

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

CRUISE No. 48

29th December, 1988 to 14th January, 1989



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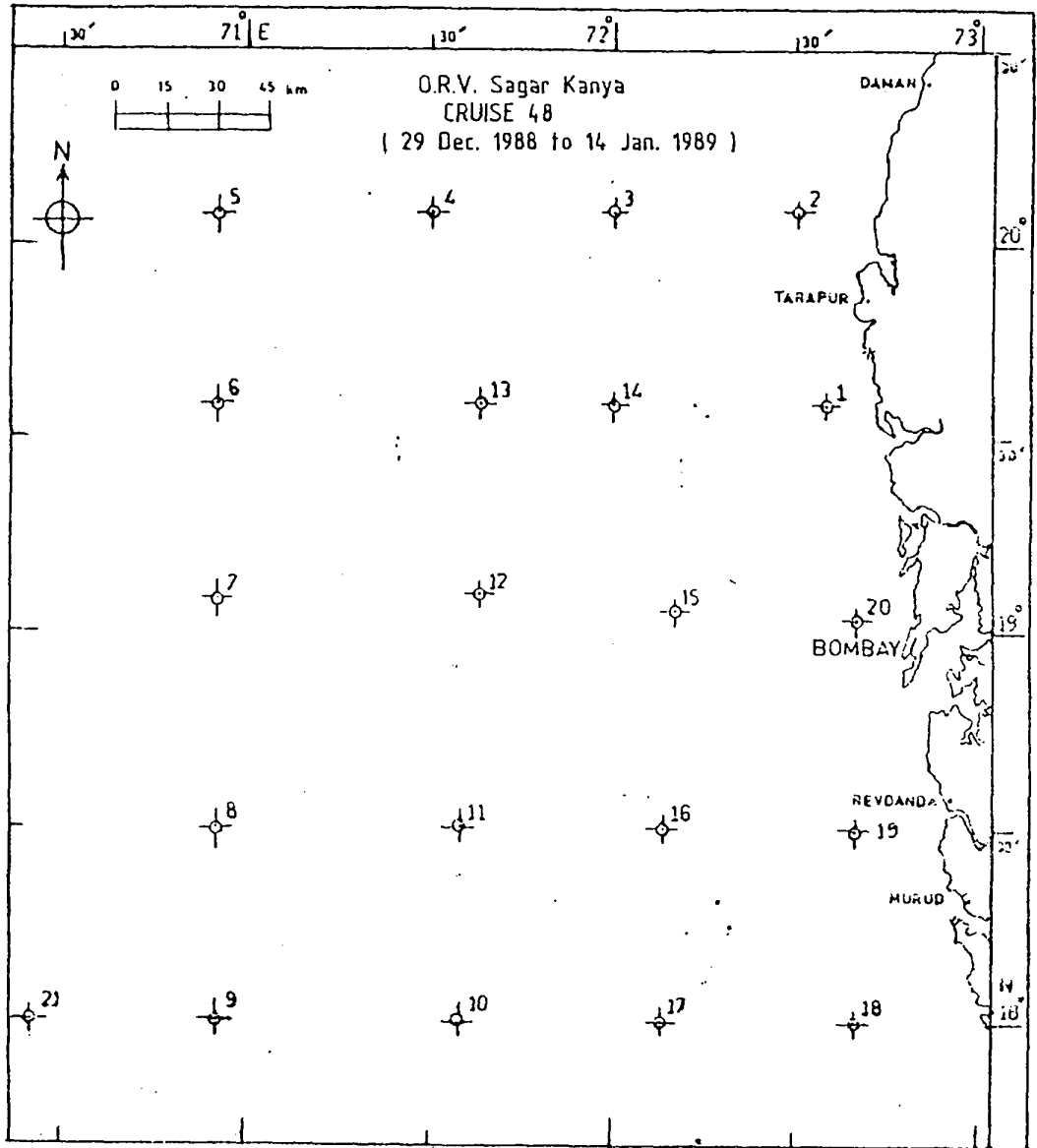
REPORT ON
48TH OCEANOGRAPHIC CRUISE OF
O.R.V. SAGAR KANYA

(29 December 1988 to 14 January 1989)

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2. CRUISE SUMMARY

ORV Sagar Kanya sailed from Bombay on the 29th of December 1988 and returned to the Bombay on 14th January 1989. The area covered during the cruise was the coastal and offshore waters off Maharashtra especially around the oil fields off Tarapore, Bombay and Ratnagiri. The main objective of the cruise was to collect the base line data on the prevailing water quality and biological productivity around the oil fields off Maharashtra and to evaluate the status of pollution, if any. Observations were made to study the physical, chemical and biological aspects of the sea around the oil fields. Twenty one stations were monitored between the lat $18^{\circ} 00'$ to $20^{\circ} 05'N$ and long $70^{\circ} 25'$ to $72^{\circ} 40'E$. A transect of 4 stations was covered for 24 hr observations and at two stations sampling was done for about 20 hr each. Samples for the water quality parameters viz; salinity, temperature, pH, DO, phosphate, nitrate, nitrite, ammonia and petroleum hydrocarbon residues were collected from all the stations and analysed. Surface sediments were collected from all the stations for the study of different inorganic and organic parameters. Primary productivity, zooplankton and benthic studies were carried out at all stations. Microbiological studies on vertical variability of microfouling were attempted at 3 stations. Coring was done at stn 13 and 15 by using a deep sea corer. Also a Box corer was used at stn 21. Bottom trawling was done to estimate demersal fishery potential at 7 stations. Experimental toxicity studies were conducted on selected groups of zooplankton by using selected heavy metals.

3. PARTICIPANTS

- a) Scientific component
- Vijayalakshmi R.Nair - Chief Scientist
- K.Govindan
- M.M.Sabnis
- S.N.Gajbhiye
- A.N.Kadam
- Jiyalal Ram
- P.K.Dinesh Kumar
- A.V.Mandalia NIO RC Bombay
- Prashant Sharma
- M.A.Rokade
- Pratik Mehta
- Neelam Lodh
- Anirudh Ram
- S.F.Hasan
- G.K.Chauhan
- N.B.Bhosle
- N.Ramaiah
- L.Krishnakumari NIO, Goa
- Shanta Achuthankutty
- K.Nandakumar
- K.Venkat
- Miss. Sharma
- E.P.Jogadesh JNU, New Delhi
- S. Venkatesan

S.J.Shekhadkar	-	Second Officer
S.D.Warke	-	Chief Radio Officer
N.K.Chattoraj	-	Radio Officer
S.Gokulnath	-	Medical Officer
G.S.D'Silva	-	Purchase Officer
R.V.Lad	-	Chief Engineer
Arun Ajmani	-	Second Engineer
A.Dutta Choudhury	-	Fourth Engineer
M.S.Malkan	-	Fifth Engineer
A.Das	-	Fifth Engineer
B.N.Mistry	-	Electrical Officer
R.M.Fernandes	-	Catering Officer
A.Fernandes	-	Catering Officer (A)

b) Ship's complement

Capt. M.S.L.Fernandes	-	Captain
N.K.Paul	-	Chief Officer
S.J.Shekhadkar	-	Second Officer
S.D.Warke	-	Chief Radio Officer
N.K.Chattoraj	-	Radio Officer
S.Gokulnath	-	Medical Officer
G.S.D'Silva	-	Purchase Officer
R.V.Lad	-	Chief Engineer
Arun Ajmani	-	Second Engineer
A.Dutta Choudhury	-	Fourth Engineer
M.S.Malkan	-	Fifth Engineer
A.Das	-	Fifth Engineer
	-	Deck Officer
	-	Deck Officer
	-	Deck Officer

4. OBJECTIVES OF THE CRUISE

The main objective of the cruise was to evaluate the impact, if any, on the water quality and biological and sediment characteristics in the sea around the oil fields due to oil well operations. The various components involved to cover the above objectives are given below.

I Physical oceanography:

- (a) Salinity and temperature observations on a vertical profile to determine the prevailing water mass and circulation pattern of the region.

II Chemical oceanography:

- (a) Data on standard water quality parameters including levels of petroleum residues - to provide baseline information for evaluating the water quality.
- (b) Accumulation of metals and petroleum residues in selected marine organisms and sediments to indicate their concentrations in sediment as well as bio-accumulation at different trophic levels.

III Biological oceanography:

- (a) Studies on primary, secondary and benthic productivity to estimate the biological production potential of the area.
- (b) Collection of zooplankton using different plankton nets viz; IOSN, Bongo, HT, Neuston and Hamburg - to evaluate precisely the secondary productivity.
- (c) Microbiological studies to determine the occurrence and distribution of different bacterial populations.

- (d) Microfouling experiments to evaluate the spatial and vertical variability in fouling on selected substratum deployed in the sea.
- (e) Bottom trawling to collect fishes for chemical estimations as well as to determine the demersal fishery potential of the area.
- (f) Experimental studies to evaluate the toxicity of selected metals on zooplankton.

5. CRUISE DETAILS

Station locations of ORV. Sagar Kanya cruise No.48 are given in Figure. The summary of the data collected is listed in Table. Of the 21 stations, 4 stations viz; stn 7, 12, 15 and 20 were observed for 24 hr each while at two stations (2 and 18) sampling was carried out for about 20 hr each. Details of the various parameters observed are as follows:

I Physical oceanography:

Salinity and temperature data collected from all stations at standard depth using Nansen bottles attached with reversing thermometers.

II Chemical oceanography:

- (a) The following water quality parameters were determined from all stations at standard depths. - pH, DO, phosphate, nitrate, nitrite and ammonia.
- (b) Water samples were collected at 1 m depth as per IOC procedure for petroleum hydrocarbon analysis.
- (c) Insitu measurements in waterquality parameters viz; temperature, pH, DO, conductivity, ORP and salinity at selected depths viz: 1, 10, 20, 40, 60 and 80 m were carried out by using hydrolab.
- (d) Surface sediments were collected by using van Veen grab to determine sediment texture as well as the concentrations of heavy metals, phenols and petroleum hydrocarbons residues.
- (e) Biological samples (zooplankton, benthos and fishes) were collected for the determination of metals and hydrocarbon accumulation.

- (f) Core samples were collected from two stations by using the deep sea corer for the study of dating and heavy metals analysis.

III Biological oceanography:

Samples were collected to estimate the biological production potential in terms of primary, zooplankton and benthic productivity. The details are as follows:

- (a) **Primary productivity:** Estimation of phytoplankton production at different depth was carried out by ^{14}C method. Estimations of phytoplankton biomass and population in terms of chlorophyll pigments and cell counts respectively were carried out. Also taxonomical studies on phytoplankton were conducted.
- (b) **Zooplankton:** Vertical and horizontal zooplankton samples were collected from all stations using IOSN and Bongo nets respectively for evaluating the abundance and diversity of zooplankton. Other types of plankton nets viz; Newston, Hamburg and HT nets were operated to obtain zooplankton samples for the study of microstructure of the upper layers, macroplankton for the bioassay experiments and also for the accumulation of metals and petroleum hydrocarbons in zooplankton.
- (c) **Benthic productivity:** Bottom sediments were collected for the estimation of benthic productivity in terms of abundance and distribution of macro and meiobenthos. Sediment texture and organic matter were also determined.

Microbiology

Studies were undertaken to estimate the occurrence and distribution of bacterial population in the area. Water samples were collected from 14 stations and analysed for total counts, direct viable counts (DVC), total viable counts (TVC), percentage occurrence of pigmented and heavy metal tolerant bacteria. Aspects on microbial heterotrophic activity and coliform groups viz; Salmonella, Shigella, Escherichia coli, Vibrio spp, total coliforms etc. were covered.

Biofouling

Spatial variability of microfouling on aluminium and fibre glass surfaces was studied at all stations. The results will be correlated to surface temperature, salinity and chlorophyll a. The vertical variability in micro fouling was also carried out at three stations at five depths where the suspended and adsorbed organic matter were compared.

Fishery

Bottom trawling was done at 7 stations for the first time in ORV Sagar Kanya by using a fish trawl net. The catch obtained was used for the estimation of demersal fishery potential as well as accumulation of metals and hydrocarbons in fishes.

Bioassay

Experimental studies to evaluate the toxicity of selected metals on selected groups of zooplankton were carried out.

The present comprehensive survey work carried out during the cruise around the oil fields off Maharashtra, provides a baseline data on the prevailing environmental conditions for the future monitoring programmes.

6. LOSSES/DAMAGES

- (a) One Bongo net along with the plankton bucket was lost. The loss report has been prepared.
- (b) During the operation of gravity corer the steel pipe was damaged and the plastic core lining got jammed inside the pipe. This was brought to the notice of the master who agreed to rectify the damage at the workshop.

7. ACKNOWLEDGEMENTS

The Chief Scientist and other participants of the cruise express their thanks to the Captain, his officers and the crew for the excellent co-operation extended throughout the cruise.

LIST OF PARAMETERS GIVEN IN TABLE

<u>Symbol</u>	<u>Parameters</u>
WP	- Water quality parameters (salinity, temperature, pH, DO, nutrients and petroleum residues)
PP	- Primary productivity (C^{14} , chlorophyll and Phytoplankton count)
ZS	- Zooplankton standing stock
A	- IOSN, Bongo, HT nets operated
B	- Neuston and Hamburg nets operated
BP	- Benthic productivity (Macro and meio benthos)
MS	- Microbiological studies
BS	- Biofouling studies
BT	- Bottom Trawling
SS	- Surface sediments for inorganic and organic analysis
CS	- Core samples

SUMMARY OF OBSERVATIONS

ORV Sagar Kanya
Cruise 48
Annex.

St. No.	Location		ZS										
	Lat.	Long.	WP	PP	A	B	BP	MS	BS	BT	SS	CS	
1	19° 35'	72° 35'	+	+	+		+	+	*			+	
2	20° 05'	72° 30'-60'	+	+	+	+	+	+	+			+	
3	20° 05'	72° 00'	+	+	+		+	+	+			+	
4	20° 05'	71° 30'	+	+	+	+	+	+	+			+	
5	20° 05'	70° 55'	+	+	+	+	+	+	+	+		+	
6	19° 35'	70° 55'	+	+	+		+		+			+	
7	19° 05'	70° 55'	+	+	+	+	+	+	+	+		+	
8	18° 30'	70° 55'	+	+	+		+		+			+	
9	18° 00'	70° 55'	+	+	+	+	+	+	+	+		+	
10	18° 00'	71° 35'	+	+	+	+	+	+	+			+	
11	18° 30'	71° 35'	+	+	+		+		+	+		+	
12	19° 06'	71° 37'-8'	+	+	+	+	+	+	+	+		+	
13	19° 35'	71° 38'	+	+	+		+		+	+		+	
14	19° 35'	72° 00'	+	+	+	+	+		+	+		+	
15	19° 03'	72° 10'	+	+	+		+	+	+			+	
16	18° 30'	72° 08'	+	+	+	+	+		+	+		+	
17	18° 00'	72° 08'	+	+	+		+	+	+			+	
18	18° 00'	72° 40'	+	+	+	+	+	+	+			+	
19	18° 30'	72° 40'	+	+	+		+		+			+	
20	19° 02'	72° 40'	+	+	+	+	+	+	+			+	
21	18° 00'	70° 25'	+	+	+	+	+	+	+			+	