



**SCIENTIFIC REPORT
OF
THIRD INDIAN EXPEDITION TO ANTARCTICA**

TECHNICAL PUBLICATION No 3

**DEPARTMENT OF OCEAN DEVELOPMENT
C G O COMPLEX, LODI ROAD
NEW DELHI-110003
INDIA
1986**

Prepared By

CENTRE FOR EARTH SCIENCE STUDIES TRIVANDRUM

CONTENTS

Introduction	1
Preface	3-4
The Team	5-12
Participants	13-14
Dakshin Gangotri The Indian Permanent Station in Antarctica — P. K .Nair and Harsh K .Gupta	15-18
Section 1 (Meteorology)	
Meteorological observations 1983-84 Antarctic summer 21-47 — N. P Singh K. I Trivedi L. S. Rathore and S R H RIZVI	
Meteorological Studies at Dakshin Gangotri (Antarctica) March 1984 to February 1985 — S .R. H RIZVI	49-73
Section II (Oceanography and Biology)	
Some oceanographic observations in the Polynya and along a section in the southwest Indian/Antarctic Ocean — S.W.A Naqvi	75-85
Studies on Antarctic Phytoplankton — A. Pant	87-96
Daily variations in the abundance of Zooplankton in the coastal waters of Queen Maud Land Antarctica during summer 1983-84 — K .J .Mathew and D. Vincent	97-108
Sponges collected during the Third Indian Antarctic Research Expedition with description of <i>Isodictya</i> <i>Echinata</i> Sp Novo — P.A Thomas and K. J. Mathew	109-116
On the sea birds observed during the Third Indian Antarctic Expedition — K.J. Mathew	117-128
<i>Primnoisis Spicata</i> (Hickson) (Order Gargonacea Lmx Family Isididae Lmx) from the Antarctic Sea — P.A Thomas and K. J. Mathew	129-132
Microbiological studies in Schirmacher Oasis Antarctica Effect of temperature on bacterial populations — S. G. Prabhu Matondkar	133-147

Spatial distribution of Knull (<i>Euphausia Superba</i>) and other Zooplankton off Queen Maud Land Antarctica — K J Mathew	149-159
Latitudinal distribution of Zooplankton in the Southern Ocean with special reference to Euphausiids — K J Mathew and D Vincent	161-174
Aerobiological investigations — S T Tilak	175-177
Section 111 (Geology and Geophysics)	
Geology of Dakshin Gangotri Hill Range Antarctica — R K Singh	181-185
Geology of Schirmacher Range (<i>Dakshin Gangotri</i>) East Antarctica — Sudipta Sengupta	187-217
Sedimentology of the glacial sands and lake terrace sediments from Schirmacher Oasis and sea bed sediment off Princess Astrid Coast Queen Maud Land Antarctica — Madan Lal	219-223
Note on the P-T conditions of metamorphism of Schirmacher Range East Antarctica — G R Ravindra Kumar	225-230
Magnetic characteristics in Antarctica over geological contacts in Schirmacher Hill region and the ice shelf near <i>Dakshin Gangotri</i> (70° 05' 37" S 12° 00' 00" E) — Harsh K Gupta and Ajay Kumar Varma	231-239
Section IV (Environmental Studies)	
A study of Dakshin Gangotri ice-shelf — Satya S Sharma	243-248
Section V (Radiophysics)	
Study of the Ionised and Non-ionised atmosphere during the Third Indian Antarctic Expedition — AK Hanjura	251-254
Section VI (Communication)	
Satellite communication - INMARSAT Terminal — M R Nayak	257-264
Amateur radio operation during the Third Indian Antarctic Expedition 1983-84 — Ashutosh Singh	265-266

INTRODUCTION

The Third Indian Scientific Expedition to Antarctica has created another landmark in India's efforts to unravel the mysteries of the frozen continent which started with the launching of the First Expedition during 1981-82. This Expedition succeeded in establishing India's permanent station Dakshin Gangotri in a record time of one Antarctic summer lasting for about 60 days. After completing the work a team of 12 members was left behind at the station for wintering in Antarctica during 1984. The rest of the summer team returned in March 1984. The first wintering team from India accomplished its task fully and returned in March 1985.

Scientific work carried out by the scientists from India in Antarctica is now internationally recognized India was admitted as a Consultative Party to the Antarctic Treaty in 1983 and became a member of the Scientific Committee on Antarctic Research (SCAR) in 1984.

This publication gives the details of the Indian Station established in Antarctica by the team of the Third Expedition and the research work carried out in the fields of meteorology biology geology and geophysics communication and radiophysics and environmental sciences.

I have no doubt that like the two earlier reports the report of the Third Expedition will also be well received by the Antarctic scientists throughout the world.

SZ QASIM

Department of Ocean Development
Mahasagar Bhavan Block No 12
CGO Complex Lod Road
New Delhi 110003

Having successfully laid the foundation of scientific research in Antarctica during the maiden expedition in 1981-82 and having continued this effort during the second expedition in 1982-'83, the Department of Ocean Development, Government of India, decided to launch the third expedition during the Antarctic summer of 1983-'84. In addition to carrying out scientific work in diversified disciplines, it was decided to set up a permanent station during the summer of 1983-84 at the Dronning Maud ice-shelf region.

The eighty one member team of the Third Indian Scientific Expedition to Antarctica was selected from among the volunteers who had offered their services for the expedition. An Ice Class 1 A Super ship, *M S Finnpolans* from Finn Lines of Finland was chartered for the expedition. The expedition sailed from Goa on December 3, 1983. The expedition accomplished all the tasks assigned to it including the establishment of the permanent station *Dakshin Gangotri* in a record time of eight weeks. The first Antarctic wintering by the Indian team of twelve members commenced from March 1, 1984 when *M S Finnpolans* sailed from Antarctica with the remaining members of the third expedition. The summer team reached Goa on March 29, 1984 and the wintering team returned on March 25 1985.

It is gratifying to note that the Third Indian Scientific Expedition to Antarctica met with complete success, inspite of inhospitable conditions and several problems and set backs, due to hard and committed team work.

This report presents the results of scientific work carried out by the Third Expedition in the fields of oceanography, geology, glaciology, geophysics, meteorology, biology and communication studies. A brief article describing the Indian Station, *Dakshin Gangotri* has been included to let the readers know about the facilities for living and scientific work, created at Antarctica.

On behalf of the members of the Third Indian Scientific Expedition to Antarctica and on my personal behalf, I wish to express our deep sense of gratitude to Shrimati Indira Gandhi, late Prime Minister of India, for her initiative and interest in the expedition, and to Shri Rajiv Gandhi, Prime Minister of India for continued support. We are thankful to S/Shri Shivaraj Patil and K R Narayanan, Ministers of State for Science & Technology for their encouragements and Shri K Karunakaran Chief Minister of Kerala for his support.

We are grateful to Dr S Z Qasim Secretary Department of Ocean Development, the architect of the Indian Scientific Programme in Antarctica, for his continued support, guidance and advice through out the mission. We are thankful to Shn J L Sarin, Director, D O D for his untiring efforts in organising the expedition and maintaining liaison between the team members and their families. Several other officers and staff members of Department of Ocean Development, particularly Shri A K Mathur, Financial Advisor and Dr Abidi, Principle Scientific Officer, helped us. Shri P S Singh did much of the running around and had a solution for most of our problems.

The largest scientific component of the expedition team came from C S I R. We would like to thank Drs G S Sidhu, S Varadarajan and A P Mitra, Director Generals of C S I R for their continued help. Dr V V R Varadachari, Director (since retired), National Institute of Oceanography and several

other officers from N I O particularly Dr Parulekar deserve our thanks for the support provided on our departure from and arrival to Goa. We are thankful to the Port Authorities of Goa for their help.

We would also like to thank Director General I M D Director General G S I Chairman O N G C Director N P L Vice-Chancellors of Jadavpur and Delhi Universities Director C M F R I and Films Division for providing personnel and equipments for the expedition.

Our thanks are due to the Chief of the Army Staff Chief of the Naval Staff Chief of the Air Staff Lt Gen G S Rawat Air Marshal K D Chadha Vice Admiral J G Nadkarni Maj Gen P N Kapoor Lt Gen A R Subramanian Brig B M Seth Capt P I Ommen Air Commodore D S Jog who provided excellent officers men and equipment for the expedition. They stood like a rock behind us and gave us all that we needed. We would also like to thank the officers and crew of *Finnpolans* for their assistance throughout the expedition. We are thankful to Mr Prem Singh High Commissioner of India at Mauritius and other High Commission personnel for their help and hospitality. I would like to thank Shri V Ramachandran Chief Secretary Government of Kerala for several useful suggestions and all the support.

In the end I would like to thank all members of the team for their hard work which made the expedition a success and to Department of Ocean Development for giving me the opportunity of being associated with this prestigious project

My thanks are also due to several of my colleagues particularly Dr K J Mathew and Mr N P Singh for reviewing the manuscripts S/Shri P K Thampi P P Kurien P G V Panicker B Sukumar Rajasekharan Nair S Devadas C K Sasidharan and Smt C R Leelamma of Centre for Earth Science Studies have assisted me in preparing this report.

Centre for Earth Science Studies,
Trivandrum-695 031, India.
December, 1986.

HARSH K. GUPTA

THE TEAM



Harsh K Gupta
(Leader)



Aditi Pant



Sudipta Sengupta



S W A Naqvi



M R Nayak



M Manoharan



A K Hanjura



K J Mathew



R K Singh

THE TEAM (Contd)



L S Rathore



J M Vartak



Madan Lal



A K Baksh



Ashutosh Singh



P K Nair



H C Lohumi



A Harnal



A S Patil



A T Parnaik



G P Krishnamurthy



P L Dwivedi

THE TEAM (Contd)



J S Kalliraman



Malkan Singh



K P Mohan Kumar



Shiv Kumar



D R Reddy



B V Subraya



Jit Ram



Shamsher Singh



K G Subramani



Robert Francis



Dayal Singh



Jagtar Singh

THE TEAM (Contd)



Gajanan Jadav



Balwant Singh



A Suregunkar



S Sekhar



Baldev Banger



M Govindaraj



T Gopal Reddy



Th mmaiah



K G Pillai



Deva Sagayam



V P Sathiamoorthy



S K Chandna

THE TEAM (Contd)



R S Gill



A S Chouhan



N P Singh



A A Khan



M S Khela



P K Balakrishnan



R K Kapoor



Hoshar Singh



D Sebastian



C Venugopalan



R S Tandon



B D Madhok

THE TEAM (Contd)



V Natarajan



K I Trivedi



G Ajit Kumar



V M Khanna



M M Rai



Joseph Mathews



R N Viswakarma



S B Gupta



A B Jadhav



K N Mandal



B K Singh



S K S Puri

WINTERING TEAM-1984



**S S Sharma (Dy leader
and Station Commander)**



S R H Rizv



S G Prabhu Matondkar



Ram Kumar



R R Sinha



Paramjit Singh



S Joseph



V S Rana



Padmansbhan



C S Thampi



S Sadekar



Alope Banerjee

PARTICIPANTS

Centre for Earth Science Studies Tnvandrum

Dr Harsh K Gupta (Leader)

National institute of Oceanography Goa

Dr (Miss) Ad ti Pant

Mr M R Nayak

Mr SWA Naqvi

Mr M Manoharan

National Physical Laboratory New Delhi

Dr A K Hanjura

Central Marine Fisheries Research Institute Cochin

Dr KJ Mathew

Geological Survey of India Calcutta

Mr R K Singh

India Meteorological Department New Delhi

Dr LS Rathore

Ministry of Information & Broadcasting New Delhi

Mr J M Vartak

Oil & Natural Gas Commission Dehra Dun

Dr Madan Lai

Jadavpur University Calcutta

Dr (Miss) Sudipta Sengupta

Delhi University (ARSD College) Delhi

Dr A K Bakshi

Amateur Radio Association New Delhi

Mr Ashutosh Singh

Indian Army

Mai PK Nair

Capt H C Lohumi

Capt A Harnal

Capt A S Patil

Capt AT Parnaik

Capt G P Knshnamurthy

Nk Sub P L Dwivedi

Nk Sub J S Kalliraman

Hav Maj (Tech) Malkhan Singh

L/Hav K P Mohan Kumar

Hav Shiv Kumar

Hav D R Reddy

Hav B V Subraya

Hav Jit Ram

Hav Shamsher Singh

Hav KG Subramani

Nk Robert Francis

Nk Dayal Singh

Nk Jagtar Singh

Nk Gajanan Jadav

Nk Balwant Singh

L/Nk A Suregaonkar

L/Nk S Sekhar

L/Nk Baldev Banger

L/Nk Govinda Raj

J/Nk T Gopal Reddy

L/Nk Thimmaiah

Nk KG Pillai

Spr Deva Sagayam

Indian Navy

Cdr VP Sathiamoorthy

Cdr S K Chandna

Lt Cdr RS Gill

Lt Cdr AS Chauhan

Lt Cdr N P Singh

Lt A A Khan

Lt MS Khela

AA3 P K Balaknshnan

Poelar R K Kapoor

AL3 Hoshiar Singh

CK 0 D Sebastian

CK 0 C Venugopalan

Indian Air Force

Wg Cdr R S Tandon

Wq Cdr B D Madhok

Wg Cdr V Natarajan

Sq Ldr K I Trivedi

Fit Lt G Ajit Kumar

Fit Lt V M Khanna

Fit Lt M M Rai

Sgt Joseph Mathews

Sgt R N Vishwakarma

Sgt S B Gupta

Sgt A B Jadhav

Cpl KN Mandal

Armed Forces Medical Services

Maj B K Singh

Sqn Ldr SKS Pun

WINTERING PARTY

**Research & Development Organisation,
Ministry of Defence, Pune.**

Lt. Col. S.S. Sharma (Dy. Leader &
Station Commander)

India Meteorological Department, New Delhi.

Dr S.R H. Rizvi

National Institute of Oceanography, Goa.

Mr. S.G. Prabhu Matondkar

Armed Forces Medical Services

Surgeon. Lt. Cdr. Alope Banerjee

Indian Army

Maj. Ram Kumar

Capt. RR Sinha

Capt. Paramjit Singh

Nk. Sub. S. Joseph

Nk. Sub. V.S. Rana

Hav. Padmanabhan

L/Nk. C S. Thampi

L/Nk S. Sadekar