



INTERNATIONAL INDIAN OCEAN EXPEDITION

NEWSLETTER

INDIA

No. 2



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INTERNATIONAL INDIAN OCEAN EXPEDITION

NEWSLETTER INDIA

No. 2

SEPTEMBER, 1963

Since the issue of Newsletter No. 1 considerable progress has been made both in the Indian Scientific Programme and in the Programme of other countries participating in the International Indian Ocean Expedition.

Indian Programme

INS Kistna and *RV Varuna* are now participating in the monsoon cruising programmes. These programmes were finalised in the month of June 1963.

The cruises of *INS Kistna* commenced on July 18, 1963. The vessel has completed six cruises so far. In the first three cruises it was not possible strictly to adhere to the cruise plans because of very rough weather. In these cruises all the scientific disciplines mentioned in the Indian Scientific Programme were covered with the exception of geological and geophysical studies, as the equipment for these studies have not yet arrived. When the ship cruises in the Andamans-Nicobars region, it is proposed to carry out a few trial fishing for tuna and other related fishes using longlines. For this purpose, fishing technicians from the Government of India Off-shore Fishing Stations and the Andamans Administration will be taken on board the ship and the scientists will have an opportunity to study the fish populations in a typically upwelling region.

The cruising programme of *R. V. Varuna* commenced in late July and the area of operation for this vessel is limited to the continental shelf between Cape Comorin in the south and Ratnagiri in the north. The stations are, however, more

closely spaced than in the case of *INS Kistna*. The emphasis is on intensive studies over a limited area.

Data Processing

The processing of the data collected during the earlier cruises has made some progress. As the data collected relate to different scientific disciplines, the processing of data is now undertaken by different organizations specialising in the particular disciplines. The participating institutions in the country have been requested to send all processed data to the Director, Indian Ocean Expedition, with a view to establishing a data centre from which information could be disseminated to interested organizations within the country as well as outside. The data are to be entered in the standard cards so that exchange of data on an international basis could be facilitated.

Equipment

Most of the equipment ordered under the foreign exchange allocation made during the last year are expected to be received before the end of the year. The Edo Echo Sounder (Model No. 185-complete for 115 volts, 60 cycles to be worked with 220 v. DC Supply) and new Bathythermographs have been put on board *INS Kistna*. The Precision Depth Recorder (P.D.R.) which is to be operated in conjunction with the Echo-Sounder has just been received and will soon be installed on board *INS Kistna*. With the Echo Sounder and the P.D.R., systematic studies of bottom profiles and studies on the Deep Scattering Layer will be commenced soon.

Essential items of equipment intended for the study of biological productivity of the different areas have been received by the Central Marine Fisheries Research Institute, Mandapam Camp, for carrying out the investigations included in the Indian Scientific Programme. The foreign exchange allocation for this equipment was arranged by the National Committee.

Under the contract with the UNESCO for procurement of essential oceanographic equipment for the physical and biological programmes a number of instruments and laboratory goods have already been received. The physical oceanographic equipment, such as Inductive Salinometer, Nansen Reversing bottles, pH Meter, etc. have been placed on board *INS Kistna* for use during the cruises. The biological equipment are in use at the Indian Ocean Biological Centre.

A deep freeze unit has been installed on board *INS Kistna* for freezing and preserving sea water samples collected during the cruises. Interesting biological specimens can also be kept frozen in the deep freeze for making studies on fresh material. Frozen samples of sea water will be analysed for nutrients and other trace elements in the shore laboratories.

A medium type winch capable of carrying 2000 m. of 8.0 mm. wire is on order through the UNESCO. When received this will be used to operate corers and other bottom sampling devices to obtain material for study by the geology and geophysics group.

Indian Ocean Biological Centre (IOBC)

The report of the Curator, IOBC for period ending August, 1963 outlining the progress in the sorting and related work at the Centre has been received.

According to the report the total number of samples received for sorting at the Centre from different participating countries including India up to the middle of August 1963 are as shown below:

Australia	— 62 samples
India	— 185 „
Japan	— 20 „

Union of South Africa	— 58 samples
U.S.A.	— 167 „

Out of this total of 492 plankton samples, 62% were taken by the Indian Ocean Standard Net collections and the rest collected by other types of gear. 48 samples are expected to be received from the U.S.S.R. (collected by *R. V. Vityaz*).

Of these samples, 114 have been sorted up to the middle of August 1963. Strengthening of the staff position at the centre will enable better turnover.

The report also stresses the need for increasing the proportion of standard net collections by the participating ships of various countries. Those ships which have lost Indian Ocean Standard Net during their cruises may obtain replacements by approaching the UNESCO Office of Oceanography, Paris. A limited number of standard nets have been placed at the disposal of the Curator, IOBC, Ernakulam and ships which are likely to call at Cochin and which do not have standard nets on board may obtain them from the Curator, Indian Ocean Biological Centre, Ernakulam—6, Tel. No. 3306.

The Indian Ocean Biological Centre will also undertake sorting of non-standard collections in a limited way on contract basis from those participating countries who desire to have this service.

International Meteorological Centre, Bombay

The activities of the International Meteorological Centre (IMC), Bombay are summarised from the reports of Dr. C. S. Ramage, Scientific Director of the U.S. Meteorology Programme and International Coordinator in Meteorology.

The IMC is receiving all weather data from the Indian region, teletype data from Moscow and Tokyo, and broadcasts from Djakarta, Saigon, Nairobi, Canberra, Singapore, Manila and Colombo. Published synoptic data are being received from Pakistan, South Africa, U.A.R. and Vietnam. The Centre prepares regularly synoptic surface and upper air charts up to 100 mb. with all avail-

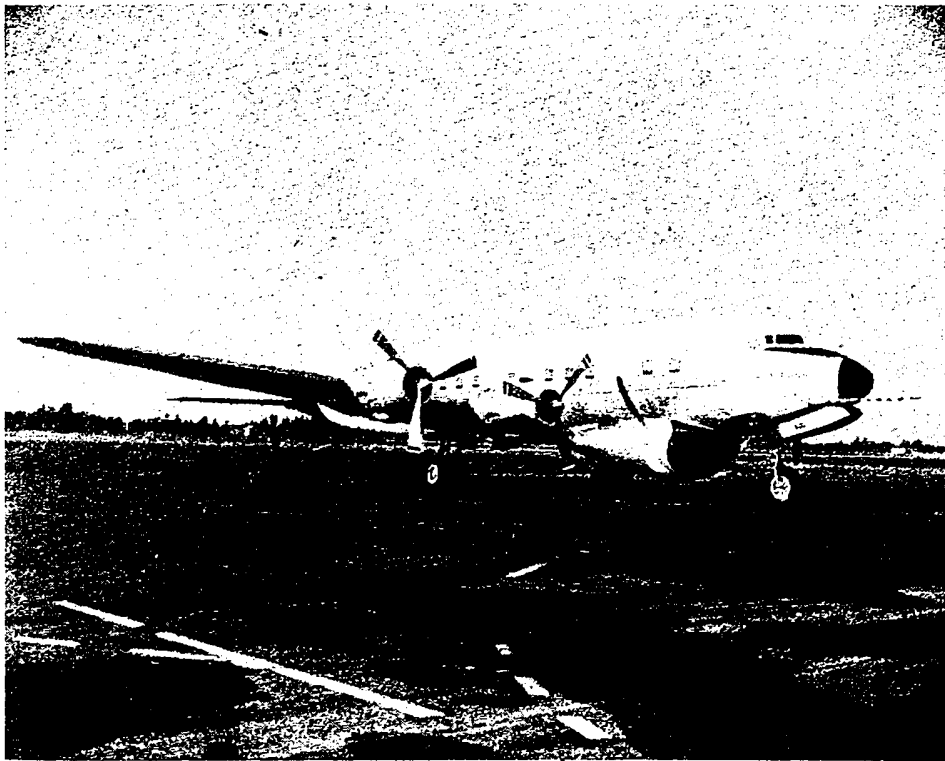
able information over the whole area bounded 45° N to 45° S Lat. and 20° E to 150° E Long. These charts are subjected to kinematic analysis and presented before a discussion group every day. Arrangements have been made for the reproduction of these charts for study purposes.

An IBM 1620 computer for the processing of data is expected to go into operation by the end of 1963. Till that time this facility is provided by the Physical Research Laboratory, Ahmedabad.

UNESCO has provided 4 scholarships for meteorologists from other south Asian countries to work at the IMC, Bombay.

Weather Aircraft Flights

Instrumented aircraft of the U.S. Weather Bureau Research Flight Facility and the Woods Hole Oceanographic Institution, USA (total five in all) which had commenced their Research Flight Programme in May 1963 have completed their flights and returned to USA. They have done in all 56 scientific missions with their base in Bombay. Their programme included (1) study of the active Bay of Bengal monsoon (2) detailed study of the east Indian Ocean Equatorial region (3) turbulence associated with speed maxima in the low-level winds (4) intensive examination of the fluctuating monsoon over east



DC-6 Instrumented aircraft of U. S. Weather Bureau.

Arabian Sea (5) two penetrations into the eye of the Tropical cyclone and (6) observations using Drop-sondes. The personnel of the Indian Meteorological Department participated in the research flights programme along with the U.S. meteorologists.

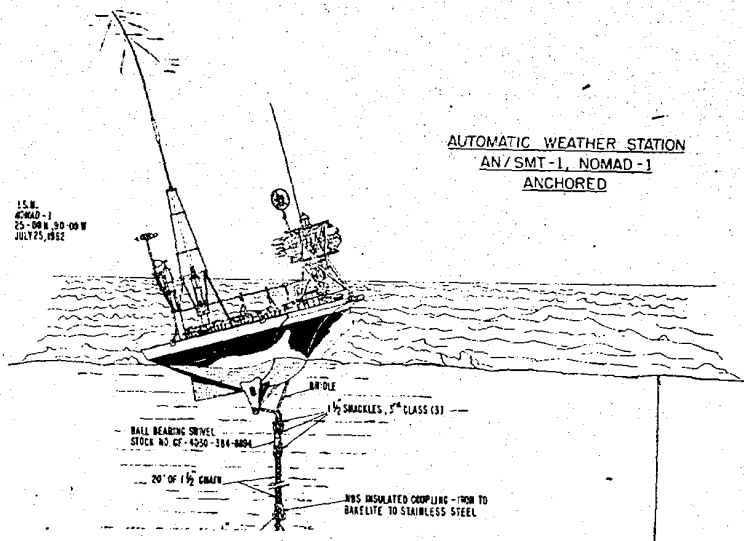
Before returning to the USA, one of the aircraft arrived in Delhi (Palam) and a demonstration flight was made on July 15, 1963. On this flight, the Prime Minister, Hon. Ministers for Scientific Research and Cultural Affairs, Defence

and Transport and Communications and other distinguished officials and scientists were taken and the operation of the various instruments were demonstrated. Dr. C. S. Ramage, Scientific Director of U.S. Meteorology Programme explained to the distinguished guests the various types of information collected by these instruments.

These aircraft are again expected in January 1964 for further studies to cover the North-east monsoon period.

* * *

Automatic Weather Buoy *NOMAD*



The *NOMAD* has arrived and is undergoing preliminary trials in the boat basin at Madras. By the end of September 1963, it is expected that the buoy will be towed to its anchorage (12.5° N—86.5° E) in the Bay of Bengal. *INS Kistna* is being specially commissioned for this purpose between her 14th and 15th scientific cruises.

* * *

Unesco Fellowships in Connection with the International Indian Ocean Expedition

The following fellowships were awarded:

(a) *Shipboard fellowship*
Shri P. K. Eapen

Modern Fish Finder Techniques on board *RRS Discovery* (UK)

(b) Regular fellowships for institutional training

(i) Shri D. V. Subba Rao

Training for 9 months in Marine Biology at the C.S.I.R.O., Australia.

(ii) Shri R. S. Shenoi Training for 7 months in Marine Geology at the Institute of Oceanology, USSR, Moscow.

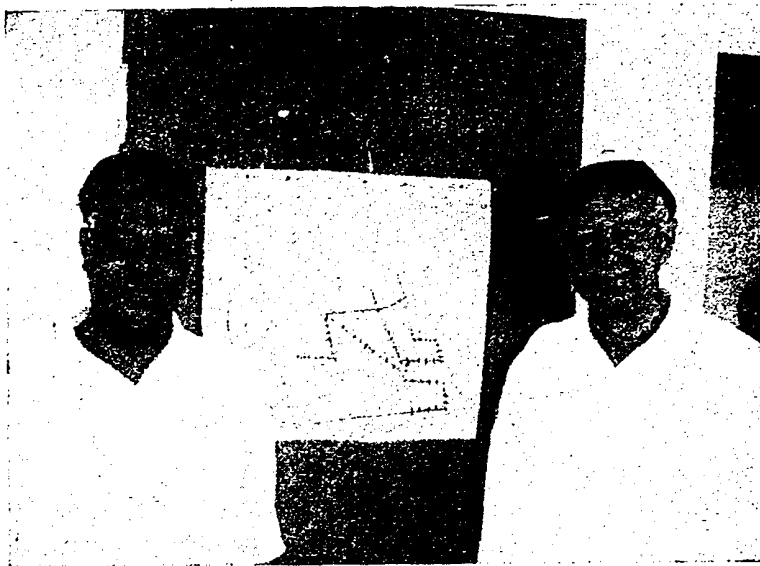
Programme of other Participating Countries

U. S. A.

The *R. V. Anton Bruun* returned to Bombay on July 22, 1963 at the end of her second cruise. The main aim of this cruise was exploratory long line fishery survey in the Indian Ocean south of equator. The ship left Bombay on her third and fourth cruises on August 12, 1963. It is anticipated that some space will be available

leadership of Dr. G. L. Clarke and Dr. John H. Ryther respectively. The emphasis will be on biological and productivity studies and distribution of chemical nutrients. The second part of the fourth cruise will have fishing as the main objective and will be under the leadership of Dr. A. T. Pruter.

R. V. Atlantis II arrived in Bombay on August 15, 1963 to carry out studies in the Indian Ocean. This 2300 ton all-weather vessel, belonging to the Woods Hole Oceanographic Institution, is now on her first long expedition after a few cruises in the Atlantic. She has a steam trawl winch and two hydrographic winches carrying 30,000 feet of stainless steel wire to lower deep-sea cameras, sampling bottles, dredges and coring gear. A hydraulic crane is fitted on the after deck



Dr. N. K. Panikkar, Director, Indian Programme with Dr. E. C. LaFond, Chief Scientist on board *The Anton Bruun*.

for Indian scientists during the second part of the fourth cruises of this ship.

The third cruise and part of the fourth cruise will be mainly oceanographic cruises under the

for handling the more cumbersome gear. This vessel will mainly concentrate on physical and chemical oceanographic studies. Among the various items of work planned, the most important

are collection of upper air data using radio-sonde balloons, salinity measurements using the salinometer, continuous surface temperature recordings, BT lowerings, current measurements using current meters, deep-floating Swallow floats and parachute drogues. Detailed studies of the Somali current are also being planned. Continuous echosounding to get the picture of the sea bottom will also be made. The main area of observation of this vessel will be the whole of the Arabian Sea and western Indian Ocean down to 40° S. Latitude. The first cruise is under the leadership of Dr. A. R. Miller, a distinguished U.S. Physical Oceanographer.

Hospitality was extended to the scientists of the ship by the Hospitality Committee of Indian National Committee on Oceanic Research at Bombay. A reception was held in honour of the visiting ship on August 16, 1963 at Bombay. The ship left Bombay on August 19, 1963 on her scientific mission.

Dr. N.K. Panikkar, Director of the Indian Programme visited the scientists on board the ship at Bombay on August 17, 1963 and held discussions with Dr. A. R. Miller, the Chief Scientist and Prof. P. Tchernia of Paris who was one of the guest scientists during the ship's cruises between Aden and Bombay.

U. K.

Dr. A. Prakash of the Fisheries Research Board of Canada who participated in the cruise of R.R.S. *Discovery* during July-August 1963 writes to us as follows:

"Royal Research Ship '*Discovery*' left Plymouth U.K., on June 1, 1963 with a complement of 20 scientific and technical personnel under the leadership of Mr. Ronald Currie of the National Institute of Oceanography. The first cruise of *Discovery* along the south Arabian coast lasted 59 days from June 23 to August 20. Since the emphasis on this cruise was mainly biological, a comprehensive survey of the south Arabian coastal upwelling region was carried out up to 200 miles offshore. This survey included zooplank-

ton sampling up to a depth of 1000 metres, phytoplankton sampling up to 100 metres, chlorophyll determinations, benthic sampling, Isaacs—Kidd trawling, and bacteriological sampling.

In addition to this biological programme, intensive chemical and physical measurements were made in order to understand the cycle of events in the upwelling region and to assess the magnitude of productivity in relation to current boundaries and water layerings. Records were also kept of the birds at sea off the Arabian coast. Some interesting 'deep scattering layers' were discovered using a special narrow-beam Sonar. Of particular mention are the sighting of *Trichodesmium* and *Gonyaulax* blooms on July 27 and August 3 respectively. The latter was seen as an extensive patch of deep rusty water almost entirely composed of dinoflagellates.

The first cruise of RRS *Discovery* terminated at Aden and on August 23 she left for Geophysical reconnaissance 'along the Carlsberg ridge.'

Scientific Committee on Oceanic Research (Scor) and Inter-Governmental Oceanographic Commission (IOC)

IOC

The Bureau and Consultative Committee of the IOC met in Moscow from May 6 to 8, 1963. Summary report of the proceedings gives the progress in the implementation of various resolutions passed at the second Session of IOC in Paris.

Many of the countries participating in the IIOE have appointed national coordinators. The SCOR has appointed the following disciplinary experts to review the status of work in various fields:

1. Prof. Johannes Krey,
Institut für Meereskunde der Universität
Kiel, Hohenbergstrasse 2, Kiel, W. Germany.
—Phytoplankton, Zooplankton, Primary
Production pigments;
2. Mr. Paul Tchernia,
Laboratoire d' Oceanographie Physique,

Museum National d' Histoire Naturella,
43, rue Cuvier, Paris-5, France.

—Dynamics and circulation chemistry;

3. Prof. L. A. Zenkevich,
Maronovsky Per Ul'ok-26,
Moscow-49, U.S.S.R.
—Benthos, midwater and deep fauna;
4. Prof. C. S. Ramage,
International Meteorological Centre
Colaba Observatories, Colaba, Bombay-5,
India.
—Meteorology;
5. Mr. D.N.F. Hall,
Director, East African Marine Fisheries
Research Organization,
Zanzibar,
—Fisheries.

The preliminary reports from the experts have been received. An IIOE coordination meeting is being planned to be held from January 22 to 24, 1964. Participants will exchange information, and secretariat of IOC would help in this. UNESCO plans to issue collected reprints of IIOE.

Plans have been approved to hold a Second International Oceanographic Congress either in 1965 or 1966, possibly in USSR. The General theme of the Congress will be "Resources of the Ocean—Ocean Research for the benefit of the mankind." The subject matter has been tentatively divided into the following categories:

- (i) Ocean and atmosphere
- (ii) Ocean and life
- (iii) Ocean and land
- (iv) Marine Geology and mineral resources of the Ocean.
- (v) Oceanography of the Indian Ocean and the Antarctic region.

SCOR

The SCOR which serves as an advisory body to both UNESCO and IOC held its sixth meeting in Halifax from April 3 to 9, 1963. Dr. N. K. Panikkar, from India participated

in the meeting in his capacity as a member of the SCOR. For the first time, in addition to its business meetings, three scientific symposia were held in the following subjects.

(1) *Marine Bio-geo-chemistry*: Discussions related to: Concentration of elements in marine organisms. Production of compounds by organisms through their influence on the environment. Fractionation and separation processes and Biochemical cycles.

(2) *General Scientific Framework symposium*: —organised under the following heads: Introduction under objectives; Basic problems in Oceanic Circulation; Marine Geophysics; Research in Marine Resources; Studies of bottom features; Air-Sea interaction and Operational Oceanic forecasting; New Techniques in marine navigation; Research programmes of the Arctic Ocean; Summary of available and required facilities, ships and manpower.

(3) *Intercalibration and standardization*: Discussions included methods on oxygen determination, conductivity and total solids, measurement of solar radiation—both incident and submarine, primary production and plankton enumeration.

SCOR recommended that national committees should continue their examination of oceanographic techniques, that international tests for the intercomparison of the methods be held in 1965 and that UNESCO should consider publication of a monograph on various aspects of oceanographic methodology.

A working group on Atlases with particular reference to IIOE has been formed with Mr. Joseph L. Reid, Jr. as Chairman and Prof. Bezrukov, Prof. S. Motoda, Prof. C. S. Ramage and Dr. Vagn Hansen as members.

News Briefs

Infra-Red Radiation Thermometer

A relatively inexpensive Infra-Red radiation thermometer (IRT) developed by M/S Barnes

Engineering Co., Stamford, Connecticut USA has been used by the U.S. Bureau of Sport Fisheries and Wildlife for an aerial survey of temperature and water movement along the Atlantic coast of USA. The principle of operation of the equipment is briefly described. The IRT operates by measuring the changes in electrical resistance of a detector flake which results from heating of the flake by infra-red radiation. The signal output is read out on a meter (or strip chart recorder) calibrated in ° F. The optical system of the instrument is designed to pass only wave lengths in the 8-13 micron band. This virtually eliminates reflected radiation and radiation from the atmosphere itself which are composed mostly of wave lengths outside the 8 to 13 micron band.

Satellites to Collect Oceanographic Data

Oceanographic data collection by satellites is expected to become a reality in the near future. National Aeronautics and Space Administration (NASA) prompted by the increasing need for the satellite collection of oceanographic, meteorological and other types of data from remote platforms, has initiated a programme for the development of a system. These satellites will be equipped with telemetry transponders and teletype recorders to record the incoming data.”—

(From National Oceanographic Data Centre, Newsletter Washington, D.C. USA April 30, 1963)

Umitaka & Cocos Sea Mountain

“The tentatively named ‘Umitaka Sea Mountain’ is a Sea mountain located south-west of Andaman Island. The mountain rises from the sea bed of 4000 m. depth up to depth of 2000 m. Some surface samples of the mountain were obtained by dredging, but since these were surface deposits, basement characteristics of the mountain are still unknown.

The tentatively named “Cocos sea mountain” is located some 79 miles south-west of Cocos Island, and rises from the 4000 m. flat sea bed

from up to a depth of 700 m. Some specimens were obtained from the bottom with N-type dredge. These contained rocks, gravel, deep-sea coral, and remains of life and small amount of marine life. Clear trace of melting was observed upon the surface of limestone which presumably forms the basement. Careful future study is needed to clarify the exact geological characteristics of the sea mount.”—

(From IIOE Newsletter, Japan, March 1963)

Indian National Committee on Oceanic Research

1. The Indian National Committee on Oceanic Research met on August 1, 1963 to review the progress of the Indian participation in the International Indian Ocean Expedition. Prior to its meeting, the Working Groups in various disciplines met separately to assess the progress so far made under each discipline and examine reorientation in the programme if necessary. Their reports were also presented before the National Committee for further discussion.

The following are the salient points mentioned in the various Working Group reports:

Physical Oceanography—

- 1) Preliminary processing of the Physical Oceanography data for 1962 cruises have been completed.
- 2) Direct current measurement programme will be started as soon as the TSK—self-recording current meters, which are on order through UNESCO, are received.
- 3) Seismic exploration studies will be started by DSR (Navy) as soon as the sonobuoy and other accessories are ready. Some receivers have been obtained by the DSR (Navy) on loan from the New Zealand Government.

Meteorology—

1. Work relating to Instrumentation for the Shallow Water Observatory at Chilka lake

is in progress at the Meteorological Office, Poona. The instruments will be first tested in a lake near Poona and then transferred to a suitable site in the Chilka lake area. The site has to be arranged with the help of the Government of Orissa.

2. Shore-based Wave recorders are to be installed by the India Meteorological Department at Bombay, Mangalore and Visakhapatnam. The recorders are on order and as soon as they are received, the installation will be undertaken.
3. The Naval scientific group are to take up the work of installing a wave recorder at Mormagao (Goa).
4. The microseismic station originally proposed for Minicoy is to be set up at Trivandrum as Minicoy is considered to have no particular advantage and Trivandrum will be most suitable from several points of view.

Chemical Oceanography—

1. Under the nutrient chemistry programme estimations for silicates on the INS *Kistna* collections are carried out for the present at the Tata Institute of Fundamental Research, Bombay.
2. A simple technique evolved by Dr. Lal and his group at the Tata Institute of Fundamental Research, Bombay for concentrating trace elements from sea water would merit detailed study. The technique employs bathing sponges coated with ferric chloride for concentrating the trace metals.

Marine Biology & Fisheries—

1. Standard plankton collections and sorting are going on according to schedule.
2. The study of euphotic zone could be made a collaborated programme between Dr. Vaidya and his team at the National Physical Laboratory, New Delhi and Dr. Prasad and his team at the Central Marine Fisheries Research Institute, Mandapam.

Marine Geology & Geophysics—

1. Marine Geology programme will be started as soon as the medium type winch on order through UNESCO is received; gravity trolleys and snappers will be used to obtain bottom samples.
2. Survey of India and the Directorate of Scientific Research (Navy) will undertake magnetic studies using the Precession magnetometer.
3. Echosounder with PDR will be used for bottom profile studies.

One of the important items of discussion at the National Committee was a long range plan for promoting oceanographic research in the country. There was unanimous agreement among the members for the establishment of a National Institute of Oceanography in the country.

A working group has been formed to plan out a comprehensive programme of work on "Coastal Problems and nearshore Oceanography" as part of the Indian participation in the International Indian Ocean Expedition. The group is to be headed by Dr. D. V. Joglekar, Adviser to the Central Board of Irrigation and Power and is to consist of the following members drawn from the various organizations interested in these problems:

1. Dr. M. S. Krishnan,
Director,
National Geophysical Research Institute,
Hyderabad.
2. Dr. N. K. Panikkar,
Director,
Indian Ocean Expedition,
CSIR, New Delhi.
3. Shri K. K. Framji,
Engineer and Joint Secretary,
Ministry of Irrigation &
Power, New Delhi.
4. Shri C. V. Venkateswaran,
Development Adviser,
Ministry of Transport &
Communications, New Delhi.

5. Shri K. L. Bhatia
Secretary,
Central Board of Irrigation
and Power, New Delhi.
6. Shri K. T. Ganapathy
Executive Engineer
Irrigation Research Station,
Poondi (Madras)
7. Shri K. K. N. Nambiar,
Executive Engineer, Kerala
Engineering Research Insti-
tute, Peechi.
8. Dr. P. R. Pisharoty,
Director,
Institute of Tropical Meteor-
ology, Poona.
9. Dr. C. V. Gole
Director
Central Water & Power
Research Station,
Poona.
10. Dr. D. Srinivasan,
Naval Physical Laboratory,
Cochin.
11. Dr. M. N. Qureshy,
C/o Shri L. N. Kailasam,
Chief Geophysicist Geo-
logical Survey of India, 15 A,
Kyd Street, Calcutta-16.

Miscellaneous

1. A rough cut of the film on the "International Indian Ocean Expedition" has been completed by the Films Division, Ministry of Information & Broadcasting. The film is presently under review by UNESCO.

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2. One of the latest oceanographic Research ships to enter marine research is *Jalanidhi*. This ship was built by The Sasebo Heavy Industries Co. Ltd., of Japan and was delivered to Indonesia on Jan. 12, 1963. Brief description of the vessel is as follows:

Gross tonnage 746; overall length 53.9 metres. Accommodation is provided for 12 officers, 26

crewmen and 26 research workers. She is fitted with a balloon station, a code recorder and radio-sonde equipment for aerological observation. There is a precision echo sounder for 10,000—meter deep-sea use, a fish 'mirror' (an echo sounder operable in all directions), and a telefinder, an echo sounder for detecting characteristics of the bottom of the sea. In addition, there is carbon-14 tracer laboratory for the measurement of basic productivity of sea water samples and a soft X-ray projector for X-ray observation of fish. For experiments on embryological and physiological studies of plankton, fish eggs and larvae for the estimation of stock size and fluctuation of fisheries resources, a graduated thermal incubator is installed, and there is also a non-graduated thermal incubator for embryological and taxonomical studies of fish eggs and larvae.

Jalanidhi is scheduled to participate in the International Indian Ocean Expedition.

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3. The German research vessel *Meteor II*, now under construction, will take part in the IIOE during the winter 1964-65. Her main working region will be Arabian Sea.

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4. On August 1, 1963, a seminar was held at the International Meteorological Centre, Bombay on "Preliminary results and future plans of the International Indian Ocean Expedition Meteorology Programme." The Seminar was jointly sponsored by the U.S. National Science Foundation and the United States Information Service. 47 meteorologists attended the seminar. The topics discussed included upper air climatology, computer processing of data, Central Indian and Peninsular thunderstorms, synoptic oscillations of transition season highs over Arabian and equatorial extension of troughs in the upper westerlies, land and sea breeze circulations of the Indian Peninsula, atmosphere-ocean interaction over the Arabian Sea, the Bay of Bengal monsoon and monsoon definition.

5. The plan of operation for the International Meteorological Centre and the Institute of Tropical Meteorology was signed at the meeting held on 20th August, 1963 between India and the representatives of the U.N. Special Fund.



6. Mr. Kyotaro Kawaguchi, FAO expert on Tuna longlining assigned for work with the Government of India, Ministry of Food and Agriculture visited the office of the Indian Ocean Expedition on September 6, 1963 and had discussions with Dr. N. K. Panikkar.



7. Mr. D. N. F. Hall, Director of the East African Marine Fisheries Research Organization, Zanzibar and Subject Leader for Fisheries for the International Indian Ocean Expedition is currently in India visiting places of fisheries interest, to acquaint himself with the fishery research problems pursued in the country and to determine to what extent the International Indian Ocean Expedition could help for the development of fisheries in the Indian Ocean region. He held preliminary discussions in Delhi with Dr. D. N. Wadia, Chairman of the Indian National Committee on Oceanic Research, Dr. S. H. Zaheer, Director-General, Scientific and Industrial Research and Dr. N. K. Panikkar, Director, Indian Programme. He also met Fishery Officials of the Government of India, Ministry of Food & Agriculture on September 9 & 10, 1963 and will be visiting various fishery research centres. Mr. Hall gives the following preliminary assessment of his assignment:

“The existing fisheries of the countries surrounding the Indian Ocean depend upon the inter-play of three basic factors:

(i) the types of fish which are present

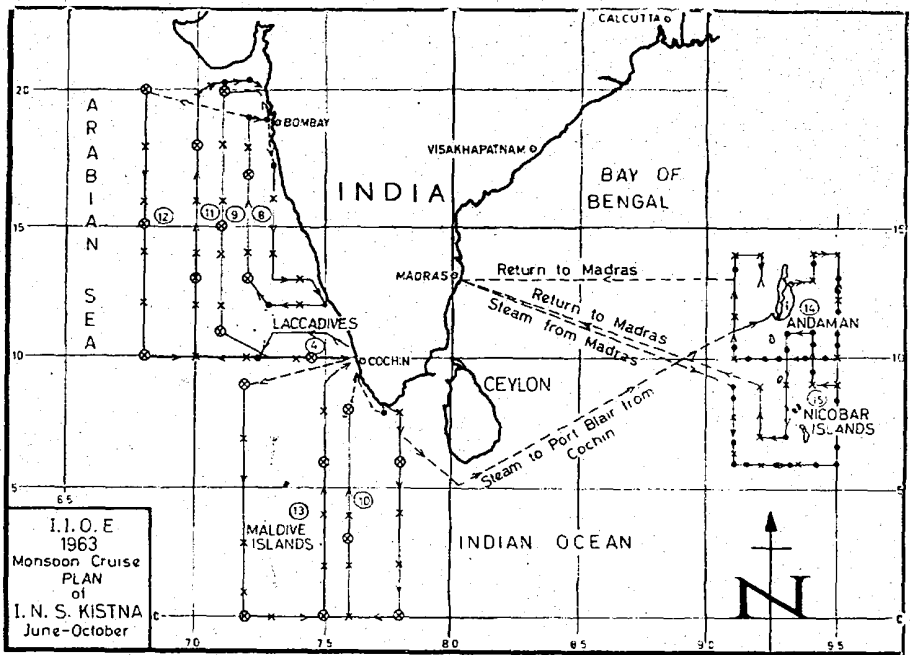
(ii) the ability to catch the fish

(iii) the consumer preferences exhibited by the various peoples.

Around the Indian Ocean there are enormous differences in the state of development of the countries, religions, population densities and topographical and hydrological conditions, which affect enormously the degree to which the three basic factors influence the marine fisheries. Typical contrasts are the high state of development of the fisheries of South Africa compared with the undeveloped fisheries of East Africa; and the minute continental shelf off Somalia with the extensive shelf off north-western India and West Pakistan; yet again the avoidance of all pleuronectidae in Madagascar, while inland from the East African coast there is an avoidance of all fish associated with a marine environment.

The Gulf of Aden has an abundance of pelagic fish and the trophic stages are fairly clearly defined but what are the factors which enable the continental shelf off north-west India to maintain a high rate of fish production.

The lines of development which countries propose are likewise influenced by the three basic factors and do not necessarily follow the lines which may be more obvious. For the presentation of the information collected by the vessels engaged in the Indian Ocean Expedition to be most effective it must take into account such factors as the economic conditions of the countries and the consumer preferences, while at the same time allowing for the changes which are to be expected, such as the greater sophistication of catching techniques and the increase of fisheries which are at present ignored due to ignorance and prejudice. At present the best means of providing for both these requirements seems to be the compilation of comprehensive atlases of all the hydro-biological phenomena of the Indian Ocean together with appreciations of features which are of particular and immediate interest to each and every country.”



I. I. O. E. 1963—Monsoon cruise plan of INS KISTNA