

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

## CRUISE 2

13th to 26th September

1983



**National Institute of Oceanography**  
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**INDIA**

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NATIONAL INSTITUTE OF OCEANOGRAPHY  
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REPORT ON  
2nd OCEANOGRAPHIC CRUISE OF  
O.R.V. "SAGAR KANYA"

(13 - 26 September, 1983)

REPORT ON THE SECOND OCEANOGRAPHIC CRUISE OF  
O.R.V. "SAGAR KANYA"

C O N T E N T S

1. Participants - Scientific component
2. Ship's complement
3. Introduction
4. Sailing schedule
5. Observational programme and salient features
6. Loss report
7. Acknowledgements

Annex - I : Summary of observations

Fig. - I : Map showing the cruise track.

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I. PARTICIPANTS.

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2. SHIP'S COMPLEMENT

Capt. K.S. Sood	- Master
A.B. Chemburkar	- Chief Officer
Rodney P. Ferdis	- Second Officer
S.B. Chitre	- Third Officer
Clevis R. Tavares	- Fourth Officer
J.B. Pereira	- Radio Officer
Conrad F. Dabreo	- Tr. Radio Officer
Dr. S. Chinna Swamy	- Medical Officer
Arun K. Goel	- Chief Engineer
K.N. Rao	- Second Engineer
Power S. Kaka	- Third Engineer
Babulal Malik	- Fourth Engineer
Vinay P. Mohile	- Fifth Engineer
Rajasekaran Sunder	- Fifth Engineer
Varinder K. Katyal	- Electrical Officer
Peter M. D'Souza	- Purser

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### 3. INTRODUCTION

After the 1st long cruise covering the Central and Southern Arabian Sea, the Cruise Planning Committee for O.R.V. "Sagar Kanya" has programmed four short cruises of about 15 days in the Arabian Sea with a view to collect oceanographic data in all the disciplines and to train scientists and technicians in the operation of various sophisticated equipment on board. As a part of fulfilment of this programme, the 2nd cruise of O.R.V. "Sagar Kanya" covered the north Arabian Sea for a period of two weeks and valuable data in the disciplines of physical, chemical, biological oceanography, marine pollution and meteorology were collected.

The objectives of the cruise are to:-

1. study the water mass structure in the Arabian Sea and to delineate the extent of spread of the Red Sea and Persian Gulf waters,
2. collect valuable meteorological data during the southwest monsoon season,
3. study the levels of tar and heavy metal pollution in the surface and sub-surface waters of the Arabian Sea,
4. conduct bacteriological studies on the denitrifiers in the surface and sub-surface waters and
5. train the participants in the operation and maintenance of equipment on board.

The scientific and technical composition of the participants was so chosen that enough trained personnel were available in each discipline to impart the operational and maintenance techniques to the new participants.

4. SAILING SCHEDULE

ORV Sagar Kanya arrived on 2.9.1983 after her 52-day long first cruise at the Mormugao Harbour. She was originally scheduled to sail on 6.9.1983. But, as some of the equipment on board required repairs, her sailing schedule was slightly altered. Dr. Peter Otten and Mr. Mayer who came from Germany were on the job continuously from the day of their arrival and when most of the repairs were done, Sagar Kanya sailed from Mormugao Harbour on 13.9.1983 afternoon, due west along the 15°N latitude and then northwards as shown in the cruise track diagrams. The stations are fixed at about one degree interval and the cruising speed between the stations were maintained at about 14.0 knots. Altogether 32 stations were covered during the cruise and the last station worked out was SK-132. The grid pattern of the cruise track provided four latitudinal sections, and three sections more or less parallel to the west coast of India covering the northern and central parts of the Arabian Sea during the south-west monsoon season.

During the sailing period it was planned to assemble the Vibro corer and the box grab and operate them initially in shallow waters on the Indian continental shelf off Gujarat coast and later in the deeper waters during the last leg of the cruise. Having completed the assembly of the Vibro corer and Box grab the bottom finding pinger was attached to the deep sea wire above the large bottom grab and lowered to about 100 m depth for testing purpose. As the Pinger was being hauled on to the main deck, the aft pump of the deep sea storage drum gave in and further testing of the Vibro corer and the

Box grab was discontinued. Having completed 32 stations and collected the required data in all the disciplines, ORV Sagar Kanya reached Mormugao Harbour on the morning of 26th September, 1983. The ship's manoeuvrability at stations was excellent and the wire angles were always kept at zero/or near zero values and very low speeds were maintained for towing surface plankton nets or for releasing the Radio Sone Balloons. The sea was rough with white horses present during most part of the cruise, though rolling was least, the pitching was considerable.

#### 5. OBSERVATIONAL PROGRAMME & SALIENT FEATURES

##### (i) Physical aspects

The observational programme in physical oceanography at all the stations consisted of the operation of Rosette sampler with CTD -  $O_2$  profiling system at each station from surface to near bottom, Bathythermograph from surface to 275 m and ship borne wave recorder. Water samples were collected at different depths and the salinity was determined using laboratory salinometer for cross checking the values recorded on the recorder connected to the CTD -  $O_2$  profiling system and for applying corrections, if necessary.

Special wave observations were also made using the ship borne wave recorder at 12 stations to derive relationship between microwave brightness temperature and wave height during certain swaths of the Indian satellite (SAMIR) Bhaskara II.

The preliminary analysis of the data indicated that the sea surface temperature decreased by about  $1^\circ C$  in the area of study from



east to west and an increase of about 1.5°C from south to north. The SST varied from 27 to 29°C.

The sea surface salinity also showed a general decrease of about 0.35‰ from east to west and about 0.3‰ from south to north. The values varied between 36.86 and 36.00‰.

The surface isothermal layer varied in thickness from 20 to 70 m. It is maximum in the south-western part of the area of study and decreased both north-ward and east-ward.

The surface winds measured varied from 9 to 35 knots and the direction from south-west to north-west.

As some difficulty was experienced in transferring the CTD-O<sub>2</sub> profiling data from the cartridge tape to half inch magnetic tape, digital print out of all the data was taken for later analysis.

(ii) Chemical aspects

(a) Composition of sea water

Out of 32 stations covered during the cruise, 14 stations at alternate positions have been selected for the study of chemical parameters which include dissolved O<sub>2</sub>, pH, alkalinity, Nitrate, Nitrite and inorganic phosphate in the water samples collected at standard depths. The auto-analyser has been used during this cruise.

The preliminary analysis of the data collected indicated that the dissolved O<sub>2</sub> in the surface layers ranged between 4.5 to 4.9 ml/l. The O<sub>2</sub> minimum layer mostly occurred in the depth range

of 200-500 m and the values varied between 0.13 to 0.27 ml/l. In the area investigated, at deeper depths, from 1000 m onwards, the oxygen values showed constant increase from 0.30 ml/l to 3.26 ml/l at 3000 m.

Among the nutrient values, the nitrate showed constant increase from surface to the bottom layer and ranged between 10 to 62  $\mu$ g. at./litre. The nitrate values were very low (4 to 20  $\mu$ g.at./litre) and were found at few stations only.

The silicate concentrations were found to increase constantly from near surface depths to the bottom layers and ranged between 7 to 130  $\mu$ g.at. per litre.

(b) Tar and heavy metal pollutants

Forty two water samples collected using Niskin-Go-Flow Bottles from twelve stations at different depths (0, 10, 20 and 50 m) were analysed for the dissolved/dispersed Petroleum hydrocarbons by spectro-flurometry. Floating tar ball samples were collected with the Neuston net by skimming the surface at 2 knots speed. Six stations (SK-110, SK-112, SK-114, SK-118, SK-120, SK-123) showed the presence of minute particles of tar and other stations showed no trace of it. The concentrations of dissolved hydrocarbons varied between 0 and 17 mg/l. Sediment samples were also collected at few stations and are being analysed for total petroleum hydrocarbons.

Stations where samples for heavy metal analysis were collected are SK-103, SK-108, SK-110, SK-114, SK-116, SK-120, SK-123, SK-127,

SK-130. At each of these stations the sampling depths were: 10, 100, 500, 1000, 1500, 2000 and 3000 m. Further analysis is being carried out.

(iii) Biological aspects

(a) Zooplankton studies

IOSN net was operated at 200 - 0 m interval at 12 stations for the study of zooplankton composition and bio-chemical analysis.

(b) Benthos

At eight stations the Van-Veen Grab was operated for the collections of benthic samples. The analysis of the samples indicated that the macrobenthic fauna in the deeper parts of the present study area is rather poor.

(c) Bacteriological studies

Bacteriological bag samplers were operated on PVC coated wire rope at 5, 100, 200 and 300 m depths at 12 stations for collecting water samples and were analysed with regard to the distribution of Chemolithotrophic denitrifiers.

(d) Biomass studies

Biomass studies included estimation of chlorophyll a, particulate oxidisable carbon and adenosin triphosphate. The preliminary analysis indicated that the maximum values of both chlorophyll a and p.o.c. occur at a depth of 25 m and ranges from 0.7 to 1.5  $\mu$ g/l. The minimum values of chlorophyll a occurred at depths of 100 to 200 m and the values ranged from 0.05 to 0.01  $\mu$ g/l.

(iv) Meteorological aspects

Meteorological data logging system was used to get printed data regarding ship's position, wind speed - direction both relative and true, dry bulb and wet bulb temperature, pressure, global radiation every ten minutes/one hour. The data was also recorded on continuous Auto Recorder.

Radio Sonde data was collected regularly every day of the cruise at the standard observation timings of 0830 and 1730 hours IST upto about 25,000 m. The ship was stopped, wherever necessary, to facilitate balloon release from the balloon deck. The surface and upper air data at the standard observation timings were transmitted to the India Meteorological Department.

Recording unit of APT station in Test mode, Facsimile recorder, Micro barograph and Aneroid barometer worked satisfactorily. Facsimile weather charts from New Delhi were received during the cruise.

(v) Instrumentation aspects

Integrated Navigation System, General purpose computer system, narrow beam and deep sea echo sounders functioned well. However, the transfer of the CTD data from the cartridge tape to the half inch tape has not been possible.

During the cruise the Vibrio corer and the Reineck box sampler (Spade corer) were assembled with a view to learn the technique of the assembly with the drawings and instrumentation manuals available on board.

The procedure followed in the assembly of Reineck box sampler was:

- (a) The two sections of the box frame were put together with bolts on each side.
- (b) The two side supporters were fixed to base frame.
- (c) Then the central ram between the two side supporters was fixed and a rod was inserted against sliding of ram through the joint.
- (d) The spade was fixed in such a way that the spade knife is opposite to the guide plates of box sampler.
- (e) Then the suspension cable of the spade was arranged to pass over the hook above the central ram and the pin was hooked.
- (f) The weights were placed on the weight plate and the sample box was attached to the end of the ram.
- (g) All the bolts were tightened (and the pins are to be removed from hook before lowering into the sea).

(vi) Colloquia

A three hour colloquia on - "some aspects of oceanography" - was organised on 22.9.1983 during the cruise where much interest was shown by the Ship's Officers and the Scientists. Talks were held on 'Dead water phenomena', Solar Energy utilization, oil and metal pollution in the Arabian Sea, defence aspects and oceanography, development of navigational techniques, life at sea, the possible role of bacteria on the growth of manganese nodules, foundation problems at sea bed, etc.

6. LOSS REPORT

Six deep sea reversing thermometers were found broken in their housing on different occasions when the CTD Rosette system was hauled on to the deck. Also, one 5 litre Niskin sampling Bottle was found broken and lost from the Rosette.

7. ACKNOWLEDGEMENTS

The Chief Scientist, Scientists and Technical Officers of the second ORV "Sagar Kanya" cruise express their thanks to the Captain, his officers and crew for excellent co-operation extended to them during this training cum multi-disciplinary cruise.

- 13 -  
CRUISE 2

SUMMARY OF OBSERVATIONS

Sta- tion No.	Position		Date	Time(IST)	Depth (m)	Operation carried out						Weather Observation
	Lat.°N	Long°E				ABT	CTD-02	Shallow cast	IOSN	Neuston	Grab	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
SK-101	14°59'	73°00'	13-9-83	1635-1845	201	+	+	+	+	+	+	+
SK-102	15°00'	71°59'	14-9-83	2357-0406	2000	+	+	+	+	+	+	+
SK-103	15°00'	71°00'	14-9-83	0917-1500	2600	+	+	+	+	+	+	+
SK-104	15°00'	7°00'	14-9-83	1950-2225	3471	+	+	+	+	+	+	+
SK-105	15°00'	69°00'	15-9-83	0335-0475	3859	+	+	+	+	+	+	+
SK-106	14°59'	67°59'	15-9-83	1256-1336	3923	+	+	+	+	+	+	+
SK-107	15°00'	67°01'	15-9-83	2040-2255	3931	+	+	+	+	+	+	+
SK-108	15°00'	66°00'	16-9-83	0420-1011	3849	+	+	+	+	+	+	+
SK-109	16°00'	65°30'	16-9-83	1740-0725	3791	+	+	+	+	+	+	+
SK-110	17°00'	65°00'	17-9-83	0145-0725	3831	+	+	+	+	+	+	+
SK-111	17°00'	65°00'	17-9-83	1209-1545	3555	+	+	+	+	+	+	+
SK-112	17°00'	67°00'	17-9-83	2030-2248	3567	+	+	+	+	+	+	+
SK-113	17°00'	6°00'	18-9-83	0320-1200	3532	+	+	+	+	+	+	+
SK-114	17°00'	68°59'	18-9-83	1710-2512	2513	+	+	+	+	+	+	+
SK-115	18°00'	68°30'	19-9-83	0136-0800	3432	+	+	+	+	+	+	+
SK-116	19°00'	67°59'	19-9-83	1330-1900	3232	+	+	+	+	+	+	+
SK-117	18°59'	67°00'	20-9-83	2356-0320	3213	+	+	+	+	+	+	+
SK-118	19°00'	66°00'	20-9-83	0810-1306	3205	+	+	+	+	+	+	+
SK-119	19°00'	65°00'	20-9-83	1850-2150	3270	+	+	+	+	+	+	+
SK-120	18°59'	64°00'	21-9-83	0122-0650	3421	+	+	+	+	+	+	+
SK-121	20°00'	63°45'	21-9-83	1150-1501	3327	+	+	+	+	+	+	+
SK-122	21°00'	63°15'	21-9-83	2025-2305	3439	+	+	+	+	+	+	+

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
SK-123	20°59'	64°00'	22-9-83	0230-0750	3379	+	+	+	+			+
SK-124	20°59'	64°59'	22-9-83	1105-1606	3080	+	+	+	+		+	+
SK-125	20°59'	65°59'	22-9-83	2040-2300	2524	+	+	+	+		+	+
SK-126	21°00'	67°00'	23-9-83	0340-0840	2380	+	+	+	+		+	+
SK-127	21°00'	68°20'	23.9.83	1358-1745	2324	+	+	+	+		+	+
SK-128	20°00'	68°45'	23-9-83	2355-0340	2833	+	+	+	+	+	+	+
SK-129	18°59'	69°15'	24-9-83	0910-1146	3043	+	+	+	+			+
SK-130	17°59'	69°29'	24-9-83	1710-2002	3173	+	+	+	+	+		+
SK-131	17°00'	70°00'	25-9-83	0138-0540	3470	+	+		+			+
SK-132	15°59'	70°30'	25-9-83	1108-1645	3493	+	+	+	+			+



