

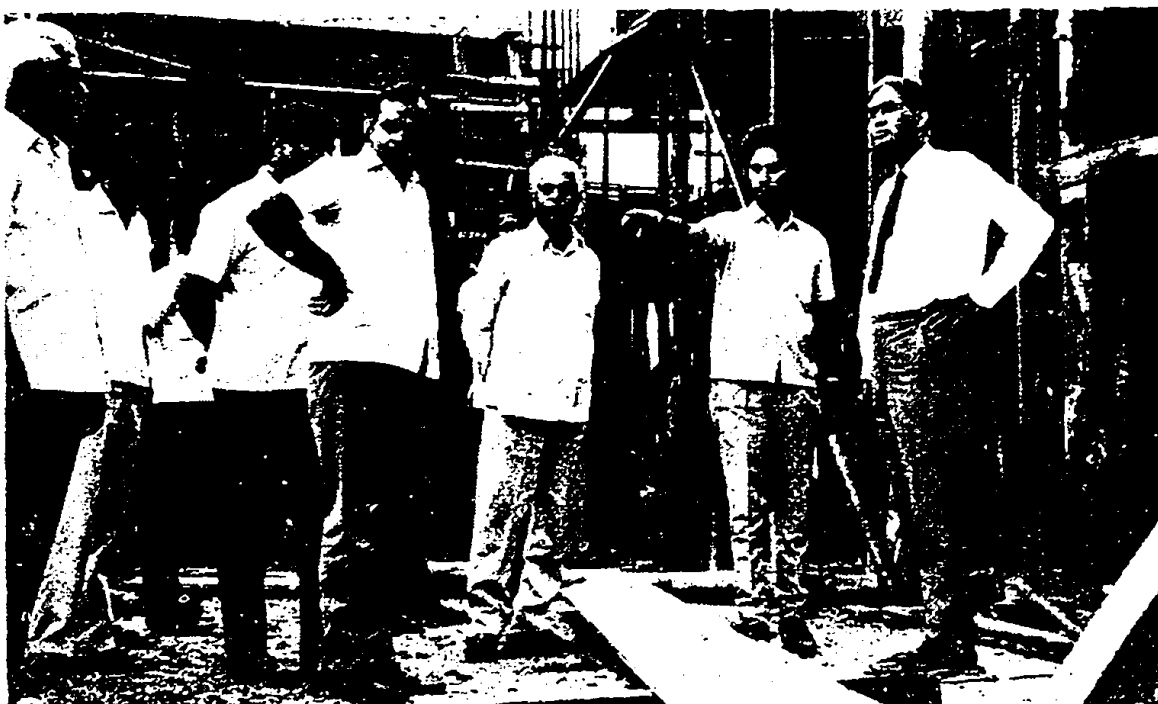
news and comments

1. DGSIR Visits NIO
2. Progress of NIO
3. Colloquium on Ocean Research in India
4. Dr. Panikkar for Malta and Hamburg
5. R. Jayaraman for USA
6. Remote Sensing in Oceanography
7. The Problem of Seabed
8. Report on Fishery Resources of Goa
9. Roy Jackson Promoted
10. British Trawler Earned £37,383 in One Trip
11. NIO Open House

I. DGSIR Visits NIO

The Director-General of the CSIR visited the Institute on 20th April, 1972. He was taken to various divisions of the Institute where he devoted most of his time with the staff of the Institute. He showed keen interest in the working of various divisions and discussed the problems connected with various programmes carried out in the divisions. He was also taken to the site of Laboratory buildings and staff quarters at Dona Paula where the construction of the buildings is in progress.

In the evening the staff club arranged a small function in the honour of the Director-General. In his talk to the members of the staff club, he stressed the social responsibility of the scientists and the need for CSIR employees to orient their work in



Prof. Y. Nayudamma, DGSIR (Extreme right) at the site of NIO Buildings

such a way as would fulfil their obligations to the nation in its economic, scientific and technological growth. He said that the most pressing need of the moment was attainment of self-reliance and that the nation expects the scientists to rise to the challenge. He stressed on the need of co-ordination of research not only within the different organisations of the CSIR but also on a national basis which would cut across boundaries of different disciplines of science. This, he said, would bring closer co-operation and much needed team work which would produce better results.

2. Progress of NIO

On the eve of 10th Anniversary of Integrated Ocean Research in India, Dr. N. K. Panikkar met a Press Party at the Building Site of the Institute at Dona Paula and spoke about the progress of the Institute. Dr. Panikkar said that the construction of the Scientists' Hostel, Senior Scientists' Residences and the Director's Bungalow at a cost of about Rs. 7 lakhs was started about two years back, of which the last one was completed and occupied in October, 1971. The first two will be completed in another month's time and will be occupied by the staff.

The major construction under way at the moment, he said, is related to the first phase of main Laboratory Buildings. This part of the works, costing about Rs. 30 lakhs, includes the entrance hall, biological laboratories, library, seminar, workshop, meteorological observation

tower, canteen and the connecting corridors. It was hoped that the construction will be over by March, 1973. Electrical work in connection with these buildings were being awarded.

Simultaneously, construction of 46 staff residences at about Rs. 14 lakhs has also been started which is going on rapidly. This will probably be completed by the end of this year.

The completion of all the laboratory buildings will be over in the next three years in the three different phases. The next two phases will involve an expenditure of Rs. 15 lakhs and Rs. 10 lakhs respectively, Dr. Panikkar said.

He reminded that the establishment of the National Institute of Oceanography was made possible by the Indian participation in the International Indian Ocean Expedition (1962-65). So far as India is concerned one of the major achievements has been the training of nearly a hundred young scientists in the country for handling different aspects of oceanographic research, a capability which will find full expression with the expected ship facilities in the coming few months.

The achievements of the International Effort in exploration of the Indian Ocean are well known all over the world. The Indian share in these efforts has been notable and has won due recognition from the International Scientific Community. Today, we know the major submarine features of the bottom of the Indian Ocean, the rich areas of upwelling where the nutrient bottom water comes up to enrich

the surface waters; we also have a broad picture of the distribution of tiny animal organisms on whom depend the major fishery resources of the sea. Our results have shown that the waters of Arabian Sea are richer than the Bay of Bengal, but the latter has been found to be a major breeding ground for marine fishes.

On 26th May, 1972, "We have completed Ten Years of Integrated Ocean Research in India under the Council of Scientific and Industrial Research", he said. The Oceanographic effort of the past ten years has been accompanied by a phenomenal growth of Indian Fisheries and will further enhance the growth of minerals and oil exploration in the country.

As regards the past few years in Goa, "our research activities have been towards the coastal zone which are of course very useful in regard to the coastal zone management. Our efforts in the oceanographic survey of Bombay waters to help the Bombay Municipal Corporation in laying sewage pipe lines, and on the sediment transport studies in Moplah Bay, Cannanore to help the Indo-Norwegian Project for the construction of a Fishing Harbour, are the examples of our recent contribution in the coastal zone management. Such efforts are bound to increase in different areas all over the Indian coastline. Our effort during the past two years has been mainly in the waters around Goa to understand the physical, chemical, geological and biological properties of these waters. Of special interest to Goa is the survey of fishery

potentials in the seas adjoining the Union Territory which is being carried out by the Institute. The information available with us will help to tackle various problems connected with the technological developments which may be pursued in the near future in this region. With the facilities, as and when they are available, the future activities of the Institute will spread to other areas both on the east and west coast, covering most of the productive zones of the continental shelf."

The future programme of the Institute will include projects pertaining to coastal zone management, including erosion, sedimentation, harbour problems, coastal aquaculture, pollution and the distribution and seasonal variations of the productivity, and resources on the continental shelf and the slope. The successful completion of the objective, particularly related to the deeper areas will depend on ship-board facilities available to the Institute.

3. Colloquium on Ocean Research in India

"Although Indian Marine resources are unquestionably large and so vital for the nation's economy, we have not made adequate investments in this field to obtain the maximum returns. Scientific capability to explore and utilise these resources is now abundantly available in the country but adequate ship and ancillary facilities for a vigorous field programme still remain to be provided."

This was stated at the Colloquium on Ocean Research by Dr. N. K. Panikkar on 26th May 1972 on the occasion of the 10th anniversary of the Integrated Ocean Research in India initiated by the Council of Scientific and Industrial Research in 1962.

Starting in a very small way as the Indian Programme of the International Indian Ocean Expedition, this effort has now resulted in the National Institute of Oceanography which is being established at Goa where extensive laboratory and field facilities are being provided. Nearly a hundred scientists are now working on various aspects of Ocean Research.

The colloquium dealt mainly with the future of ocean research for a decade. The discussions included a variety of topics such as tropical cyclones and maritime meteorology, trace elements in sea water, algal resources, coastal oceanography, coastal zone management, new fields in chemical oceanography, geology of the continental shelf with special reference to drilling and oil exploration of the Cambay Region and Biological Oceanography of the Bay of Bengal and the Arabian Sea. About eighty scientists took part with about 18 leading speakers.

Arising out of International Programmes, were discussions concerning the GEOSEC Programme for trace elements and the data systems now being developed for specialised fields of work on a global scale. The work of the National Oceanographic Data Centre was discussed.



Dr. Panikkar addressing the Colloquium

Other special problems which came before the group were the marine borer problem, tropical zooplankton research, production of life in specialised environments, benthic and prawn resources and new ideas in population dynamics.

Among the participants, apart from the Scientists of the National Institute of Oceanography, were Dr. Saha of the Institute of Tropical Meteorology Poona, Dr. Lal of the Tata Institute of Fundamental Research, Bombay, Dr. A. K. Ganguly of the Department of Atomic Energy, Professor Deshpande of the Poona University, Professor P. N. Ganapati of Waltair, Dr. Qasim of the Marine Fisheries Institute,



Shri K. S. K. Usgaonkar, Minister of Agriculture, Irrigation & Power, Govt. of Goa, Daman & Diu with Dr. Panikkar at the Colloquium

Dr. N. Balakrishanan Nair of the Kerala University and Professor Desikachary of Madras University. Principal contributions from the Institute itself came from Shri R. Jayaraman, Dr. T. S. S. Rao, Dr. S. N. Dwivedi and Dr. V. V. R. Varadachari.

The most challenging problem as emphasized by Dr. Panikkar at the conclusion of the discussions, so far as our national programmes are concerned, is an all out effort to survey the living resources of the seas around India and to make available those raw materials which are in short supply on the mainland. As regards the living resources, the Indian Ocean contribution today was less than 3 million tons out of the world total production of 70 million tons per annum and even the most conserva-

tive estimates are that the yield from the Indian Ocean could be increased at least 3 to 4 times. This requires a massive effort but enough exploratory work to attract capital has still not been done. Our present Indian production is 1.3 million tons of sea fish which could be raised several times this figure. On the other hand the potentialities have already been indicated by the enormous rise in the catch and processing of prawns from the Indian coasts which yielded an export value of something like 46 crores of rupees last year. In some areas the prawn resources appear to have touched the danger of over exploitation owing to excessive concentration of small vessels nearer the coast, such as at Cochin.

Absence of adequate exploration facilities have also hampered the solution of problems relating to major fisheries, the sardines and the mackerel, whose causes of annual fluctuations are still uncertain.

Dr. Panikkar added that the Indian National Committee on Oceanic Research under the auspices of the Indian National Science Academy was shortly issuing a long term plan for oceanic exploration and research in India. In this national programme an effort will be made to bring together the problems of scientific importance for the advancement in our frontiers of knowledge and the economically important aspects of exploration and assessment of resources. This was a task in which several teams of marine scientists, many institutes in

the country and the universities could join hands as the field is so vast. The National Institute of Oceanography will be playing a vital role in this expanded activity.

The Prime Minister, Mrs. Indira Gandhi in her message for the occasion said, "It was astonishing that any part of our earth should still remain unexplored. The oceans have challenged mariners through the ages, yet it is comparatively recently that oceanography has become a subject of systematic study." The Minister of Planning, Science and Technology, Shri C. Subramaniam in his message complimented the marine scientists of India for making much progress with very limited facilities and equipment. He expressed confidence that efforts will enable us to utilize our marine resources for the prosperity of the nation.

4. Dr. Panikkar for Malta and Hamburg

(III Pacem in Maribus Convocation and IOC Meets)

Dr. N. K. Panikkar, Director, National Institute of Oceanography attended III *Pacem in Maribus* Convocation at Malta from 27th June to 3rd July 1972. Later from July 3 to July 8, 1972, he participated at the meetings of the Executive Council of the Inter-governmental Oceanographic Commission at Hamburg, West Germany. At the conclusion of these meetings Dr. Panikkar also visited the Marine Institute of



Dr. Panikkar with Prof. Haeckel (left) at the Baltic Coast adjoining the Coastal Oceanography Institute in Poland

Poland under the exchange agreement between the Polish Academy of Sciences and the CSIR.

The third *Pacem in Maribus* which was held in Malta was attended by Scientific, Political and Legal specialists from all over the world to discuss problems related to World Oceans. About 6 study projects were presented during the plenary sessions. These were: 1. The Development of the Mediterranean and its Impact on the Marine Environment; 2. The Economic Potential of the Oceans; 3. Ocean Development Tax; 4. Disarmament and Arms Control in Ocean Space; 5. An International Sea Service; and 6. A Constitution of the Oceans.

All these meetings form facets of preparatory work for the full scale International Conference of World States on the Laws and Regimes of the Oceans scheduled to be held in 1973 under the auspices of the United Nations for working out a comprehensive treaty.

As regards the Executive Council Meeting of the Intergovernmental Oceanographic Commission, Dr. Panikkar said that the Council, besides reviewing the previous decisions taken by the UN, UN agencies, ICSPRO and the advisory bodies of the commission, also took action on the implementation of the resolutions of the 7th session of the IOC held early this year in Paris.

Some of the important scientific problems discussed at the meeting were: (i) processing of major projects to be taken up by the member States as component of the International Decade on Ocean Exploration (IDOC); (ii) establishment of Integrated Scientific Information Service of Aquatic Sciences and Fisheries; (iii) establishment of International Coordination Group for the Global Investigation of Pollution in the Marine Environment; (iv) to decide how Monitoring of Marine Pollution will be handled within the Commission; (v) to organize meeting regarding the activities of other marine research Institutes of the world etc., besides several administrative problems of the Commission.

5. R. Jayaraman for USA

Shri R. Jayaraman, Scientist-in-Charge, Planning and Data Division of the

National Institute of Oceanography left on 21st August on a 6-week programme under US National Science Foundation-C S I R exchange agreement. He spent some time at the World Data Centre 'A' and US National Oceanographic Data Centre at Washington DC. Later he visited important Oceanographic Institutes & Marine Laboratories in the USA.

6. Remote Sensing in Oceanography

Dr. P. Krishna Rao, Senior Scientist with the National Science Foundation U.S.A. gave a talk on "Remote Sensing on Sea Surface Temperature". In his talk arranged on September 2 in the lecture hall of the National Institute of Oceanography, Dr. Krishna Rao mentioned that with the advent of spacecraft oceanography and the development of new techniques, charting of synoptic temperature on global basis has become a reality. The whole thing can be done in a matter of a few hours, not even days, to do the job irrespective of the fact whether it is day, cloudy or clear weather. This is a tremendous improvement on the conventional methods being used for the recording of sea temperature which may take years to do the job of similar nature. The methodology is being developed and its accuracy is being worked out. Dr. Rao discussed certain problems connected with remote sensing of the sea surface temperature.

7. The Problem of Seabed

On September 4, Dr. N. K. Panikkar, Director, National Institute of Oceanography gave a talk on the Progress at the United Nations Committee on Seabed in the lecture hall of the Institute. In his address he reviewed the results of the recent seabed committee meetings of the UN at Geneva.

Following the acceptance of the United Nations Resolution that seabed and ocean floor beyond the limits of national jurisdiction should be exclusively reserved for peaceful purposes for the benefit of the entire mankind, the United Nations set up the Seabed Committee which has now held several meetings.

The Seabed Committee channels its work through three sub-committees: one, to deal with the regime and machinery for the proposed UN Seabed authority and the broad concepts of territorial sea, the high seas, the continental shelf, etc.; the second subcommittee deals with the question of preparing comprehensive list of subjects based on which articles prepared for adoption at the plenipotentiary conference in 1973 and also for the study of the question of the living resources like fisheries and the mineral resources of the seabed; and the third Sub-committee deals with questions of marine pollution, scientific research and related matters.

The whole Committee acting through its sub-committees is functioning as the preparatory committee for the proposed 1973 conference to frame the

new world treaty on oceans. Both Chile and Austria had invited the Committee to hold the first conference in their countries respectively at Santiago and Vienna.

As the principal achievement of the recent Geneva meetings may be mentioned the acceptance of the list of subject to be submitted to the UN at the next General Assembly as the list of subjects for which treaty articles are required. There was much controversy during the preceding and the present sessions and the final acceptance of the list came about after protracted negotiations between the different interests: the developed nations, the developing nations, the shelf locked states and land locked states. The list as finally adopted into several amendments is based on a common list co-sponsored by 56 countries including India. The majority of them are developing countries.

Important policy statements were made at the Geneva meetings by several countries and noteworthy changes in position relating to fishery rights came from Canada, USSR, Japan, Australia and New Zealand. These departures have indicated a slow change in concept from the traditional freedom of fishing in the high seas towards acceptance of the principle of preferential or exclusive fishing rights in favour of the coastal states. The latter stand has been advocated by India in all the sessions.

In the Indian statement our position clearly indicated the adequacy of a 12 mile territorial sea together with an exclusive fishery zone; India has not

advocated an identity of width of fishery and mineral zones. India also clearly expressed in favour of the early convening of the 1973 conference to evolve an ocean treaty. Kenya introduced the concept of an economic zone to cover both the living and nonliving resources adjoining the coastal states.

The report of the Geneva meetings will be placed before the next General Assembly of the United Nations in November 1972 and the subject will be further pursued at the remaining meetings of the Committee on Seabed scheduled for 1972. If the preparatory work relating to the conference is completed, the conference of all nations to draft the ocean treaty may be held in 1973. While the majority of the delegation were in favour of an early convening of the 1973 conference, a small number of countries were in favour of completion of all preparatory work including the preparation of draft articles under each section before the final conference is convened.

Statements regarding marine pollution and scientific research were made on behalf of many countries specially with reference to the outcome of the international conference on Environment convened recently by the UN in Stockholm.

8. Report on Fishery Resources of Goa

At a function arranged on the 14th September 1972, Dr. N. K. Panikkar, Director, National Institute of Oceanography presented a Report on the Assess-

ment of Marine Fishery Resources of Goa to Shri D. B. Bhandodkar, Chief Minister of Goa, Daman and Diu. The report incorporates findings of a project undertaken by the National Institute of Oceanography on the survey of marine fishery potential in the waters of Goa. The project was started as desired by the local Government and was principally carried out during 1971-72 by Dr. M. S. Prabhu and Shri R. M. Dhawan, Scientists of the Biological Oceanography Division of the Institute.

Since the fishery potentials of the coast of Goa have not been fully worked out so far, the main objective was to understand the composition of the bottom dwelling prawns and fishes and the variations in their occurrence from month to month. These fishes are caught by trawlers.

The whole of the Goa coast was divided into Northern, Central and Southern Zones and the survey was made at 20 and 40 meter depths in each case at five different stations spread over these zones. In all, 22 cruises were made on the 45-foot Institute's trawler, *Tarini*, a hired boat, *Jalmaharudra* and a chartered 60-foot vessel *Arjun Prasad*.

The results of the survey indicate that the areas falling at 20 meter depth are more productive than those at 40 meter depth. The catch composition of fishes at two different depths are also varying in nature. On an average, the percentage of prawns is found to be more at 20 meter depth (12%) as compared to that of 40 meter depth (4.4%). The



A View of the Audience

Central Zone off Goa was found to be more productive than the Northern and Southern Zones. The high catches of prawns were found from December to February, butterfish (*Lactarius*), locally called *saundale* from January to March and catfishes, *sangat*, from November to February. Silverbellies (*Leiognathus*), locally called, *kapi* were found throughout the year.

According to Dr. Panikkar, the investigations presented in this report would throw some light on the magnitude and regional importance of the marine fishery potential of the Goa coast, and also open up new vistas for the future development of fisheries on a more organized basis by the government as well as other interested entrepreneurs. This study can be considered only as a beginning towards further work.

"Vital data on various other environmental parameters having a direct and indirect bearing on the living resources of this region, are being

collected and all these investigations form a part of this Institute's overall programme of work carried out on a continuing basis," Dr. Panikkar said.

Shri D. B. Bandodkar in his address, said that it was his first visit to the National Institute of Oceanography, but after going around various labs, he felt that the scientific work at the Institute was being done much more than what he had imagined. "The Institute, established by the Central Government, has a very sound foundation and I hope that the research work will also be of the same status."

The production of mackerel and sardines has decreased considerably in the recent past. "Can we increase the production of these fishes?" he asked. The scientists shall have to study the factors responsible for it, he hoped.

Presently our fishermen have to work more while the returns are less. Hereafter with the help of scientists, it is to be

reversed. The fishermen are to be informed what fish they will get in the areas of their operation. To develop the fishery of Goa, the Government of Goa is collecting a lot of information of the surrounding sea. I am sure that the National Institute of Oceanography under the leadership of Dr. Panikkar will extend them all sorts of help and guidance.

To catch the fish in Goa, we should use modern equipment and methods. There can not be any progress in the fishery of Goa unless we adopt modern techniques, as this is the age of science.

There is lot of demand for our fish in the foreign countries, but due to packing difficulties we are not able to supply in accordance with the demand. Since the packing of fish in the tins is costly we have to use cheaper methods and material. Techniques of packing are as important as catching of the fish.

9. Roy Jackson Promoted

Mr. Roy I. Jackson who has been fisheries chief at FAO since 1964, has been appointed as Deputy Director-Gen-

eral early this year. Mr. Frederick E. Popper has succeeded him as Assistant Director-General of the Fisheries Department.

10. British Trawler Earned £37,383 in One Trip

According to a report contained in the *Fishing News International* Vol. II No. 1, the British distant water wet fish side trawler *Ross Renown*, caught nearly 194 tons of fish during a three-week voyage. The catch included more than 172 tons of cod the price of which had gone up 66% by the time the fish was landed on return. The total landing was worth £37,383. This figure breaks an early record of £28,375 set last year by another ship '*Ross Revenge*.'

Commanded by 31-year old Skipper Barry McCall, the 188 ft. *Ross Renown* took her catch off the north west coast of Iceland in a three-week voyage. Skipper McCall said, "We had one 37.5 tons-day, and the best haul of the lot was one of 18-tons in two hours."

II. NIO Open House

“Why don't we have such exhibitions frequently,” was a curious question from a young student. “It is just a new experience to me,” was another comment of a visitor to the exhibition organised by the National Institute of Oceanography in the temporary laboratory buildings at Miramar, Panaji on 15th & 16th August 1972. The exhibition attracted the unexpected number of men and women from all walks of life. The impressions of the visitors were, in their own words, ‘thrilling’, ‘very good’, ‘excellent’, ‘great’ as recorded by them in the visitors register placed at the entrance of the exhibition.

The ocean science and technology has become a must for the maritime

nations. As the technology led to the growth of crafts from a dugout canoe—sail boat to the present sophisticated vessels, it also provided ample opportunity to the growth of maritime activities including marine science. The maritime history of India from ancient times to the present, progress of marine research during 1873-1960 and during the International Indian Ocean Expedition from 1960-65 was presented in the exhibition. It was of special interest to those who have fancy for historical development. At the same time a view of the latest sophisticated methods including the oceanographic investigations from space, presented in the exhibition, were of interest to those who peep in the future of this fascinating science.



Explaining the Working of Nansen Bottle

Physical Oceanography

The exhibits in the Physical Oceanography illustrated the physical processes in the sea affecting our coast, beaches and harbours. The instruments used for the measurement of these processes and physical parameters, namely temperature, salt content, currents, waves, tides, water transparencies, wind, humidity, solar radiation etc. were also exhibited in the Division of Physical Oceanography.

How the waves and currents cause beach erosion? How does a harbour undergo the process of sedimentation, becoming shallower and shallower? What are the coastal currents? How the knowledge of these currents will help in working out a sewage disposal system? The exhibits answered these and a variety of such questions by illustrating through examples, based on the researches conducted by the Physical Oceanography Division in Goa, Kerala and Bombay region.

An exhibit showed, so far known, upwelling areas along the Indian coast. The nutrient-rich bottom water comes up in these areas and spreads on to the surface, thus enriching the surface waters. The knowledge of such areas is very important from fisheries point of view.

Chemical Oceanography

The nutrients are the basis of the production of all the living organisms in the sea. Therefore, the areas rich in

nutrients are generally rich in the flora and fauna. The exhibits in Chemical Oceanography, showed such areas in the Arabian Sea and the Bay of Bengal.

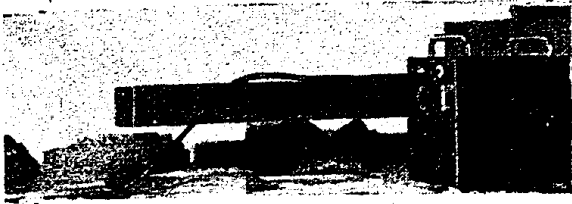
In another exhibit the interesting results showing effect of current and turbidity in retarding the rate of fouling was illustrated. A new shallow water sampler designed and fabricated in the Institute was also on display. A chart, based on studies in Institute, showed positive effect of upwelling on the distribution of nutrients along the west coast of India during monsoon period.



Shallow Water Sampler

Geological Oceanography

The exhibits in this Division tried to project the mineral wealth present in the sea. Various types of equipment used in the collection of sediments from the deep waters and methods used for the study of heavy minerals were displayed. A variety of sand, gravel and rocks present along the coast of Goa were on display highlighting their geological significance. The fluorescent dye used as tracer of the sand movement was one



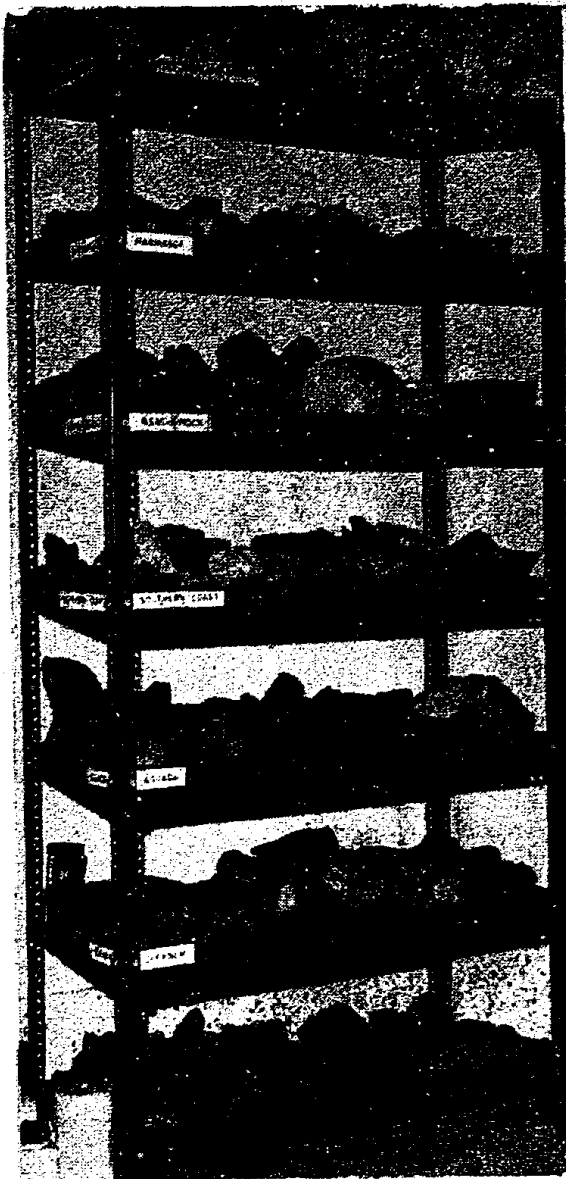
Ultraviolet Lamp to detect Fluorescent dye in the Sand

of the interesting exhibits. Among instruments the Gamma Ray Spectrometer used for the detection of radioactive elements and the Flame Spectrophotometer used for the estimation of sodium, potassium, calcium etc. from the samples, were shown in working condition and interested the visitors.

Besides, there were a variety of exhibits showing physiographic features of the Indian Ocean, such as submarine ridges, mounts, plains, trenches and canyons.

Biological Oceanography

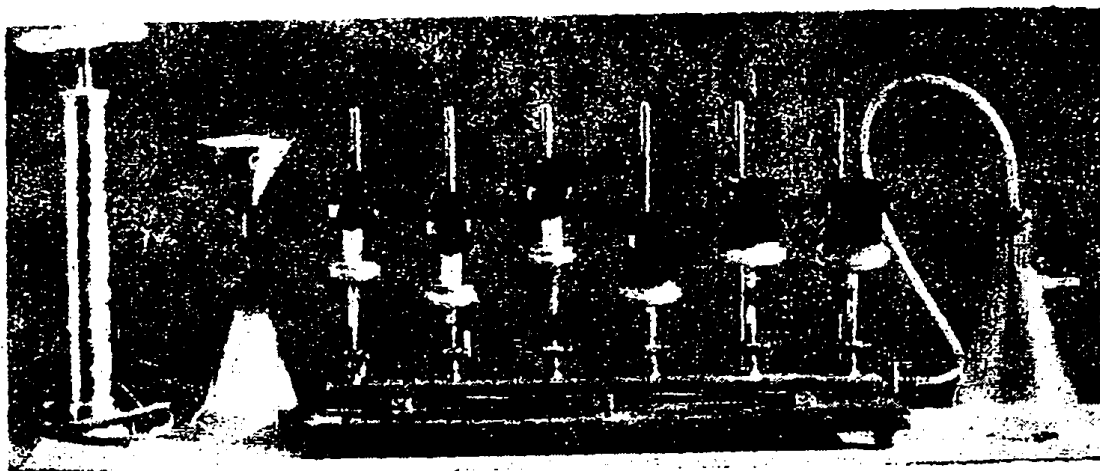
Most of the exhibits in the Biological Oceanography were found revolving round a main theme '*Marine Food Resources*' of the estuaries, beaches and sea around Goa. How life begins in the sea from the infinite microscopic plant organisms (phytoplankton) using nutrients, carbon-di-oxide and water present in the sea and producing organic carbon through well known 'photosynthesis'? How this infinite variety of minute plants are grazed by the microscopic animal organisms called zooplankton? The visitors could have the glimpse of 'ocean window' with these micro-



Rocks of Goa Coast

scopic living organisms projected on the screen, in a specially converted dark room.

The fishes feed on the zooplankton. The exhibits showed the process of food cycle which is the basis of the produc-



Filtration Units for Studies on Primary Productivity of the Water

tion of all the seafood, and a variety of fishes found in the waters of Goa.

The bottom of the sea and the beaches possess a variety of animals scientifically known as benthos. This group comprises clams, mussels, oysters, lobsters which form an important food of people in Goa. A variety of such animals found in the beaches and sea bottom of Goa were exhibited. A specialized group

of foraminifera found at the depth of 1500 m of the Arabian Sea were also shown in the exhibition.

The dead and decaying matter in the sea is converted into the nutrients by a variety of bacteria and their possible role was explained in various exhibits.

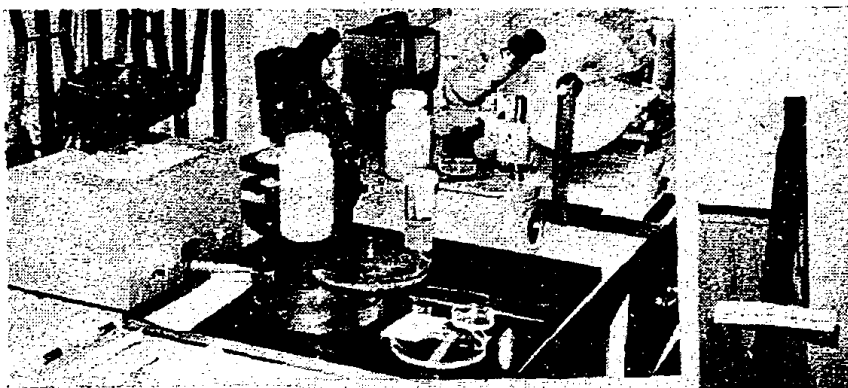
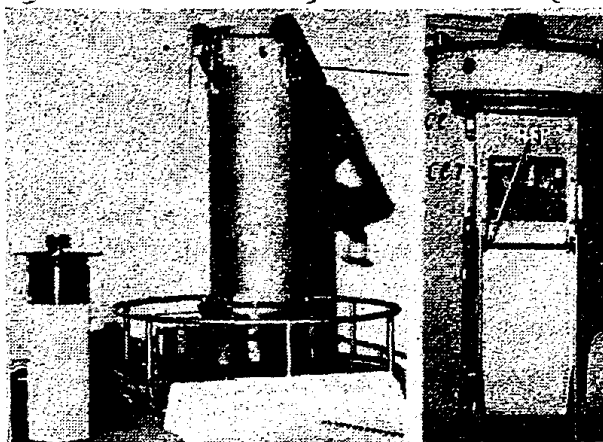
The shore of the estuaries have hundreds of square miles of area occupied by mangroves which are inundated during high tide. During low tide they are exposed in the form of a marshy swamp field. A number of exhibits on this aspect showed that these mangrove swamps with their characteristic environmental features can be utilised for aquaculture.



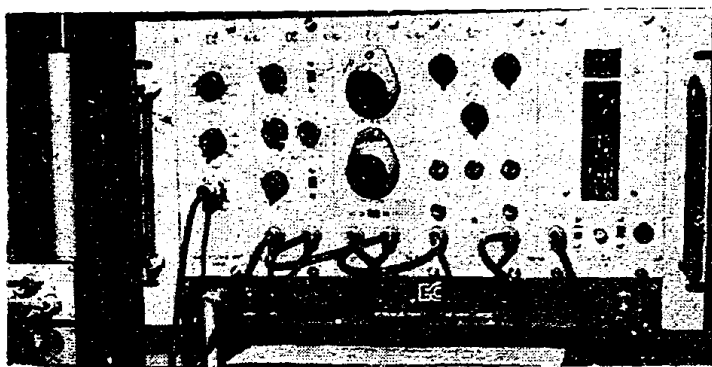
Plankton Net

news and comments

Temperature-Salinity-Depth Recorder (left) and OSPOS Wave Recorder (right) were among several instruments displayed at the Physical Oceanography Division.



Plankton Laboratory of the Biological Oceanography Division. On display are the equipment for collection and analysis of zooplankton, tiny floating animals of the sea. Zooplankton studies are one of very important aspects of Marine Biology.



Gamma Ray Spectrometer, displayed at Geological Oceanography Division, is used for the estimation of the radioactive elements present in the sediments, rocks and water.

A Glimpse of the Exhibition



Edible Molluscs of Goa

The equipment, material and methods used at various stages of biological studies were exhibited in operation.

Data Centre

The information gathered from thousands of sites (stations) on physical, chemical and biological aspects is so voluminous that it can not be retained in the memory of any individual. It has to be stored in an accurate manner. The information (data) is also to be stored in such a way that its retrieval and dissemination may be done as early as possible on demand by users. Moreover, maximum amount of data is to be stored in the minimum space to save the storing space. How is this data stored? The science of Data Processing is now well developed. The Indian Oceanographic Data Centre is making full use of this methodology and has developed its own standard system suiting to the present needs. The oceanographic data of the Indian Ocean is being stored in the punch cards after processing and necessary quality control.

The exhibits in the Data Centre showed a variety of such cards through which the information goes during processing—from on board the ship to the storing stage. This included—log sheet, standard format, punch card and necessary catalogues of the holdings.

Conclusion

The exhibition projected well about our problems connected with oceans in general and Goa in particular. The waves, the tides, the currents, the chemicals, the sediments, the marine food (crabs, clams, fish)—how all these factors can be used in a best way for the benefit of the people, is a question. The exhibition meant to make an effort to answer this question. The exhibition made it quite apparent that the studies leading to acquire knowledge about these points, will help immensely to the exploitation of living and non-living resources of the Indian Ocean.

—V. S. Bhatt