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Unesco Office of Oceanography  
Paris, February 1970.



REPORT OF THE SEVENTH MEETING OF THE CONSULTATIVE COMMITTEE FOR  
THE INDIAN OCEAN BIOLOGICAL CENTRE, HELD AT ERNAKULAM (COCHIN)  
FROM 24th FEBRUARY TO 1st MARCH, 1969

The Seventh Meeting of the Consultative Committee for the Indian Ocean Biological Centre was held from 24th February to 1st March 1969. Formal sessions concluded on the 28th February. The opening session on the morning of 24th February and the closing session on the afternoon of 28th February were held at the Indian Ocean Biological Centre at its new premises at Pullepady Cross Road, Ernakulam. The intervening sessions were conducted at the Grand Hotel.

The opening session on the morning of 24th February was attended by the Chairman and members of the Consultative Committee, the representatives of Unesco and SCOR and invited guests who included members of the Indian Advisory Board for IOBC, visiting scientists at IOBC and senior staff members of the National Institute of Oceanography (NIO, India) at Ernakulam. This session was devoted to welcome speeches by the Committee Chairman, Professor Krey, and the Director of NIO, Dr. N.K. Panikkar. It was followed by the discussion and adoption of the agenda for the following sessions. Presentation of reports by the Director of IOBC (Appendix 1) and by the Unesco Curator (Appendix 2) was also done at this session although detailed discussions arising out of the reports were deferred to the afternoon.

I. WELCOME BY THE CHAIRMAN

Professor J. Krey welcomed the members and invited participants to the Seventh Meeting of the Consultative Committee. He drew the attention of the members to the circulated papers, to the progress recorded by IOBC and to its changing pattern of activities. He invited the members to participate fully in the discussions during the week ahead and formulate recommendations which would help the scientific development of the IOBC.

II. REVIEW OF THE PREVIOUS YEAR'S WORK

The Director of IOBC presented the Report for 1968-69 and this was followed by a discussion. The points which figured in the discussion inter alia were:

- (1) Acquisition of a building site of 1.6 acres for putting up a permanent building for IOBC;
- (2) Full-time Chief Scientist-in-Charge for IOBC;
- (3) A Librarian or a Library Clerk to organize and maintain the IOBC Library on efficient lines.

The present position of these was explained by the Director.

The Unesco Curator, in accordance with the recommendation adopted by the Consultative Committee at the sixth meeting, then presented a Draft Report giving all the historical background and bringing up to date the information on the work at IOBC as requested by the IOC Fifth Session. In the course of the discussion Dr. Humphrey, on behalf of SCOR, laid very strong emphasis on the need to bring out the report. By including essential and introductory information, the report would also serve as a "Guide Book" to the IOBC. He welcomed the draft compiled by the Curator and mentioned additional information that should find its place in the "Guide Book".

The Curator had not prepared a special Report for 1968-69 since most of the data was included in the above report. The Committee felt, however, that a special report for 1968-69 nevertheless would be useful and the Curator extracted the necessary data and made the report available the second day of the meeting.

The Chairman called upon Dr. Østvedt (Unesco) to give an account of the steps leading to the setting up of the Plankton Sorting Centre at Singapore. Dr. Østvedt gave a brief account and also circulated the reports from the Singapore Centre. In the ensuing discussions, the relation between the CSK (Cooperative Study of the Kuroshio) Plankton Sorting Centre and the Regional Marine Biological Centre for South East Asia, located in Singapore, was explained. The possibility that the IOBC could be developed into another Regional Marine Biological Centre after 1970 was also discussed. It was fully recognized that there was wide scope for fruitful cooperation between IOBC and the Singapore Centre by exchange of information on techniques adopted in sorting and reciprocal visits by staff members.

The following recommendations 1, 2 and 3 were adopted:

1. The Consultative Committee noted with satisfaction the progress reviewed in the reports for 1968-69 of the Director and Curator and recommended that they be published in full, in the IIOE Information Paper.
2. The Consultative Committee requests the Curator to prepare for the Secretariat of the IOC before May 1969 a guide book to the IOBC, in consultation with the Director, in accordance with the lines given in the report discussed at the seventh meeting of the Consultative Committee.
3. The Committee, noting the operating of the Plankton Sorting Centre for the Cooperative Study of the Kuroshio (CSK) at the Regional Marine Biological Centre in Singapore established under an agreement between Unesco and the Government of Singapore, recommends to Unesco that close collaboration between IOBC and the Singapore Centre concerning sorting and curatorial procedures be encouraged through exchange of information and visits of staff between the two Centres.

### III. ROUTINE SORTING AND SUB-SORTING OF THE INTERNATIONAL COLLECTIONS

Discussion of this item of the Agenda opened with a brief account given by the Unesco Curator about (1) completion of basic sorting of 1,927 samples; (2) special problems posed by groups such as Copepoda and fish-larvae in regard to sub-sorting; (3) the need for some of the members of the IOBC to receive specialized training abroad with Unesco travel support; and (4) the need to balance time spent by an individual on his own research projects with the time devoted by the individual to routine activities of the Centre. In the course of the discussions, the recommendation of Dr. Ahlstrom in his report on Fish Eggs and Larvae of the International Collections was recalled, and the desirability of preparing and publishing quickly a general account of the Fish Larvae component as a whole was emphasized. The ability of utilizing bilateral agreement between India and USSR for the visit of specialists from the Institute of Oceanology at Moscow to help the work of the IOBC Fish Larvae team was also pointed out. It was agreed that Mr. P. Gopala Menon and Mr. V.T. Paulinose, who had accomplished very good work in sub-sorting the Decapod Crustacean Larvae, should be supported by Unesco with travel aid to go to Britain and France for further training at the laboratories of Dr. Williamson and Dr. Dechance. The Committee discussed at length how to meet the challenge posed by the large group Copepoda and considered whether procedures alternative to those of Dr. Fleminger could be devised to speed up the work. Professor Krishnaswamy and Dr. J. E. Smith were very helpful in discussing this topic and their continued efforts to find ways and means to speed up work on Copepoda was requested and embodied in a recommendation.

The following recommendations were adopted:

4. The Committee noted with satisfaction that basic sorting of 1,927 samples had been completed. The more difficult and complicated task of sub-sorting and specialist sorting had now become a priority. The Committee therefore recommends that Research Fellows participate in the sorting programme of the Centre. It further recommends that all qualified staff be given opportunities for research.
5. (a) The Consultative Committee recommends that owing to the urgency to finish sub-sorting of fish eggs and larvae in a short time, two specialists from the Institute of Oceanology in Moscow be invited to come to IOBC for two to three months in 1969 to collaborate in sub-sorting. This could possibly be arranged under the bilateral agreement between India and USSR for exchange of specialists.
5. (b) The Committee, recalling the report by Dr. Ahlstrom, further recommends that the team under Mr. K.J. Peter be authorized to give a general account on the distribution of fish eggs and larvae arising out of the basic and sub-sorting programmes and that the report be made available as soon as possible.

6. The Consultative Committee, having considered the progress made in the basic sorting and subsorting of samples and recognising the special difficulties that arise in the sub-sorting of the group Copepoda, recommends that, in order to expedite the process of sub-sorting of the group, Professor Krishnaswamy be invited, in collaboration with Dr. J.E. Smith, to discuss by correspondence with Dr. Fleminger alternative methods of processing samples in order to expedite the placing of sub-sorted material in the hands of specialists.
7. The Consultative Committee, noting the need for Mr. Gopala Menon to collaborate with Dr. Williamson (Port Erin) and for Mr. Paulinose to collaborate with Dr. Dechance (Paris) on working up taxa from the International Collections, recommends that Unesco provide the necessary facilities for them to do this.

#### IV. ANALYSIS OF THE INTERNATIONAL COLLECTION BY TAXONOMISTS

The Unesco Curator gave a brief statement about the visit of Dr. Gruner to examine the Amphipoda of the International Collections. Dr. Gruner's report (Appendix 4) was read out, discussed and recommended to be published in the IIOE Information Paper. Two visiting scientists were invited to present their reports in person. Dr. Marta Vannucci gave a review of her findings after examining the Hydromedusae of the International Collections, and Dr. Alan Bé on the Foraminifera. A number of minor groups were allocated to scientists (Recommendation 8). The need to keep in touch with the scientists who had been entrusted IIOE material for study and to obtain periodical progress reports from them was then discussed and the following recommendations adopted:

8. The Consultative Committee recommends that the Curator invite the following specialists to examine material from the International Collections:

Cirripede Larvae	Daniel (alternative - Wagh)
Pelagic Tunicata	Nagabhusanam (alternative - Godeaux)
Cladocera	Della Croce (possible collaborators: Tiwari, Kimor, Mordulay, Boltovskoy)
Tornaria	K.P. Rao
Trochophore	Thorson
Meroplanktonic Gastropoda	Pilkington
Tanaidacea	Karl Lang (alternatives - Batescu, Kurian)
Echinoderm Post-larvae	L. Fenaux (alternative - Tortonese)
Actinotrocha Larvae	Wilson (alternative - Thorson)
Halobates	Hinton

9. The Committee took note of the report on Amphipoda by Dr. Gruner (Berlin Zoological Museum, GDR), and the reports by Dr. Allen Bé (Lamont Geological Observatory, USA) on Foraminifera and by Dr. M. Vannucci (Institute of Oceanography, Sao Paulo, Brazil) on Hydromedusae, and recommends that the three reports be printed in the IIOE Information Paper.
  
10. The Committee reviewed the present position regarding the material distributed on loan to institutes. It recommends that, in accordance with the Rules of Procedure, the Curator send at yearly intervals to each specialist (with a copy to the Institute) a letter requesting a progress report. Copies of progress reports would be distributed at regular intervals to the members of the Committee and to Unesco.

#### V. SEMINARS, LECTURES AND PUBLICATIONS

Discussions on this item of the Agenda took a great length of time. The earlier considerations were about the Workshop on Plankton Methodology organized at the IOBC during the preceding week (17th to 22nd February, 1969) and appreciation of the efforts put forth by the staff of IOBC to make it a success. The advisability of organizing such meetings at intervals of two or three years was also recognized, because of the stimulus it affords to the workers in this field. The importance of choosing a topic for the Workshop to be organized in future, without infringing on the spheres of work of universities, fishery institutions, etc., was also underlined. "Taxonomy of Tropical Planktonic Organisms" was accepted as a possible topic for the Workshop of 1971.

The Committee was informed that Fascicle 2 of Volume I of the IIOE Plankton Atlas had been published and the Atlas project as a whole was discussed at length, the chief participants being Dr. Humphrey and Dr. Panikkar. The discussions mainly centred on increasing the usefulness of these publications and for bringing these out on the same lines as the other series of atlases. It was felt that a more comprehensive proposal might be put to the IOC Editorial Boards for Atlases. The status of the present issues as background material for more detailed atlases was appreciated by members who desired wide circulation of these publications.

The procedure to be adopted in bringing out future numbers of the Atlas series, and how far computer plotting could be or should be utilized in the preparation of distribution maps, was also discussed. The advantages of plotting distribution maps manually, irrespective of whether computer facilities are available or will become available, was also stressed by Dr. Panikkar and others.

The Committee was appreciative of the very neat get-up of the "Hand Book to the International Collections, Volume I, Station List" which was printed locally, and recommended that a further volume, devoted entirely to methods used at the IOBC in treating the International Collections, should be prepared by the Curator.

The following recommendations were adopted:

11. The Committee recorded its approval and appreciation of the Workshop on Plankton Methods organized at IOBC from 17 to 23 February 1969, and complimented the Curator and the staff of the IOBC on the success of the Workshop. It recommends that similar activities be organized at intervals of two to three years, and welcomes the suggestion that "Taxonomy of Tropical Planktonic Organisms" be a possible topic for the next workshop, to be held in 1971.
12. The Committee noted the important use which would be made of the first and second fascicles of Volume I of the Plankton Atlas issued by IOBC and made some suggestions on how these could be improved. The Committee requests the General Editor of the series to give IOC a report on the progress of work and a detailed proposal for further parts of the Atlas, including those on special categories of organisms, and involving the use of computer plotting.
13. The Committee welcomed the publication of the "Hand Book to the International Collections" Volume I, Station List; commented on the high quality of the production of work at low cost; and recommends that a further volume be published describing methods used on the International Collections at IOBC. Relevant papers presented at the Workshop on Plankton Methods (February 1969) should be included.

#### VI. RESEARCH ACTIVITIES IN THE INDIAN OCEAN OF INTEREST TO IOBC

The Curator recalled that the building-up of "Reference Collections" was one of the aims with which IOBC was started and that it was now time to make a beginning. The very idea and scope of a reference collection came in for much discussion. While some of the participants thought of a Reference Collection of identified taxa for each station embracing all the 2,000 stations, others questioned whether a Reference Collection at IOBC was called for, once type specimens had been deposited at the Indian Museum, which is the National Reference Centre. However, in accordance with the original proposal for the establishment of the Centre it was agreed that all specialists would be requested to deposit holotypes in the Indian National Reference Collection and paratypes in the Centre at Cochin. The collection would expand as more and more groups from the International Collections were studied and worked up by specialists.

The Committee also discussed a proposal of Dr. Hamond (CSIRO, Australia) for identification sheets of tropical zooplankton, details of which were explained by the Curator. The scope for IOBC to collaborate in this proposal was also explored. The Committee decided to refer the proposal to Unesco for closer consideration.

The Committee adopted the following recommendations:

14. The Consultative Committee, noting the original aim of the IOBC to build up reference collections at the Centre, endorses the proposal of the Curator that a start should now be made by the staff at IOBC towards this end.
15. The Consultative Committee, recognizing the need for identification sheets of tropical zooplankton in research and teaching, commends the proposal of Dr. Hamond (CSIRO, Australia) concerning such sheets, for close consideration of Unesco.

#### VII. FURTHER DEVELOPMENT OF IOBC

The future of the IOBC was informally discussed at length. The Unesco-CSIR agreement would end in December, 1970, and whether after that date the IOBC would continue as a purely national body and a part of the NIO (India), or continue to fulfil an international rôle and discharge functions as a Regional Marine Biological Centre for South Asia, with Unesco support, was a matter for thought and decision. It was stressed by the Chairman that IOBC now incorporates so much scientific and specialized talent that this should be fully utilized by providing for the continuation of both its national and international activities. Dr. Panikkar referred to the forthcoming extensive programmes in the Indian Ocean envisaged by the USSR, by the Indian Ocean Fisheries Council, and by the USA agencies, particularly the Smithsonian Institution. He spoke of the scope for IOBC to play a prominent rôle and cooperate in these programmes, with the help of bilateral agreements or support from Unesco (or FAO) or support from both sources. The following recommendation was then formulated and adopted:

16. The Consultative Committee noted that the basic sorting and dispatch to specialists of the International Collections will be completed in 1969 and that the present Unesco-CSIR (India) agreement will end in December 1970; recognized the commendable contribution made by the Indian Ocean Biological Centre to the International Indian Ocean Expedition; noted the need for further training and research projects in the region; and being aware of the many national and international projects proposed for the region, the Committee recommended that before the next meeting of the Committee, Unesco should give active consideration to the rôle which the Indian Ocean Biological Centre, in its present or in an altered form, could play in the marine science activities in the region and elsewhere.



## VIII. OTHER MATTERS

With the permission of the Chairman, and arising out of points made by Drs. Østvedt, Tranter and Panikkar pointing to gaps in the system of intercommunication, the following recommendation was adopted:

17. The Consultative Committee requests the Chairman and Secretary of the Committee and the Unesco Curator to keep each other, the Committee members and the National Institute of Oceanography informed, by means of copies of relevant correspondence, of matters relating to the IOBC which fall within the terms of reference of the Committee. Full files of correspondence relating to the International Collections will be maintained at the IOBC.

## IX. ELECTION OF NEW CHAIRMAN

At a closed meeting of members only, Professor J.E. Smith was elected Chairman of the Committee in succession to Professor J. Krey.

## X. CONCLUDING REMARKS

The concluding session on 28 February 1969 was devoted to bidding farewell to Professor Krey, Dr. V.N. Greze, Professor S. Krishnaswamy and Dr. M. Anraku who retired from the Committee after conclusion of their terms. Dr. Østvedt, on behalf of Unesco, expressed satisfaction at the successful outcome of the meetings.

REPORT OF THE DIRECTOR OF THE INDIAN OCEAN BIOLOGICAL CENTRE  
FOR THE YEAR 1968-1969

1. GENERAL

The Indian Ocean Biological Centre, which was founded in November 1962 under the auspices of the Council of Scientific and Industrial Research of India and United Nations Educational, Scientific and Cultural Organization, has now completed six years of scientific activity. It is now widely known in India and in other countries, as the repository of the International Collections, comprising the standard samples of Zooplankton collected by the research ships of the countries which participated in the International Indian Ocean Expedition. In its continuing programme developing out of the International Collections, it has completed in June 1968 its first and most laborious stage of the work, namely, that of basic sorting. What has been achieved at the IOBC is a matter of great satisfaction, when we consider the number of categories separated (sixty to eighty), the number of samples handled (1947) and the accuracy of the separation of taxa which has been acknowledged by numerous visiting scientists who have examined the sorted material. For this, credit must be given in full measure to the devoted work of the sorting assistants, the supervising staff and the UNESCO Curators. The IOBC is now entering on a new phase of activities with emphasis on detailed research on individual groups and of advanced sorting of a highly specialised character by smaller groups of staff members. Along with this, the number and frequency of visits by scientists from outside are increasing and the despatch of consignments of sorted material to specialists all over the world for study is being completed rapidly.

2. ACCOMMODATION AND SERVICES

During 1968, the Centre functioned in two buildings as in earlier years, namely, the South-western block of rooms in the Kerala University Oceanographic Laboratory on the Foreshore Road and the rented building on the Ravipuram Sannidhi Road. But from January 1969 the Indian Ocean Biological Centre is located in a new and commodious rented building on Pullepady Cross Road, thus bringing together, the Research Laboratories, the Stores and the Administrative offices into one building. Laboratory services are being maintained at the same high standard as before and will be further improved. Air-conditioning is provided for the International Collections, Visiting Scientists' laboratory and the Curator's office. A collection Tender is being appointed immediately who will attend to the maintenance of the International Collections. Steps are in progress to erect a permanent building which will provide

ample and well-designed laboratory accommodation for the IOBC and the other units of NIO located at Ernakulam.

### 3. SCIENTIFIC EQUIPMENT

The routine needs of the Centre for Chemicals, glassware and so forth are being provided in adequate volume from Indian Sources. The requirements of chemicals for the staff engaged in histological studies have been very fully provided although, owing to certain difficulties in providing alcohol, the work of this section is still hampered. Specialised equipment has been supplied by UNESCO as in earlier years. Among the items received from UNESCO during 1968, mention may be made of the following:

- (1) ASAHI PENTAX 35mm Camera.
- (2) KATADYN Ceramic filter for providing bacteria-free water, necessary for laboratory rearing of larval forms.
- (3) RIGOSHA Flowmeters, two numbers.
- (4) CRYSTAL Air-conditioners, two numbers.
- (5) OLYMPUS Stereo Microscopes, with rotating plankton trays, 3 numbers.
- (6) LEROY II Lettering Set.
- (7) SPECTROPHOTOMETER PARTS and sundry other items.

A workboat with de Havilland Hercules 40 HP outboard motor has been ordered for IOBC by UNESCO and despatched by the makers in Australia to India. It will be reaching Cochin shortly.

### 4. LIBRARY

The library of the Centre is expanding steadily by additions of new journals on subscription, by acquisition of much needed reference works and by exchange of publications with laboratories in many countries abroad. The library is located partly in the building of the Biological Oceanography Division and partly in the IOBC building. Care is taken to ensure that all the works for which there is frequent need are retained in the IOBC. A card index catalogue is being assembled for the library with cabinets for the files of cards. Special box type containers for loose reprints have been provided. The organization of the library for efficient service is being attended to. The post of librarian, vacated recently, will be filled soon by recruitment.

### 5. STAFF

#### a) Scientific

1. Chief Scientist-in-Charge (part-time till October 1968; full-time from 1969) .. 1
2. Senior Scientists .. 3

3.	Senior Scientific Assistant	..	4
4.	Junior Scientific Assistants	..	12
5.	Senior Laboratory Assistants	..	8 + 1
b)	<u>Administrative</u>		
1.	Junior Accountant	..	1
2.	Junior Stenographer	..	1
3.	Junior Stenographer (for the Curator)	..	1
4.	Store Clerk	..	1 (Vacant)
5.	Librarian	..	1 (Vacant)
c)	<u>Ancillary Technical</u>		
1.	Laboratory Attendants	..	7
d)	<u>Subordinate Staff</u>		
1.	Gestetner Operator	..	1
2.	Peon/Messenger	..	1 (Vacant)
3.	Security Guard	..	1
4.	Watchman (daily wages)	..	1

Dr. R. Raghu Prasas continued as Chief Scientist-in-Charge providing all necessary guidance and supervision till 26.10.1968 when he relinquished charge following his posting to another assignment in New Delhi. The current duties of the Chief Scientist-in-Charge are being discharged by Shri L.R. Kasturirangan from 26.10.1968 onwards. Mr. David Tranter continued as the UNESCO Curator during 1968-1969 and has, besides his normal duties, stimulated the interest of the staff in various experimental approaches to the problems of plankton studies.

6. SCIENTIFIC ACTIVITIES AT THE CENTRE:

a) Plankton Sorting

Sorted Samples as on 31.12.1967	..	1776
Sorted January to June 1968	..	<u>171</u>
Total Sorted	..	<u>1947</u>

Samples held unsorted for separate study	.. 234
Total of IIOE samples at IOBC	.. 2181
INS Kistna samples re-sorted during 1968	.. 39

b) Advanced sorting

This has been gathering momentum during 1968. There are small groups of 4 or 5 scientific assistants engaged in advanced sorting of such sections as Fish Eggs and Larvae, Copepoda, Decapoda Larvae, Amphipoda and Cephalopoda. This advanced sorting is combined with the sorting involved in the detailed studies which every member of the staff of IOBC is engaged in (with very few exceptions) with respect to selected taxa as indicated below:-

c) Research on Plankton Groups

Studies are being carried out, along with advanced sorting, by the following persons, on groups indicated:-

1. Shri P. Gopala Menon .. Decapod Larvae:  
Solenocerinae and Aristaeinae
2. Shri M. Sakthivel .. Euthecosomes (Mollusca,  
Pteropoda)
3. Shri K.J. Peter .. Fish Larvae: Clupeidae,  
Engraulidae, Scombridae.
4. Dr. M. Saraswathy .. Copepoda: Pleuromamma,  
Gaussia: Lamellibranch  
larvae of the IIOE
5. Shri P.N.Aravindakshan .. Heteropoda (Mollusca):  
Carinariidae & Pterotracheidae
6. Shri Jacob George .. Ostracoda
7. Shri George Peter .. Pelagic Polychaeta
8. Shri V.T. Paulinose .. Decapod larvae: Panaeinae
9. Mrs.Vijayalakshmi R. Nair .. Chaetognatha

10. Shri T. Balachandran .. Pelagic Anthozoa
11. Smt.C.B.Lalithambika .. Fish Larvae: Pleuronecti-  
Devi formes
12. Shri T.C.Gopalakrishnan .. Pelagic Foraminifera
13. Shri K.K.Chandrasekharan .. Amphipoda: five families  
Nair of Hyperiidæ
14. Smt. K. Sarala Devi ..  
Copepoda: Haloptilus
15. Smt. Rosamma Stephen ..
16. Dr. C.Sankarankutty .. Brachyura larvae (3 families)
17. Dr. N.R. Menon .. Cyphonautes larvae
18. Shri S.C. Goswami .. Copepoda: Oithonidæ
19. Dr. Saramma Abraham .. Copepoda: Acartiidæ &  
inshore Centropagidæ
20. Dr. R.V. Unnithan .. Platyhelminths of the IIOE
21. Shri L.R.Kasturirangan .. Copepoda: Harpacticoida

The publication of the General Properties Atlas, under the co-editorship of Dr. N.K. Panikkar and Dr. Edward Brinton, is now well underway. Two fascicles, both by Dr. R.R. Prasad, were issued during 1968. The first fascicle includes 18 maps of distribution of zooplankton biomass in the Arabian sea and the Bay of Bengal; the second fascicle includes 9 maps showing distribution of zooplankton biomass over the entire Indian Ocean. Further fascicles will come out in 1969 charting the distribution of Euthecosomes, Meroplanktonic larvae, Total Copepoda, Total Fish Larvae etc. The Handbook on the International Collections has been corrected, collected and completed by the Unesco Curator and has just been issued.

d) Field Activities

Notable among the scientific activities which have taken root during 1968 should be mentioned: (a) the continuation of fortnightly collections of fresh plankton from the marine and lagoon environments near Cochin under the overall charge of Dr. N. Ravindranatha Menon (Senior Research Fellow), the plankton being studied by a large number of interested staff members, including all the research fellows. (b) the collection of fresh plankton once a week in the early dusk hours with a view to gathering newly spawned fish eggs for rearing in the laboratory. (c) the full participation by IOBC staff members in a

co-operative programme of oceanographic studies around the Laccadive Islands jointly by scientists from IOBC, BOD and POD.

#### 7. FACILITIES FOR VISITING SCIENTISTS

Visiting Scientists were given full facilities as in all previous years. From 1969, on the new premises of IOBC, a separate air-conditioned room with necessary laboratory facilities is set apart for the use of visiting scientists. Dr. Marta Vannucci is now with us in the IOBC and using this room. Among visiting scientists who were at IOBC in 1969 on the old premises, four scientists may be mentioned: Dr. R.V. Nair (April 1968) who examined the Salps of the International Collections and reported on their condition of preservation, Dr. Richard Hamond of Cronulla (April - May 1968) who had fruitful suggestions for the staff on the design of zooplankton identification sheets; Dr. H.E. Gruner of the Zoological Museum of Berlin and Dr. Thomas Bowman of the Smithsonian Institution, Washington D.C., U.S.A. The last mentioned two scientists were at IOBC for an eight weeks' stay (October - November 1968) and examined the Amphipoda of the IIOE and reported and offered advice to the Curator and Director of IOBC on the further study of this taxon by specialists. The two scientists were given assistance and co-operation by Shri K.K. Chandrasekharan Nair (U.S.A.)

#### 8. LECTURES AND SEMINARS

Regular weekly discussion meetings were held at IOBC, and in some instances, these were attended by colleagues from the Kerala University Oceanographic Laboratory, the Central Marine Fisheries Research Institute and the sister Laboratories at BOD and POD. Some members from the IOBC were interested participants at the Symposium on the Marine Resources around India, organised by the CMFRI in Ernakulam in December 1968. Special mention may be made of the talks given at IOBC by Dr. R. Hamond, and Dr. Richard Bowman at the discussion meetings.

#### 9. BUDGET

(in Rupees)

	<u>1960-69</u>	<u>1969-70</u>
Pay and Allowances ..	1,80,000.	2,00,000.
Scientific Equipment & Contingency ..	<u>1,30,000.</u>	<u>1,50,000.</u>
	<u>3,10,000</u>	<u>3,50,000</u>

10. ORGANIZATION

The organizational set up continued in 1968 without much change from previous years. In 1969, the Chief Scientist-in-Charge will be a full time officer and function as the Head of the Division.

11. PUBLICATIONS

Items 1 to 9 listed below appeared in the Symposium Number of the National Institute of Sciences of India, Part II, Biology:-

1. Shri M. Sakthivel .. "A preliminary report on the distribution and relative abundance of Euthecosomata with a note on the seasonal variation of Limacina species in the Indian Ocean".
2. Shri P.N.Aravindakshan.. "Preliminary report on the geographical distribution of the species of Carinariidae and Pterotracheidae (Heteropoda, Mollusca) from the International Indian Ocean Expedition".
3. Shri Jacob George .. "A preliminary report on the distribution and abundance of plankton Ostracoda in the Indian Ocean".
4. Shri George Peter .. "A preliminary report on the general distribution and seasonal variation in abundance of the planktonic polychaetes in the Indian Ocean".
5. Smt. Vijayalakshmi R. Nair .. "A preliminary report on the biomass of Chaetognaths in the Indian Ocean comparing the southwest and northeast monsoon periods".
6. Shri K.Gopalakrishnan and Dr. E. Brinton .. "Preliminary observations on the distribution of Euphausiacea from the International Indian Ocean Expedition".
7. Shri K.J. Peter .. "Larvae of Rastrelliger (Mackerel) from the Indian Ocean".
8. Shri K.J. Peter .. "Preliminary report on the density of fish eggs and larvae of the Indian Ocean".



9. Shri M. Krishna Menon .. "Preliminary notes on the decapod larvae of the Arabian Sea".

The following appeared elsewhere, as indicated.

1. Dr. R.R. Prasad .. I.I.O.E. PLANKTON ATLAS, Vol. 1, Fascicle 1 Maps on Total Zooplankton Biomass in the Arabian Sea and Bay of Bengal. Issued by IOBC, NIO, CSIR, New Delhi.
2. Dr. R.R. Prasad .. IIOE PLANKTON ATLAS, Vol. 1, Fascicle 2 Maps on Total Zooplankton Biomass in the Indian Ocean. Issued by IOBC NIO, CSIR, New Delhi.
3. Shri M. Sakthivel .. "A note on the abundant occurrence of Desmopterus gardineri Tesch in the Indian Ocean".  
J. Bombay National History Society, 65 (1), pp 259-260 (May 1968).
4. Shri George Peter .. "On a new variety (var. nov. indica) of Lopadorhynchus (Prolopadorhynchus) henseni, Reibisch (Pelagic Polychaeta) from the Indian Ocean". (in the press).

12. SCIENTIFIC STAFF

a. 1. Chief Scientist-in-Charge

Dr. R.R. Prasad (part-time) till 26.10.68  
Shri L.R. Kasturirangan (Current duties, from 26.10.68)

2. Head of Office of NIO Units in Ernakulam

Dr. S.Z. Qasim

3. Scientist/Associate Curator

Shri L.R. Kasturirangan

4. Scientist

Dr. R.V. Unnithan

5. Pool Officer

Dr. C. Sankarankutty

b. 1. Senior Scientific Assistants

- i. Shri P. Gopala Menon
- ii. Shri M. Sakthivel
- iii. Shri K.J. Peter
- iv. Dr. M. Saraswathy

2. Junior Scientific Assistants

- i. Shri P.N. Aravindakshan
- ii. Shri Jacob George
- iii. Shri George Peter
- iv. Shri V.T. Paulinose
- v. Smt. Vijayalakshmi R. Nair
- vi. Shri T. Balachandran
- vii. Smt. C.B. Lalithambika Devi
- viii. Shri T.C. Gopalakrishnan
- ix. Shri K.K. Chandrasekharan Nair
- x. Smt. V. Santhakumari
- xi. Shri P.S. Gore
- xii. Shri K. Kameswara Rao (at Bombay)

3. Senior Laboratory Assistants

- i. Smt. P.P. Meenakshi Kunjamma
- ii. Shri S.V.M. Abdul Rahim
- iii. Shri T.O. Chandrabhanu
- iv. Smt. K. Sarala Devi
- v. Smt. Rosamma Stephen
- vi. Shri O. Raveendran
- vii. Shri P. Venugopal
- viii. Shri T.N. Sivadasan
- ix. Vacant (SLA, Collection Tender)

c. Research Fellows

1. Senior Research Fellows

- i. Dr. N.R. Menon
- ii. Shri S.C. Goswami
- iii. Shri Selva Kumar

2. Junior Research Fellows

- i. Shri S. Subramanian

3. K.U. Research Fellow:

- i. Dr. Saramma Abraham

13. VISITORS TO IOBC, 1968 - 69

- February 1968: Dr. P. Sandven, Dept. of Fisheries, FAO, Rome, Italy.  
 Dr. G. Saetersdal, Dept. of Fisheries, FAO, Rome, Italy.  
 Dr. H. Kasahara, United Nations Development Programme.  
 Shri U.H. Narayanan, S & M Centre of CSIO of  
 Chandigarh, Madras.  
 Dr. M. Anraku, Seikai Regional Fisheries Research  
 Laboratory, Japan.  
 Dr. O.J. Ostvedt, Office of Oceanography, Unesco, Paris.  
 Prof. J. Krey, Institut für Meereskunde der Universität  
 Kiel, 23-Kiel, FRG.  
 Prof. V.N. Greze, Institute of Biology of South Seas,  
 Sevastopol, USSR.  
 Prof. B. Kimor, Sea Fisheries Research Station, Haifa.  
 Prof. S. Krishnaswamy, Madurai University, Madurai.  
 Dr. A. Fleminger, S.I.O, La Jolla, California, USA.  
 Dr. Bains Prashad, Dehra Dun, U.P.  
 Dr. T. N. Srivastava, President, Forest Research  
 Institute, Dehra Dun.  
 Dr. A. Purushotham, Director of Biological Research,  
 F.R. Institute, Dehra Dun.  
 Dr. K.N. Sankolli ) Taraporevala Marine Biological  
 Dr. (Miss) S.S. Shenoy ) Research Stations, Bombay-2, BR.  
 Dr. S. Tewfik, Unesco Chief of Mission, New Delhi.  
 Dr. T.S.S. Rao, N.I.O., Bombay  
 Dr. K. Subbaramaiah, Central Salt & Marine Chemicals  
 Research Institute, Bhavanagar-2.  
 Dr. W. Eifion Jones, Marine Science Laboratories,  
 Menai Bridge, U.K.
- March 1968: Mr. Yasumas Matsuzake, Japanese Colombo-Plan Expert,  
 M.P.P.T.C., Mangalore.  
 Mr. Kaoru Okabe, Japanese Colombo-Plan Expert, M.P.P.T.C.,  
 Mangalore.  
 Mr. Peter Savage, Dept. of Oceanography, Southampton, UK.  
 Mr. T.M. Arumugam, Asst. Director of Fisheries, Madras.  
 Dr. W. Koch, I.I.T., Madras, Physics Department,  
 Visiting Professor.
- April 1968: Dr. R.V. Nair, CMFRI, Mandapam Camp.  
 Dr. R. Hamond, Cronulla, Australia.
- May 1968: Dr. S. Jones, Director, CMFRI Mandapam Camp.  
 Dr. A.G. Jhingran, Director-General, Geological Survey  
 of India (Retired) and Professor of Geology,  
 Delhi University.
- June 1968: Dr. Roy I. Jackson, Asst. Director-General (Fisheries),  
 FAO, Rome.  
 Dr. G.M. Gerhardsen, Senior Fisheries Development Adviser  
 to the Govt. of India, FAO, Delhi.  
 Dr. S.Raphi Jonssen, FAO Fisheries Expert, Ernakulam.  
 Dr. Chi Yun Pao, FAO Fisheries Expert, Cochin.

- Mr. A.I.George, Director of Fisheries, Kerala, Trivandrum.
- July 1968: Mr. M.C.Penumal, Director, CIFO, Ernakulam.  
Dr. B.V. Hamon, CSIRO, Cronulla, Australia.  
Dr. D.A. Ritz, CSIRO, Cronulla, Australia.
- September 1968: Dr. Wymen Harrison, Director, Land and Sea Interaction Laboratory, Norfolk, Virginia, USA.
- October 1968: Dr. H.E. Gruner, Zoologisches Museum, Berlin, Germany.  
Dr. Thomas E. Bowman, Smithsonian Institution, Washington D.C., USA.
- November 1968: Dr. K. Sadasivan Pillay, Senior Chemist, Fisheries Technology Section, University of Kerala, Trivandrum.
- Prof. Evold Nielsen, Karnataka Regional Engineering College, Surothkal, South Kanara.
- December 1968: Prof. P.M. Annamalai, Govt. Arts College, Coimbatore.  
Dr. B.K. Moorthi, CMFR Unit, Waltair.  
Mr. M.G. Dayanandan, CMFRI, Ernakulam.  
Mr. Annasahib P. Shinde, Union Minister of State for Food and Agriculture.
- Mr. P.R.S. Tampi, CMFR Substation, Madras-28.  
Dr. G.Seshappa, CMFR Substation, Calicut-5.  
Dr. D.V. Rama Sarma, Andhra University, Waltair.  
Dr.P.Chandra Mohan, Andhra University, Waltair.
- January 1969: Dr. A.H. Musavi, Dept. of Zoology, Aligarh University.  
Dr. N.V.Thitsin, Moscow Main Botanical Gardens, USSR.  
Dr. P.J. Lapin, Moscow Main Botanical Gardens, USSR.  
Dr. Marta Vannucci, Instituto Oceanografico, Cx 9075, San Paulo, Brazil.  
Dr. R.R.C.Edwards, Marine Laboratory, Victoria Road, Aberdeen, U.K.  
Dr. J.H.S.Blaxter, Zoology Department, University of Aberdeen, Scotland, UK.  
Dr. William Aron, Smithsonian Institution, Washington D.C., USA.  
Dr. Richard H. Benson, Smithsonian Institution, Washington D.C., USA.  
Dr. Y.Y. Kim, Assistant Regional Representative, UNDP, New Delhi.  
Mr. M.R.Malhotra, Assistant, UNDP, New Delhi.  
Mr. P.K.Eapen, Deputy Director, O.S.F.S., Cochin.  
Dr. Edward Brinton, SIO, La Jolla, California, USA.  
Dr. F.H. Talbot, The Australian Museum, Sydney, Australia.

REPORT OF THE UNESCO CURATOR OF THE INDIAN OCEAN BIOLOGICAL CENTRE  
FOR THE YEAR 1968-1969

1. INTERNATIONAL PLANKTON COLLECTIONS

Attention has been directed at recent meetings of the Consultative Committee to signs of deterioration in the International Plankton Collections at IOBC. During the last 12 months a survey has been carried out to determine the nature and extent of the problem. The results of the survey are shown in Appendix 2.1. It is clear that the collections at IOBC are generally not as well preserved as collections made by National Laboratories during the IIOE. This is due, most probably to the stress of repeated biomass determinations. Determination did not occur while samples were being sorted. Despite this situation, most of the collections are still of value, particularly the crustacean taxa which dominate the catches. With this in mind, emphasis has been placed in the last year on advancing the sub-sorting programmes so that material can be placed in the hands of specialists as soon as possible.

The state of the sorting and sub-sorting programmes is shown in Appendix 2.1. A total of 1927 samples has been sorted at the basic level, and the station data relevant to these is given in Volume 1 of the Handbook to the Collections, recently published and now distributed to specialists. A part from this basic programme, five main subsorting programmes have been initiated. Of these, the Decapod Larvae work is complete. The fish eggs and larvae work is half-finished and will take another year to complete. The Amphipod programme is well under way and will be finished by September. The Cephalopod programme will take another 18 months. The Copepod work, which is perhaps the most difficult and specialized of all will not be complete in under eight years. This last estimate indicates the large amount of effort required to sort at this level, a point which might not have been fully appreciated by the C/C when it decided to undertake this work for specialist copepodologists. These rates could be increased by diverting effort from other activities at the Centre, and the C/C might consider the desirability of this. Because of the great urgency to place the collections in the hands of specialists, a decision has been taken not to sort a group of some 200 samples from the Agulhas Bank. These samples come from a small area of the Indian Ocean, represented by other samples in the collection, and constitute a seasonal rather than a zoogeographic series. Aliquots of these samples are already under study by South African scientists. A decision is sought from the C/C as to the future of this material, and later collections still in South Africa awaiting despatch.

Appendix 2.3 provides an up-to-date list of the specialists who have agreed to receive and study material from the International Collections at IOBC. The taxa which they will study are set out

in Appendices 2.4 to 2.8. The attention of the Committee is drawn to the fact that the allocations recommended by Dr. Gruner (Appendix 2.7) require endorsement by this meeting. The attention of the Committee is also drawn to the need to select specialists to study the following taxa which are now available for immediate consignment: Salps and Doliolids, Cladocera, Actinotrocha Larvae, Echinoderm Post-larvae, Tornaria, Trochophore Larvae, Meroplanktonic Gastropoda, Tanaidacea, and Halobates.

The Consultative Committee has placed various taxa in the hands of specialists at IOBC. The names of these specialists, the groups they are studying, and their progress to date is shown in Appendix 2.9. Any decision to accelerate the work on the collections in other directions must also take into account the adverse effect this would have on the specialist work being carried out at IOBC at the invitation of the C/C.

Appendix 2.10 shows the date of despatch of material from the IOBC to various specialists. It can be seen that this consists principally of material arising from basic sorting. However, within a few months, material arising from the amphipod, copepod, and fish larvae sub-sorting programmes will begin. It can also be seen that most of the consignments made to date have taken place since the last meeting of the C/C.

Apart from Dr. Gruner, whose visit has been pending for some time, the last year has also seen the materialization of the recommendation from the last meeting that Dr. Bowman from the United States (Amphipoda and Copepoda), and Dr. Vannucci from Brazil (Hydromedusae) should be invited to visit the Centre. The work which these scientists have carried out while at IOBC has greatly accelerated the work on the collections and materially increased the morale and competence of the Centre. Within the last few days, Dr. Bé from the United States has arrived to examine the Foraminifera collection and make arrangements for its study. In addition to these scientists from abroad, Drs. Velappan Nair, Jones, Nagabushanam, and Daniel have paid short visits to the Centre and have examined parts of the collection at our invitation.

To accelerate the work on the collections, a wide request has been made for taxonomic literature. A list of essential works has been circulated to National Coordinators for the IIOE and this has resulted in generous donations from Australia and an offer of assistance from the UK (Royal Society). In addition to this, many requests have been made to individual authors for recent

taxonomic papers, and as a result stocks of specialist literature have been built up, particularly in those taxa under study by the IOBC staff.

## 2. DATA CONCERNING THE INTERNATIONAL COLLECTIONS

At long last, the widely-sought "Handbook" to the International Collections has been published. This publication lists the station data for the collections together with their displacement volume. The decision was taken to publish locally to ensure rapid publication and greater control over accuracy in reproducing the station lists. Volume 2 of the Handbook has been held up because of difficulties in obtaining the required environmental data from the World Data Centre. It might be useful to publish in another volume of the Handbook the various papers recently presented by members of IOBC staff at the Workshop on Plankton Methods, concerning methods used with the International Collections.

The attention of the C/C is directed towards the data arising from the sorting and sub-sorting programmes at IOBC, and to the data which will eventually be returned to IOBC by the various specialists working with the collections. These data are currently being assembled in a form suitable for automatic data processing, and it is planned to lodge these with the World Data Centre through INODC. Arrangements have been made with WDC to receive and process these data, but to release the information only with the permission of the specialists responsible for its collection. The endorsement of the C/C is sought for this arrangement.

Once these data are recorded on punch cards or tape, they can be used to produce atlases of zooplankton taxa quickly and accurately, by making use of automatic data plotting machines. Such facilities are available at the University of Hawaii where other IIOE atlases are being produced. Investigations are also under way concerning the availability of similar facilities in India. Guidance is required from the Committee as to which of these alternatives should be followed or whether a compromise can be reached that is more satisfactory than either. We also need advice as to which atlases should be proceeded with in the next 12 months.

## 3. TRAINING

Training programmes at IOBC have followed various directions. Two members of the staff have been sent abroad, one to the Marine Biology Course in Copenhagen (Aravindakshan) and one to London, for specialist training in polychaete systematics (George Peter).

At IOBC emphasis has been placed on training in plankton sampling and laboratory methods. Last week a Workshop in Plankton Methods was held at IOBC, the first scientific meeting ever organised by the staff. There was wide participation, both from within Indian and abroad, and many members of the staff contributed papers (Appendix 2.11) and prepared demonstrations. The Workshop included a cruise at sea in which members of staff tested equipment recently designed and locally built. Other fieldwork has been carried out during the year, both in the backwaters, and in the lagoons of the Laccadive Archipelago. Regular discussions and seminars have been held throughout the year (Appendix 2.12), and attitudes of helpful criticism are beginning to take root. The proposal is placed before the Committee that "Workshops" be held at IOBC regularly every year, and that participants be brought to these training courses from other countries in the Asian region.

#### 4. REFERENCE COLLECTIONS

One of the original purposes of the IOBC was to build up a series of "Reference Collections". This work has not yet begun but a start could be made during the next few months. The point is made that the existence of extensive reference collections of tropical zooplankton would greatly enhance the attraction of the IOBC as a centre of Plankton research, and encouragement is sought from the Committee to begin this work.



APPENDIX 2.1: CONDITION OF THE INTERNATIONAL PLANKTON  
COLLECTIONS AT THE INDIAN OCEAN BIOLOGICAL  
CENTRE

D. J. Tranter

SUMMARY

The material of the International collections at the Indian Ocean Biological Centre (IOBC) has been compared with that of "Duplicate" material collected by National Laboratories, these collections being made during the International Indian Ocean Expedition (1962-65). The Copepoda were chosen as a convenient and sufficiently representative Taxon for detailed study. From each sample the condition of 100 copepods was examined with respect to four criteria: Dissolution of Tissue (D), Body rupture (R), Fracture of antennae (A), and Loss of Legs (L). Thus quantitative descriptions were made of the condition of each sample.

The condition of Duplicate samples from National Laboratories was compared with that of material sorted from the International Collections as well as that of unsorted archives. A total of 396 collections were examined yielding more than 100 comparisons. The samples involved represent more than 5% of the International Collection. They were so chosen as to yield, with minimum bias, the maximum information about factors likely to influence plankton condition. The samples chosen were collected by 5 ships coded A-E, and were processed by 4 technicians coded F, G, H and K. The influence of the following factors was investigated: Ship, Date of Collection, Preservative, Container, Sample Size, Date of Processing, Sorting Duration and Technician.

A preliminary analysis of the results led to the following tentative conclusions:

Both the sorted material ("Taxon") and the Archives held at IOBC show considerable damage with respect to samples taken at the same station ("Duplicate") but held in laboratories abroad (Table 2.1.1). This difference can be seen most clearly in the disintegration and dissolution of protoplasm.

Because there was no significant difference between the condition of sorted material and unsorted archive, nor between the material handled by one technician and another (Table 2.1.2) it is clear that the deterioration observed occurred prior to the sorting process at IOBC. The deterioration was not the result of the inadequate fixation of large catches (Table 2.1.3) if anything, large catches showed less deterioration than small samples.

Comparison of the duplicates collected by various ships showed that there was significant difference in sample condition: as with the material at IOBC, the variation in the dissolution of protoplasm was more evident than the variation in structural damage. This effect was twice as great in ships B and C as in ships A and E (Table 2.1.4).

An examination of the likely reasons for this deterioration (Table 2.1.5) eliminated the type and strength of fixative used (4% formaldehyde), the type of buffer, and the type of container used to store the catch. The most probable cause of the deterioration is the mechanical and perhaps osmotic damage inflicted on the sample by successive biomass determinations.

APPENDIX 2.2: PROGRESS OF SORTING AND SUBSORTING  
PROGRAMMES AT IOBC

Group	Sorting Team	No. of components	No. of samples completed
Main Sample	20 Technicians	65	1927
Decapod Larvae	Gopala Menon Paulinose	27	1927
Fish Eggs and Larvae	Peter Lalithambika Devi Chandrabhanu Gore Santhakumari	58	957
Copepoda	Saraswathy Rosamma Stephen Sarala Devi Gopalakrishnan	35	98
Amphipoda	Chandrasekharan	20	415
Cephalopoda	Aravindakshan	3	109

APPENDIX 2.3: NAMES AND ADDRESSES OF SPECIALISTS STUDYING  
OR PLANNING TO STUDY TAXA FROM THE IIOE  
COLLECTIONS

Name	Addresses
Dr. K.H. Alikunhi	Director, Central Institute of Fisheries Education, Bombay, INDIA.
Mr. P.N. Aravindakshan	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Mr. T. Balachandran	Indian Ocean Biological Centre, P.B. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. S.V. Bapat	Research Officer and Officer-in-Charge, CMFR Sub-Station, Karwar, N.Canara, INDIA.
Dr. A.H. Bé	Lamont Geological Observatory, Palisades, New York 10964, USA.
Dr. T.N. Belianina	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J.387, USSR.
Dr. E. Bertelsen	Denmarks Fiskeri-og, Havundersøgelse, Charlottenlund Slot, Charlottenlund, DENMARK.
Dr. E. Brinton	Scripps Institution of Oceanography, La Jolla, California, USA.
Dr. Buckmann	Em O. Professor der Hydrologie und Fischerei Wissenschaft, 200 Hamburg, Halwigstr, FRG.
Dr. P. Castle	Rhodes University, Grahamstown, S.AFRICA.
Mr.K.K. Chandrasekharan Nair	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr.Chuang-Tai Shih	Scientist-in-Charge, Zooplankton Laboratory, Canadian Oceanographic Identification Centre, National Museum of Canada, Ottawa, CANADA.
Chiba, T.	Shimonoseki University, Yoshimi, JAPAN.

Name	Addresses
Dr. S.H. Chuang	Zoological Department, University of Singapore, Bukit Timah Road, SINGAPORE-10.
Dr. P.L. Cook	Department of Zoology, British Museum(N.H.), Cromwell Road, LONDON S.W. 7.
Dr. R. Daniel	Zoological Survey of India, 34 Chittaranjan Avenue, Calcutta-12, INDIA.
Dr. M. Dechance	Museum National d'Histoire Naturelle, 61 rue de Buffon, Paris 5, FRANCE.
Dr. R. Fenaux	Chargé de Recherche CNRS, Station Zoologique de Villefranche-sur-Mer, Alpes-Maritimes, FRANCE.
Dr. A. Fleminger	Scripps Institution of Oceanography, La Jolla, California, USA.
Mr. P. George	Indian Ocean Biological Centre, P.B. No 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. R.U. Gooding	University of Singapore, SINGAPORE.
Mr.T.C. Gopalakrishnan	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Mr. P. Gopala Menon	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. N.N. Gorbunova	Institute of Oceanology, Academy of Sciences, 1, Sadovaya, Moscow J.387, USSR.
Mr. S.C. Goswami	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. G. Grice	Woods Hole Oceanographic Institute, Woods Hole, Massachusetts, USA.
Dr. J.R. Grindley	Port Elizabeth Museum, Port Elizabeth, S. AFRICA.
Dr. H.E. Gruner	Zoologisches Museum, Invaliden Str, 43, Berlin-4 GERMANY (G.D.R.)

Name	Addresses
Dr. S.M. Haq	University of Karachi, Invertebrate Reference Museum, Zoology Department, Karachi 32, PAKISTAN.
Dr. Henning Lemche	Universitets Zoologiske Museum, Universitets Parken-15, København, DENMARK.
Dr. M. Heptner	Institute of Oceanology, USSR Academy of Sciences, 1 Sadovaya, Ljublino, Moscow J-387, USSR.
Dr. Iwao Taki	48, Alakayama-cho, Kamikamo, Kyoto, JAPAN.
Mr. Jacob George	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. S. Jones	Director, Central Marine Fisheries Research Station, Mandapam Camp, Madras, INDIA.
Mr. L.R. Kasturirangan	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Prof. Keitaro Uchida	Faculty of Agriculture, Kyushu University, Fukuoka City, JAPAN.
Mrs. N.V. Kovalevskaia	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J-387, USSR.
Dr. N. Krishna Pillai	Reader, Marine Biology Laboratory, Aquarium, Trivandrum-7, INDIA.
Dr. S. Krishnaswamy	University of Madurai, Madurai, INDIA.
Dr. C.V. Kurian	Professor and Head of the Department, University Oceanographic Laboratory, Foreshore Road, Cochin-16, INDIA.
Mrs. C.B. Lalithambika Devi	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.

Name	Addresses
Dr. B.T. Lang	University of Saigon, Saigon, VIETNAM.
Dr. J.B.L. Matthews	University of Bergen, Bergen, NORWAY.
Dr. R.R. Makarov	Research Institute of Marine Fisheries and Oceanography, Moscow W.B.140, USSR.
Dr. J. McGowan	Scripps Institution of Oceanography, P.B. No. 109, La Jolla, USA.
Dr. T. Minoda	Hokkaido Regional Fisheries, Yoichi, Hokkaido, JAPAN.
Miss V.A. Mukhacheva	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J.387, USSR.
Dr. E. Naylor	Department of Zoology, University College of Swansea, Singleton Park, Swansea, UK.
Dr. N. Novikova	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J.387, USSR.
Prof. T.A. Ostroumova	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J.387, USSR.
Dr. R.S. Park	Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, USA.
Mr. V.T. Paulinose	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Mr. K.J. Peter	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. R. Philip Dales	Bedford College, University of London, Regents Park, LONDON N.W.1.
Mr. P.P. Pillai	Central Marine Fisheries Research Station, Ernakulam, INDIA.
Prof. A.J. Provenzano	Institute of Marine Science, 1 Rickenbacker Causeway, Miami, Florida, 33149, USA.

Name	Addresses
Dr. P.M. Ralph	Department of Zoology, P.B. No. 196, Wellington, NEW ZEALAND.
Dr. T.S.S. Rao	National Institute of Oceanography, 169-170, E.P.T. Buildings, Sasson Docks, Colaba, Bombay-5, INDIA.
Prof. T.S. Rass	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J-387, USSR.
Dr. N. Raveendranatha Menon	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. A.L. Rice	British Museum (N.H.) Department of Zoology, Cromwell Road, LONDON S.W.7.
Miss Rosamma Stephen	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. Robert R. Rofen	Research Director, Aquatic Research Institute, Port of Stockton, California, USA.
Dr. P.R. Sadasivan Tampi	Indian Council of Agricultural Research, Central Marine Fisheries Research Substation, 10 Leith Castle South St., Madras-2C, INDIA.
Mr. M. Sakthivel	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Miss K. Sarala Devi	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. M. Saraswathy	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. Saramma Abraham	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.



Name	Addresses
Dr. C. Sankarankutty	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.
Dr. K.W. Sankolli	Marine Zoology & Fisheries Division, Department of Zoology, Karnatak University, Dharwar-3, Mysore, INDIA.
Dr. A. Schmeleva	Institution of Biology of the Southern Seas, Sevastopol, USSR.
Mr. Y. Sheherbachev	Institute of Oceanology, Academy of Sciences, 1 Sadovaya, Moscow J.387, USSR.
Dr. Shoji Ueyanagi	Nakai Regional Fisheries Research Laboratory, Kochi Prefecture, JAPAN.
Dr. Satoshi Mito	Director, Inland Sea Regional Fisheries Laboratory, Vjina, Hiroshima City, JAPAN.
Dr. E.C. Silas	Research Officer, CMFR Sub-Station, Gopala Prabhu Road, Ernakulam, INDIA.
Dr. Rakashi Okutani	Tokai Regional Fisheries Research Laboratory, 5-5 Kachidoki, Tokyo, JAPAN.
Dr. O. Tanaka	Ocean Research Institute, Tokyo, JAPAN.
Dr. Thomas E. Bowman	Division of Crustacea, Smithsonian Institution, Washington D.C. 20560, USA.
Dr. N.M. Tirmizi	Officer-in-Charge, University of Karachi, Invertebrate Reference Museum, Zoology Department, Karachi-32, PAKISTAN.
Dr. Tokiharu Abe	Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, JAPAN.
Dr. A.N.P. Ummerkutty	Assistant Director, Language Institute, Trivandrum, INDIA.
Dr. R.V. Unnithan	Indian Ocean Biological Centre, P.B. No. 1913, Pullepady Cross Road, Cochin-18, INDIA.

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Name	Addresses
Dr. Vagn Hansen	Plankton Laboratoriat, Charlottenlund Slot, Charlottenlund, DENMARK.
Dr. W. Vervoort	Rijksmuseum v. Nat. Hist., Leiden, NETHERLANDS.
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Dr. M. Vinogradov	Institute of Oceanology, USSR Academy of Sciences, 1 Sadovaya, Ljublino, Moscow J-387, USSR.
Dr. J.H. Wickstead	The Laboratory, Citadel Hill, Plymouth, ENGLAND.
Dr. D.I. Williamson	Marine Biological Station, Port Erin, Isle of Man, UNITED KINGDOM.

APPENDIX 2.4: ALLOCATIONS OF DECAPOD LARVAE FROM THE  
IIOE COLLECTIONS FOR SPECIALIST STUDY

Taxon	Specialist	Country
Caridea Amphion Stenopidea	Williamson	U.K.
Procellanidae	Provenzano	U.S.A.
Crangonidae Galatheidae	Makarov	U.S.S.R.
Paguridae	De chance	France
Axiidae Callianassinae Upogebiinae Albunidae	Sankolli Shenoy	India
Zoea and Megalopae	Sankarankutty	India
Sergestidae	Tirmizi	Pakistan
Homoliidae Raninidae Dromiidae	Rice	U.K.
Penaeinae Sicyoninae Paguridae	Paulinose	India
Solenocerinae Aristaeinae Pandalidae	Gopala Menon	India

APPENDIX 2.5: ALLOCATIONS OF FISH LARVAE FROM THE  
IIOE COLLECTIONS FOR SPECIALIST STUDY

Taxon	Specialist	Country
Carangidae	Bapat	India
Ceratoidei	Bertelson	Denmark
Anguilliformes	Castle	South Africa
Gempylidae	Gorbunova Belianina	U.S.S.R.
Scomberomoridae Thunnidae Holocentridae Dactylopteridae	Jones	India
Beloniformes	Kovalesvskaia	U.S.S.R.
Pleuronectiformes	Lalithambika	India
Gonostomidae	Mukhacheva	U.S.S.R.
Stomiidae	Novikova	U.S.S.R.
Myctophidae	Ostroumova	U.S.S.R.
Clupeidae Engraulidae Scombridae	Peter	India
Argentinoidei	Rass	U.S.S.R.
Paralepididae Scopelarchidae Omosudidae Chlorophthalinidae	Rofen	U.S.A.
Coryphaenidae	Scherbachev	U.S.S.R.
Synodontidae Bregmacerotidae	Silas	India
Xiphiidae Histiophoridae	Ueyanagi	Japan
Miscellaneous Families	Abe Mito Uchida	Japan

APPENDIX 2.6: ALLOCATIONS OF COPEPODA FROM THE IIOE  
COLLECTIONS FOR SPECIALIST STUDY

Taxon	Specialist	Country
Calamoides Parœuchaeta russelli	Tranter	Australia
Megacalanus	Chiba	Japan
Undinula Augaptilidae	Matthews	Norway
Eucalanidae	Lang	Viet Nam
Calocalanus	Schmeleva	U.S.S.R.
Clausocalanus	Frost	U.S.A.
Aetideidae Phaennidae	Vervoort	Netherlands
Euchaeta	Tanaka	Japan
Scolecithricidae	Ummerkutty	India
Centropagidae (Oceanic)	Fleminger	U.S.A.
Centropagidae (Neritic)	Saramma	India
Pseudodiaptomidae Tortanus	Grindley	South Africa
Temoridae Calanopia	Haq	Pakistan
Metridia	Park	U.S.A.
Pleuromamma & Gaussia	Saraswathy	India
Lucicutidae	Minoda	Japan
Heterorhabdidae	Park	U.S.A.
Haloptilus	Rosamma & Sarala	India
Candaciidae	Grice	U.S.A.

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Taxon	Specialist	Country
Labidocera & Pontellina	Fleminger	U.S.A.
Pontella & Pontellopsis	Pillai	India
Acartiidae	Saramma	India
Harpacticoida	Kasturirangan	India
Oithonidae	Goswamy	India
Corycaeidae Oncaeidae Clausidiidae & related groups	Gooding	Singapore
Sapphirinidae	Krishnaswamy	India

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APPENDIX 2.7: ALLOCATIONS OF AMPHIPODA FROM THE  
IIOE COLLECTIONS FOR SPECIALIST STUDY

Taxon	Specialist	Country
Platyscelidae Parascelidae	Gruner	German Democratic Republic
Hyperiididae	Bowman	U.S.A.
Lycaeopsidae Lycaeidae Pronoidae	Shih	Canada
Gammaroidae Scinidae Lanceolidae	Vinogradov	U.S.S.R.
Vibiliidae Oxycephalidae Phronimidae Paraphronimidae Anchylomeridae	Chandrasekharan	India

APPENDIX 2.8: ALLOCATIONS OF TAXA FROM THE IOEE COLLECTIONS  
 FOR SPECIALIST STUDY, (OTHER THAN DECAPODA,  
FISH LARVAE, COPEPODA AND AMPHIPODA)

Taxon	Specialist	Country
Cyphonautes	Menon	India
Siphonophora	Daniel	India
Scyphozoa	Ralph	New Zealand
Anthozoa	Panikkar Balachandran	India
Platyhelminthes	Unnithan	India
Polychaeta	Dales Peter	U.K. India
Sipunculida	Rice	U.S.A.
Bivalve Post-Larvae	Saraswathy	India
Nudibranchiata	Lemche	Denmark
Pteropoda Gymnosomata and Thecosomata	McGowar Sakthivel	U.S.A. India
Heteropoda	Aravindakshan	India
Cephalopoda	Taki Okutani	Japan
Ostracoda	Iles McKenzie Jacob	U.K. U.K. India
Mysidacea	Pillai	India
Cumacea	Kurian	India
Isopoda	Naylor	U.K.
Euphausiacea	Brinton Gopalakrishnan	U.S.A. India
Sergestidae	Tirmizi	Pakistan



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Taxon	Specialist	Country
Stomatopoda	Alikunhi	India
Brachiopoda	Chaung	Singapore
Chaetognatha	Rao Vijayalakshmi	India
Appendicularia	Fenau Buckmann	France Federal Republic of Germany
Branchiostoma	Wickstead	U.K.

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APPENDIX 2.9: PROGRESS OF SPECIALIST STUDIES AT IOBC

Specialist	Taxon	Stations analysed	Comments
Aravindakshan	Atlantidae Other Heteropoda	79 1903	Generic level Species level (2 families)
Balachandran	Anthozoa	1280	Order level (3)
Chandrasekharan	Amphipoda	63	Species level (5 families)
George Peter	Polychaeta	264	Species Level
Gopala Menon	Solenocerinae	225	Family level
Goswami	Oithona	45	Species level
Jacob	Ostracoda	122	Species level (Arabian sea)
Kasturirangan	Harpacticoida	-	-
Lalithambika	Heterosomata	637	Species level
Paulinose	Peneaeinae	311	Family level
Peter	Engraulidae Clupeidae Scombridae	957	Scombridae complete
Ravindranatha Menon	Cyphonautes	402	Arabian sea complete
Rosamma Stephen	Haloptilus	5	Species level
Sakthivel	Thecosomata	1903	Species level (10 genera complete)
Saraswathy	Bivalve Larvae Plouromamma	102 20	Type level Species level
Saramma Abraham	Acartia Centropages	2 2	Species level Species level
Unnithan	Platyhelminthes	-	
Vijayalakshmi	Chaetognatha	190	Species level (Arabian sea)

APPENDIX 2.10: DELIVERY OF COLLECTIONS OF IOE MATERIAL  
TO SPECIALISTS, IN ORDER OF DESPATCH DATE

Taxon	Specialist	No. of Collections	Date
Appendicularia	Fenau	757	1966
Mysidacea	Pillai	-	1967
Cumacea	Kurian	5	1968
Euphausiacea	Brinton	-	June 1968
Stomatopoda	Alikunhi	408	Jan. 1968
Branchiostoma	Wickstead	515	Feb. 1968
Chaetognatha	Rao	88	Feb. 1968
Fish Larvae	Jones	71	March 1968
Scyphomedusae	Ralph	345	April 1968
Decapod Larvae	Williamson	997	June 1968
Siphonophora	Daniel	1129	July 1968
Decapod Larvae	Sankarankutty	866	Aug. 1968
Decapod Larvae	Makarov	162	Aug. 1968
Eel Larvae	Castle	77	Sept. 1968
Decapod Larvae	Rice	15	Sept. 1968
Decapod Larvae	De chance	279	Sept. 1968
Cephalopod Larvae	Taki	75	Oct. 1968
Isopoda	Naylor	107	Dec. 1968
Sergestidae	Tirnizi	1606	Dec. 1968
Phyllosoma	Tampi	65	Dec. 1968
Polychaeta	Dales	213	Jan 1969
Nudibranchiata	Lemche	107	Jan 1969
Brachiopoda	Chuang	60	Jan. 1969

APPENDIX 2.11: PAPERS PRESENTED BY IOBC STAFF TO THE FEBRUARY  
(1969) WORKSHOP ON PLANKTON METHODS

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Balachandran	..	Experiments at IOBC on Plankton Fixation
Gopalakrishnan	..	Performance of the Wiborg Plankton Splitter
Goswami	..	Comparison of Plankton Catches by Pump and Net
Lalithambika Devi	..	Rearing Fish Larvae in the Laboratory Plankton Shrinkage after Fixation
Peter & Sathivel	..	Plankton Samplers in Use and under Trial at IOBC
Ravindranatha Menon	..	Plankton Fractionation by Size
Rosamma Stephen & Sarala Devi	..	Relation between Numbers, Displacement Volume, and Biomass in the International Collections at IOBC
Sakthivel	..	Analysis of Data from the International Collections to find a useful Format for preparing Atlases of Zooplankton Taxa.
Saraswathy	..	Possibilities of preparing Atlases of Plankton Larvae
Tranter	..	Factors influencing Condition of Plankton at IOBC
Venugopal	..	Success of Standard Sampling at IOBC

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APPENDIX 2.12: DISCUSSIONS HELD AT IOBC DURING 1968/1969

Convener: Dr. N. Ravindranatha Menon

Topics Discussed

1. A programme for regular collection of plankton from the environs of Cochin.
2. The case for altering routine techniques at IOBC
3. Distribution of the species of genus Desmopterus (Pteropoda, Mollusca).
4. On some general aspects of the study of fish eggs and larvae.
5. Basic principles of the recent systematics of fish eggs and larvae.
6. Appendages of Halocyprididae.
7. Biology of the Sandy Beaches.
8. Some of the hydrographic features of Cochin Backwaters.
9. A proposed new series of Plankton Sheets for Indo-West Pacific area.
10. Food and feeding habits of some selected fishes.
11. Rearing in general.
12. Standard samples.
13. Some aspects of brackish water ecology.
14. General aspects of circulation in the Indian Ocean.
15. Temperature from a barnacle's point of view.
16. Seminar on zooplankton methodology.
17. Condition of International Collections.
18. Laccadives Programme.
19. Modern taxonomy.
20. Preliminary report on Laccadive Cruise 3/68 and results of Laccadive Cruise 2/68.

TABLE 2.1.1: MEAN DAMAGE OBSERVED IN COPEPODS - FROM ALIQUOTS OF THE INTERNATIONAL COLLECTIONS AT IOBC; "ARCHIVES" HELD AT IOBC; AND "DUPLICATES" TAKEN AT THE SAME STATIONS BUT STORED IN LABORATORIES ABROAD

Mean Damage (%)	D <sup>‡</sup>	R <sup>‡</sup>	A <sup>‡</sup>	L <sup>‡</sup>
Taxon	66	10	29	33
Archive	65	11	26	30
Duplicate	34	6	20	29

‡ D : Disolution of Protoplasm  
R : Rupture of Thorax  
A : Antennal Fracture  
L : Loss of Legs

TABLE 2.1.2: COMPARISON OF TECHNICIANS WITH RESPECT TO THE "SORTING STRESS" AT IOBC AS INDICATED BY THE MEAN AMOUNT OF DAMAGE TO COPEPODS IN THE SORTED FRACTION ("TAXON") AND IN THE ARCHIVE

Sorter	Taxon				Archive			
	D	R	A	L	D	R	A	L
F: Mean Damage (%)	65	12	33	35	66	13	29	33
G: " " "	69	11	32	30	66	11	28	27
H: " " "	66	9	27	34	61	10	24	29
K: " " "	65	7	23	32	66	12	23	30

TABLE 2.1.3: COMPARISON OF DAMAGE TO COPEPODS FOR VARIOUS SIZES OF THE ORIGINAL PLANKTON CATCH, AS SHOWN BY THE SORTED FRACTION ("TAXON"), ARCHIVE, AND DUPLICATE. RELATIVE DETERIORATION IS INDICATED BY THE DIFFERENCE BETWEEN ARCHIVE AND DUPLICATE

Catch size (ml)	Mean Percentage Damage															
	Taxon				Archive				Duplicate				Arch. - Dup.			
	D	R	A	L	D	R	A	L	D	R	A	L	D	R	A	L
< 4	70	15	39	41	74	22	32	35	40	10	26	31	34	12	6	4
4- 8	70	12	32	35	70	13	28	31	40	5	21	31	30	8	7	0
8-12	67	8	26	34	66	12	28	31	29	4	17	30	37	8	11	1
12-16	66	8	28	32	57	9	25	25	37	6	21	30	20	3	4	5
> 16	61	6	25	28	58	7	22	28	29	6	16	26	29	1	6	2

TABLE 2.1.4: COMPARISON OF SHIPS WITH RESPECT TO THE MEAN DAMAGE TO COPEPODS FROM COLLECTIONS TAKEN AT THE SAME STATIONS AS THE INTERNATIONAL COLLECTIONS AT IOBC ("DUPLICATES")

Ship	Mean Damage To Duplicate (%)			
	D	R	A	L
A	15	6	13	25
B <sup>x</sup>	49	10	25	30
C	43	5	25	39
D	27	4	22	29
E <sup>x</sup>	23	3	34	22

<sup>x</sup> Copepods from residue after sorting out other taxa

TABLE 2.1.5: POSSIBLE CAUSE OF DETERIORATION IN THE  
PLANKTON SAMPLES EXAMINED

Damage & Possible Causes	D u p l i c a t e S h i p s					Archive	Taxon
	A	E	D	C	B	(IOBC)	
Dissolution (D)	15	22	27	42	48	66	65
<b>Treatments:</b>							
Formaldehyde Strength (%)	4	4	4	4	4	4	4
Diluted with	SW	SW	SW	SW	SW	TW	TW
Buffer used	Borate	Hex	Hex	Hex	-	Hex	Hex
Buffer Conc. (%) to p <sup>H</sup>	7,8	1	1	1	-	1	1
Bo. Biomass determinations	-	-	1	1	2	1	-
TW during Biomass determs.		No	No	Yes	Yes	Yes	
Alc. during Biomass determs.	No	No	No	Yes	No	No	No
Container	Glass	Poly	Glass	Styr	Glass	Orig.	Glass



LIST OF PARTICIPANTS

Seventh Meeting of the Consultative Committee for  
the IOBC, Ernakulam, 24 February to 1 March 1969

1.	Prof. John Krey	Chairman
2.	Prof. S. Krishnaswamy	Member
3.	Dr. M. Anraku	Member
4.	Dr. V.N. Greze	Member
5.	Dr. B. Kimor	Member
6.	Prof. J.E. Smith	Member
7.	Dr. N.K. Panikkar	Member - Secretary
8.	Dr. G.F. Humphrey	SCOR Observer
9.	Dr. O.J. Østvedt	Unesco, Paris
10.	Dr. D.A. Boutaev	Unesco, New Delhi
11.	Dr. D.J. Tranter	Unesco Curator of IOBC
12.	Mr. L.R. Kasturirangan	Associate Curator of IOBC
13.	Dr. R.R. Prasad	Indian Advisory Board
14.	Prof. P.N. Ganapati	Indian Advisory Board
15.	Dr. K.K. Tiwari	Indian Advisory Board
16.	Dr. S.Z. Qasim	N.I.O. (India)
17.	Dr. T.S.S. Rao	N.I.O. (India)
18.	Dr. M. Vannucci	Visiting Scientist
19.	Dr. Alan Bé	Visiting Scientist
20.	Dr. D.M. Damkaer	Visiting Scientist