INTERNATIONAL ASSOCIATION FOR BIOLOGICAL OCEANOGRAPHY

Proceedings

Vol 1, 1971

INTERNATIONAL UNION OF BIOLOGICAL SCIENCES

DIVISION OF ENVIRONMENTAL BIOLOGY

INTERNATIONAL ASSOCIATION FOR BIOLOGICAL OCEANOGRAPHY

IABO is an association under the Division of Environmental Biology
of the International Union of Biological Sciences (IUBS).
It is affiliated to the Scientific Committee on Oceanic Research (SCOR).

THE EXECUTIVE COMMITTEE

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1. PREFACE

At its General Assembly in Tokyo, September 1970, the International Association for Biological Oceanography decided to publish at irregular intervals IABO Proceedings. The Purpose of the new publication is to keep marine biologists informed on international activities in the field of biological oceanography and to stimulate discussion on broader collaboration and on stronger biological input in international oceanographic projects. It was recognized that there is a considerable gap between the few biologists actively engaged in international science affairs and the great number of scientists who promote biological oceanography in their home laboratories and on board research vessels. Many of them participate in international research projects and in international scientific meetings and work-shops but take little part in the initial planning of those international activities.

It is the task of National Correspondents of IABO to bridge the gap between the IABO Executive and the biological oceanographers in the various countries. In order to facilitate that task IABO Proceedings will report on recent meetings and other activities of IABO and related non-governmental organizations, particularly the Scientific Committee on Oceanic Research (SCOR). Furthermore the Proceedings should inform on plans for future activities and will call for comments and further suggestions. The present first issue has also to go back into the early history of IABO and has to put on record the statutes and the organizational set-up of IABO.

The publication of the Proceedings was partly financed through a contribution by SCOR. A large number of copies of the first issue will be sent to IABO National Correspondents and to marine biological laboratories. Some further copies are available on request. In order to establish a list of addresses, a postcard of request for copies for future issues is included.

G. Hempel

2. THE ESTABLISHMENT 0F IAB0

The first moves towards the creation of the International Association for Biological Oceanography were made by the late Dr. Anton Bruun at the first session of the Intergovernmental Oceanographic Commission in 1961. Dr. Bruun convened a meeting of the biologists present at that meeting and as a result of their discussions the group decided to take steps towards the formation of the IABO.

This decision was founded on a realisation that without the backing of an International Association, there would be serious difficulty in ensuring adequate attention to Biological Oceanography in the rapidly growing field of international oceanography at large. It was essential to be in a position to provide the best possible scientific advice concerning biological phenomena in the sea to bodies such as the Intergovernmental Commission and to ensure adequate representation on biological matters at their meetings.

Furthermore, there existed at that time no organisation or association which could provide a world-wide forum for the scientific discussions of biological oceanography.

The Scientific Committee on Oceanic Research were approached for support and advice and finally it was proposed that the best approach would be to ask the International Union of Biological Sciences to assist in the creation of a suitable organisation within their structure. This move seemed most appropriate since it was felt important to retain in any new organisation, close links with the basic discipline.

At the 15th General Assembly of the International Union of Biological Sciences in July, 1964, a Section on Biological Oceanography was created and Professor E. Steemann Nielsen (Denmark) was asked to serve as President and R. I. Currie (UK) as Secretary of the new section. A provisional committee was set up to arrange the first general meeting of the Section, which was held in the Lomonosov Moscow State University in June, 1966, on the occasion of the Second International Congress of Oceanography.

In a discussion on the aims and objects of the Section it was felt that the greatest need was to provide a forum for the biological oceanographers from different countries to hold scientific discussions. By this means, the pressing problems of the subject could be identified and in those fields where international cooperation could help, steps could be taken to bring these matters to the attention of bodies that had the means of initiating international action upon them.

There had been some doubt about the best name for the Section and what its scope should be. Many studies of marine plants and animals are undertaken without the specific objects of contributing to knowledge of the sea as a biological system, but their relevance to the latter could not be ignored. No one field of biological study could be omitted except on purely arbitrary grounds and the Association had to accept a very wide responsibility. It was felt that this could best be met by entitling it the International Association for Biological Oceanography.

Countries adhering to the International Union of Biological Sciences are members of the Association, and the official point of contact in different countries is through their National Committees for Biology. The close affinity of interest with other organisations in the marine field has meant that in some countries the National Committees for Oceanography have been more active points of contact.

The need for close contact with working scientists is, however, fundamentally important to the work of the Association and this led to the introduction of a system of National Correspondents to improve communications both at this level and also with countries active in the field of biological oceanography, yet not possessing the appropriate national committees.

The Association is financed by periodic subventions from the International Union of Biological Sciences and also grants from this body, which assist with travelling expenses of the officers and participants in meetings.

The Association co-sponsored along with SCAR and SCOR, a Symposium on Antarctic Oceanography in Chile in 1966 and held its first Scientific Meetings at Woods Hole, Massachusetts in 1968. The second General Meeting was held in Tokyo in 1970 on the occasion of the "Ocean World", Joint Oceanographic Symposium. Representatives and observers have been appointed from time to time to attend various meetings of both intergovernmental and non-governmental organisations.

At the second general Meeting the need for more formal and closer relationships with the large number of biologists engaged in fishery science was recognized by the co-option to the committee of specialists in this field, including the Secretary of the Advisory Committee on Marine Resources Research.

A stage has now been reached where the Association must consolidate and strengthen its position but this can only be achieved through the active co-operation of working scientists in each country. It is in their interest to ensure that the world of International Science is made aware of their needs and able to benefit from their opinion.

R.I. Currie

3. STATUTES
of
INTERNATIONAL ASSOCIATION FOR BIOLOGICAL OCEANOGRAPHY

I. Objects. Composition and Membership of the Association

1. The International Association for Biological Oceanography is a constituent Section of the International Union of Biological Sciences. The Association is subject to those articles of the Statutes and By-Laws of the Union which apply to Sections, and also to the following Statutes.

2. The objects of the Association are to promote the advancement of knowledge of the biology of the sea, by:

a. providing opportunities for communication between marine biologists. These opportunities shall include meetings and discussions either during General Assemblies of I.U.B.S. or other suitable occasions.

b. co-operating with organisations and individuals with similar aims and interests.

c. nominating biological oceanographers as representatives of I.U.B.S. whenever appropriate.

3. The National Members of the Union are members of the Association.

II. Administration

1. The authority of the Association shall be vested in the National Organisations adhering to the Union and exercised collectively by their delegates meeting in the General Assembly of the Association.

2. The affairs of the section will be managed by a committee elected at the General Assembly of the Association and consisting of the President, Secretary, Treasurer, and two other members.

4. NATIONAL CORRESPONDENTS

One of the main objects of IABO is to provide opportunities for communication between marine biologists. After the establishment of the organisation it was therefore decided to try to build up as quickly as possible a firm and reliable link between the Executive Committee and the individual biologists of the member states.

Only a limited number of member states have a national committee for oceanography who could be approached regarding the nomination of one or a few National Correspondents. In most cases the Executive Committee has been obliged to address quite informally individual persons to ask them to act themselves as National Correspondents or to recommend somebody from their home country. This is the background for the compilation of the list given below which may thus be of a somewhat provisional character.

The duties of the National Correspondents are as follows:
1. Disseminate information from IABO to institutions and/or individual biologists of their home country.
2. Bring to the attention of IABO suggestions from institutions and/or individual biologists in their home country regarding meetings, publications, etc., which may serve to strengthen international relationships in marine biological sciences.
3. Bring to the attention of IABO any exciting new or major developments in the subject, in their country, which they feel may be of interest to biologists elsewhere.

The establishment of contact between the National Correspondents and the colleagues in their home country is obviously much easier in small countries than in large ones. The Secretary of IABO welcomes suggestions from National Correspondents or individual scientists on how to further the contact in the best possible way. So far the following countries have explained their procedure in this respect.

Japan: In February 1969 a IABO Group was established inside the National Committee for Biological Sciences under the Science Council of Japan, in close contact with the National Committee of Oceanic Research under the same council. It consists of 10 members representing 8 fields within biological oceanography and meets, as occasion calls, to discuss and manage national and international affairs within biological oceanography. All information to the National Correspondent (who is the Secretary of the Group) is circulated to its members. An informative paper on the activity of IABO was published in the Bulletin of the Plankton Society of Japan (vol. 17, 1970).

South Africa: There are about fifty professional marine biologists in South Africa employed at the Division of Sea Fisheries, the State research laboratories, museums, and universities.

Although there is no South African association of marine biologists as such, it has not proved difficult to learn the main trends in current research from the various progress reports, scientific publications, and from Symposia organised by various scientific societies. The National Correspondent summarized the main points up to June, 1970, and sent a copy to IABO. Similarly he distributed copies of the circular letter issued by the President of IABO to local marine biologists and he recently sent them a summary of the Tokyo Conference.

Argentina: The National Oceanographic Committee consists of representatives of 18 institutions in which some kind of oceanographic studies takes place. As a member of the Committee the National Correspondent participates in all meetings of the Committee and thus has contact with all the institutions interested in biological oceanography.

Denmark ; Due to the modest size of the country, contact is easily maintained by circulation, duplicating of relevant material, or even by telephone. Principal matters are discussed in the National Council for Oceanology.

United Kingdom: Although the UK has a national committee for biology which is technically the point of contact, it has been agreed internally that the British National Committee for Oceanography will liaise with IABO and will also maintain contact with the appropriate biologists in the UK.

T. Wolff

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5. REPORT of the SECOND GENERAL MEETING
Tokyo, 21 September 1970

The Second General Meeting of the International Association for Biological Oceanography was held in Keidanren Kaikan, Tokyo at 13. 30 hrs on Monday 21 September, 1970.

47 representatives of the following countries were present:

Argentina (1)	Italy (1)	Switzerland (1)
Canada (1)	Japan (6)	UAR (1)
Denmark (1)	Netherlands (1)	UK (4)
Germany, FRG (6)	Norway (2)	USA (8)
Germany, GDR (1)	Philippines (1)	USSR (1)
India (3)	South Africa (2)	Viet Nam (1)
Israel (2)	Spain (1)	

ACMRR was represented by its Secretary, Dr. M. Ruivo.

The meeting was opened by the President of IABO, Mr. R.I. Currie, who chaired the meeting.

1. The proposed Agenda was adopted unanimously.

2. The minutes of the First General Meeting held at the Lomonosov Moscow State University on 4 June, 1966 had been circulated. The Secretary summarized the main issues and on a proposal from Professor Braarud (Norway), seconded by Dr. Heydorn (South Africa) the minutes were approved and signed by the chairman.

3. There were no matters arising from the minutes which were not covered in the agenda items.

4. Report of the President:
The 1st General Meeting of IABO had been held in Moscow in June 1966. Subsequently IABO had sponsored along with SCAR and SCOR a symposium on antarctic oceanography at Santiago, Chile in September, 1966, the proceedings of which had been edited by the President of IABO and published in 1969. Arrangements had also been made for the 1st Scientific Meeting of IABO which had been held at Woods Hole, Massachusetts in May, 1968. The topic was "Design and analysis in plankton sampling" and the meeting was attended by 81 participants from the US, UK, Italy, New Zealand, Canada, New Caledonia, and Brazil.

The first seminar had dealt with the objects of particular sampling programmes, the second with the means of sampling, the third laid emphasis on the nature of the problem, the fourth dealt with statistical design and the fifth with sampling error. A final seminar had presented techniques ranging from component analysis to recurrent group analysis and generally had dealt with the handling of data.

The comparatively small number of papers and long discussion periods proved extremely fruitful and Dr. McGowan (Scripps Institution) who had convened the meeting and Dr. Grice (Woods Hole) who acted as secretary were warmly congratulated. Abstracts of the papers were awaiting publication by FAO.

Following this scientific meeting, various attempts had been made to improve communication between different countries. Little contact had been achieved through National Committees for Biology. Indeed rather more had been achieved through National Committees for Oceanography, but eventually it had proved necessary to seek the help of individuals in different countries to act as 'contacts'. National Correspondents had thus been appointed and so far had responded willingly and enthusiastically when called upon to do so.

Until 1968, IABO had no funds, but a small profit arising from the 1st Scientific Meeting had provided a beginning and with the growing help of IUBS more activity had been initiated in 1969.

Since 1960, the President had served on the Scientific Committee on Oceanic Research and represented IUBS at both the SCOR meetings and meetings of the Intergovernmental Oceanographic Commission. In 1969, both the President and Secretary had attended a meeting of the Executive of the Scientific Committee on Oceanic Research at Gothenburg in August and had been pleased to note that the activities of the SCOR Working Groups in the biological field were actively progressing. Of particular relevance were the following Working Groups:

Photosynthetic Radiant Energy. This Group is concerned primarily with finding a more satisfactory means of determining the available radiant energy for photosynthesis in the sea. Both sea trials and laboratory work have been conducted and a report appeared as UNESCO Technical Paper in Marine Science number 13. More observations were made aboard R/V Discovery during the period 2 May - 4 June 1970 and further work is progressing. The next meeting will be in Copenhagen in June 1972. Chairman: Dr. John E. Tyler, Scripps Institution of Oceanography, P.O.Box 109, La Jolla, California'92037, U.S.A.

Zooplankton Laboratory Methods. A new study of fixation and preservation methods is currently in hand under the supervision of Dr. Steedman of the University of Bath. He had received a contract from UNESCO for the preparation of a handbook which will embody the results of the experimental programme. A recent report appeared in SCOR Proceedings vol.6, No. 2, Annex IV. The next meeting will be in Bath in July 1972. Chairman: Dr. Vagn Hansen, Phuket Marine Biological Center, P.O.Box 200, Phuket, Thailand.

Estimation of Primary Production under Special Conditions. This Group was set up to examine the difficulties of estimating primary production in unusual conditions such as when there is heavy contamination from inorganic suspended matter, etc. A first report appeared in SCOR Proceedings vol. 5, No. 1, Annex IV. A meeting of the Group was held in Nanaimo in November 1970, and the Group will be disbanded upon completion of the report of that meeting. Chairman: Dr. T. R. Parsons, Fisheries Research Board of Canada, Biological Station, P. 0. Box 100, Nanaimo, B. C.

Continuous Monitoring in Biological Oceanography. The Group met in La Jolla in May 1970, and a report was published in SCOR Proceedings vol. 6, No. 2, Annex VII. The next meeting will be in La Jolla in January 1972. Chairman: Dr. A. R. Longhurst, Bureau of Commercial Fisheries, P.O. Box 271, La Jolla, Calif orma 92037, U.S.A.

Biological Data Inventories. This Group was set up in conjunction with ACMRR to re-examine the problem of disseminating information about biological data. A meeting was held in Washington in April 1970, and a report appeared in SCOR Proceedings vol. 6, No. 1, Annex VII. Chairman: Professor G. Hempel, Institut fur Meereskunde, 23 Kiel, Niemannsweg 11, Germany FRG.

Phytoplankton Methods. This Group conducts an examination of methods for quantitative phytoplankton studies, excluding pigment and other chemical methods, to explore the possibilities of specifying some standard procedures in such work, and to prepare a report which might serve as a basis for a manual on the subject. The first meeting was held at Kingston, Rhode Island in December 1970. Chairman: Dr. K. Banse, Dept. of Oceanography, University of Washington, Seattle, Washington"98105,""U. S. A.

Besides reviewing the activities of the Working Groups, the SCOR Executive had also considered three other important matters of interest to biological oceanographers. The first was the question of the organization of international scientific contact in marine science; discussions had been held on a proposal received from the Association for the Physical Sciences of the Ocean that a possible solution towards simplifying contact would be to form an International Union of Marine Sciences. An alternative to this, however, had found greater favour and present feeling was toward a strengthening of the Scientific Committee on Oceanic Research to act as a focal point for the various associations concerned with different aspects of marine science. By a reorganization it would be possible to ensure that SCOR would be in a position to conduct and coordinate many of the practical activities such as standardisation, intercalibration, Working Group activities, etc., which were beyond the scope of the budget of the different organizations.

The second matter discussed had been the present Joint Oceanographic Assembly which it had been agreed should be a joint meeting between the Associations for Physical, Biological, and Geological Oceanography. The Executive Committee had felt that this meeting might form the framework for a future pattern of international oceanography congresses.

The third matter discussed had been the current activity of the Intergovernmental Oceanographic Commission and a certain amount of apprehension had been expressed that this was tending too much towards telling scientists what they must do and how to go about studying the ocean. It had been felt that a strong case existed for putting a memorandum to the IOC expressing the views of the SCOR.

The last day of the SCOR Executive Meeting had been held in Paris along with members of the Advisory Committee on Marine Resources Research, and the officers of ACMRR had joined in drafting a paper which went forward to the IOC meeting, where it had received a rather mixed reception from the Governmental delegates from several countries. Indeed from the discussion at the IOC meeting it was clear that the Governmental delegates considered they had their own objectives to pursue and these might differ markedly from those of the International Associations.

The President of IABO had been asked to attend a meeting of the Executive of the International Union of Biological Sciences to convey to them information on the activities of the Association and SCOR. The Committee were pleased to record that the IUBS Executive expressed considerable interest in these activities and agreed to give an annual grant to assist in the administrative expenses of the Association and also made a grant towards travel costs of the Tokyo meeting.

The Association had been represented, by Professor R. B. Clark of Newcastle, at the first two meetings of the Joint Group of Experts on the Scientific Aspects of Marine Pollution convened by the Intergovernmental Maritime Consultative Organization. The meetings were held in London and Paris.

In the absence of the Treasurer, the President went on to make a Financial Report.

At the first General Meeting, the Association possessed no funds. As a result of the first Scientific Meeting at Woods Hole, however, a surplus of some $560 had accrued. In 1969, IUBS awarded a grant of $250 to assist with administrative expenses. Grants totalling $3052 were received from IUBS to meet travelling and subsistence expenses.

Administrative expenses had to be minimised and secretarial expenses, postage, etc., had amounted to a total of about $70, much of the real cost being met by the President's and the Secretary's own Laboratories.

When all outstanding expenses were met there should be a remaining balance of about $770. Some of this, however, would be required for preparation of a report of the present meeting. On a proposal from Dr. Postma (Netherlands), seconded by Dr. Banse (USA) these reports were approved unanimously by the meeting.

5. National Reports

In response to a request from the President, several National Correspondents had contributed reports on the principal activities in Biological Oceanography in their countries. Copies of those received were distributed at the meeting and it was anticipated that more such reports would be received in due course. While noting the somewhat different approach adopted in these reports, it was considered that distribution of reports on national activities would be a useful means of disseminating information. It was agreed, therefore, that National Correspondents should be contacted again and invited to make more of an appraisal of views on the development of the subject in different countries.

6. Organization

The President noted the difficulties which had been experienced in establishing communication with different countries and which had led to the setting up of a system of National Correspondents. While this did create some difficulty in relation to the Statutes of the Association it had, nevertheless, proved successful in contacting different countries.

It was appreciated that probably no one system could serve all countries and it was agreed that the views of National Correspondents should be sought on the best means of contact with their countries. At the same time, in view of the constitution of the Association as a section of IUBS it was recognized that the National Committees for Biology should continue to be informed on the activities of the Association.

7. Election of Office Bearers

By Statute the Association is required to elect its office bearers in General Meeting and a nomination committee consisting of the President, Professor Sugawara (Japan), Professor Braarud (Norway), and Dr. Postma (Netherlands) had been set up to make recommendations. The President announced his intention of resigning from the office but was co-opted to the new committee in the capacity of Past President to help to maintain continuity in the development of the Association. In addition, because of the great importance of establishing close contact on fisheries matters with other organizations in the field, it was decided to co-opt Dr. Ruivo, secretary of the Advisory Cornmittee on Marine Resources Research, as an ex-officio representative on the committee.
The following were elected:

President:	Professor G. Hempel (FRG)
Secretary:	Dr. T. Wolff (Denmark)
Members:	Professor R. Marumo (Japan)
	Dr. R.C. Dugdale (USA)
	Dr. P. A. Moiseev (USSR)
Past President:	Mr. R.I. Currie (UK)
Ex officio:	Dr. M. Ruivo (ACMRR)

8. Future activities

Coral Reef Symposia

A proposal had been received from Dr. Stoddart (Cambridge, UK) that an informal committee set up in 1969 to arrange Symposia on Coral Reefs should form the basis of a formally constituted committee for this purpose within the Association. It was recognized that in view of the great importance of this subject, this should be done, and some further names were proposed

to the Executive Committee for possible members of the Committee on Coral Reef Symposia. The next Symposium is planned for 1973 when it will be held on Heron Island, Queensland.

SCOR Symposium on the Biology of the Indian Ocean
It was noted that plans were well advanced for this Symposium which will be held at Kiel, Germany 31 March - 6 April, 1971. Funds had been requested from IUBS to assist with travel expenses of participants.

International Sea-Weed Research Symposium
It was noted that this would be held at Sapporo, Hokkaido, 9-13 August, 1971.

Symposium on Early Life History of Fish
It was decided, following the recommendations of an ACMRR Working Party, to hold a Symposium on this subject. The place and the time are still to be decided.

Relations with other organisations
A proposal for the formation of a new International Union of Marine Science had been made by the International Association for the Physical Sciences of the Ocean. Subsequent discussion gave more favour to broadening the existing structure of SCOR and strengthening it financially to enable it to carry out more of the practical activities called for by the three Associations (Biology, Geology, and Physics). The meeting was in favour of adopting this approach in further discussions on the subject.

Other activities
Dr. Boltovskoy (Argentina) drew attention to the desirability of holding a Symposium on Biological Indicators. Professor Braarud noted the need for some way of introducing marine scientists to new techniques in taxonomy with electron microscopy. These points were referred to the Committee for their consideration.

9. There was no other business and as the meeting concluded, Professor Braarud thanked the retiring President and Secretary for their work during the past session.

The meeting concluded at 17,15 hrs.

R.I. Currie
Chairman

Income and Expenditure Account
1 September 1970

Income

Received from surplus funds of Woods Hole meeting, less bank charges			£ 235-17-10
Sales of 'Antarctic Oceanography'			2-17- 4
IUBS			
Travel and subsistence grant SCOR meeting La Jolla		$ 400.00	
IOC meeting Paris		$ 401.45	
IUBS Executive meeting, Budapest		$ 250.56	
		$1052.01	£ 438- 6- 8
IUBS			
Grant to administrative expenses	$ 250.00		
Travel grant for Tokyo meeting	$2000.00		
		$2250.00	
Less charges			£ 932-13- 9
Bank interest			£ 13- 8- 6
			£1623- 4- 1

Expenditure

Secretarial costs	£ 21- 2-11
Postage	£ 8- 9- 6
Repayment of sales to SCAR	£ 2- 5- 0
Travel and subsistence as per IUBS grants to La Jolla, Paris, and Budapest	£ 438- 6- 8
Cash in hand	£ 12- 4
Balance	£ 1152- 7- 8
	£ 1623- 4- 1

(Signed) Ronald I. Currie, President
Dunstaffnage Marine Research Laboratory
P.O. Box 3, Oban, Argyll

Audited and found correct:
(Signed) W.H. Gillebertus
Dunstaffnage Marine Research Laboratory
P.O. Box 3, Oban, Argyll

6. REPORT of EXECUTIVE MEETINGS IN KIEL

Three members of the Executive Committee of IABO attended the Kiel Symposium: The President (Professor G. Hempel), the Treasurer (Mr. R.I. Currie), and the Secretary (Dr. T. Wolff). They held several meetings, some of which with persons involved in the planning of scheduled activities.

The items were as follows:

1. Proceedings of IABO. The contents, printing, date of issue, distribution, and financing were discussed in detail.

2. Symposium on Design and Analyses in Plankton Sampling, held at Woods Hole Oceanographic Institution in May 1968 under the auspices of IABO. Report and abstracts of the symposium will be circulated by FAO in May 1971 to the participants who have been invited to provide further information on recent publications in the field for the inclusion in a future issue of the IABO Proceedings.

3. Symposium on Coral Reefs. The topic, attendance, date, meeting place, terms of reference, etc., were discussed with Dr. D. R. Stoddart, University of Cambridge (cf. p. 23).

4. Symposium on Early Life History of Fish. The date, meeting place, members of the Preparatory Board, attendance, etc., were discussed with Dr. E.H. Ahlstrom (La Jolla), Dr. D.M. Cohen (Washington, D.C.), Dr. R. Marak (FAO), and Dr. W. Nellen (Kiel) (cf. p. 23).

T. Wolff

7. REPORT of MEETING OF NATIONAL CORRESPONDENTS IN KIEL

On Monday, 5 April 1971, at 18.15 hrs a meeting was held in the Audimax of Kiel University for National Correspondents of IABO attending the Kiel Symposium.

Present were National Correspondents from 7 countries (Australia, France, Germany FRG, India, Israel, Norway and Pakistan) and 3 members of the Executive Committee (Hempel, Currie and Wolff, the 2 latter being at the same time National Correspondents).

1. The reports by National Correspondents

The Secretary informed that 14 reports had been received in time for distribution at the Second General Meeting of IABO held in Tokyo in September 1970. Here it was decided to edit and publish these together with later received reports in the first Proceedings of IABO. Following a request from the Secretary, 15 additional reports have come in.

2. Proceedings of IABO

The President noted that these will be published at irregular intervals and follow the scheme adopted in the Proceedings of SCOR. On the request of the Secretary, 16 National Correspondents have provided lists of institutions in their home countries to which the Proceedings should be sent. Addresses in the remaining countries will be taken from the International Directory of Marine Scientists. It was proposed and adopted that National Correspondents will receive the Proceedings directly. The Proceedings will also be sent to

national committees of IUBS, members of SCOR, etc. The Secretary was asked to urge SCOR to send future Proceedings of SCOR to the National Correspondents.

3. Future activities

The President mentioned that quite a number of the International Biological Programme activities will be carried on by FAO. The need for the establishment and participation of IABO in working groups on the philosophy of comparisons in ecosystems, benthos methodology, and basic studies in marine aquaculture and larval ecology was noted, while it was felt that pollution should rather be dealt with by governmental organisations. Limited economic subsistence will prevent IABO from sponsoring more than one symposium per year.

Symposium on Coral Reefs. Discussions the previous days with Dr. Stoddart (Cambridge) were reported and further debated (cf. p. 23). The advisability of using Heron Island Research Station was questioned; it was suggested to hold the symposium on the Australian mainland and the work-shop on Heron Island or to use Noumea as alternative meeting place.
Symposium on Early Life History of Fish. Discussions with Dr. Ahlstrom and others were reported (cf. p. 23).

Various proposals

Dr. Kimor suggested a symposium on taxonomy of tropical marine plankton, including preparation of Identification Sheets (like those of ICES). As symposia are not a very appropriate forum for discussions on taxonomy, it was felt that this topic might better be covered by a working group created by SCOR after relevant terms of reference having been worked out.

Dr. Kurian proposed a symposium on speciation in the tropical environment. This is an important, fundamental problem, but lack of data probably makes it necessary to postpone the matter until the late 70's.

The President emphasized the current need for discussions on benthos methodology. It was decided to approach Dr. M. J. Dunbar (Montreal) and Dr. A. D. Mclntyre (Aberdeen) concerning the actual status of a manual in benthos sampling (IBP). The National Correspondents will be invited to put forward their suggestions as to the best way of approaching the benthos problem.

The President mentioned that it had been proposed to let general and historical zoogeography (paleogeography) form an inter-disciplinary topic at the next Joint Oceanographic Assembly which is scheduled for 1975.

Mr. Currie suggested a symposium on physical, biological and geological aspects of upwelling regions past and present to be held at the termination of CINECA (Cooperative Investigation of the Northern Part of the Eastern Central Atlantic).

The President mentioned that FAO intended to create a working group of ecologists interested in aquaculture (disregarding the technical side) with special reference to shellfish.
4. Meetings of IABO

Previously IABO meetings have been held only in conjunction with international oceanographic congresses every 4-5 years. Although this seems sufficiently frequent for formal General Meetings, it was felt to be too restrictive for the promotion of activities of IABO. Therefore the President proposed that other international meetings with a fair attendance of marine biologists should be utilized for arranging meetings for the National Correspondents and other interested

biologists. This was generally accepted. Such meetings are planned for the forthcoming Pacific Science Congress in Canberra in August 1971 and the Challenger Centenary in Edinburgh in 1972.

The next General Meeting of IABO would be held in conjunction with the next Joint Oceanographic Assembly (probably in 1975).

The meeting concluded at 19.50 hrs.

T. Wolff

8. REPORT of THE IABO SYMPOSIA at the Joint Oceanographic Assembly in Tokyo, 1970

During the Joint Oceanographic Assembly in Tokyo (13-25 September 1970) the scientific sessions, collectively titled "The Ocean World", consisted of interdisciplinary symposia of interest to several associations, specialized symposia, and sessions of miscellaneous contributions.

The subjects of the general and special symposia and the titles of invited papers for the IABO symposia and titles of contributed papers on biological oceanography are listed below.

The abstracts of invited and contributed papers will be published by the Japan Society for the Promotion of Science around September 1971, titled "THE OCEAN WORLD" - Joint Oceanographic Assembly, with Professor M. Uda as Chief Editor and Dr. M. Ishino as Secretary. The book will be sent free of charge to the contributors to the Proceedings and the participants in the Assembly. Other copies will be presented to libraries of universities, institutions, and laboratories.

General Symposia
Man's Intervention in the Sea
Deep-Sea Drilling
Remote Sensing of Ocean Variables
Engineering Problems in Monitoring the Ocean
Antarctic Ice and Water Masses
The Benthic Boundary
Long-term Air-Sea Interaction
Environmental Data and Forecasting for Fisheries

Special Symposia
Distribution of Chemical Species
Oceanic Microstructure
Tropical Circulation
Ocean Circulation Models
Nutrient Limitations and the Nitrogen Cycle
Life in the Deep-Sea
Vertical Structure of Ecosystems
Sedimentation of Marine Organisms
Global Tectonics and Sea Floor Spreading
Marginal Seas of the Western Pacific

List of Papers (Papers read in title only have been marked *)
Man's Intervention in the Sea (General Symposium)
Conveners: E. D. Goldberg, IAPSO/IAGC and H. Steinitz, IABO

Invited papers:

K. Saruhasi & Y. Miyake (Tokyo)	The artificial radioactivity in the sea
J. Hunt & M. Blumer (Woods Hole)	Oil pollution in the marine environment
R. Risebrough (Berkeley)	Pesticides
C. Patterson (Pasadena)	Industrial lead in the oceans
S. H. Fonselius (Goteborg)	On eutrophication and pollution of marine areas
E. Smith (Plymouth)	Oil pollution and its effects on marine communities
A. A. Aleem (Alexandria)	River outflow management as effecting marine life
W. Aron (Washington).	The biological consequences of engineering - history and speculation

Contributed papers:

B. Kimor (Haifa)	The Suez Canal as a link and barrier in the migration of plankton organisms
B. L. Gordon (Boston)	Marine technological controls, an answer to threatened extinction of marine organisms

Environmental Data and Forecasting for Fisheries (General Symposium)
Conveners: A. Longhurst, IABO/ACMRR, and A. J. Lee, IAPSO

Invited papers:

*S. Potaichuk (Moscow)	Long-term variations in abiotic conditions in relation to variations in the abundance of commercial fishes
0. Østvedt (Bergen)	Environmental data and forecasting for herring and cod fisheries in Norway
M. Inoue (Tokai Univ., Japan)	On the environmental data to be used for forecasting fishing grounds of tunas
G. Flittner (San Diego)	Applications of synoptic environmental data in forecasting availability and distribution of albacore tuna on the U.S. West Coast
P. Moiseev (Moscow)	Biological resources of the world ocean and their use
T. Hirano (Tokyo)	A review of the fisheries and oceanographic forecasting system around Japan
*J. B. Birman (Moscow)	Dependence of long-term variations in fish abundance on solar activity

Nutrient Limitations and the Nitrogen Cycle (Special Symposium)
Convener: R. C. Dugdale, IABO

Invited papers:

S. Ichimura (Tokyo)	Nutrients, phytoplankton production, and light in the Kuroshio region
J. Caper on (Honolulu)	Kinetics of nutrient uptake by phytoplankton with special reference to nitrogen
A. Kamatani (Tokyo)	Kinetics of silicon uptake by marine diatoms
D. K. Button & S. S. Dunker (Denver)	Kinetics of nutrient uptake by microorganisms with special reference to phosphate

*R. Margalef (Barcelona)	Nutrient concentration and turbulence in relation to the composition of phytoplankton
Y. Saijo & 0. Mitamura (Nagoya Univ., Japan)	Regeneration of nutrients in the waters of a coastal oyster bed

Contributed papers:

*'K. Krishnamurthy (Madras)	The ratio of nutrients in the nearshore and estuarine Porto Novo Water
*V. D. Ramamurthy (Madras)	Further studies on red water phenomenon at Porto Novo Waters caused by Trichodesmium erythraeum (Ehr.) (marine blue green alga)
T. Okuda (Univ. de Oriente, Venezuela)	Denitrification in the Cariaco Trench
*'R. Sen Gupta (Göteborg)	On the nitrogen compounds in the Baltic
*M. V. Fedosov (Moscow)	The chemical and biogenic basis of the bio-productivity of the ocean and its seas
*M. P. Maximova (U.S.S.R.)	Biogenic elements in the waters of the Indian Ocean and their dependence on the sea productivity (Northern Hemisphere)
*V. S. Ziobin (Murmansk)	Seasonal variations of phosphate and oxygen content as a basis for forecasting the primary productivity of a photic layer of the ocean
*T. C. Hung (Taipei)	Studies on inorganic nitrogen compounds in sea water of the Kuroshio Current near Taiwan

Life in the Deep-Sea (Special Symposium)
Convener: N. B. Marshall, IABO

Invited papers:

J. A. Alien (Woods Hole)	Evolution and functional morphology of the deep water prosobranch bivalves of the Atlantic
J. M. Bassot (Paris)	Structure and evolution of the light organs of the Stomiatoidei
*M. R. Clarke (Godalming, U.K.)	Structure and function of the Spermaceti-organ of the sperm whale
E. J. Ferguson Wood (Miami)	Marine algae in the deep oceans
P. Foxton (Wormley, U.K.)	Depth distribution and morphology in pelagic decapod crustacea
Y. Haneda (Yokosuka, Japan)	Observations on luminescence of the deep-sea angler fish, *Himantolophus groenlandicus*
K. Kawaguchi (Tokyo)	The biology of a deep-sea fish, *Gonostoma gracile* (Gonostomatidae)
*R. Y. Morita (Oregon State Univ.)	Relationship between hydrostatic pressure and bacterial life in the deep-sea
H. L. Sanders (Woods Hole)	The interactions of diversity, distribution and mode of reproduction among major groupings of the deep-sea benthos
J. Teal (Woods Hole)	Respiration of decapods from the Scattering Layer
R. E. Young (Honolulu)	Light, parolfactory vesicles and the vertical distribution of pelagic cephalopods

Contributed papers:

H. Weyland (Bremerhafen)	Studies on Actinomycetes of the sea benthos

R. J. Menzies (Florids State Univ.)	The influence of hydrostatic pressure on colonization of the deep sea

Vertical Structure of Ecosystems (Special Symposium)
Convener: S. Motoda, IABO

Invited papers:

S. Nishizawa (Hokkaido Univ.)	Concentration of particulate and dissolved organic material at the sea surface skin
*A. Tsyban (Odessa)	Marine bacterioneuston
G. W. Harvey (Hawaii)	The microlayer ecosystem at the air-sea interface
M. V. Angel & M. Fasham (Wormley, U. K.)	Species assemblages and their depth distribution off the Canary Islands
K. Banse (Seattle)	Vertical and small-scale horizontal distribution of small zooplankton in the wind-mixed layer of the ocean
*M. E. Vinogradov, I. I. Gitelzon & Yu. I. Sorokin (Moscow)	Vertical structure of a pelagic community in the tropical ocean
G. Hempel (Kiel)	Distributional and trophic relationships of neuston and plankton
M. Murano (Tokyo)	Pelagic fauna near the bottom in Sagami Bay and Suruga Bay, Central Japan

Sedimentation of Marine Organisms (Special Symposium)
Conveners: E. Seibold, CMG and J. Hedgpeth, IABO

Invited papers:

J. Hedgpeth & E. Seibold	Introduction
A. Lisitzin (Moscow)	Organic matter in the oceans and in marine sediments
W. H. Berger (La Jolla)	Sedimentation of planktonic Foraminifera
T. Kanaya (Tohoku Univ., Japan)	Diatoms in oceanic sediments
R. G. Johnson (Chicago)	Animal-sediment relations in shallow water benthic communities
G. F. Lutze (Kiel)	Organic remains as sediment particles: Observations and experiments with benthic Foraminifera
K. E. Chave, K. J. Roy & R. V. Smith (Honolulu)	Carbonate production by coral reefs

Contributed paper:

T. J. Smayda (Rhode Island)	Normal and accelerated sinking of phytoplankton in the sea

Session of Contributions to Biological Oceanography

In addition to the contributed papers listed above, 39 papers dealing with other various topics had been submitted to the organizers. In view of the short time allotted for the Session it did not seem advisable to ask each author to review very briefly his paper. Four experts were therefore asked to review group of papers, stressing major findings and ideas in the papers concerned and putting them in a general context. Like the presentation of papers read by the authors in the general and special symposia, each review was followed by a very lively and

stimulating discussion, during which authors of contributions took the opportunity to make certain points and to answer questions. The papers were grouped as follows:

[p. 20]

A._ Distribution of Plankton
Reviewer: K. Banse

J. R. Grindley (Port Elizabeth)	Recent plankton studies in the seas around Southern Africa
E. Boltovskoy (Buenos Aires)	Distribution patterns of living planktonic Foraminifera in the uppermost layer of the Drake Passage and their relation to the surface hydrology
E. A. Lubny-Gertzik (Moscow)	Zooplankton of subarctic front in the northwestern Pacific
A. K. Heinrich (Moscow)	The neuston pontellids of the Pacific Ocean
M. Savich (U.S.S.R.)	Seasonal dynamics of phytoplankton in the Aden Gulf
A. I. Gapishko (U.S.S.R.)	Distribution and quantitative development of zooplankton in the Aden Gulf
V. V. Krakatitsa (U. S. S. R.)	The ichthyoplankton distribution in the area of Aden Gulf
S. Tjuleva (U. S. S. R.)	Features of forming of zooplankton seasonal productivity in the shelf water of India
N. Della-Croce & P. Picone (Genoa)	Time factor and plankton sampling in biological oceanography
W. Nellen (Kiel)	Neuston and plankton observations above and beside the Great Meteor Seamount in the subtropical North Atlantic
B. Kimor (Haifa)	Some aspects in the vertical distribution of the micro-plankton in the Gulf of Eilat (Red Sea)
S. Motoda (Hokkaido Univ.)	Desirability of descriptions of detailed vertical distribution of macroplankton in the sea for understanding marine ecosystems
J. Kinzer (Hamburg)	On the contribution of euphausiids and other plankton organisms to deep scattering layers in the Eastern North Atlantic
J. A. Rudjakov (Moscow)	Vertical distribution and diel migration of planktonic animals as exemplified by *Cypridina sinuosa* (G. W. Miiller) (Crustacea, Ostracoda) in the Western Equatorial Pacific
R. Marumo & S. Nagasawa (Tokyo)	Some ecological notes on *Sagitta nagae* Alvarino
N. Wai (Taipei)	Non-sulphur bacteria, *Rhodopseudomonas,* in Kuroshio Taiwan area surface sea water

B. Distribution of Benthos and Nekton
Reviewer: M. Horikoshi

A. A. Neyman (U. S. S. R.)	Some problems of the division of the shelves of the world's ocean basing on bottom fauna
V. N. Semenov (Moscow)	On the vertical faunistic division of the temperate sublittoral of South America
J. H. Day, J. G. Field & M. P. Montgomery (Cape Town & Ohio)	The use of numerical methods to determine the distribution of the benthic fauna across the continental shelf of North Carolina
C. V. Kurian (Univ. of Kerala)	Bottom fauna of a tropical estuary
R. N. Burukovsky (U.S.S.R.)	Some aspects of the shrimp's systematics, Genus *Penaeus*
A. E. F. Heydorn (Durban)	Vertical and spatial distribution of Palinuridae in the South

	African region
Ya. K. Gololobor & V. A. Bibik (U.S.S.R.)	Vertical structure of the Arabian sea water and its influence on the distribution of the commercial fishes
B. S. Solovjov & B. N. Kuzmin (U.S.S.R.)	Some aspects of biology and distribution of tuna in the western part of the Indian Ocean
V. V. Krylov (Moscow)	On some criteria of affinity of species
0. N. Kiselev (Murmansk)	Results of a visual study of cod distribution in the Barents Sea during the feeding period

C. Productivity and Feeding
Reviewer: T. J. Smayda

G. C. Anderson (Seattle)	Biological prediction from environmental data in the North Pacific Ocean
A. K. Yurkovskis (U. S. S. R.)	Results of fraction investigation of the organic substance in the Baltic Sea
B. Zeitzschel (Kiel)	Primary production, phytoplankton standing stock and phytoplankton composition in the Eastern Tropical Pacific
R. 0. Fournier (Honolulu)	Light and electronmicroscopy of some aphotic oceanic microorganisms
V. Y. Pavlov (Moscow)	On the feeding habits of *Euphausia superba* Dana
T. Nemoto (Tokyo)	Chlorophyll pigments in the stomach and digestive guts of macrozooplankton

[P. 21]

T. K. Sysoeva (Murmansk)	Conditions of feeding and survival of larvae of the Barents Sea cod
R. Y. George (Florida State Univ.)	Thermal sensitivity of hypopsychral species of antarctic and high arctic marine Crustacea

D. Cultivation and Growth
Reviewer: T. Wolff

W. N. Shaw (Maryland)	Off-bottom oyster culture in the United States
A. N. Sastry (Rhode Island)	Culture of brachyuran larvae under controlled conditions
B. G. Ivanov (Moscow)	The biology of the most important shrimps and the fishery for them
I. A. Sadikhova (Moscow)	The growth of the sea mussel, *Crenomytilus grayanus* (Dunker), in the Gulf of Peter the Great
N. B. Nair (Univ. of Kerala)	Recent biochemical studies on tropical shipworms

9. REPORT of THE SYMPOSIUM ON THE BIOLOGY OF THE INDIAN OCEAN
31 March - 6 April, 1971

In Kiel, FRG, a symposium was held on the biological results of the International Indian Ocean Expedition (IIOE) and of other recent investigations in the Indian Ocean. The meeting was mainly sponsored by SCOR with contributions from UNESCO, FAO, IBP, and IABO. The plans for the symposium had been developed by Humphrey (SCOR) in collaboration with Krey (IBP) who was also the local organizer.

In 21 invited papers, the present state of our knowledge about the physical environment of the Indian Ocean, the distribution of nutrients and rate of primary production as well as composition and abundance of phytoplankton, organic sediments, zooplankton, and fish were described. Studies of benthos, particularly in the deeper parts of the ocean, and on fisheries resources were less emphasized. The IIOE atlas on physical and chemical properties of the Indian Ocean was the basis for the presentation by Wyrtki. Furthermore, parts of the zooplankton atlas which are prepared by Indian scientists on the material of the International Collections of the Indian Ocean Biological Centre and additional data were discussed. Krey demonstrated drafts of the atlas on chemical biology (including primary production) of the Indian Ocean. The distribution and abundance of the different tuna populations have been mapped by Japanese workers, as demonstrated by Susa.

The invited papers and presentation of atlases were supplemented by 31 contributed papers. More than half of them were presented by Indian authors. Invited as well as contributed papers stimulated lively discussions for which sufficient time was allocated.

The final session was devoted to the question how far the IIOE had helped to develop a detailed and concise picture of the biology of the Indian Ocean. While the northern part of the Indian 0cean is now rather well known with regard to the composition and abundance of its plankton and to the major seasonal changes, little is known about the southern part. The information on the structure of marine food chains and on the energy flow therein is very incomplete both in highly productive areas of the Arabian Sea and Gulf of Bengal and in the vast oceanic gyres.

The symposium was attended by about 180 scientists from 22 countries. Participation from Soviet experts was lower than expected. Thanks to international and national subventions a considerable number of Indian and Pakistani scientists were able to attend. The Kiel University and the German Federal Government acted as hosts of the symposium. The proceedings will be published by Springer Publishers, Heidelberg, New York, and Toronto.

G. Hempel
(P. 22)

10. FUTURE SYMPOSIA AND WORKING GROUPS

Symposium on Coral Reef Biology

This Symposium will be held at the end of May, 1973, on Heron Island. The Symposium will be organized by the University of Queensland and by the Great Barrier Reef Committee. IABO is not officially involved in the Symposium but expressed great interest in the plans for the Symposium and created through SCOR a Working Group which will hold a workshop in conjunction with the Heron Island Symposium.

Further information: Dr. D. R. Stoddart, Department of Geology, University of Cambridge Downing Street, Cambridge, U.K.

Symposium on the Early Life History of Fish

A Working Group of the Advisory Committee on Marine Resources Research (ACMRR) had suggested a Symposium on taxonomic and biological studies in the early life history of fish. ACMRR at its meeting in March 1971 had recommended to hold a Symposium of that kind. Meanwhile the plans were further developed by IABO which invited a preparatory board, at present consisting of:

J. H. S. Blaxter, U.K.	Sensory physiology and behaviour
D. P. de Sylva, U. S. A,	Geographical distribution
R. Lasker, U.S.A.	Metabolism
T. S. Rass, U. S. S. R.	Identification
W. Richards, U. S. A.	Systematics
S. Tanaka, Japan	Population studies

The Symposium should contribute to the understanding of the r61e of the early life history of fish to the subsequent productivity of the exploitable phase of fish and to marine aquaculture. Therefore, studies in feeding, food conversion and growth, in sensory physiology and behaviour of larvae, in their reaction to pollution as well as predator-prey relationships and vertical and horizontal distribution are topics of interest to the symposium. The potential r61e of larvae surveys for monitoring changes in fish stocks and for tracing new resources should be critically considered and the use of studies of larvae and juveniles for progress in understanding taxonomy and phylogeny of fish should be demonstrated. A workshop on identification of eggs and larvae could be held in conjunction with the Symposium.

The Symposium is planned for 1973. The place has not yet been decided. It is envisaged that ACMRR (FAO) and possibly other organizations will co-sponsor the Symposium.

For further information: Dr. G. Hempel, Direktor der Abteilung Fischereibiologie, Institut für Meereskunde, 23 Kiel, Niemannsweg 11, Germany (FRG).

Partly on the suggestion of IABO, a number of international working groups have been established by SCOR and ACMRR during their recent meetings in May and March 1971, respectively.

ACMRR Working Party on aquaculture. The group should assist FAO and other organizations concerned in designing regional and international research programmes on aquaculture in the estuarine and marine environment. The group should provide guidance to FAO in the preparation for the proposed FAO Technical Conference on Aquaculture (? in 1975).

ACMRR Working Party on application of ecological theory to exploitation and conservation of marine fishery resources.

SCOR Working Group on methods in quantitative ecology of coral reefs. The group should mainly evaluate and test methods for the quantitative description of the abundance, composition and distribution of benthic communities on reefs.

SCOR Working Group on processes of coastal upwelling. This group should advise on research programmes on the physical characteristics of upwelling in coastal regions and on the chemical and biological phenomena related to coastal upwelling processes.

SCOR Working Group on Marine Plankton and Sediments. The group is basically concerned with problems related to planktonic remains in marine sediments.

Several other of the past and present SCOR Working Groups are of immediate interest to biological oceanographers. Reviews of the activities of the groups are contained in the current issues of the SCOR Proceedings.

G. Hempel

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11. REPORTS BY THE NATIONAL CORRESPONDENTS

ALGERIA

1. Institut Océanographique d'ALGER (founded in 1882) is chiefly devoted to plankton studies. From 1940 to 1970, about 115 papers have been published, first in French periodicals and from 1963 in "Pelagos", the Algerian review of the Institute. The main subjects in those papers are:

Phytoplankton: Life cycles of coccolithophores, diatoms and peridinians off Algerian coasts. Photosynthetic production, measured by the C^{14} method near Algiers and La Calle.

Zooplankton: Life cycles of copepods, and decapod larvae. Pelagic gastropods. Eggs and larvae of fish.

Benthos: Ecology of *Donax* . Mollusca of Algeria. Spermatogenesis of gastropods. Biology of *Sphaeroma* and other crustaceans.

2. Station d'Aquiculture de BOU SMAIL (founded in 1924) at 43 km W. of Algiers, and

3. Station des Pêches de BENI-SAF (founded in 1957). Beni-Saf is the main fishing harbour in Algeria, owing to the large continental shelf near Gibraltar.

The two latter laboratories work on fish, prawns and clams, and a large work about the fishes sold in Algiers has recently been finished and will be published soon.

For the following years (1971-73), Algeria will get 3 larger boats, given by the U.N.O. or by U. S. S. R. A third Fishery Station will be built near Tunesia (La Calle).

Since 1965, the University of Algiers has offered a "Diplôme d'Etudes Approfondies d'Océanographie Biologique". Each year, 5 to 8 young Algerian students are enrolled in this programme, much of which is applied oceanography.

F. Bernard

ARGENTINA

Staff. There are approximately 50 specialists and 30 technicians occupied in marine biological studies. However, taking into account that many of the researchers simultaneously belong to a teaching staff, it should be estimated that on the average perhaps only 50-60% of each researcher's time is dedicated to scientific activity.

Institutions. The researchers are distributed among 10 institutions (museums, universities) where marine biological studies take place. The following institutions (arranged alphabetically) are the most active: 1) Centre de Investigación de Biologia Marina (C.I. B.M.), 2) Institute interuniversitario de Biologia Marina (I.B.M.), and 3) Museo Argentine de Ciencias Naturales "B.Rivadavia" (M.A.C.N.).

Stations. There are six marine biological stations, the most important of which are: Estación de Biologia Marina Austral (Ushuaia), Estación de Biologia Marina Puerto Deseado, and Estación Hydrobiologica de Quequen. Besides these, Argentina possesses several stations in the Antarctic which are visited from time to time by Argentine and foreign marine biologists.

Oceanographical Committee. The Comité Nacional de Oceanografia, created by the Consejo Nacional de Investigaciones Cientificas y Técnicas (C.N.I.C.T.) consists of representatives of 18 institutions whose activities are related to oceanography (not merely biological). This Comité (address: Rivadavia 1917, Buenos Aires) organizes working groups for different oceanographic problems, coordinates oceanographical activity and represents Argentine Oceanography in our country and abroad.

Ships. a) Two ships transformed for general Oceanographical work (1. 250 and 1. 863 tons), b) one sailing ship with a motor (296 tons), c) one ship especially designed for fisheries research (about 300
tons), and d) two hydrographic cutters.
Studies. Argentine researchers carry out different kinds of studies (systematical, zoogeographical,
biological, on productivity, etc.). The following groups of marine plants and animals are studied (some of them partially) regarding their distribution in Argentina: Cyanophyceae, Chlorophyceae, Rhodophyceae, Phaeophyceae, Diatomeae, Dinophyceae, Foraminifera, Spirotrincha, Mollusca, Crustacea, Echinodermata, Tunicata, Pisces. The others are either completely unstudied or very poorly known. During the last decade, besides papers of systematical and biological character, a number of papers appeared in which the surface hydrology of the southwestern part of the Atlantic Ocean was investigated by means of biological indicators. A very large and important programme of fisheries studies was started in Argentina a few years ago. This programme is sponsored jointly by the Argentine Government and the FAO.

Publications. During 1965 and 1966 a total of 65 papers on marine biological problems were published by Argentine researchers, while 40 papers appeared in 1969. Of the former group about 85% were published in Argentina, the others in scientifical journals of other countries.

Participation in International Oceanographical Projects. During the last decade Argentinian ships and/or scientists participated actively in numerous international oceanographic programmes. Some of these projects were: the Equalant Project, several studies carried out with ships of some American Universities, several Antarctic expeditions, fisheries investigations performed with the F.R.G. and others.

Main difficulties in our research activity are: a) lack of specialists in many marine oceanographic problems; for this reason, we have not yet finished the first phase of each general marine biological study. We are still poorly informed with respect to the marine life of the Argentinian sector of the Antarctic, and especially of the South Atlantic; b) lack of equipment for marine biological investigations. Often we do not have the most basic and necessary equipment such as nets, dredges, etc., and we are forced to work with quite old equipment or to improvise. Naturally these difficulties are mainly caused by insufficient financial aid.

E. Boltovskoy

AUSTRALIA

There is little biological oceanography being carried out in Australia at the present time other than the working up of data collected in past years. The main reason for this is the lack of oceangoing ship facilities.

Some work in shallow waters is being done in relation to Australian Fisheries. This includes a programme based in Perth (West Australia) on the oceanic distribution of rock lobster larvae, and survey work in the Gulf of Carpentaria on the distribution of Penaeid larvae.

Estuarine and nearshore biological studies are being carried out at Perth (W.A. University), Brisbane (University of Queensland), and Townsville (James Cook University). Ecological studies directed toward pollution problems are at present centred in Melbourne (Victorian Dept. of Environmental Studies).

Some laboratory work of great significance is being carried out, in particular, with respect to chlorophylls and photosynthesis in marine algae.

This dreary situation is likely soon to change for the better. There is increased awareness of the Great Barrier Reef due to the threat of oil pollution and damage by the "Crown of Thorns" starfish. An Institute of Marine Science is likely to be set up in Townsville to study the ecology of the Great Barrier Reef. The Division of Fisheries and Oceanography of CSIRO may receive an oceanographic ship for fisheries work within a few years.

David J. Tranter

BRAZIL

1. Zoology

General. Studies on marine biological resources are being carried on along the Brazilian coast, mainly referring to the fish and shrimp stocks. Some landing statistics and aspects of population dynamics are focused in order to advise the National Fisheries Agency.

In detail. Studies on taxonomy and marine ecology are being made on the center-south Brazilian coast, comprising Sao Tome Cape to Chui, and referring to diversified animal groups, such as fish, crustaceans and benthos, as follows:

a. Fish; Taxonomy (in catalogue form), abundance, distribution, populations identification, species associations, migrations, feeding, eggs and larvae, maturation and fecundity.

b. Crustacea (shrimp): Abundance, distribution, taxonomy, migrations.
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c. Isopoda and Amphipoda: Taxonomy, zoogeography and ecology.

d. Benthos: Faunistic, zoogeography and ecology, particularly Echinodermata (Amphiuridae) and Polychaeta.

G. Vazzoler

2. Botany

Past. Serious field work began around 1950. First marine flora of the Atlantic coast of South America appeared 1957. A much larger region was covered in the years to follow (1965). training of students in this particular field was one of the first topics; students included Brazilians as well as Argentinians, Chileans and Mexicans. As a result, over 70 papers were finished.

Present. Several State floras are under way; some are to be finished this year or the next. A deepwater flora covering the entire coastline of Brazil north of Cabo Frio is in preparation by the single largest group of Brazilian phycologists (12 persons) working together. Bio-ecological studies have been started (2 projects are under way on *Pterocladia pinata* and *Colpomenia sinuosa*).

Future. The shore floras of all other states will eventually be finished. Only then will it be possible to start a comprehensive marine flora of Brazil. Bio-ecological studies will be extended.

A. B. Joly

CANADA

Atlantic Plankton Productivity Studies

Work is in progress on the occurrence, production and r6le of non-living organic matter in food chains. Attention is also being given to the development of biochemical indicators (specifically DNA, RNA and ATP) of biomass and production rate of both phytoplankton and zooplankton. In another continuing, study the three-year average of annual production by phytoplankton in St Margaret's Bay is 190 $gC/m^2/yr$. An index based on the degree of optical attentuation due to photosynthesis has proved to be a useful predictor of primary production. Most of the variance in this index can be explained by changes in chlorophyll concentration. A self-contained in situ radiometer for measurement ob submarine light energy in absolute units has been developed to further these studies. Initial studies have been completed on the relationship between heterogeneity of phytoplankton distribution and complexity of the physical environment. The relationship between energy flow and plankton species diversity in St Margaret's Bay has also been studied.

Laboratory studies have been made on the growth, feeding and metabolism of the pteropods *Cliona limacina* and *Spiratella retroversa* which have a unique predator-prey interaction in the plankton community and form the top two links in a specialised food chain. It is an excellent opportunity to measure growth efficiency and food chain efficiency. Studies have continued on the distribution of herring larvae in relation to environmental factors in the Gulf of St. Lawrence and on the Scotian Shelf.

Pacific Plankton Productivity Studies

During the past two years a cooperative programme has been developed for the study of production processes in the subarctic North Pacific Ocean. The programme is expected to last for an initial period of five years. The primary purpose is to examine components of oceanic variability which may affect commercial fisheries (e.g. high seas salmon mortality) and further to assess the productivity and diversity of organisms having potential value as a food resource for man. The principal agencies in this cooperative programme are the Fisheries Research Board of Canada, Nanaimo, and the Department of Oceanography, University of Washington, Seattle.

This programme was initiated with a transpacific cruise from Esquimau, B. C. to Tokyo for the purpose of studying environmental parameters for use in production models. The follow-up to this programme is a continuing study of the subarctic North Pacific using data collected from American Mail Line vessels.

Arctic Plankton Productivity Studies

A marine ecology study in Frobisher Bay (63°40'N, 68°27'W) has been underway for a little more than two years, conducted by the Arctic Biological Station of the Fisheries Research Board of Canada. From carbon-14 studies primary production by phytoplankton was estimated as 93 g carbon per m^2 for the year 1969, which may be interestingly compared with an estimated value of 53 g carbon per m^2 for 1968. Annual variation in time of melting of snow cover from the sea ice surface appears to be a major contributor to this difference. The herbivorous zooplankton shows an approximately 10-fold increase between winter minimum and summer (August) maximum, varying in dry weight from about 250 to 2500 mg per m^2.

L. M. Dickie

CHILE

The first step of this country towards the foundation of a national research center on Marine Sciences was taken in 1941, when the University of Chile established the first "Estación de Biologia Marina de Montemar", now named "Departamento de Oceanologia". The interest for the marine sciences has developed quite rapidly in the last decade; studies in marine biology, fisheries and hydrography are now being carried on by several (approx. 13) institutions scattered along the country (see FAO Directory of Fisheries Institution of Latin America, 1963, and UNESCO Directory of Chilean Scientific Institution, 1966).

The University Centers are mainly devoted to research on taxonomy, biology and ecology of marine plants and animals; the applied marine biology (fishery and technology) is the main task of Governmental departments supported by the Ministry of Agriculture and an Intergovernmental Center (Institute de Fomento Pesquero) established through FAO in 1963.

Thanks mainly to UNESCO and FAO Technical Assistance Programmes, most of the Chilean research workers on biological oceanography have completed their training in European or North American specialized centers. Actually there are Chilean scientists working on: Plankton (phytoplankton): Diatomaceae and Dinoflagelata; zooplankton: Copepoda, Euphausiacea, Medusae, Chaetognatha and Salpae; benthos; taxonomy and biology of Crustacea, Mollusca, Echinodermata, fishes, marine mammals and birds, algae and marine bacteriology. Advanced knowledge on the biology of the following Chilean species of economical importance has been achieved:

Fishes: *Engraulis ringens*. anchovy and *Merluccius gayi gayi*, hake.
Molluscs: *Aulacomya ater*, mussel, *Concholepas concholepas*. abalone, *Ostrea chilensis*, oyster, *Mesodesma donacium*, soft clam.
Crustaceans: *Lithodes antarcticus*, king crab, *Jasus frontalis*, lobster, *Cervimunida johni* and *Pleuroncodes monodon*, red crab ("langostinos").
Echinoderms: *Loxechinus albus*, edible species of high commercial value.
Algae: *Gracilaria lemanaeformis*, *Porphyra columbina* and *Macrocystis integrifolia*.

The experimental marine research is mainly carried out in the Department of Oceanology

(University of Chile); there, the life-cycle of endemic decapod crustacean species is being methodically studied through laboratory cultures, and experiments are also being made on larval development of fishes, echinoderms and molluscs.

Finally, the Chilean National Committee of Marine Sciences had outlined a coordinate programme for the decade 1970-80 (see "Plan decenal chileno de investigaciones oceanograficas 1970-1980"), taking into account the human and material resources available in the different national Institutions.

Elda Fagetti G.

DENMARK

Marine Biological Laboratory. Helsingør. Investigations are at present focussing on quantitative aspects of the meiofauna, predator-prey relationships (particularly turbellarian, *Natica* and *Asterias*), biological-ecological studies (parasitic turbellarians, polychaetes, *Thyasira, Bathyporeia*, and crab larvae), physiology of *Crangon*. comparative morphology of larvae of Ento- and Ectoprocta, and the influence of pollution on the algae of the Øresund.

The Isefjord Laboratory. Vellerup Vig: Ecological field studies of the benthic invertebrate fauna of the complex, mixo-haline Isefjord area, supplemented with an investigation of the eelgrass and its communities.

The Zoological Museum. University of Copenhagen: Taxonomy, distribution and ecology of Greenland marine animals, North Atlantic opisthobranchs and deep-sea organisms (particularly brotulid fish, echinoderms, prosobranchs, bivalves, isopods, polychaetes, and foraminiferans) and interpretation of photographic evidence of deep-sea animal life.

August Krogh Institute. University of Copenhagen: A long-term investigation of food and other particle retention in suspension-feeders, studied with the Coulter counter technique and a special study of nereid polychaetes (osmotic regulation and ion transport, uptake of organic molecules from the environment).

Institute of Thallophytic Botany, University of Copenhagen. A comprehensive investigation on the ecology of algae in a shallow Danish fjord is being completed. Studies on the systematics and ecology of algae in S.W. Greenland and of algae growing in calcareous shells are in progress.

University of Aarhus. The Department of Ecology is mainly concerned with the ecology of shallow water sediments (decomposition of dead organic material, utilization of detritus by animals, photosynthesis in sediments, ecology of anaerobic sediments). The Department of Zoology runs a project studying the population dynamics and sensory physiology of seals. The Department of Genetics studies polymorphic systems in a population of *Zoarces viviparus*.

The Danish Institute for Fisheries and Marine Research. Two-thirds of the 24 scientists are concerned with studies on fish and shellfish and related environmental problems in the sea. The working areas are the Baltic, Belt Seas, North Sea, the Faeroes, and North-West Atlantic waters. The research programmes are co-ordinated through ICES with those of other countries concerned with the same areas. The major tasks are assessments and other studies on the populations of the commercially important species, in 1970 with special attention to the problems concerning herring in the North Sea, cod in the Baltic and salmon in the Baltic as well as in the North Atlantic. Plankton investigations include a continuation of the carbon-14 measurements of primary production which since 1953 have been carried out twice every month from a light ship in northern Kattegat and for about 10 years at three additional ships with simultaneous counting of zooplankton. Research on marine pollution has been increased in

these investigations as well as in the continued environmental studies of physical chemical properties in the working areas. Specific projects include i.a. taxonomy of bathypelagic fish, Clupeiformes and tropical gobies, and biology of Anguillidae.

The Greenland Fisheries Investigations. The present activities comprise hydrography of Greenland waters, studies of the recruitment and exploitation of commercially important fish (particularly cod), growth and migrations of salmon, and investigations on seals and the deep-sea prawn, *Pandalus borealis*. An essential part of the research (especially on cod, salmon and seals) is made in international co-operation organized by ICNAF and ICES.

Torben Wolff

FRANCE

Résumer en une page 1'activité française en ce domaine conduit évidemment a n'en retenir que les grandes lignes et à passer sous silence nombre de travaux interessants.

La politique francaise en matière d'océanographie est largement commandée par 1'action d'un organisme récemment créé, le Comité National d'Exploitation des Océans (CNEXO), 39 Avenue d'Iena, Paris 16°, dont Ie programme prévoit en priorité 1'étude des points suivants:

1. Recherche fondamentale. Evaluation de la production aux différents échelons. Ses modalités. Transferts d'énergie dans la chaine alimentaire.

- 1.1 Systématique
- 1.2 Cartographie de la production primaire planctonique
- 1.3 Mesure de la production des végétaux benthiques
- 1.4 Mesure de la production secondaire planctonique et benthique
- 1.5 Mesure de la production tertiaire et quaternaire
- 1.6 Réalisation de modèles
- 1.7 Etude des substances ectocrines d'origine marine. Application.

2. Recherche appliquée à 1'exploitation rationelle des pêcheries. Comportement et évaluation des stocks d'interêt économique.

- 2.1 Etudes générales des stocks. Clupeides et Thonidés.
- 2.2 Etudes particulières:
  - 2. 2.1 Sur exploitation du hareng en Mer du Nord (participation aux opérations internationales)
  - 2. 2.2 Sardine du Golfe de Gascogne et du Golfe du Lion
  - 2. 2.3 Merlu du Golfe de Gascogne
- 2. 3 Habitats artificiels
- 2.4 Prospection du domaine profond
- 2.5 Orientation vers de nouveaux domaines géographiques: N.E. et N.W. Atlantique, côte N.W. d'Afrique, Golfe de Guinée, Mer d'Arabie.

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3. Recherche appliquée à 1'aquaculture

3.1 Connaissance des conditions naturelles des eaux côtieres
3.2 Cultures d'algues
3.3 Elevages:
    3.3.1 de Mollusques
    3.3.2 de Crustacés
    3.3.3 de Poissons
3.4 Les aspects physiologiques et biochimiques de 1'aquaculture.

4. Amélioration des méthodes et techniques de pêche. (Pour mémoire, de sujet touchant à. 1'océanographie biologique, mais n'en faisant partie à proprement parler).

A noter les principaux organismes qui, soit independemment du CNEXO, soit en collaboration (plus ou moins poussee) avec lui, traitent de questions d'océanographie biologique:

1. Ministère de 1'Education Nationale
    1.1 Direction des enseignements superieurs, rue de Grenelle, Paris 6° (Facultés des Sciences de Paris, Marseille, Rennes, etc.)
    1.2 Centre National de la Recherche Scientifique (CNRS), 15 Quai Anatole France, Paris 7°
    1.3 Muséum National d'Histoire Naturelle, 57 Rue Cuvier, Paris 5°
    1.4 Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), 24 Rue Bayard, Paris 8°

2. Sous-secrétariat d'Etat à la Marine Marchande

    Institut Scientifique et Technique des Peches Maritimes (ISTPM), La Noe, Route de la Jonelière, Nantes (44)

3. Organisme indépendant
    Institut Océanographique, 195 Rue St. Jacques, Paris 5°.

E. Postel

GERMANY. F.R.G.

In the brief outline given below on the principal activities in biological oceanography in the F.R.G., only the main objects of research work are mentioned. Certain investigations, particularly experimental laboratory studies and many of the taxonomic investigations on marine organisms, have not been included in this report.

Biologische Anstalt Helgoland: Investigations on primary production and plankton in the North Sea and in the eastern North Atlantic. Ecological experiments, *in situ* and in the laboratory are done on the behaviour and on competition and species composition in benthic and pelagic organisms.

From material collected during recent cruises of R.V. "Meteor" taxonomic studies are done on fishes from the Arabian Sea and the subtropical eastern North Atlantic.

Institut fiir Meeresforschung. Bremerhaven: Investigations on the transfer of organic material within the benthic community of the North Sea and the eastern North Atlantic, covering

bacteriological and mycological studies as well as investigations on the meio- and macrofauna. Experimental work has been initiated on the physiological efficiency of some marine organisms and their relevance to the food chain.

Institut für Meereskunde, Universität Kiel: Planktological studies are focusing on short time variations in phyto- and zooplankton distribution and on the transfer of organic matter in the food web. Primary productivity and zooplankton biomass, particularly in relation to chemical parameters, are investigated in areas of upwelling off western North Africa. The distribution of fish larvae is studied in its relation to the zooplankton distribution. In current neuston investigations, particularly the diurnal migration of ichthyoneuston is investigated. Cooperative studies on the effects of pollution on micro-organisms and plankton have been initiated.

Institut für Hydrobiologie und Fischereiwissenschaft, Universität Hamburg: The abiotic parameters of the pelagic environment are studied in their relationship to the primary production. In regard to food web studies, the r6le of the deep scattering layers in the transfer of organic material by means of zooplankton organisms is investigated. In the benthic environment investigations on the meiofauna and macrofauna of Atlantic seamounts and of the abyssal depths will be continued.

Institut für Meeresgeologie und Meeresbiologie Senckenberg. Wilhelmshaven: Investigations are done on sedimentological processes in recent marine environments and the relationship between the benthic fauna and sediments to obtain a geological-palaeontological picture of the different sub-environments.

J. Kinzer

GREECE

1. Institutions and Agencies. Fundamental and applied research in biological oceanography is carried out by the Institute of Oceanographic and Fisheries Research (IOKAE), the Fisheries Division of the Ministry of Agriculture, the University of Athens, Thessaloniki and Patras, the Technical University of Athens, the Nuclear Research Center "Democritos", etc.

2. Fundamental research includes Zooplankton ecology and systematics (Zool. Lab. Univ. of Athens); Primary production and ecology of phytoplankton (N.R.C. Democritos); Benthic biocoenoses (Zool. Lab. Univ. of Athens); Systematics of marine fishes (Zool. Lab. Univ. of Thessaloniki and Patras); Systematics of decapod Crustacea (Zool. Lab. Univ. of Athens); Systematics of microalgae - Sulfuretum (Syst. Bot. Lab. Univ. of Athens); Physiology of algae (Gen. Bot. Lab. Univ. of Athens); Trace elements in edible molluscs, tunicates and fishes (N.R.C. Democritos).

3. Applied research includes distribution of commercially important fishes (Fish. Div. Dept. of Agriculture), and crustaceans (IOKAE); Culture of fishes, molluscs and crustaceans (Fish. Div. Dept. of Agriculture); Marine erosion and fouling (Physicochem. Lab. Technic. Univ. of Athens); Marine pollution and biological purification (Hygiental. Univ. of Thessaloniki); Distribution and ecology of marine fish eggs and larvae (Zool. Lab. Univ. of Athens).

4. Education in Oceanography. A programme of graduate studies in oceanography with emphasis on biological oceanography is initiated this year by the Faculty of Sciences, Univ. of Athens. This is the first time a programme of specialized courses and a degree in oceanography will be offered to students in Greece.

5. International Cooperation. Among other activities one has to mention the cruise of R/V "T. G. Thompson" in Greek waters during Spring 1970 and the participation of Greek oceanographers in cooperative research carried out as part of the IBP.

V. Kiortsis

ICELAND

The main work on marine biology is devoted to applied research, especially in fisheries biology. This work is carried out exclusively at the Marine Research Institute, which commands three research vessels and is concentrated on species of high commercial value, i.e. cod, haddock, saithe, herring, capelin, redfish, plaice, catfish and lumpsucker. The investigations cover the most common branches of fisheries biology, such as growth, age composition, population dynamics, behaviour, migration, and the search for new fishing grounds by accoustic methods and trawling. Further, research is done on 0-group fish and larvae. In this connection there are also made quantitative and qualitative investigations on zoo- and phytoplankton in the waters around Iceland.

Much work has been done on deep-sea shrimp (*Pandalus borealis*), Norway lobster (*Nephrops norvegicus*) and Iceland scallop (*Clamys islandica*). which are all of commercial importance for Iceland. Finally, some small scale investigations on whales are conducted at the Marine Research Institute.

There is only one other institution in Iceland connected with marine biological research. This is the Surtsey Research Society, which was founded in 1963 in order to follow the colonization of life on and around the vulcanic island Surtsey. This research covers both the bottom fauna and flora around Surtsey and the islands nearby.

Sigfús A. Schopka

[P.30]

INDIA

Work in biological oceanography is pursued mainly in the National Institute of Oceanography, Central Marine Fisheries Research Institute, and in the Marine Biology/Biology Departments of Kerala, Annamalai, Andhra, Madras, Madurai and Bombay Universities. The Fisheries Departments of Kerala, Madras and Bombay States and Indo-Norwegian Project carry out investigations on stock assessment and exploratory surveys connected with fisheries with special reference to prawns and lobsters. The Marine Organisms Scheme of the Forest Research Institute concentrate their studies on the fouling and boring organisms in the major harbours and coastal regions - their incidence, abundance, seasonal distribution, etc.

The Kerala, Annamalai and Andhra Universities have full fledged marine biological laboratories, where besides carrying out research on plankton, benthos, productivity, fisheries biology and physiology of marine organisms, two-year Master of Science courses are conducted. Students working on research problems connected with biological oceanography are admitted in the above university departments and also in the Central Institutes for doctorate degree. Work on larval development, qualitative and quantitative investigations of plankton, determination of primary production, faunal surveys and ecological studies in the inter-tidal and eulittoral zones are being done in the various laboratories of the Central Institutes and university departments. Most of the studies on biological oceanography are carried out in the inshore

waters on the west and east coasts of India, rarely extending up to the edge of the continental shelf. Biological, physical and chemical oceanographic data have been collected from about 4000 stations distributed in the Indian Seas during the last 15 years using R.V. Kalva, R.V. Varuna and R. V. Conch. Productivity and faunal studies of the major estuaries are also undertaken.

C. V. Kurian

IRELAND

1. Agencies involved:
    a. Department of Agriculture and Fisheries
    b. Colleges of the National University of Ireland
    c. Irish Sea Fisheries Board.

2. Total graduate staff employed: Approx. 36.

3. Field Stations: 5.

4. Research subjects:
    a. Biology and population dynamics of: Herring (*Clupea harengus*); Whiting (*Merlangus merlangus*); *Nephrops norvegicus*; Lobster (*Homarus gammarus*): Crawfish (*Palinurus elephas*); Crab (*Cancer pagurus*); Escallop (*Pecten maximus*); Queen (*Chlamys opercularis*)
    Biology and mariculture of: Mussel (*Mytilus edulis*); Oyster (*Ostrea edulis*); American hard shelled clam (*Mercenaria mercenaria*)
    Molecular biology of marine animals
    Pollution of estuarine and inshore environs
    Research vessel surveys (2 boats)
    Limited hydrographical records
    b. Biology and population dynamics of: Crawfish (*Palinurus elephas*); Prawn (*Palaemon serratus*)
    Planktonic studies of certain fish, and decapod larvae
    Ecology of the benthos and intertidal shoreline
    Tunicates, echinoderms and polychaetes
    Mariculture of bivalves
    Molecular biology of aquatic organisms
    Ecology of estuaries and inshore pollution
    c. Resource development of crab (*Cancer pagurus*) and mussel (*Mytilus edulis*)
    Development of industrial fisheries

F.A. Gibson

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ISRAEL

Biological oceanography activities in Israel are pursued within the framework of the appropriate departments of the two major universities in the country, i.e. the Hebrew University of Jerusalem and the University of Tel-Aviv, and at the Sea Fisheries Research Station in Haifa.

The major project, which is now in its fourth year, is a study of the migration problem of organisms through the Suez Canal, by means of a comprehensive study of the "Biota of the

Eastern Mediterranean and the Red Sea", as the project is officially named. It is supported jointly by the Smithsonian Institution in Washington, D.C., and the Hebrew University of Jerusalem, with the active participation of the Sea Fisheries Research Station and individual scientists from the University of Tel-Aviv.

In addition to detailed studies of the composition, distribution and numerical abundance of the different biota in the coastal waters of two marine environments connected by the Suez Canal, the survey extends also to the Levant Basin as a whole, through periodic cruises to the Eastern Mediterranean.

This latter phase of the work is aimed both at a study of the oceanic biota as a whole as well as ascertaining how far west and north certain species of fishes, invertebrates or algae of Indo-Pacific origin, which have successfully reached the Eastern Mediterranean, have dispersed. Special projects comprise taxonomic surveys, life history studies on individual species, as well as behaviour studies carried out by individual scientists at the three institutions mentioned above. In this endeavour the Marine Biological Laboratory at Eilat, affiliated with the Hebrew University of Jerusalem, is ideally situated near the local nature reserve, for both field and laboratory studies of tropical biology and coral reef ecology.

Lately, experiments have been in progress on various aspects of marine farming in artificial ponds adjoining the Mediterranean coastline, with special emphasis on the selection of fish species suitable for this purpose. The work carried out in Israel on the artificial breeding, ecology and physiology of *Mugil* species is of special relevance in this respect. Closely related to this activity is the study of the biological productivity of the superhaline lagoons, on which considerable work has been done in the past three years.

The marine pollution aspect has not been neglected, although the work is in its initial stages and will be mainly channeled to a more urgent problem of the effects of oil pollution on marine life. On the other hand, physical, chemical, and biological aspects of river and estuarine pollution have been studied in greater detail, chiefly by the Sea Fisheries Research Station in Haifa. At the same time, marine fouling studies which were carried out for many years, chiefly in Haifa, have lately been temporarily discontinued.

Teaching activities consist of regular post-graduate courses in marine biology offered by the Department of Zoology of the Hebrew University of Jerusalem with the active participation of senior members of the Sea Fisheries Research Station in their respective fields. Special research grants in marine biology and other branches of marine sciences are made by the government sponsored Limnological and Oceanographic Research Company on the advice of a national scientific committee.

This Limnological and Oceanographic Research Company is also the official body coordinating the research activities in the fields of oceanography and limnology in the country, which includes the operation of the research vessels and the building of the National Institute of Oceanography near Haifa.

B. Kimor

ITALY

1. Institute of Marine Biology of the C.N.R.. Venice
Plankton and productivity section. The influence of the main Italian rivers on the hydrological and biological features of the Northern Adriatic Sea is being studied in connection with the

hydrology of the rivers Po and Adige. Primary productivity, phyto- and zooplankton distribution and abundance, and the hydrology and plankton of the Venice lagoon are also under investigation.
Sedimentolqgy and benthic ecology section: Beach rock distribution in the Northern Adriatic Sea, with special reference to its importance as a palaeo-coastline indicator and to its animal population; sedimentology of the Venice lagoon.
Section of dynamics and genetics of marine animals. Research is concerned with taxonomical, biogeographical, genetical and physiological investigations on some species of marine copepods of the genus *Tisbe*.

2. Institute of Zoology, University of Genoa. The distribution of the plankton and its qualitative and quantitative composition in relation to the characteristics of the water masses (Sicilian waters) and to environmental conditions of a polluted area (Genoa harbour) are being investigated. Another research is dealing with fisheries and meteorological conditions in the Ligurian Sea to find out possible relationships. A cooperative study of the DSL in the Tyrrhenian Sea and in the eastern Algero-Provencal basin is also under way. The populations of the coralligenous platform of Apulian and Ligurian waters and the ecology of the Porifera of the Italian continental shelf are being investigated.

The Genoa Museum of Natural History studies the biogeography of the percoids of the Mediterranean and adjacent seas, and the relationships between the Mediterranean and Black Sea ichthyo-fauna. Investigations have been planned on deep-sea fishes of the Ligurian Sea.

3. Institute of Zoology. University of Parma. The main topics are: radioecology of marine plankton, benthos and sediments; artificially induced breeding in mullet and field research on its eggs and larvae in the Adriatic Sea; systematics and ecology of Acantharia (in collaboration with the Woods Hole Oceanographic Institution).

4. Institute of Zoology and Institute of Hydrobiology, University of Messina. The former carries out research on plankton, primary productivity and bottom communities at fixed stations north of Sicily. The latter mainly deals with the study of the nitrogen and sulphur bacteria and the self-depuration processes of sea water. The Thalassographic Institute of Messina is mainly conducting researches on the biology and ecology of the sword-fish.

5. Institute of Zoology, University of Rome. The study of fouling and of the vagrant mesobenthos of reef pools in the Civitavecchia area are the main research topics.

6. Laboratory of Marine Biology at Fano: Biological studies on Adriatic Clupeidae and Pleuronectidae, partially in relation to fisheries, bottom communities and their biomass, and the seasonal variation and distribution of planktonic organisms at fixed stations. Distribution of 3-4 benzopyrene in the bottom and its presence in the food chain is also being investigated.
7. Aquarium of Bari. The seasonal variations of the zooplankton in the Apulian waters of the Adriatic Sea are being studied.

8. Laboratory of Lagoon Biology of the C.N.R.. Lesina: The hydrology of lagoons in relation to fisheries and the breeding of commercial species of Decapoda and Mollusca.

B. Battaglia N. Delia Croce B. Schreiber

JAPAN

During later years the activity in biological oceanography has been remarkably increased

both in the national or international cooperation and in individual studies. This report deals mainly with the activity in the former category.

Biological work was carried out by research vessels. As an example, a three months biological survey was undertaken by 28 scientists on board the Hakuho Maru, research ship of the 0cean Research Institute, University of Tokyo, in the North and Equatorial Pacific to study the productivity of lower trophic levels, including bacteria, phytoplankton, zooplankton and micronekton, metabolism and food chain, and also the biogeography along 155°W in these areas. Later on the same ship made a one month cruise to clarify the ecosystem in the Japan Sea.

Future cruise plans of the Hakuho Maru are tentatively as follows: study on *Trichodesmium* in the East China Sea in 1971 (28 days), study on metabolism in the subarctic and subtropical waters in the summer of 1971 (42 days) and in the winter of 1972 (28 days), study of fishing ground formation near Yamato Bank in the Japan Sea in the summer of 1971 (24 days), study on ecosystem in waters of Southeastern Asia in 1972 (85 days), and study on Japanese eels in the sea southwest of Japan in the winters of 1972 (38 days) and 1973 (28 days).

Japanese scientists have taken great interest in the International Biological Programme (IBP), and more than 100 persons joined in the research of IBP-PM (Productivity Marine). Three regions were selected in order to compare their ecosystems and productivity: Akkeshi and Sendai Bays, influenced by the Oyashio cold water; Suruga and Sagami Bays, washed by the Kuroshio warm water; and the Inland Sea of Japan, with a strong embayment.
[P.33]
The Cooperative Study of the Kuroshio and its Adjacent Regions (CSK) was closed with great success in 1970. Valuable contributions were made for the Kuroshio biology during CSK, mainly in taxonomy and geography of plankton, standing crop and productivity of phytoplankton, ecology of bathypelagic animals, and analysis of particulate and dissolved organic matters.

A number of symposia have been held by various bodies in Japan, e.g., the Oceanographical Society of Japan, the Plankton Society of Japan, PM Section of IBP and the Ocean Research Institute, concerning themes such as "Pigments of phytoplankton", "Red-tide", "Reproduction of plankton organisms", "Marine food chain", "Vertical migration of plankton and micronekton", "Plankton distribution in the intermediate water of the North Pacific", "Kuroshio plankton", "Productivity in coastal waters of the Kuroshio, especially in Suruga and Sagami Bays", "Ecosystem and metabolism in the North and Equatorial Pacific", "Ecosystem in the Japan Sea", "Coral reefs", "Migration of eels", and "Sounds of marine animals".

The National Committee on Oceanic Research in the Science Council of Japan had been responsible for the promotion of national oceanographic studies and active as the corresponding body to international oceanographic organisations. In 1969 a Working Group for Biological Oceanography was started under the Committee of Biological Science in the Science Council of Japan as corresponding body to IABO. Its first activity was mainly directed at arranging a symposium "The Ocean World", held in Tokyo in September 1970.

Ryuzo Marumo

NETHERLANDS

1. Netherlands Institute for Sea Research, Texel. Investigations on nutrients, primary and secondary production in the southern North Sea and the Wadden Sea, including intertidal flat

investigations. Studies on population dynamics and migration of marine animals. Participation in international programmes, such as IBP and CICAR.

2. Delta Institute for Hydrobiology, Yerseke. Marine biological studies in the Rhine-Meuse estuary in relation to the enclosure projects carried out in this area.

3. Netherlands Institute for Fishery Investigations, Ijmuiden. Stock assessment and population dynamics of commercially important fishes. Productivity studies.

4. Shellfish Department of Netherlands Institute for Fishery Investigations, Texel. Productivity studies for shellfish farming.

5. Museum of Natural History, Leiden and Zoological Museum, University of Amsterdam. Zoogeography of marine species.

H. Postma

NORWAY

Fiskeridirektoratets Havforskningsinstitutt. Bergen
Studies on migrations, growth rate, age composition, recruitment, and mortality, and assessments of present and future populations of commercially important species of fish,, such as cod, haddock, herring, and sprat have long traditions at the institute and are still being continued. Today important contributions are presented by SONAR records which now give information on the species and size of the fish as well as their number and distribution. Recently, particular interest is focused on eggs, larvae, and 0-group young fish of various species. Present investigations include: cod, haddock, saithe, blue whiting, polar cod, herring, sprat, capelin, mackerel, tunny eel, Greenland halibut, Norway haddock, basking shark, and others. Population genetics, fish behaviour, physiology, and reactions to various toxic substances are subjects of special studies. Crab, lobster, euphausiids, *Calanus*, squid and mussels are being investigated with a view to exploitation and cultivation. Studies are being carried out on the quantitative occurrence and biology of the harp seal, hooded seal, bearded seal, ringed seal, bottle-nosed whale, killer whale, and piked whale. Quantitative studies of zooplankton and phytoplankton production, in particular in connection with studies of fish larvae. Investigations are carried out in Norwegian coastal waters, the Skagerak, North Sea, Norwegian Sea, Northwestern Atlantic and Greenland waters, and the Barents Sea.

Inspektøren for Ferskvannsfisket. Vollebekk
Migration studies on Atlantic salmon.
[P. 34]
Norsk Institutt for Tang- og Tareforskning. Trondheim
Analyses on phytoplankton pigments. Physical and chemical properties of seaweed constituents and products. Ion exchange, in particular with polysaccharide components, in marine organisms.

Statens Biologiske Stasjon. Flødevigen, Arendal
General studies of fisheries biology in the Skagerak and adjacent waters.

Tromsø Museum. Tromsø
Taxonomic and floristic studies on Phaeophyceae. Population studies and physiology of the Iceland scallop. Population studies on sub-arctic echinoderms. All-year biological survey of a fjord near Narvik.

Marinbiologisk Stasjon, Tromsø. Quantitative studies of zooplankton in several fjords of Northern Norway. Distribution of eggs, larvae, and young fish in fjords and coastal waters, in cooperation with Fiskeridirektoratets Havforskningsinstitutt.

Universitetet i Bergen
Biologisk Stasjon, Espegrend, Blomsterdalen. Floristic studies and growth of benthos macro-vegetation. Influence of of components on photosynthesis in seaweed. Biochemistry of seaweed. The trophic levels of a plankton community, and annual cycles of radiolarians and hydromedusans in a deep fjord. Biology of soft bottom fauna in deep fjords. Ecosystem analysis in a land-locked fjord. Pollution ecology of zooplankton and zoobenthos in a land-locked fjord. Meiofauna of the Gullmar Fjord. Occurrence of salps. Systematic studies on calanoid copepods, amphipods, and prosobranchs. Systematics, development, and distribution of Pogonophora. Biological and ecological studies on amphipods, isopods, mysids, cumaceans, a crangonid shrimp (*Pontophilus norvegicus*), decapod anomurans, brachiopods, prosobranchs, *Syndosmya* spp. (mussels). Littoral ecology of the Bahamas. General zoogeography.
Zoologisk Museum, Bergen. Parasitology. Marine ecology. Systematics and biology of isopods, decapod crustaceans, ophiuroids, and squid.

Universitetet i Oslo
Biologisk Stasjon, Drøbak. Ecology of benthic algae. Histochemical and histological studies on fish kidneys. Pathological studies on hagfish.
Institutt for Marin Biologic A & C, 0slo. Ecological studies of zooplankton, zoobenthos, and sprat, in particular with respect to pollution. Toxicity studies. Osmoregulation. Propagation, growth, age, and serology of the fin whale. Feeding in sperm whale.
Institutt for Marin Biologi B, Oslo. Annual cycle and ecology of phytoplankton in a polluted basin and other Norwegian coastal waters. Ecological studies on nanno-phytoflagellates. Distribution studies of marine plankton diatoms. Taxonomy and fine structure of coccolithophorids, diatoms, and microflagellates. Experimental studies on the physiology of plankton algae. Investigations on benthic algal vegetation of Norwegian fjords.
Zoologisk Laboratorium, Oslo. Ecology of foraminiferans. Systematics of polychaetes. Migration of the char.
Zoologisk Museum, Oslo. Development of Brachyura. Systematics and zoogeography of isopods and fish.

Universitetet i Trondheim
Biologisk Stasjon, Trondheim. Systematics and ecology of prosobranchs.
Det Kongelige Norske Videnskabers Selskab. Museet, Trondheim. Ecosystem analysis in a landlocked fjord. Ecology of octocorals.

Fredrik Beyer

PERU

1. Established institutions for oceanographic work in Peru
    1.1 Instituto del Mar del Peru (Peruvian Institute of the Sea). Dedicated to intensive biological oceanographical investigations and studies of evaluation of populations of marine organisms. Maintains close relations with other entities.
[P. 35] 1.2 Dirección de Hidrografía y Faros (Office of Hydrography and Lighthouses). Principally dedicated to maintaining lighthouses on the coast and obtaining limited hydrographical data.

1.3 Servicio Nacional de Meteorología e Hidrología (National Service for Meteorology and Hydrology). - Maintains a network of coastal meteorological stations and furnishes observations on sea temperature and atmospheric data.

1.4 Universities. - There are eight universities which offer courses in marine sciences, but only some of these actually carry out limited basic investigations, principally on the biology of marine and continental species.

2. Facilities for investigation at the Peruvian Institute of the Sea

This institute which was originally created by FAO and the Peruvian government in 1960 has since 1964 been an entity with funds direct from the government and supported by the fisheries industry. Facilities: Laboratorio Central in Callao, 3 coastal stations and fisheries inspectors in all the principal ports of disembarkation. It operates a fisheries investigations vessel, the "SNP-1", equipped with electro-acoustic instruments, echo-sounder, biological laboratory, fishing gears of purse seine and trawl, and oceanographic winch. Moreover, it periodically operates the vessel "Unanue" for oceanographical studies and a small craft for studies of fish shoals and fishing operations near the coast. The personnel consists of 62 professionals, mainly biologists, oceanographers, some chemists, technologists, and mathematicians; 24 technicians and 50 correspondents for personal administrative and secretarial work.

3. Investigations supported by the Institute of the Sea

The Institute is composed of: Department of Biology; Department of Oceanography; Department of Technology; Department of Statistics and Economics. These branch offices work under coordinated programmes.

The most important biological oceanographical investigations are:

3.1 Evaluation of the stock of anchovies and biological and ecological studies.

3.2 Studies of productivity, composition of plankton and food chains related principally to the anchovy.

3. 3 Studies of the surrounding environment (currents, upwelling, physical and chemical variables of the sea) in relation to points 3.1 and 3.2.

3.4 Biological and fisheries studies of fish, crustaceans and molluscs. This includes taxonomical studies, explorations of fishing grounds, estimations of the stock, topographical data on the bottom and characteristics of the deeper water layers.

3. 5 Studies of populations of marine birds related to changes of the surrounding milieu and effects of the exploitation of those items which serve as food (anchovies).

3.6 Studies of populations of mammals, principally whales and seals. At present there exists a major impulse and support from the government to enlarge these investigations and establish a Subdirectorate of Continental Waters.

4. Publications of the Institute of the Sea: Bulletins, Reports (sent to specialized libraries of different countries) and Special Reports (of limited distribution).

B. R. Jordan

POLAND

The following is an extract of the Progress Report 1967-1968, published by the Polish National Committee for IBP.

1, Cooperating institutions

1.1Department of Oceanography and Department of Ichthyology, Sea Fisheries Institute, Gdynia.

1.2 Sea Fisheries Institute, Division at Swinoujscie.

1.3 Department of Oceanography, State Institute of Hydrology and Meteorology, Gdynia.

[P. 36]1.4 Marine Station, Polish Academy of Sciences, Sopot.

1.5 Marine Biological Station at Gorki Wschodnie, Medical Academy of Gdansk.

2. Investigation problems

2.1 Environmental studies. Seasonal observations (institutions 1.1, 1.3, 1. 4) of changes in distribution of temperature, salinity, oxygen and phosphate contents at standard depths were carried out in the Southern Baltic, and calcium, magnesium, and carbon dioxide contents as well as the state of carbon equilibrium were worked on. Also the basic composition of sea water with respect to ions present in the Baltic waters, and the concentration of sea salts together with its chemical composition in the Bay of Gdansk were determined. The presence and concentration of certain radioactive elements such as ^{137}caesium, ^{90}strontium and ^{40}potassium in the waters of the deeps and in those of the Vistula and Odra estuaries were determined. Observations were also carried out on changing of these elements with time, temperature, and sea level. A full hydrographical description of the conditions in the estuary areas of the Smiala Wisia River was elaborated. The iodine content in the coastal atmosphere of the Gdansk Bay was examined; its rate of decrease with increasing distance from the coast was determined. Some experimental equations were developed for the height of wind-created waves and swell.

2.2 Primary production was measured *in situ* at 7 observation stations by ^{14}C-method

2.3 Physiology of marine organisms. Comparative studies were performed on the hormone which inhibits the activity of ovaries in the crab *Rhithropanopeus harrisi*, and the shrimp *Crangon crangon*. The occurrence and distribution of the crab was investigated in the area of the rivers Martwa Wisia and Wisia Smiala. The gastric contents of the crabs caught were examined and cultures of the larval and post-larval stages were established.

2.4 Plankton and benthos. The seasonal variability in composition and dynamics of the Southern Baltic phytoplankton was studied. The horizontal distribution of zooplankton was established on several profiles from the coastal zone towards the open sea. The volume and weight of zooplankton were evaluated in three fractions with respect to size. The distribution and abundance of the Baltic zoobenthos were studied and observations were made on the sessile fauna on plates immersed in the water and regularly inspected.

2. 5 Ichthyological investigations were carried out on cod, herring, and sprat, on trout and salmon, and on perch-pike and bream.

2.6 Other sea resources. The mineral composition of algae was examined in bays and the coastal zone of the Baltic.

2.7 Investigations on the biological production in the Firth of Szczecin included the share of organic matter in the composition of bottom sediments, primary production, the biomass of vascular plants, the ecology of the mollusc *Dreissena polymorpha,* and the dynamics of stocks of basic commercial fish.

2.8 Investigation on destruction processes in the marine environment (1.1) concerned the qualitative composition of the micro-flora engaged in decomposition of cellulose and the break-down rate.

PORTUGAL

The principal work is being conducted by the "Instituto de Biologia Maritima" and "Instituto Hidrográfico", working in cooperation.

During 1970, a cruise was made off the Portuguese coast and samples of water and of plankton (phyto- and zooplankton) were collected together with water samples for determinations of temperature, salinity, dissolved oxygen, and phosphates.

Some other observations of plankton and water quality were made on the Tagus and Sado estuaries, and on the Ria de Faro (south coast of Portugal).

R. Monteiro

[P. 37]
SINGAPORE

In Singapore there are four institutions interested in biological oceanography:

1. Regional Marine Biological Centre, University of Singapore
2. Fisheries Biology Unit, University of Singapore
3. Southeast Asian Fisheries Development Centre, Research Department
4. Fisheries Division, Department of Primary Production, Ministry of National Development

Regional Marine Biological Centre
The sorting of plankton is the main function of the Centre. During April 1968 to August 1970 a total number of 1473 samples were received, 822 of which had been sorted. The following countries sent in samples (arranged according to numbers): Republic of Korea, Japan, Republic of Philippines, Singapore, Republic of China, Hongkong, and Thailand. A total of 623 sorting reports (primary sorting) were sent to the countries concerned.

The main problems are as follows: Poor condition of several samples on arrival (particularly a widely varying pH of the preservative fluid); finding the best methods of long-term preservation; biomass determination without damaging the plankton organisms; difficulty in getting grants from UNESCO sufficiently early for renewal of contracts of the sorters.

Fisheries Biology Unit
1. Fisheries biology has mainly been concerned with growth stages, bionomics and life history of the common anchovy *Stelephorus pseudoheterolobus* and in recent years of species of *Ambassis* (including artificial fertilisation) and the goby *Ctenogobius criniger*.
2. Plankton studies have mainly been concerned with the plankton of Singapore waters and the biology of various plankton organisms, e.g. *Paracalanus* sp.
3. Environmental studies comprise i.a. biota and environmental conditions in various estuaries and fish and prawn ponds.
4. Culture of aquatic organisms has comprised experiments in a promising cultivation of the seaweed *Eucheuma spinosum*, oysters (using nylon ropes for spat collection) and the green mussel *Mytilus viridis*.
5. Fouling organisms have been the subject of preliminary studies in Johore Straits.
6. Biometrics are being applied to a large number of local inshore fishes and the results will be published in the near future.

Tham Ah Kow

SOUTH AFRICA

The main research institutes in Cape Town are the Division of Sea Fisheries, the biological group of the Oceanographic Institute of the University of Cape Town, and the marine biological

section of the South African Museum. Another group is in the Port Elizabeth Museum and Oceanarium,
and in Durban there is an Oceanographic Research Institute. There are two small but active groups at Rhodes University, in the Department of Zoology and in the Institute of Ichthyology. There are also individual workers in the Zoology Departments at the Universities of Natal and Witwatersrand. Altogether there are about 60 professional marine biologists in South Africa.

Financial support is received from the several universities and from government sources channelled through the Department of Commerce and Industry, the Council of Scientific and Industrial
Research and the South African National Committee for Oceanographic Research (SANCOR).

So many independent lines of research are in progress that it is only possible to deal with them here in general terms.

Taxonomy. Current ichthyological studies are centred at the South African Museum and the Institute of Ichthyology at Rhodes University. Possibly the most important recent study is a revision of the Clinidae, but many other studies such as a revision of the Rajidae are in progress. Among invertebrate groups, a check list of Mollusca will shortly be published, the Stomatopoda of South Africa have been revised, and new additions to the Decapoda have been reported.

Life histories and bionomics. Such researches are mainly concentrated at the Division of Sea Fisheries, but the University of Cape Town and the Oceanographic Institute at Durban are also concerned. The long-term studies of South African pilchards, mackerels, anchovies, and snoek continues, and new work is being done on the S. African hake in collaboration with the Lowestoft laboratories. Reef fishes of interest to anglers and line-boat fishermen are being studied for the first time, as is the biology of the Cape Sole. The biology of commercially important invertebrates such as the rock lobster, *Jasus*. is being studied afresh at the Division of Sea Fisheries. In the Institute of Oceanography at Durban Panulirus burgeri, Nephrops andamanicus, and penaeid prawns are receiving attention. Studies of the larval stages of echinoids and the biology of Patella spp. are under way in the University of Cape Town, and the Division of Sea Fisheries has recently reported on the bionomics of Haliotes midae (abalone). More physiological studies of the scavenging whelk Bullia and the mud prawn Upogebia are in progress at the Universities of Cape Town and Rhodes.

Marine distribution and biogeography. Records of the distribution of all benthic invertebrates have been catalogued and an annotated check list of the fauna of False Bay has recently been published by the University of Cape Town. Numerical methods for the objective analysis of distribution patterns have been developed and tested on a transect across the continental shelf of North Carolina (USA) and another transect in False Bay. More recently, the South African Museum has undertaken a study of intertidal distribution between the cold water fauna of S.W.Africa and the tropical fauna of Angola.

Estuarine Ecology. This field includes a study of mangrove swamps (Witwatersrand University) and of the ecology of a tropical estuary in Mocambique and the effects of variable rainfall in the St. Lucia System (University of Cape Town). The Oceanographic Institute in Durban and the Cape Department of Nature Conservation are concerned with the biology and physiology of estuarine fishes. Rhodes University has made a special study of the oligohaline to fresh water fauna of Lake Sibaya, and the Port Elizabeth Museum is making a survey of estuarine plankton and its productivity.

Plankton. Besides estuarine plankton, several other studies of marine plankton are under way. The Division of Sea Fisheries is particularly concerned with the plankton on the Atlantic coast

in relation to the pelagic fisheries, and an active team specializes in Copepoda. Work on *Sagitta* in the Agulhas Current has recently been published by the University of Cape Town, and an account of planktonic amphipods and the genus Ceratium will appear shortly.

Pollution is a particularly urgent problem in South Africa, which is perennially short of fresh water. The National Institute of Water Research has recently produced a valuable report on "The disposal of effluents into the sea off the Natal coast". While it does not deal with biological processes, it gives an account of near-shore circulation and the positioning of waste discharge pipes. Similar work on a smaller scale has been done around the Cape Peninsula by the University of Cape Town which has also studied the uptake of radioactive isotopes and the effect of oil on sea birds. Government funds are awaited for a full-scale investigation of oil pollution in the sea.

J. H. Day

SPAIN

The main research on biological oceanography in Spain is carried out at the Institute of Fisheries Research (Instituto de Investigaciones Pesqueras) and the Spanish Institute of Oceanography (Institute Español de Oceanografia). Each of these has several laboratories located on the Atlantic and Mediterranean coasts of Spain.

Bacteriology. Chemosynthetic productivity of bacteria from the Atlantic and Mediterranean coasts (western and eastern); Productivity, bacteriology and pollution.

Planktonology 1. Phytoplankton. Analysis of the distribution of species diversity in the Caribbean seas; Association or segregation in congeneric phytoplankton species; Controlling relations between phytoplankton and environmental factors; Systematics, physiology and experimental ecology of phytoplankton (western Mediterranean and eastern Pacific); Influence of phytoplankton population on different nitrogen compounds and their stratification in the sea; Cultures of phytoplankton in a non-uniform medium, as models of marine distributions; Silicate concentration in the "Ria of Vigo" compared with the amount of phytoplankton and especially with diatoms; Productivity in the "Ria of Vigo" calculated from the photosynthetic assimilation, daily turnover of living phytoplankton and total annual production; Phytoplankton and hydrography; Quantitative and qualitative study of photosynthetic pigments (mainly porphyrine derivatives) by spectrometric, chromatographic and autoradiographic methods; Primary productivity in the Bay of Palma; Studies on the primary productivity of the Canario-africana zone.

Planktonology 2. Zooplankton. Systematics, vertical distribution and ecology of the copepod populations from the Atlantic coasts of North Africa; Pelagic Copepoda of the Antarctic and Indian Oceans; Studies on the larvae of molluscs, *Penaeus kerathurus*, and Decapoda (breeding in recirculating aquariums); Pelagic ostracods from the northeastern Atlantic waters; Feeding strategies of some Chaetognatha from the western Mediterranean; Hydrography and zooplankton of an area south of Cabrera Island; Eggs and larvae of fishes of the Bay of Palma; Recent biocoenosis of foraminiferans in the Alboran Sea; Quantitative and qualitative variation of the planktonic populations from Malaga waters; Qualitative and quantitative studies on the neritic plankton from the Canario-africana zone.

Crustaceans. Breeding of the prawn *Penaeus kerathurus*: Bionomic studies on the deep-sea shrimps in Balearic Islands; Biology of *Aristeus antennatus*.

Molluscs. Culture experiments and studies on the different settling substrata for oyster larvae and their effects on the farming systems; Culture of oysters and mussels in the delta of the Ebro river; Extension and fixation of oyster larvae in controlled environments; Scleroproteins and basic amino-acids of the mussel; Determination of metals (especially manganese) in the oyster, with regard to their influence on sexual maturity; Techniques for the culture of molluscs; "Illness of the gills": studies and observations in oyster and mussel farming; General systematics of Cephalopoda; Biology of Cephalopoda, especially of Octopoda.

Fishes. Biology of the Sardine and Anchovy from the Gulf of Cadiz; Biology of the Sardine in the Catalonian region, with special consideration of growth; Study of the alternate fluctuations of the anchovy and sardine production; Biostatistics and biometry of *Micromesistius poutassou* and *Merluccius merluccius*; Fishing efforts and density index of *Merluccius merluccius* from NW Spain; Biological studies on *Pagellus centrodontus*, *Merluccius merluccius*, and *Trachurus trachurus* from NW Spain; Studies on the otholiths of the Cod fished by Spanish trawlers in the ICNAF area; Biological study of Tuna: its migrations and their relationship with the environmental conditions; Size of Tuna from May to August (1.355 individuals); Studies on the biology of the ichthyological fauna from the "Mar Menor"; Fishery production and faunistic studies and food chains in "Mar Menor"; Faunistic studies in the "Rias" and statistics on the condition of the populations; Experiences on semi-culture of fishes: catching of larvae, growing in confined spaces, nutrition with artificial foods, etc.; Experimental fishing in the Canario-africana zone to 1000 m depth; Statistics on fish landings and fishing efforts for the harbours between the Ebro river and south of the Castellon province; Actual conditions and estimation of the fishing effort; Mesh size used by the trawlers from the Malaga region and their adequacy to the min. legal size of fish; Fishing charts from the regions "Levante" and "Balear"; Population dynamics.

Seaweeds. Ecology of seaweeds from the northwest of Spain; Mannitol contents in the alga *Bifurcaria tuberculata*, related to incident energy; Specific distribution and density per m^2 (production) of sea-weeds from Cape Penas to the French frontier; Pre-treatment of Gelidium to improve the quality and yield of the agar-agar.

Benthos. Specific diversity of different benthonic ecosystems from the continental shelf.

Miscellaneous items. Constant of decomposition of organic nitrogenous matter dissolved in deep-sea water; Accumulation of copper, iron and zinc in the spleen of Tuna; Cytochemical studies, erythrocytometric curves, leucocytes and thrombocytes in Tuna; Haematology of Tuna; Study of fractionating proteins for the identification of species of fishes; Study of degradation of protoplasmic fish proteins using disc electrophoresis; Distinction of different populations of the Sardine based on protein analysis with disc electrophoresis; Artificial compound foods for feeding fishes in confined waters; The quantitative variations of sodium, potassium, lithium, barium, and calcium in the blood of fishes.

F. Vives

SWEDEN

Research on biological oceanography is mainly carried out in the institutes listed below, to which the numbers in the text refer.

Ecology. Research is carried out from a number of different aspects. There is work on most groups of the animal and plant kingdom: pinnipedes (5, 16), fish (5, 7, 12, 13, 14, 18), invertebrates (1, 2, 5, 7, 10, 12, 14, 15, 17), higher plants and algae (1, 3, 6, 8, 9), phytoplankton

and primary production (8, 9, 12). There are also studies on marine micro-organisms (1, 5, 11). The topography of the sea surrounding Sweden creates special hydrographic conditions (e.g. salinities from l°/oo to 34°/oo) and shows a vast number of communities and different ecosystems distributed over a large geographical area. It is therefore natural that there is an intensive study of ecosystems in different regions: e.g. the Baltic, with centers in Umea (1) and Stockholm (5), the Swedish west coast with centers around the Gullmarfjord (2, 7, 8, 9, 10, 12), and open-sea research in general (12). There are special studies on the benthos, both in coastal waters (1, 2, 5, 7, 10, 14, 15) and in the open sea (12, 15), including the meiofauna in coastal waters (5,15). There are some investigations in specialized milieus as rock-pools (5), hard-bottom communities (10, 15), and the fauna of algae (5). The plankton is studied both in the Baltic and in the Kattegat and Skagerrak; the main interest is on the zooplankton (2, 12), including ichthyoplankton (12), but there is also work on phytoplankton (9). An important part of the ecological work is carried out on the fish stocks of commercial importance (12, 18). These studies include research on migrations of fish and shellfish, population dynamics as well as prey-predator relationships and propagation (5, 12, 18). There are also studies on fish of secondary importance as food organisms to other species (5, 12).

Long term changes in the composition of the flora and fauna are being studied by several institutes (1, 5, 7, 12, 15). As there have been major hydrographic changes in the waters of the Baltic the biological effects are studied in the benthos, the plankton and fish. Similar studies are carried out in the Kattegat and the Skagerrak, although the hydrographical changes have been of a minor scale (12,15).

A number of experimental studies are carried out in order to understand the mechanism of the ecosystem. The first goal is to establish quantitative models of ecological relationships in restricted areas (5). The studies are either carried out as research on production between different trophic levels or as a study of a restricted number of species under controlled conditions. It is hoped that the understanding of these mechanisms will help to interpret the long term changes in the fauna and flora of the sea (5, 15).

Pollution of the sea. Nearly all institutions listed carry out some work connected with this problem. There is a special catalogue on Aquatic Milieu Research, edited by the National Environment Protection Board (address: Fack, 17120 Solna 1, Sweden). The effects of pollution on living organisms are studied practically on most parts of the ecosystem. There are two great groups of research: Studies in certain regions, as a rule connected with an important discharge of waste, and studies concentrated on certain compounds or elements. Compounds of major interest are mercury (12), heavy metals (12, 14), biocides (12, 16), and many others. Of special interest is the accumulation of these compounds in the food chain and finally in fish. A special type of "pollution" is the warm-water discharge in coastal areas. Its possible effects are studied (13, 14). One of the main questions is to what extent the situation in the Baltic has been caused by man.

Armin Lindquist

University of Umeå:
1. Biological Institute
University of Uppsala:
2. Zoological Institute and Klubban Biological Station (Fiskebäckskil)
3. Plant Biological Institute
4. Zoophysiological Institute
University of Stockholm:
5. Zoological Institute and Askö-Laboratory (Trosa)
6. Botanical Institute

University of Lund:
7. Zoological Institute
8. Institute of Systematic and Ecological Botany
University of Goteborg:
9. Botanical Institute
10. Zoological Institute and Tjärnö Marine Zoological Station (Strömstad)
11. Virological Laboratory
Royal Board of Fisheries:
12. Institute of Marine Research, Lysekil
13. Institute of Freshwater Research, Drottningholm
14. The National Environment Protection Board, Drottningholm
Royal Academy of Science:
15. Kristineberg Zoological Station, Fiskebäckskil
16. Swedish Museum of Natural History, Stockholm
17. Institute of Water and Air Protection Research, Stockholm
18. Institute of Salmon Research, Älvkarleby

[P.41]

THAILAND
1. Marine Fisheries Laboratory. The Laboratory includes four Projects which have the following types of research and investigations:

1.1 Marine Fisheries Laboratory Project
- a. Assessments of the primary productivity of coastal waters in the Gulf of Thailand
- b. Identification and the assessments of plankton populations in the sea
- c. Evaluation of benthic fauna
- d. Water chemistry
- e. Fish and invertebrate taxonomy

1.2 Invertebrate Fisheries Investigations
- a. Life histories, bionomics, and stock assessments of economically important crustaceans, including *Penaeus* and *Metapenaeus*
- b. Experimental oyster culture
- c. Experimental shrimp (*Penaeus* and *Metapenaeus* spp.) farming

1.3 Demersal Fisheries Investigations
- a. Life histories, bionomics, and stock assessments of some commercially important demersal fishes, including Nemipteridae, Carangidae, Leiognathidae, and *Saurida* spp.
- b. Monitoring studies of the trawl fisheries resources in the Gulf of Thailand

1.4 Pelagic Fisheries Investigations
- a. Life histories, bionomics, and stock assessments of *Rastrelliger neglectus*, *Scomberomorus* spp., and *Stolephorus* spp.

2. Phuket Marine Biological Centre. This new Centre has been built on a Thai-Danish cooperative basis and has just been completed. The work of the permanent staff (5) is concerned with: rearing and biology of spiny lobster and taxonomy of polychaetes; microflora of sandy beaches; intertidal zone ecology; micro-infauna; plankton and primary production in general. Research done by visiting scientists is anticipated to be a major contribution to the activities of the Centre. Projects for the near future comprise studies of marine algae, the boring bivalve *Lithophaga*, mangrove bivalves, crab/coral associations and crab identifications. A long-term research project is concerned with the taxonomy of marine organisms and establishment of a reference collection as well as the preparation of identification sheets of commercially important fish.

3. The Marine Department, Chulalongkorn University, Bangkok. Among the major subjects of research: selected taxa of the material from the Naga Expedition and from the 5th Thai-Danish Expedition (Prof. T. Piyakarnachana has recently given a very interesting account on the distribution of *Amphioxus* in the Andaman Sea and demonstrated that two environments were kept separate by current systems: 1) the Bay of Bengal and the water masses southwards towards Phuket, and 2) the region south of Phuket).

Vagn Hansen

UNITED KINGDOM

In the United Kingdom there are several institutions wholly concerned with marine research. The following have major activities in biological oceanography:

1. National Institute of Oceanography, Wormley, Surrey
2. Ministry of Agriculture, Fisheries and Food, Lowestoft, Suffolk
3. Department of Agriculture and Fisheries for Scotland, Marine Laboratory, Aberdeen
4. Scottish Marine Biological Association, Dunstaffnage Marine Research Laboratory, Oban, Argyll [P.42]
5. Marine Biological Association of the U.K., Plymouth, Devon
6. Natural Environment Research Council units:
    a. Fisheries' Helminthology, c/o Fisheries Laboratory, Lowestoft, Suffolk
    b. Fisheries' Biochemical Research Unit, Torry, Aberdeen
    c. Seals Research Unit, c/o Fisheries Laboratory, Lowestoft, Suffolk
7. The SMBA Oceanographic Laboratory at Edinburgh has recently been taken over by NERC and is to be incorporated in the structure of a new organization, the Institute of Marine Environmental Research, which will be based at Plymouth.

Of these organizations only the NIO Biology Group is wholly concerned with deep-sea biology. The remaining work on both deep-sea and inshore waters.

Besides these institutions a number of University departments have a continuing interest in marine science and the following are particularly concerned with biological oceanography:

1. University of Bangor, Marine Science Laboratories, Menai Bridge. Zoology Department
2. - - Liverpool, Port Erin Marine Station, Isle of Man. Botany Department
3. - - Southampton, Oceanography Department
4. - - St. Andrews, Gatty Marine Laboratory
5. - - Newcastle, Dove Marine Laboratory. Botany Department
6. - - Stirling, Biology Department
7. - - Belfast, Marine Biological Station, Portadown

The following University Departments also have an interest in marine organisms in coastal waters:

1. University of Bristol, Zoology Department
2. Queen Mary College, London, Zoology Department
3. University of Swansea, Zoology Department
4. - - Belfast, Zoology Department
5. - - East Anglia, Department of Biological Sciences
6. Queen Elizabeth College, London, Biology Department
7. University of Glasgow, Zoology and Botany Departments
8. - - Leeds, Zoology and Botany Departments
9. - - Exeter, Zoology Department
10. - - Durham, Botany Department

11. - - Birmingham, Zoology Department
12. - - Cambridge, Geology and Zoology Departments
13. - - Strathclyde, Applied Microbiology Department
14. - - Sheffield, Zoology Department
15. - - London, Westfield College, Zoology and Botany Departments
16. - - Aberystwyth, Zoology and Botany Departments

Other laboratories concerned with topics of marine biological interest are:
The Ministry of Agriculture, Fisheries & Food's Radiobiological Laboratory and Shellfish Research laboratories at Burnham and Conway; Central Electricity Generating Board, Marine Laboratory, Fawley, Southampton.

The range of activities of these organizations is described in a book "Marine Science in the United Kingdom", published by the Royal Society, London, in 1968. This will shortly be revised. In this note it is not possible to deal with them all in detail but some general remarks will be made concerning the main activities.

The needs for teaching invertebrate biology in University zoology departments has led historically to the establishment of several smaller marine stations which play both a part in undergraduate teaching and in providing research facilities for University workers.

Facilities for University research workers are also provided by the MBA laboratory at Plymouth, particularly for those concerned within marine physiology, and the Marine Station at Millport, formerly run by the SMBA, has now become a University Marine Biological Station mainly for undergraduate teaching, run by the Universities of London and Glasgow.

Both the SMBA and MBA are independent Associations but they derive the major part of their funds from the Government through the Natural Environment Research Council. The National Institute of Oceanography is a component part of this Research Council. The MBA has a long history of research in the English Channel and more recently has extended its interest to some biological problems in the deep-sea. The physiology of deep-sea organisms, work on Pogonophora in deep sediments and on larger bathypelagic fish are examples. The SMBA likewise had a long history of biological studies in the Firth of Clyde and adjacent arms of the sea but recently a new laboratory has been established at Oban (about 100 miles north of Glasgow) and all the research activities are now based at this laboratory. The work is concerned with fundamental research in marine ecology, with particular reference to total ecosystem studies on the west coast lochs of Scotland. These are paralleled with experimental microbiological and benthic studies and with a study of fish metabolism, behaviour and activity in conjunction with the University of Stirling. A deep-sea programme will be commenced in 1972.

The NIO biological work is at present concentrated in resolving the detailed vertical structure of the zooplankton community and its variations in the deep-sea. Highly sophisticated sampling techniques have been developed for this work and studies are being made at 10° intervals of latitude in the North Atlantic. Research on whales is also being continued.

The two fisheries laboratories at Aberdeen and Lowestoft are under departmental control but besides pursuing studies of immediate relevance to departmental interest they both pursue fundamental research in selected fields. At Aberdeen, sandy beach production and ecosystem studies, benthic processes and fish behaviour are some examples, while at Lowestoft production studies of plankton have made major contributions in the fields of primary and secondary production. The Lowestoft laboratory has also made extensive studies of the basic problems of fish and shellfish cultivation.

The new Institute of Marine Environmental Research being operated by NERC will in future control the Continuous Plankton Recorder programme of the Edinburgh Laboratory and the new development of an undulating recording system. In inshore and coastal waters it is planned to commence observations which will monitor the variability and distribution of biological variables, with particular reference to areas in which pollution may be of importance.

At the University marine laboratories, major topics cover pharmacology of marine animals, invertebrate larval studies, chemical composition of marine organisms, growth of littoral and sub-littoral seaweeds, etc. In the remaining University departments, topics vary widely but work tends to be oriented more towards the studies of organisms themselves rather than on their role in the sea.

R. I. Currie

U. S. A.

Biological Production in the Open Sea
Emphasis has been recently directed largely toward understanding the dynamics of upwelling systems. Predictive models are being developed to help relate events in the chemical and physical environment with the structure and size of biological communities in upwelling and oligotrophic areas. Corollary studies are being conducted in the Antarctic Ocean.

Food-Chain Dynamics
Problems associated with food-chain dynamics are being studied largely by two approaches 1) laboratory experimentation on energy uptake and transfer and 2) understanding the biological, physical, and chemical mechanisms by which energy is transferred vertically in the water column. Laboratory studies are diffused through many laboratories and investigators, each with their specific individual interests. These may be categorized broadly as relating to the uptake kinetics of nutrients and accessory growth factors of bacteria and phytoplankton and energy requirements and feeding behaviour of zooplankton. Little effort is directed toward a comparable understanding of benthos and nekton.

The vertical transfer of energy in the open ocean is being examined to relate bottom depth, surface production, and distance from shore on the concentration of organisms occurring both in the water column and on the bottom. Independent investigations are concerned with energy metabolism of micro-organisms occurring in deep waters using biological and chemical means to establish the rate of these processes and to associate the same with biologically variable chemical components of the deep-sea.

Zoogeography and Community Structure
Many investigations of the species structure of biological communities are currently being pursued in special restricted environments such as estuaries and near shore areas. There are a few studies being conducted on the effects of massive additions of pollutants to the marine environment (oil spills) and others being carried out in relatively pristine areas. Emphasis in the deep-sea is being directed mostly toward the causes of benthic diversity, understanding of zooplankton patchiness and the distribution of midwater fishes.

George D. Grice

Plankton
The overall trend is away from mapping and toward problem solving. With more large

ships available, more open-ocean work is being done although its relative proportion to the overall effort may not have changed owing to the general increase of manpower and funding, and because problem-solving often has a higher shore-time/ship-time ratio than mapping. This approach, together with the fact that the problems of interest in different disciplines have diverged, makes the integrated expedition, with biological, chemical, geological, and physical oceanographers working together, less and less common.

In food-chain work, with emphasis on primary production, the trend is to design field programmes guided by models. Automated analysis of environmental variables or results of shipboard experiments often permit data to be processed within 24 hours, so that the models and the cruise plans can be materially changed while at sea. Many people with training in physiology and biochemistry now work at sea or on the shore in close connection with the ecologists, and the ships are therefore changing, as well as their mode of employment.

Studies in production of herbivorous plankton are done in many laboratories, facilitated by the ability to culture a few common zooplankton species. Modeling is just beginning, and carnivorous plankton have hardly been investigated experimentally. It is noteworthy that a biome study on the same large scale, i.e., number of scientists involved, as done under IBP on several terrestric biomes, is presently not conducted in the sea; the US-IBP supports, however, a comprehensive investigation of upwelling.

Great progress has been made in the experimental studies of the kinetics of growth on specific substrates by bacteria, and to a degree also by phytoplankton, and of rates of mineralization. Sampling of bacteria and enumeration remain problems.

Zoogeographic studies of plankton tend now to treat questions such as the stability of communities of population dynamics rather than distribution of species as such. Sampling errors are realized as a most important problem, and are much investigated, but general solutions, i.e. recipes, are not yet available.

Benthos

Applications of statistical methods originally developed by plant sociologists and first used in biological oceanography by planktologists have led to new work in several laboratories on macrofaunal associations. This replaces the more intuitive approach introduced by C.G.J. Petersen. Outlining of communities is usually not the final goal but, for example, factor analysis is used for finding the most typical stations within associations for intensive studies of population dynamics. Alternatively, species can be selected which seem most sensitive to the environmental gradients that account for much of the variance in the material. Also in the deep-sea, community structure is now being studied along with geographic distribution of species.

Investigation of rates, either by means of population dynamics or direct measurements, e.g. of oxygen consumption, is taking its place beside the traditional determination of concentrations (abundance and biomass) of organisms. Studies of meiofauna are rare.

Fisheries

Attempts are being made to model fisheries covering the entire geographic range of species that involve hatcheries, if any, as well as landings.

Since much biological work in the U. S. outside universities has been financed by the Bureau of Commercial Fisheries, it is worth noting that the funds of this agency for the current fiscal year have been reduced by about 15%. A major re-organization of non-military oceanography in the government has been proposed by the President, putting together among other things the Environmental Science Services Administration (Weather Bureau, Coast and Geodetic Survey),

elements of the Bureau of Commercial Fisheries and marine activities of the U. S. Fish and Wildlife Service, the U. S. Lake Survey, the National Oceanographic Data Center, and the Sea Grant Program into a National Oceanic and Atmospheric Administration.

Multiple Use of the Oceans
The biological problems of coordinated multiple use of near-shore waters and pollution of this zone as well as the open sea have been realized in the very last years by many scientists, including physical and chemical oceanographers. In many areas we have too little basic information to state whether environmental changes observed after man-made alterations fall within the range of natural variability or are significant deviations, and whether a given deviation is harmful. Many oceanographers agree that we must devote more efforts than before to base-line studies (most often time series) which means collecting without working hypotheses.

Discussions with Dr. M.M. Mullin, Scripps Institution of Oceanography, were helpful while preparing this statement.

Karl Banse

(P.46)

PROFESSOR HEINZ STEINITZ
(In Memoriam)

Dr. Heinz Steinitz, Professor of Zoology at the Hebrew University of Jerusalem and Director of its Marine Biological Laboratory at Eilat, passed away suddenly on April 28, 1971, at the age of 62, following a stroke. The previous evening he had delivered an important lecture in Eilat, on the occasion of a Seminar in Marine Biology, on the role of the Marine Biological Laboratory, planned and founded by him for the advancement of tropical marine biology. All present on that occasion, including faculty members, guest scientists from abroad, and many students, were shocked to learn of his death the following day.

Professor Steinitz was a pioneer in the field of marine sciences in Israel, and in Marine Biology in particular. His early association with the Sea Fisheries Research Station in Haifa and with its first Director, the late Dr. Helmut Lissner, brought him in contact with the basic problems of fisheries and marine biological research. For over a quarter of a century he maintained that contact in a continuous and fruitful exchange of information in all branches of basic and applied research, which he found indivisible.

A renowned ichthyologist, he was the author of numerous papers relating both to freshwater and the marine environment. Nothing fascinated him more than the fauna of the Red Sea, so different in many respects from that of the Mediterranean, and this stimulated his interest to study the transport and migration process of marine animals from one environment to another. In this connection, he followed closely any tangible evidence indicating changes in the composition of the biota of the Eastern Mediterranean or the Red Sea, that could be attributed to migration of fishes and other marine organisms through the Suez Canal. In his quest for knowledge of the Red Sea, he organized and led a party of Israeli scientists in 1956 to the Sinai coast, and later on in 1962 he led the Israel South Red Sea Expedition, with the participation of a number of foreign scientists, which was carried out within the framework of the International Indian Ocean Expedition (IIOE). The enormous material gathered in these expeditions to a poorly-known marine environment was put at the disposal of interested scientists throughout the world, and Steinitz continued to serve with unbounded energy both as coordinator and as Chief Editor of the reports which kept coming in up to the last days of his life.

As a member of the National Committee on Oceanography in Israel, he was instrumental in the preparation of the Programme of the Oceanographic Study of the Red Sea, which was submitted to SCOR in 1960 as part of Israel's participation in the IIOE. In 1967, Steinitz obtained for his Department of Zoology an important research grant from the Smithsonian Institution in Washington for the joint study of the Biota of the Eastern Mediterranean and the Red Sea, which is now in its final stages.

In recognition of his outstanding contribution to the investigation of man-made changes in the sea, such as those induced by the opening of the Suez Canal, Steinitz was invited on behalf of IABO to serve as Convener of one of the general Symposia held under the auspices of The Ocean World Oceanographic Assembly in Tokyo in 1970. In that capacity, he chaired with great skill and competence the session on this topic, which included engineering achievements, - such as the digging of canals linking different aquatic environments or the construction of dams such as the Aswan High Dam in the Upper Nile on the one hand, and the man-induced pollution of different sorts on the other hand.

His latest contribution to marine science was a paper which he had prepared at the invitation of SCOR, for the Symposium held at Kiel on the biological results of the IIOE. In his lecture dealing with the fish ecology of the Red Sea and the Persian Gulf, Steinitz summed up the wealth of scientific information already available on this subject and at the same time drew attention to the limitations of knowledge still awaiting the attention of interested scientists in this field.

Through his personal competence and his manifold interests in marine biology which transcended national boundaries, Heinz Steinitz belonged to the international community of marine scientists and had recently accepted a request to act as a IABO National Correspondent. His cheerful and kind personality, his endless energy in the pursuit of his work, and his open and constructive approach to all aspects of research in marine science, will be cherished and remembered by all those who knew him or collaborated with him both in Israel and abroad.

Baruch Kimor
Sea Fisheries Research Station
Haifa June, 1971