

# CRUISE REPORT

ORV SAGAR KANYA

Cruise No. 107

(9 November to 1 December 1995)



राष्ट्रीय समुद्र विज्ञान  
संस्थान

**NATIONAL INSTITUTE  
OF  
OCEANOGRAPHY**

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**Cruise No. 107**

(9 November to 1 December 1995)

**NATIONAL INSTITUTE OF OCEANOGRAPHY**

(Council of Scientific and Industrial Research)

**Dona Paula - 403 004, GOA**

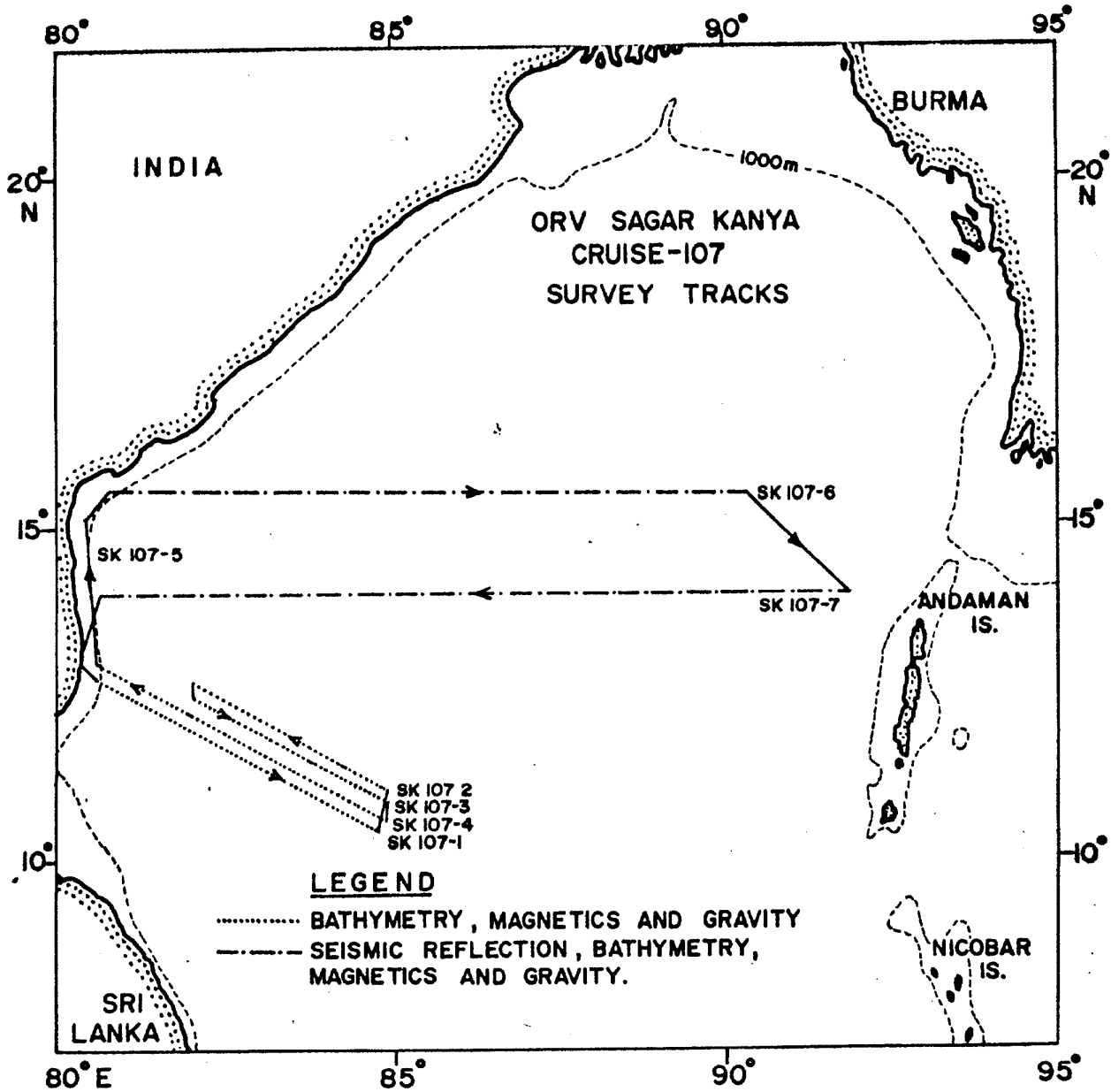
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# **REPORT ON THE 107<sup>th</sup> OCEANOGRAPHIC CRUISE OF O.R.V. SAGAR KANYA**

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## 2. CRUISE SUMMARY

The ORV Sagar Kanya cruise 107 was undertaken from Madras Port on 9 November 1995. The cruise was in the northern Bay of Bengal to study the seismic stratigraphy of the Bengal fan sediments, structure of the 85°E Ridge and Ninetyeast Ridge and Cretaceous Ocean floor fracture zones and tectonics. About 1980 line km of multichannel seismic reflection and 2000 line km of gravity, magnetic and bathymetric data were collected along two E-W and four NW-SE profiles (Fig.1). The E-W profiles along 14°00' N and 15°00' N latitudes are from the eastern continental shelf of India to the east of the Ninetyeast Ridge. They cut across the Western Basin, the 85°E Ridge, the central Basin and the Ninety east Ridge. Along the NW-SE profiles off Madras coast gravity, magnetic and bathymetric data were collected.

The seismic reflections upto about 3.5 S two-way travel time have been recorded on the single channel near trace seismic records. The structure of the sediments within the basins and the ridges and associated free-air gravity and magnetic intensity anomalies could be identified. The closely spaced NW-SE profiles of Madras coast reveal clear magnetic smooth zone except the anomaly on the shelf and between 83°E and 84°E. The anomalies near the 85°E Ridge appear to be localised and associated with the magmatism and/or basement undulations. The rest of the area is mostly devoid of significant and correlatable anomalies.

On completion of the cruise, the ship returned to Madras Port on 1 December.

### 3. PARTICIPANTS

#### 3.1 Scientific component:

D. Gopala Rao	) —	Chief Scientist
G.H. Ranade	)	
G.M. Phadte	)	
V.D. Khedeker	)	
P. Marathe	)	
G.P. Naik	)	
G. Janakiraman	)	
V. Gowthaman	) —	N.I.O
S.K. Nayyar	)	
G.A. Walker	)	
M.M. Subramaniam	)	
S.S. Pattan Shetti	)	
K.S. Krishna	)	
K.S.R. Murthy	)	
A.S. Subramaniam	)	
B. Fernandes	)	
S. Chand	)	
K.K. Subash Chandan	) —	Goa University
A.K. Purushotham	)	
T.D. Sanu	)	
Miss Noothan Mary John	)	
B.P.K. Patro	) —	Andhra University
M. Suresh Gandhi	) —	Tamil University
R. Thombre	) —	CMC Engineer, Bombay
Mahendhran	) —	University of Madras

#### 3.2 Ship's complement:

Capt. P.P. Batra	) —	Master
M.S. Pangtey	) —	C/o.
H.C. Medha	) —	N/Ch. Officer
A.K. Tiwari	) —	A.W.K.O.
V.C. Chandran	) —	R/o.
Dr. S. Murthy	) —	Med/Officer
R. Saldana	)	Purser
S. Janaka	) —	C/Engg/Officer
P.K. Mitra	) —	2/Engg/Officer
R.P. Ghosh	) —	3/Engg/Officer
M.N. Muraleedharan	) —	3/Engg/Officer
D. Singh	) —	4/Engg/Officer
K.P. Mishra	) —	5/Engg/Officer
K. Pandey	) —	E1. Officer
P.J. Valsan	) —	E1. Officer

## 4. INTRODUCTION

The Bay of Bengal sedimentary fan is the thickest in the world and the fan sediments span upto 1°S in the northeast Indian Ocean. The crustal structure of the Bay of Bengal is complex with the near north-south trending 85°E Ridge and the Ninetyeast Ridge separating the sediment filled basins e.g. the western basin and the central basin. The structure and age of the crust below the sediments is not clearly known. Hence the ORV Sagar Kanya cruise was planned to carryout multichannel seismic reflection, gravity, magnetic and bathymetric investigations in the northern Bay of Bengal. The studies are aimed to decipher the seismic stratigraphy of the Bengal fan sediments, origin of the two aseismic ridges, cretaceous ocean floor fracture zones beneath the sediments, tectonics and evolution of the crust in the study area (Fig.1). Similar studies have been done along three east-west lines between 13°N and 14°30' N latitudes and the results were published. The proposed studies bridge the knowledge gap of the crustal structure in the Bay of Bengal sedimentary fan area and provide scientific results and ground truth to our earlier results.

## 5. QUANTUM OF WORK

During the cruise the following data were acquired along two east-west and four north west - south east profiles between 13°00N and 15°N latitudes in the Bay of Bengal :

Underway geophysical data :

Bathymetry	2000 line kms
Gravity	- do -
Magnetics	- do -
Seismics	1980 line kms

All the geophysical equipment worked well throughout the cruise and good quality and quantity of geophysical data were acquired. Two cyclones - one before sailing and other during the cruise were experienced. During the cyclone period all towed geophysical equipment were hauled up and surveys were suspended.

## 6. ACQUISITION OF UNDERWAY DATA

### 6.1 Navigation

The positions during the survey were obtained by using a Magnavox series 5000 Integrated Navigation System (INS) and Global Positioning System (GPS, Model MX 4400) receiver as primary navigation aid. The survey lines were shot in a total distance made with 50 m as shot point interval. The raw navigational and other underway geophysical data were recorded on magnetic tapes (800 BPI) at every shot point.

### 6.2 Bathymetry

The bathymetric data were obtained using Honeywell Elac deep sea echosounder. The data were recorded on a 25.5 cm wide electrostatic paper. The master was kept at 5000 m range, whereas the record on a repeater/slave was obtained at an enhanced scale for resolution purpose. The seafloor topography in the area ranged from 116 to 3150 m water depth and varied significantly on the margins and in levee channels in contrast to a more even bathymetry in the basins.



### **6.3 Gravimeter**

The gravity data was collected using Bodenseewerk KSS 30 model sea gravimeter. Parabola and ball calibration tests were carried out prior to commencement of cruise. The Phillips dual channel chart recorder was used for quality control and ship's acceleration and raw gravity data were recorded continuously. The closely spaced profiles (SK107-1 to 4) in the western basin show NE-SW trending free-air gravity low, about 60 km wide and 20 mGal in amplitude. It is localised and associated with the magnetic anomalies. Very steep and high amplitude anomalies are seen associated with the slope region on profiles (SK107-1 to 4). Prominent free-air gravity anomalies of profiles SK107-6 are associated with the 85°E Ridge and 7 are associated with the 85°E Ridge and the Ninety east ridge.

### **6.4 Magnetics**

Earth's total magnetic intensity data was recorded continuously using Geometric Proton Precession Magnetometer (Model G886). The sensor was towed about 250 m aft the vessel. The data were recorded in analog form on a strip chart recorder as well as on the floppy diskettes. The closely spaced NW-SE profiles (SK107-1 to 4) reveal clear magnetic smooth zone except the anomaly on the shelf and between 83° and 84°E. The 85°E Ridge (SK107-7) is associated with magnetic anomaly of 300 nT in amplitude, while on the other profile, SK107-6 the Ridge is associated with anomaly of about 200 nT.

### **6.5 Seismics**

Seismic reflection data were acquired deploying 24 channel seismic streamer with 32 hydrophones per group spaced at 25m, and D-Type array of 7 air guns with a total capacity of 7.98L and shot firing at every 50 m. The near trace signals were recorded on EPC analog record.

The preliminary results indicate that the maximum sub-bottom penetration of about 3.5 S (Two way travel time). The seismic structures of the 85°E Ridge and the Ninety east Ridge carpeted by thick sediments are closely seen. The central and western basins are filled with large thick sediments.

## **7. LOSS OF EQUIPMENT**

Two tail buoys of seismic streamer and airguns array were lost.

## **8. PRESENT STATUS OF EQUIPMENT**

The seismic, gravity, magnetic and bathymetric systems were in working conditions as on December '95. All the electric cables of the airgun array were spoiled due to water leakage. No spare cables were available and they would be required for April '96 geophysical cruise. A message was sent from ship for procurement of the same immediately.

## **9. ACKNOWLEDGEMENTS**

The chief scientist and other participants of the cruise are grateful to the Master and other crew for their cooperation throughout the cruise.