

# Report on Oceanographic Cruise of O. R. V. Sagar Kanya

**CRUISE No. 30**

**11th to 20th March, 1987**



**National Institute of Oceanography  
Dona Paula-403 004, Goa  
INDIA**

NATIONAL INSTITUTE OF OCEANOGRAPHY  
(Council of Scientific & Industrial Research)  
Dona Paula - 403 004, Goa

REPORT ON  
30TH OCEANOGRAPHIC CRUISE OF  
O.R.V. SAGAR KANYA

(11th to 20th March, 1987)

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O.R.V. SAGAR KANYA

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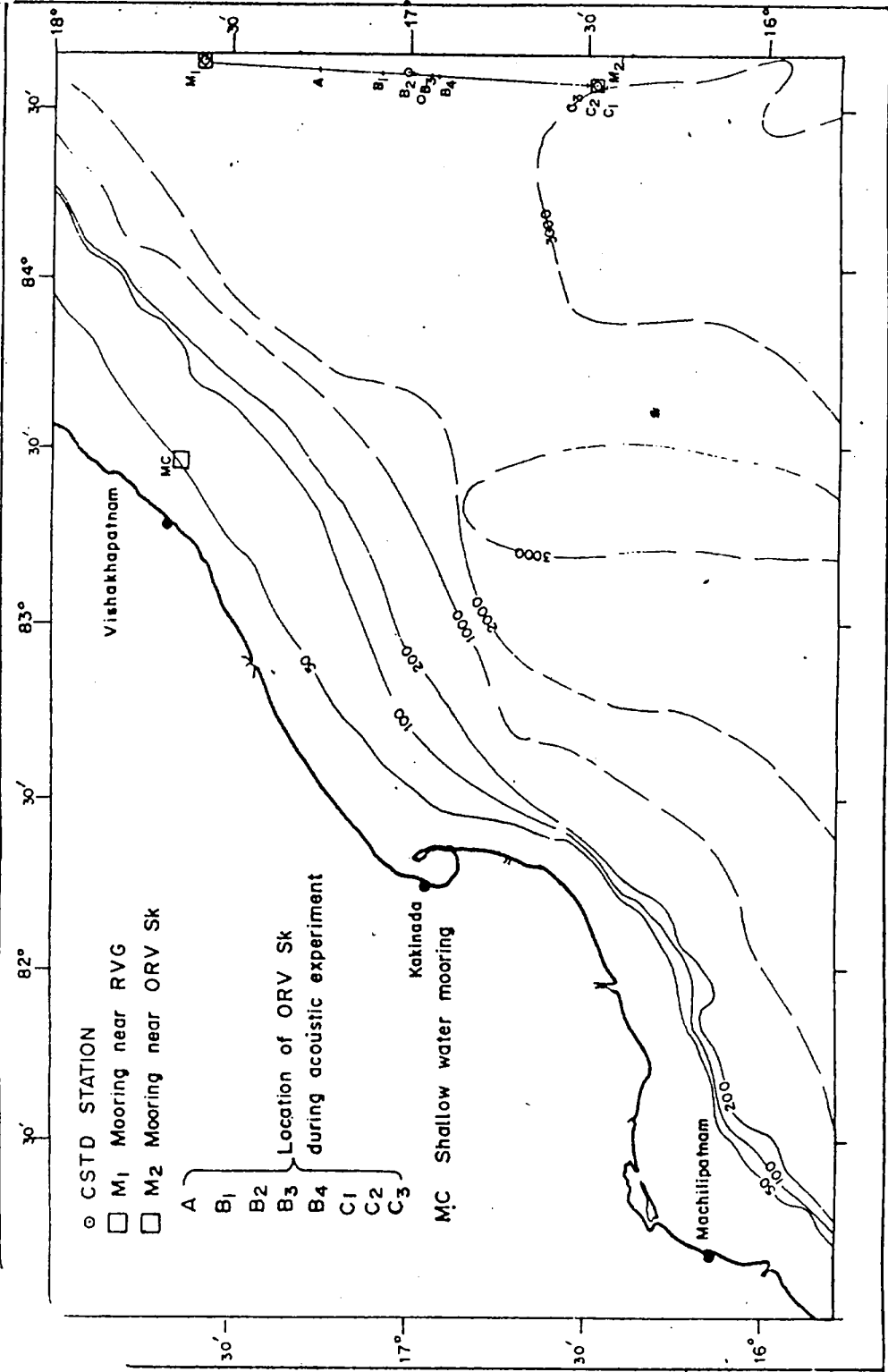


Fig.1 Positions of R.V.Gaveshani and Sagar Kanya during the experiment

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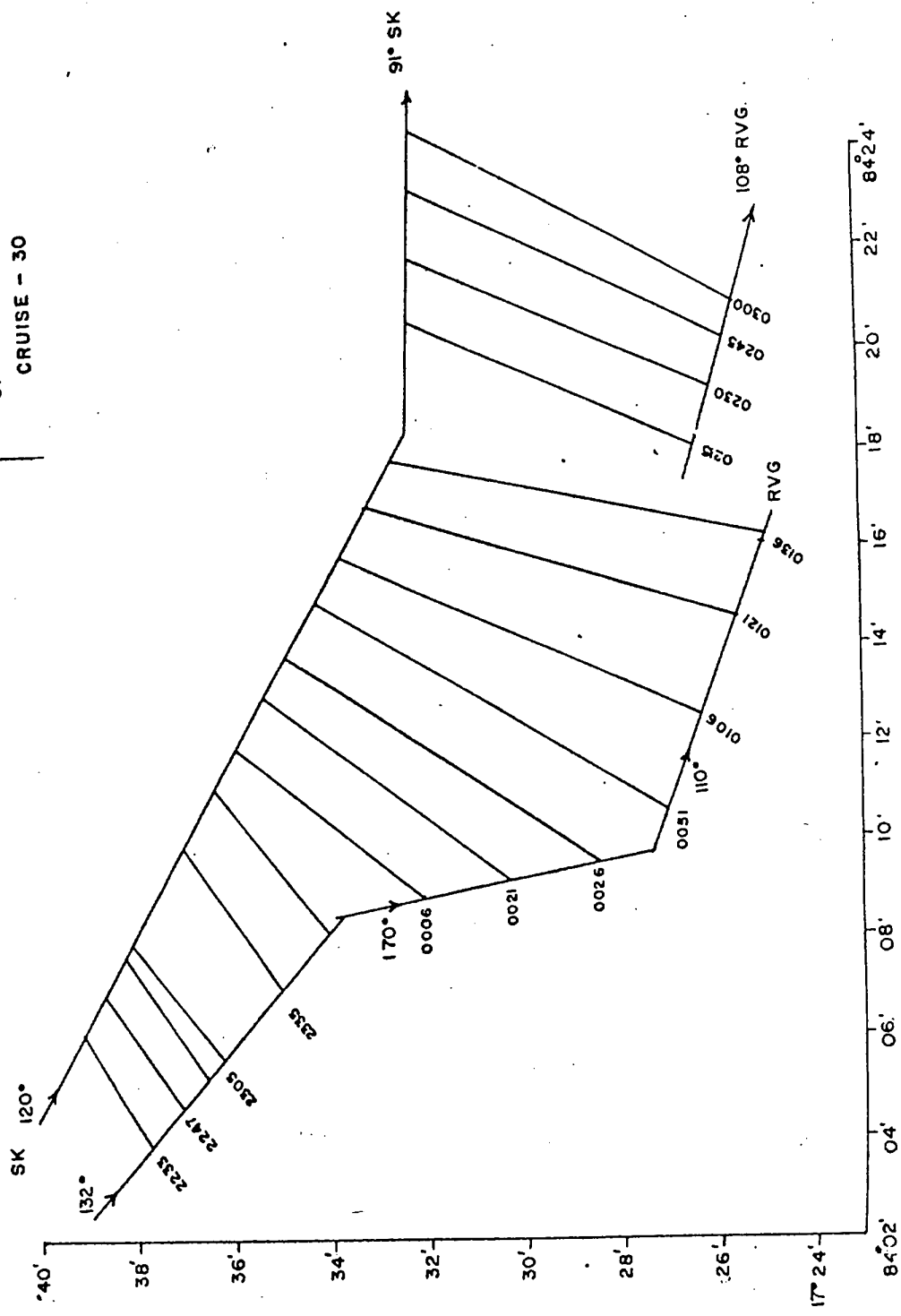
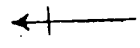


Fig. 2 Tracks during measurement of noise from the moving ship

## 2. CRUISE SUMMARY

The cruise was for a duration of ten days beginning on the 11th March 1987 from Visakhapatnam. The cruise terminated on the 20th March 1987 at the same port.

During the above period the following jobs have been tried.

- i) Underwater moorings - 2 deep sea and 1 shallow water - have been made to test the functioning of Acoustic release systems.
- ii) The stations have been occupied for collection of environmental data using CTD system.
- iii) Experiments have been carried out on the acoustic properties in collaboration with the scientists of NPOL, Cochin. They involve (i) recording the acoustic noise of the ships sailing in the vicinity and (ii) examining the refractive index of the upper layers of the sea using an underwater streamer fitted with hydrophones and acoustic transducer.

3. PARTICIPANTS

a) Scientific component

|                   |   |   |
|-------------------|---|---|
| J.S. Sastry       | - | Chief Scientist   |
| S. Prasanna Kumar | Y | Physical Oceanography<br>Division, N.I.O., Goa          |
| T.V. Ramana Murty | * |   |
| G. Nampoothiri    | * |   |
| K. Santanam       | * |   |
|                   | ^ |   |
| N.M. Anand        | Y | Ocean Engineering<br>Division, N.I.O., Goa.             |
| Ashok Kumar       | * |   |
| P. Pednekar       | * |   |
|                   | ^ |   |
| G.M. Phadte       | Y | Geological Oceanography<br>Division, N.I.O., Goa.       |
| Tony J. Thottam   | * |   |
| A.K. Chaubey      | * |   |
| G. Walker         | * |   |
|                   | ^ |   |
| Vani Peshwe       | Y | Marine Instrumentation &<br>Computer Division, N.I.O.   |
| A.P. Selvam       | * |   |
| K.R.G.K. Murty    | Y | Naval Physical & Oceeano-<br>graphic Laboratory, Cochin |
| P.V. Nair         | * |   |
| M.J. Davis        | * |   |
| K.A. Abdul Salan  | * |   |
| S.P. Pillai       | * |   |
| K. Sudarshan      | * |   |
| Kurian Isaaic     | * |   |
|                   | ^ |   |





b) Ship's complement

|                |                          |
|----------------|--------------------------|
| Patwardhan     | - Master                 |
| G. Singh       | - Chief Officer          |
| Paramjit Singh | - Second Officer         |
| Ravi Iyear     | - Third Officer          |
| Kher           | - Chief Radio Officer    |
| Pinto          | - Radio Officer          |
| H.K. Jumani    | - Medical Officer        |
| D.K. Basu      | - Chief Engineer         |
| R.V.B. Nair    | - Second Engineer        |
| R.K. Diwakar   | - Third Engineer         |
| N. D'Sousa     | - Fourth Engineer        |
| S. Ravi        | - Fifth Engineer         |
| A.D. Corneiro  | - Chief Catering Officer |

#### 4. OBJECTIVES AND ORIGINAL CRUISE PLAN

The following objectives were sought to be achieved:

- a) to check the capability of deploying and retrieving moorings for ocean acoustic tomographic system and to assess the requirements for the future experiments;
- b) to carry out acoustic transmission and reception between two ships with maximum distance of separation equivalent to that of two convergences zones;
- c) to carryout measurements on ambient and ship noise;
- d) to test the performance of acoustic transponder and release systems in shallow water;
- e) to obtain environmental data on temperature, salinity, currents, waves etc. and to process the data for use in acoustic propagation study;
- f) to test the performance of EBT developed at NIO and
- g) to assess field problems and their possible solutions.

#### 5. CRUISE DETAILS

Date of departure from Visakhapatnam Port : 11th March, 1987

Date of arrival at Visakhapatnam Port: 20th March, 1987.

### 5.1 Deployment of Moorings

Two deep sea moorings were deployed using ORV Sagar Kanya, one each at two stations M1 and M2 off Visakhapatnam in the Bay of Bengal at water depths 2800 m and 3000 m respectively. The coordinates of the sailing M1 and M2 are:

Lat.  $17^{\circ} 35.57'N$ ,  $16^{\circ} 30.89'N$ ;

Long.  $84^{\circ} 38.28'E$ ,  $84^{\circ} 34.63'E$

A marker buoy was dropped for the mooring and the location of the same was determined by way of SATNAV. The same was used to recover the mooring.

### 5.2 Hydrographic observation

The CTD was lowered at 3 stations (M1 -  $17^{\circ} 36.21'N$ ,  $84^{\circ} 41.28'E$ , B2 -  $17^{\circ} 01.88'N$ ,  $84^{\circ} 38.75'E$ , M2 -  $16^{\circ} 29.65'N$ ,  $84^{\circ} 35.31'E$ ) to obtain a data set to compute sound velocity and ray path geometry for a given source depth. However, the ray tracings could not be executed owing to the non-functioning of the computer system on board ORV Sagar Kanya.

In addition, Electronic Bathythermograph (EBT) developed at NIO was operated in conjunction with Digital Bathythermograph (DBT) system on board ORV Sagar Kanya on 11 occasions.

### 5.3 Acoustic Transmissions

RV Gaveshani was positioned at mooring station M1 and ORV Sagar Kanya moved a distance of about 1 km to set up the hydrophone array and test the performance of various equipments. After receiving the signals, ORV Sagar Kanya moved to stations at A, B1, B2, B3, B4, C1, C2, C3, etc. before reaching M2 which is expected to be a second convergence zone. In all, about 17 transmissions were carried out during the experiment. During the entire cruise the ship drift was considerable.

### 5.4 Acoustic noise

The noise generated by the ship RV Gaveshani was monitored as per the track shown (Fig.2). For the purpose of recording, multichannel recorder belonging to NPOL was utilised while the sensing streamer was towed.

### 5.5 Current and wave measurements

Time series data on currents (at about 100 m depth) using RCM4 Aanderra current meter attached to the mooring at M1 and M2 were collected. Wave data was collected using DATA VELL wave rider buoy deployed at M2. The duration of data collected at M1 was 7 days and that at M2 was 3 days.

## 6. Synopsis of observations and data collected

### 6.1 Processing of data

The CTD data was processed and cubic spline method was used to interpolate the irregularly spaced data set to a new sample interval of 10 m, and to obtain temperature and salinity values for depths of 10 m interval.

The sound velocity profiles for all the stations have been constructed and the range dependent acoustic ray trace program has been utilised to determine the ray parameters for the given set of source and reaches positions.

### 6.2 Temperature

CTD data showed variability of temperature in space. The maximum variability is confined to the upper 125 m water column while the differences are appreciable to depths of 325 m. Incidentally this is the zone with intense thermal gradients, the distribution below this depth is more or less monotonic.

### 6.3 Salinity

Surface salinity is 33.150 ppt. From 75 m salinity profile showed strong positive gradient upto 150 m

where the value is about 35.100 ppt followed by gradual decrease upto 34.850 ppt near bottom ( 3000 m).

#### 6.4 Sound velocity

Surface sound speed is 1538.6 m/s. In the surface layer positive gradients are noted. Below this, negative gradients are found in the thermocline. The sound channel axis depths about 1500 m while the channel velocity is about 1493.25 m/s. Below the axis a slight positive gradient exists upto the bottom. The bottom velocity is about 1502 m/s ( 3000 m).

#### 6.5 Current and wave data

The RCM-4 current meters used in the study had the pressure, temperature and conductivity elements in addition to obtaining current speed and direction. At station M1 temperature varied from about 25° to 12° C over the duration of observation. The pressure sensor recorded a depth of about 100 m. Conductivity was not recorded. The currents were directed east northeast. The maximum current speed was about 80 cm/sec which showed a gradual decrease towards the end of the experiment.

At station M2 the instrument depth recorded was about 15 m and the temperature recorded by the current meter is about 14° C which seems to be erraneous. The direction and speed of the currents are highly variable at this station.

The wave data was analysed on board the ship using HP85 B personal computer. The typical wave spectra shows the dominance of the two peaks with significant wave height ranging from 69-80 cm.

#### 6.6 Performance of EBT

The data collected using EBT and DBT were plotted and compared against each other. The results show that the behaviour of both the instruments are almost identical.

#### 7. Final reports/significant findings

#### 7. Special reports/significant findings

The results of the experimental study have been submitted to DGSIR in the form of a report which has been approved by the special committee on OATS.

#### 8. Loss Report

No loss has been reported during this cruise.

#### 9. Acknowledgements

The Chief Scientist and other participants of the cruise wish to express sincere thanks to the Master, Officers and Crew of ORV Sagar Kanya for their cooperation during the cruise.