°
90°
80°
70°