

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS



INDO-PACIFIC FISHERIES COUNCIL

PROCEEDINGS

6TH SESSION

TOKYO

JAPAN

30th September—14th October, 1955

SECTION I

IPFC Secretariat, FAO Regional Office
for Asia and the Far East
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APPENDIX II

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OPENING ADDRESS OF HIS EXCELLENCY, MR. ICHIRO KONO, MINISTER
OF AGRICULTURE AND FORESTRY, AT THE SIXTH SESSION OF THE
INDO-PACIFIC FISHERIES COUNCIL

Tokyo, Japan, 30 September 1955

Mr. Chairman, Distinguished Delegates, Ladies and Gentlemen :

It is a great honour for me to have an opportunity to extend my sincere greetings and welcome to you at the opening of the Sixth Session of the Indo-Pacific Fisheries Council.

As you know, Japan highly appreciates the achievements of the Indo-Pacific Fisheries Council, and has been cooperating enthusiastically since she became a member of this Council in 1952. Both the Government and people of Japan, therefore, are very happy to have invited that this meeting be held at Tokyo.

The world food production has remarkably increased in recent years, thanks to the untiring efforts of the countries concerned as well as the Food and Agriculture Organization of the United Nations. It must be admitted, however, that the present food situation in the Indo-Pacific region is still far from satisfactory. Much greater increases in food production are required, especially in the field of marine products as a source of protein supply. Fish is indeed a valuable resource and an indispensable item of nutrition for the people of this region.

A survey of the situation of marine products in the Indo-Pacific region shows that the greater part of the marine resources in this vast area remains undeveloped. One of the important questions for this region in the future, therefore, is to discover how to exploit, utilize and conserve these undeveloped resources.

I would like especially to point out that my country is obliged by force of circumstances to depend heavily upon aquatic resources in order to supply its teeming population with adequate food. It is for this reason that, compared with other nations, Japan has an overwhelmingly greater number of people who are engaged in the fishing industries. The Japanese Government is making great efforts to develop these industries as one of the measures to help reconstruct her national

economy as well as to solve her acute food problem. We are, therefore, looking forward with keen interest to the outcome of this Session in Tokyo.

I therefore believe it to be of great significance that we are gathered here to sit in conference for about two weeks, to discuss various technical problems related to the fisheries which are common to the countries of this region.

As the host Government we have done our best in making the preparations for this conference. I realise, however, that there is still much to be desired and I hope that you will be so kind as to give us your generous indulgence and cooperation so that this conference may be crowned with success.

In this connection I should like to call your attention to the post-conference field trip we have planned for the delegations. I sincerely hope that this trip will afford an opportunity to observe this country as she actually is as well as her fishing industry, and thereby take away with you a fair understanding of Japan and her fisheries.

During your stay in my country, you will find the manners, customs and climate of Japan quite different from what you are used to ; nevertheless, I hope you will have a most pleasant sojourn while you are here.

In conclusion, may I ask you, Mr. Chairman, to convey to Dr. Cardon, the Director-General of FAO, my personal greetings and my Government's satisfaction that the Sixth Session of the Indo-Pacific Fisheries Council is being held in Japan, and also to express my thanks to Dr. Finn, Director of the Fisheries Division of FAO represented at this Session by Mr. Fiedler ; to Dr. Miles, Executive Secretary of the Indo-Pacific Fisheries Council and Regional Fisheries Officer of FAO, and to all the FAO personnel who have given us guidance and assistance in the preparations for this conference.

I now have great pleasure in declaring open the Sixth Session of the Indo-Pacific Fisheries Council.

MESSAGE FROM HIS EXCELLENCY, MR. NAMORU SHIGEMITSU,
FOREIGN MINISTER, TO THE SIXTH SESSION OF THE INDO-
PACIFIC FISHERIES COUNCIL

Tokyo, Japan, 30 September 1955

Mr. Chairman, Honourable Delegates, Ladies and Gentlemen:

On behalf of the Government and people of Japan, I wish to extend to you my hearty greetings on the occasion of the opening of the Sixth Session of the Indo-Pacific Fisheries Council.

It was only last spring that FAO held its 3rd Session of the Asia-Pacific Forestry Commission in Tokyo and it was last year that the 4th Session of the International Rice Commission was held in our country. Japan, as the host country, feels it an honour and a pleasure that Tokyo has for the third time been selected by FAO as the site for the present Session of the Indo-Pacific Fisheries Council. We are very happy to see that such a large number of fisheries authorities and experts of international fame have come to participate in this meeting from various countries.

Fishing is one of the most important industries of Japan. Being surrounded by sea, Japan owes very much to the aquatic products, the main source of animal protein supply to feed her people. Therefore, naturally enough, we have a very keen interest in how to properly conserve these invaluable marine resources as well as how to exploit and utilize them to the fullest extent. I understand that the present gathering will be devoted for study of such problems solely from the scientific and technical point of view, and I am sure that various discussions in this Session will doubtlessly be of great value to all the nations concerned for the development of their respective fishing industries, which, I believe, will result in raising the nutritional standard of the people in this region.

Fishing is also one of the most popular hobbies of the Japanese people, which at the same time serves to add some nutrition to their supper. I dare say that almost all of the Japanese people have at least some experience of fishing, some on the high seas, some on a river and some at a small pond in the countryside. I may be too bold to conclude that this, along with various kinds of fish in the sea around Japan, is one of the reasons for the fact that a great variety of fishing methods are used in my country—from the very primitive way of using just a single rod and line on a small wooden boat to large-scale fishing using mother-vessels of more than several thousand tons together with catcherboats. If any of the delegates are interested in some of the fishing techniques we have and wish to utilize them, both the Government and people in the fishing industry of Japan are ready to be at your service and also to co-operate with any member nations, whenever requested. It is my sincere hope that during your stay in Japan, short as it may be, you will be able to make first hand observation on the fishing industry of Japan, and also that this session will become an opportunity of promoting closer co-operation among the member countries.

In concluding, I would like to express my hope that your sojourn in Japan will prove to be enjoyable as well as profitable, and I wish the present session of the Council be crowned with every success.

Thank you.

AGENDA FOR 6TH COUNCIL SESSION

Tokyo, Japan, 30 September-14 October 1955

A. Procedural Items

1. Adoption of the Agenda (IPFC/C55/1).
2. Report on Credentials.
3. Statements of Delegations.
4. Report of the Executive Committee (IPFC/C55/2).
 - 4.1 Membership.
 - 4.2 External relations.
 - 4.21 With United Nations Organization.
 - 4.22 With FAO.
 - 4.22a FAO World Survey of Fishery Resources.
 - 4.23 With UNESCO.
 - 4.24 Other.
 - 4.3 Council's Report to FAO (IPFC/C55/12).
 - 4.4 Publications and Editorial Policy.
 - 4.41 Proceedings Sections I and II and 5th Meeting Symposium.
 - 4.42 Special Publications and Handbooks.
 - 4.43 Register of Institutions.
 - 4.44 Bibliographic work.
 - 4.45 Other.
 - 4.5 Financial and Budget Report.
 - 4.6 Special Evaluation Report on the Council's work (IPFC/C55/2-A).

5. Proposal by the Government of Thailand for Amendments to the Council's Agreement (IPFC/C55/3):—

THAT, in the Council's Agreement, the word 'meeting' be deleted wherever it occurs and substituted by the word 'session'.

THAT the second and third sentences of paragraph 2 of Article II of the Council's Agreement be deleted, commencing with the word 'Decisions' and ending with the word 'quorum'.

THAT the following be added to paragraph 3 of Article II of the Council's Agreement after the full stop following the word 'Committee':

'In the unavoidable absence of one or two members of the Executive Committee from a Committee session, the Chairman shall have the power to co-opt the chairman of Technical Committee I or of Technical Committee II, or both, at

his discretion, to substitute the absent Committee member or members for that Committee session only, provided that one permanent member of the Executive Committee shall always be present and that the number of voting members attending the Committee session shall in no case exceed three.'

6. Proposal for Amendments to the Rules of Procedure.

6.1 Proposal by the Executive Committee for certain Amendments to the Council's Rules of Procedure, specified in IPFC/C55/4.

6.2 'Notes on Parliamentary Procedure' (IPFC/C55/5).

7. Nomination of Technical Committees.

8. Nomination of Council Correspondents.

9. Proposal by Technical Committee I for an 'Indo-Pacific Fisheries Year' (IPFC/C55/6).

10. Time and Place of 7th Session.

B. Technical Items

11. Reports of Technical Committees for period 1954/55.

12. Technical Assistance.

13. Technical Instruction.

14. Matters for Technical Committee I.

14.1 Inland Fisheries and Fish Culture.

14.10 Soil Composition in relation to Aquatic Productivity (Item proposed by Government of India).

14.11 Fish Culture in Rice Fields (Item proposed by F.A.O. for joint action with International Rice Commission) [IPFC/55/7].

14.12 Pollution of Waters (Resolution 55/3).

14.12a Control of Vegetation including floating grasses (Item proposed by Governments of India and Thailand, IPFC/C55/8).

14.13 Densities and Combinations of Species.

14.14 Food and Feeding of Fishes.

- 14.15 Fisheries in River Development Schemes (Resolution 55/4).
- 14.16 Exchange of Cultivable Species.
- 14.16a Introduction of Exotic Species, e.g., Black Bass (Item proposed by Government of Ceylon, IPFC/C55/10).
- 14.17 Work of Chanos Sub-Committee.
- 14.18 Work of Hilsa Sub-Committee.
- 14.19 Outline of Programme for ensuing Period.
- 14.2 Sea Fisheries.
 - 14.21 Age Determination of Tropical Fishes.
 - 14.22 Fishing with Lights.
 - 14.23 Tuna—Evaluation of Work to date.
 - 14.24 Other groups, e.g., Clupeoids, Engraulids, Scombroids, Carangids.
 - 14.25 Work of Rastrelliger Sub-Committee.
 - 14.26 Outline of Programmes for Ensuing period.
- 14.3 Miscellaneous Fisheries.
 - 14.31 Advances in Collection and Recording of Oceanographic Data with Application to Fisheries.
 - 14.32 UNESCO Activities in Oceanography (see 4.23).
 - 14.33 Implementation of Recommendations on Plankton (Proc., I, 1954, p. 85-86).
 - 14.34 'Possible Changes in Aquatic Faunal Distribution due to gross Modification of World Climate' (Resolution 55/2).
 - 14.35 Outcome of Shrimp Symposium—Biology and Ecology.
 - 14.36 Outline of Programmes for ensuing period (Notes: The terms of reference of this Panel cover Oceanology, Limnology, Plankton, Crustacea, Mollusc, Seaweeds, Taxonomy, Minor Fisheries).
- 14.4 Evaluation of Committee Work during Period and Means for Improvement.

15. Matters for Technical Committee II.

- 15.1 Craft and Gear.
 - 15.11 Outboard versus Inboard Engines.
 - 15.12 Appraisal of Mechanization of Fishing from Small, Indigenous Craft.
 - 15.13 Evaluation of introduction of Non-indigenous Fishing Methods.
 - 15.14 Indigenous versus Imported Materials for construction of Nets and other Gear.
 - 15.15 Outcome of Shrimp Symposium—Fishing Methods.
 - 15.16 Outline of Programmes for ensuing period.
- 15.2 Food Technology.
 - 15.21 Production and Storage of Dried Fish with special reference to humid, rainy weather.
 - 15.22 Outcome of Shrimp Symposium—Processing, Storing, and Transportation.
 - 15.23 Outline of Programmes for ensuing period.
- 15.3 Statistics, Socio-economics and Marketing.
 - 15.31 Advances in the Collection of Adequate Fisheries Statistics, including sampling survey methods, in the production phase.
 - 15.32 Outline of Programmes for ensuing period.
- 15.4 Evaluation of Committee Work during recent period and means for improvement.

16. Inter-Committee Working Group on Fisheries Development.

17. Subject for Symposium at 7th Session.

C. Election of Chairman and Vice-Chairman for ensuing period

D. Any other business

SUMMARY REPORT OF THE SIXTH SESSION OF THE INDO-PACIFIC FISHERIES COUNCIL

1. The 6th Session of the Indo-Pacific Fisheries Council was opened by the Honourable Minister of Agriculture and Forestry in Sankei Kaikan, Tokyo, Japan, on Friday, 30 September 1955.

2. The Chairman, Mr. Boon Indrambarya, in asking the Honourable Minister to declare the 6th Session officially open, thanked the Government of Japan on behalf of the Council for the gracious invitation to hold this Session in Tokyo, and also on behalf of the delegates for the arrangements made for their reception and for the excellent meeting facilities. He believed that it was especially appropriate that this Session of the Council, which coincided with the 10th anniversary of the Food and Agriculture Organization, should be held in a country in which fish formed such an important part of the diet and which has, therefore, developed its fishing industry. He praised the spirit of dedication of the Japanese fishermen and fishery scientists, which he believed were responsible for the maintenance of reasonable standards of nutrition for a growing population living on a relatively small arable land area.

3. The Chairman added that most of the countries represented are faced with the same problem of balancing food and population. Their governments are becoming more and more convinced of the urgency to turn to the water for fish as a source of additional food and it was hoped that delegates might take back with them the conviction that some of their own problems are by no means insuperable. It was stressed that many governments are taking advantage of the skills of Japanese operatives and technicians, or were forming joint fishing companies with Japanese undertaking, or were applying the results recorded in the Japanese fishery literature.

4. The Chairman hoped that the presence of so many prominent fishery administrators and experts at the Session might result, not only in cementing the bonds of friendship which have received expression in the past Sessions of the Council, but that this spirit of good-will might extend to other relationships between nations.

5. The Honourable Minister of Agriculture and Forestry, after delivering the address, recorded as an introduction to this report, graciously declared the 6th Session of the Indo-Pacific Fisheries Council to be open,

6. The Chairman then introduced the representative of the Honourable Minister of Foreign Affairs of the Japanese Government who, on behalf of the Honourable Minister, conveyed a message to the Council which is also recorded at the opening of this report.

7. The Chairman then requested Mr. R. H. Fiedler to convey a message from Dr. P. V. Cardon, Director-General of the Food and Agriculture Organization. Mr. Fiedler stated that the Director-General had requested him to convey to the Council his sincere wishes for a fruitful and successful session and to express his deep regret that the pressure of his other duties made it impossible for him to be present.

8. The Director-General recalled with great pleasure his visit to Japan a little under a year ago. The warm greeting he received at that time, and the sympathetic understanding which he encountered of the problems FAO is facing had remained an inspiration to him. The leading part which Japan is taking in the work of FAO is evidenced by the fact that the last sessions of the International Rice Commission and of the Asia-Pacific Forestry Commission were held in Tokyo and now this Session of the Indo-Pacific Fisheries Council. Next year, it is understood, Japan would again be host to a FAO-sponsored meeting—this time on nutrition.

9. Finally, the Director-General desired to convey to the Government of Japan his sincere thanks for the time and energy which had gone into making possible this Session of the Council and he expressed the hope that these will be amply justified by the results achieved.

10. The provisional agenda, having been unanimously approved by the Council, the Chairman passed to Item 3 of the Agenda and statements were made by the delegates and observers, as follows:

Statement of Delegations

11. The delegate from *Australia* expressed his pleasure to be attending the sixth session of the Council and once more assured the delegates of the continued support and cooperation of the Australian Government in the Council's work. The Japanese Government had made every effort to facilitate the

successful functioning of the Session. He expressed thanks on behalf of the Australian Government, for the acceptance of this tremendous international responsibility with characteristic energy and determination and wished the present Session of the Council every success. On his own behalf, he also wished to assure the assembled delegates of his own personal cooperation in these activities.

12. The delegate for *Burma* also expressed thanks to the Government of Japan and stated that, since the independence of his country, the Government had realized its responsibility to foster the expansion and improvement of the fishery industry and the newly established Division of Fisheries is engaged in the active re-orientation of fishery policy, although the staff available is still inadequate. This was the main reason why Burma is not yet able to contribute substantially in the work of the Council.

13. Training and recruitment of staff has, however, been initiated and ways and means are being devised to make Fisheries appointments more attractive.

14. The inland fisheries are fairly well exploited and further improvement of this seems to depend largely on the capacity to undertake stocking operations, there being as yet no fish fry industry in Burma and proper technique in handling, transporting and nursing are still lacking. Two officers had, at the invitation of the Government of India, toured West Bengal and Orissa, and an active programme to develop the fish fry industry is being undertaken. The Government of India may be approached with a request for a pond culturist.

15. The Government had requested the Government of Canada through the Colombo Plan for a fisheries specialist to organize a programme for mechanized fishing in in-shore waters, and arrangements to implement a project for training in off-shore fishing methods are under way.

16. The delegate for the Royal Government of *Cambodia* requested the Chairman to convey to His Excellency, the Chief of the Japanese Government, his country's thanks for the invitation to participate in the present Session in Tokyo, and for the reception given to the delegates. He was pleased to be once again present at the 6th Council Session and to participate in the cooperative work of the Council.

17. This was the fourth time that Cambodia had been represented, and it was stated that the country had greatly benefited from the Council's work, the National Fishery Service having functioned according to the technical recommendations of the Council. Several officers had been able to

increase their knowledge of fish culture and fishery statistics, thanks to training courses given by FAO on the Council's recommendation. He regretted that Cambodia was not yet in a position to make greater contributions to the Council's work, because of lack of personnel and funds. However, work of a purely practical nature was proceeding and the Government was seeking means to protect the fishery resources and to maintain the productivity of the inland waters, until such time as qualified technicians could be found to engage in the necessary biological surveys, which, it is hoped, will be enhanced through the cooperation of the Council's member countries, and the technical assistance which they may graciously provide.

18. The delegate for *Ceylon*, after thanking the Government of Japan for the opportunity given to fisheries workers of the region to assemble in Tokyo for the 6th Session of the Council, mentioned the inauguration of a joint Japan-Ceylon fishing venture between the Fisheries Agency of the Kanagawa Prefecture and a Cooperative Fishing Society in Ceylon, with Colombo as its operating base, as a tangible indication of Japan's desire to work with other countries.

19. The Ceylon Government had endeavoured to give support to all programmes of fishing investigation and development sponsored by the Council, so far as available personnel permitted. Additional staff are now being trained to meet the growing need for qualified leadership and the Government has endeavoured to make the fullest use of instruction centres initiated by the Council. The Council has been instrumental in stimulating considerable expansion of Governmental activity in the field of fishery development in Ceylon, and much progress has been achieved during the last few years through coordinated FAO and Colombo Plan Technical Assistance programmes, which, it is hoped, will result in the fuller use of the country's fishing resources.

20. The delegate for *France* stated that his Government had followed the work of the Council since its foundation with the greatest interest. The technical contributions presented by Member Governments at the Council's Sessions constituted, both in quantity and quality, a unique documentation on the fishery problems of the region and were evidence of the efforts being made by the Member Governments of the Council towards international scientific collaboration.

21. Because of the geographical situation of metropolitan France, contributions to this immense effort had been rather meagre but the Government recognizes the benefit received from the Council's

work, and will endeavour to participate more effectively in the future.

22. The work of the Council will be of invaluable assistance in the development of the fisheries of the territories of the French Union situated outside the Indo-Pacific area. The development of the fishing industries in New Caledonia was at present engaging the attention of the Government. The Oceanographic Laboratory of the Institut Français d'Océanie in New Caledonia had recently acquired a research vessel, which would study the tuna resources and would, it was hoped, contribute to the knowledge of these fishes in the South Pacific Ocean.

23. The French delegation was happy to express its thanks for the welcome extended to the delegates, which would result in a better knowledge of technical methods employed by Japanese fishermen.

24. The delegate for *India* believed that no country was better suited for the holding of a Council Session than Japan, which is one of the leading fishing nations of the world, and the closest cooperation was anticipated with Japanese fishery experts.

25. In India some progress has been made in fishery work since the last meeting of the Council, the research programmes on inland and marine fisheries having been strengthened both in staff and equipment. The question of fisheries research was recently reviewed by an *ad hoc* Committee and in the second five-year plan, research on Hilsa, Fish Culture, Sardines, Mackerel and Prawns will be substantially strengthened and mechanized fishing operations will be augmented.

26. All the States are taking part in an extensive programme of fishery development and fisheries extension services have been started by the Central Government. In addition to the research stations on inland and marine fisheries now in existence, a Fisheries Technological Station is to be established. Volumes I and II of the Indian Journal of Fisheries have appeared and it is hoped to bring out Vol. III by March 1956. Technical Co-operation programmes with Norway and the United States have also made noteworthy progress. A training centre for mechanized fishing has been started near Bombay to be followed by others in Cochin and Tutucorin; the Inland Fisheries training at Calcutta continued to attract trainees while a centre for fisheries administration and research will be established at Mandapam.

27. One of the means of developing Council activities is the organization of Co-operative projects. Two such projects—relating to Hilsa and

Rastrelliger—are already under active consideration by the Council. The Government was happy to note that the Council's Sub-Committee on Hilsa met in Calcutta in June 1955 and had drawn up a programme of research.

28. India has taken a keen interest in the work of the Indo-Pacific Fisheries Council ever since its formation in 1949. Although the achievements of the Council during the six and a half years of its existence are considerable, the time has come for even greater efforts if the Council is to develop into an active organization playing an important part in the development and utilization of the fishery resources of the area. The Government is following with interest the possible lines in which Council work could be strengthened and will gladly consider and extend support to any practicable measures calculated to make the work of this organization more effective.

29. The delegate for *Indonesia*, after thanking the Japanese Government, stated that his Government greatly appreciated the efforts of the Council. Japan is one of the most advanced countries as far as fishing activities are concerned and the holding of the 6th Session in Tokyo will be of particular benefit.

30. Two Japanese training ships had visited Indonesia since the 5th Session, the *Syungkoku Maru* in 1954, and the *Oshoru Maru* in 1955. The visits of these vessels have been most beneficial to Indonesian workers.

31. The efforts of the Indo-Pacific Fisheries Council and of FAO in Rome in the field of fisheries training are greatly appreciated in Indonesia, which has also contributed in the holding of training centres in Inland Fisheries. A third such centre will be held at Bogor in November 1955, with Mr. Hasanuddin Saanin, the Alternate Delegate at this Session, as Director.

32. The Indonesian Government had been happy to act as host to the Executive Committee at its 19th Meeting in Indonesia, and would be happy to act as host to the 7th Session of the Council, as a sincere gesture towards the efforts of the Council.

33. The Indonesian delegate believes the formation of a Sub-Committee on Fish Culture in Ricefields, in line with the proposal put forward at the Session of the International Rice Commission in Tokyo in October 1954 to be of the utmost importance.

34. The leader of the *Japanese* delegation, the Director of the Japanese Fisheries Agency, expressed satisfaction that the 6th Council Session was being held in Japan, and it was hoped that the

6th Session would be at least as profitable as the previous ones. This was the first time in the annals of Japanese fisheries that so many distinguished fisheries experts had assembled from so many countries.

35. Japan is situated in the farthest northern part of the Indo-Pacific area, and the aquatic products as well as the fishing vessels, implements and methods are vastly different from those of other member countries. The Japanese depend upon fish for their protein food and consume far larger amounts of fishery products than any other people in the world. Every effort is therefore being made to develop and conserve the aquatic resources, and in this Japan will collaborate closely with other member countries.

36. The delegate for *Korea* wished to congratulate the Chairman and the Secretariat on the excellent arrangements of the Session, and, while reserving detailed technical observations to subsequent sessions, stressed the importance of fishing in the national life and economy of Korea which is surrounded on three sides by water.

37. Commencing with simple indigenous gear, fishing in Korea had gradually developed on modern lines.

38. The United Nations Korean Reconstruction Agency has very actively helped the rehabilitation of the Korean fishing industry which sustained great damage during the turmoil in 1950.

39. Regulation of fishing activities to enable the rational exploitation with proper conservation of the Korean fishing grounds is being earnestly pursued.

40. The Delegate expressed genuine appreciation of the significant service rendered by the Council in effecting valuable exchange of technical information among the member countries and co-ordinating fishery development in the area.

41. The delegate for *Netherlands* expressed thanks for the very good arrangements made by the Government of Japan and the IPFC Secretariat for the 6th Session of the Council. Both Dr. Hardenberg and Mr. Zwollo who, in the past, had represented the Government, actively associating themselves with the Council's work, were unfortunately not able to attend the present Session. The delegate conveyed the best wishes of the Government of Netherlands for a very successful Session of the Council in Tokyo.

42. The delegate for *Pakistan* stated that the work of the Council has been a source of guidance in planning the development of the fisheries of Pakistan.

43. Pursuant to the recommendations of the Council, work is progressing on the mechanization of fishing fleet and the construction of a fish harbour at Karachi. In the field of fish culture some measures have also been taken. *Tilapia* has been introduced in East Pakistan and some other exotic fishes are being obtained for propagation from Thailand, Malaya, Indonesia and India with the help of the International Cooperation Administration of the United States. Under the same aid, two fisheries experts have been assigned to Pakistan for developing mechanized fishing.

44. The Government of Pakistan would be happy to continue her active association and co-operation with the Council and wished to extend her best wishes for the success of the Session. Finally, the delegate wished to convey the heartiest greetings of the Government and people of Pakistan to the Government and people of Japan.

45. The *Philippine* delegate reiterated the benefits derived from membership of the Council, which has made it possible for Philippine fisheries workers to have direct contact with fisheries specialists of other member countries especially during sessions of the Council, and to see laboratories, methods and techniques, field practices and development programmes being undertaken in the host country, which are then applied in their own country, with a corresponding increase in the efforts to increase fisheries production. Seminars and training centres have also produced good results both for the individuals and for the service, and the fisheries documentation has given valuable information to the technical workers.

46. Tribute was paid to the spirit of camaraderie at the sessions which has greatly contributed to the smooth working of the Council, and which has constituted an intangible but nonetheless real asset. Membership in Council has done much towards assisting the Philippines in its efforts to improve fish production and to raise the standard of living of people engaged in the fisheries industries.

47. The delegate for *Thailand* said that from the formation of the Council in 1948, his Government had evinced a keen interest in the aims and activities of the Indo-Pacific Fisheries Council and has been pleased to maintain continued contact and cooperation with the Council through its Secretariat located in the capital of Thailand. His country had accepted the recommendations of the Council in the solution of several fisheries problems and finds in the delegations of Member Governments an unfailing source of advice and assistance in the vital task of fishery development.

The Thai delegation appreciated the Council's action in bringing up for consideration Thailand's proposal for amendments to the Agreement and for the study of the floating weed menace.

48. The delegate for the *United Kingdom* stated that Her Majesty's Government welcomes the opportunities for the exchange of views on technical and scientific aspects of fisheries which the sessions of this Council afford. Two research stations have been established on British territory in South East Asia, the first at Hong Kong and the second at Singapore.

49. The most significant feature in the development of the industry in Malaya in recent years has been the steady progress in mechanization. The process is encouraged and fostered by the Government through training courses for fishermen. In spite of increased fishing density, the total yearly landings show no increase for the past five years. It is evident that fish must be sought farther afield and that an offshore fleet must be trained and developed. Preliminary exploratory work with this end in view has already been done by the headquarters vessel M. F. V. *Dunvegan* and will now be continued and expanded by the Singapore Regional Fisheries Research Station. The large entrepot trade which Singapore carried on in salt fish has declined rapidly in recent years owing to the restrictive measures of certain importing countries. Turning to the fresh water fisheries the improvement in emergency conditions in the Federation of Malaya has led to an increased interest in fish culture, especially in the Chinese new villages.

50a. In British North Borneo the culture of fresh water fish is financed under a Colonial Development and Welfare Scheme administered by the Department of Agriculture.

50b. In Hong Kong extension work was continued by the provision of loans to fishermen for mechanization of their vessels; the training of skippers, coxswains and engineers; the introduction of non-indigenous fishing methods; and, new techniques of oyster culture based on established Japanese methods. The Fish Marketing Organization in the Colony is operating with continuous success and in view of increased landings of fish at the markets various improvements, particularly with regard to landing facilities, are now being actively considered. The Fisheries Research Unit which has been set up within the Department of Biology of the University possesses its own research vessel, the F.R.V. *Alister Hardy*, and its staff are engaged in research into marine and inland fisheries, oceanography and oyster culture. In addition, experiments with non-indigenous types of fishing

gear are being pursued in the fishing grounds within 200 miles of the Colony. The Hong Kong University Fisheries Journal No. 1 was published in December 1954 and it is anticipated that successive volumes recording the scientific work of the Unit will be produced annually.

51. On behalf of the Government of the *Federation of Malaya*, the delegate extended a welcome to the Members of the Rastrelliger Sub-Committee to hold their deliberations in Malaya at any time in 1956 with advance notice.

52. The delegate for the *United States of America* expressed appreciation and thanks for the opportunity for participating in the Session in Japan where interest in the sea and its resources is deep in the hearts of the people and where the Emperor himself is a biologist of great distinction.

53. The formation of many international organizations like the IPFC marks the progress which has been made in interest in fishery research throughout the world during the past decade. The general public which had been hardly aware of the existence of this branch of science has become more conscious of it and has been giving ever-increasing active support to it.

54. Perhaps one of the most important conclusions of past fishery studies has been that to understand the vagaries of abundance and distributions of species, it is necessary to carry on systematic biological and hydrographic studies of the entire ecological systems which they occupy. In many instances, this can be carried on only by international cooperation such as this Council affords.

55. The expansion in research programmes has been accompanied by a scarcity of scientists educated in this field. How can we induce young men to specialize in fishery and oceanographic research? What is the best way to prepare men to direct and conduct the new research programme? How can the talents of those who are experienced in this field be best utilized? These are questions which trouble members of this Council and which perhaps could be discussed during the Session.

56. Finally he conveyed the good wishes of his country for the success of the present Session and for the continued progress of the Council.

57. The delegate for *Viet Nam*, after stating that it was difficult for him to express sufficiently strongly his thanks to the Japanese Government for the manner in which preparations had been made for the holding of the 6th Session because all the adjectives had already been exhausted, stated that Japanese fishing companies had sent

fishing vessels to Viet Nam, which had enabled his country to initiate its own fishermen in the use of non-indigenous gear.

58. Fisheries are of great importance in Viet Nam, which has more than 2,000 kilometers of coastline and an intricate network of inland waterways. Viet Nam has, since the last Session, made great progress in the administration of the fisheries, particularly in the propagation of *Tilapia*, and the area under cultivation has increased tenfold. It is hoped that this tendency will continue, and that the necessary staff and finance will shortly become available so that the production of animal protein food may be intensified.

59. The representative of *Portugal* stated that he was gratified to represent his country as an observer, and added that it gave him great satisfaction to announce that Portugal would very soon become a member of the Council.

60. The observer for *New Zealand* endorsed the general appreciation of the excellent arrangements made by the Government of Japan for the Conference. The Government of New Zealand had been taking the keenest interest in augmenting food production through the Colombo Plan and in other ways.

61. If Japan is in the extreme north of the Area, New Zealand is in the extreme south. Nevertheless there are many problems connected with fisheries in the island territories of New Zealand which extend northward, and the Council's deliberations would be of utmost value in the solution of such problems.

62. The observer for the *International Commission for Scientific Exploration of the Mediterranean* thanked the Council for the invitation to participate in the Session and explained the scope of the work of the Mediterranean Commission in fisheries investigations. The fact that the latter had nominated an observer was a reflection of its great interest in the Council's work.

63. The observer for the *Pacific Science Council* expressed the eagerness of that Council to co-operate in the activities of the Indo-Pacific Fisheries Council, and offered its best wishes for a successful and profitable Conference.

64. The observer for the *South Pacific Commission* conveyed a message from the Secretary-General of the Commission who, on behalf of the Commission, expressed appreciation for the invitation to the Council Session. The Commission welcomed the opportunities which exist for collaborating and co-operating with the Council and the FAO in fields of mutual interest, and looked for-

ward to further developments in this direction in the near future. He wished the Session every success. He expressed personal interest in the deliberations of the Council especially since a number of the items on the Agenda were of direct interest to him.

65. The observer of the *United Nations Educational, Scientific and Cultural Organization* presented on behalf of his Director-General, the greetings of that Organization and its most sincere wishes for the full success of the 6th Session.

66. He referred to the interest of UNESCO in the development of research in marine biology and oceanography in the region, to the maintenance of contact between UNESCO and the IPFC, to the reproductions of Dr. Tweedie's charts on Marine Biology for the use of students and fishermen and to the Symposium on Plankton conducted jointly by the UNESCO and IPFC, the proceedings of which have been recently published and widely appreciated.

67. He mentioned how on the basis of the suggestion made by the IPFC Executive Committee, a new impulse was given to the UNESCO support in the promotion of increased research in oceanography in the Indo-Pacific region and cited the joint meetings held on the subject in Manila in 1953 and in Rome in April 1954.

68. Using the opportunity of the 6th Session of the Council, UNESCO was organizing in Tokyo a meeting of Representatives of Marine Science Institutes in the Indo-Pacific region to be followed up by a symposium on Physical Oceanography and then by a meeting of an Interim Advisory Committee on Marine Sciences.

69. In conclusion, the observer reiterated UNESCO's sincere greetings for the Session and assured its full co-operation and support in the Council's activities.

70. The observer for the *World Meteorological Organization* stressed the significance of weather to fishing operations. The Organization is attempting to impress upon fishing vessel operators that it would be to their great advantage to be recording and reporting meteorological observations. The observer assured the fullest co-operation of the WMO in the Indo-Pacific Fisheries Council's efforts to improve and safeguard fishing operations.

Steering Committee

71. The Executive Committee's functions under Section X, paragraph 1-B, having ceased upon the inauguration of the 6th Session, the Council

constituted a Steering Committee for the conduct of the Meeting, consisting of the following :

Chairman of the Council	...	Mr. Boon Indrambarya.
Member of the Japanese Delegation	...	Mr. S. Okamoto.
Chairman of Technical Committee I	...	*Dr. K. Kuronuma.
Chairman of Technical Committee II	...	Dr. M. R. Qureshi.
Member of the Executive Committee	...	Mons. R. Serene.
Executive Secretary of the Council	...	Dr. C. Miles.

Membership

72. It was noted from the Executive Committee's Report that the sixteen Member Governments remained unchanged as reported at the 5th Session, but that the Observer for Portugal had submitted a communication from his Government to the effect that Portugal would shortly adhere to the Council's Agreement.

Credentials

73. The Secretary, in accordance with Section III, Rules of Procedure, submitted his Report on Credentials, from which it transpired that **51 participants were present, each of the sixteen Member Governments having sent a delegate, beside which Portugal and New Zealand were represented by Observers, as were the Commission International pour l'Exploration Scientifique de la Mer Méditerranée, Pacific Science Council, South Pacific Commission, United Nations Educational, Scientific and Cultural Organization and the World Meteorological Organization.

Council's Report to FAO

74. The Secretary's Report to the FAO Conference (Working Paper No. 12), which would be meeting as from 4 November 1955, in accordance with the Council's constitutional obligation to report annually to the Organization, was approved. It had been drawn up in brief summary form as had previously been requested by the Organization, since at that time all that was required was justification for the disbursement of funds to cover the Council's Budget. Mr. Fiedler, of the FAO Secretariat, informed the Council that the Organization would shortly be requesting all its regional bodies to submit more substantial reports, including all such

resolutions as might eventually require implementation by the Organization, or affect its finances in any way.

75. The Secretary was instructed to send by air-freight to Rome sufficient copies of the mimeographed Final Report of this Session so that the Director-General might be in possession of them at the time of the Conference in November.

Amendments to the Council's Agreement

76. A motion was submitted by the Government of Thailand for an amendment to the Council's Agreement, and a modification to the amendment was submitted by the delegate for France. The final wording of the motion approved by the Council was as follows :

THAT, in the Council's Agreement, the word 'meeting' be deleted wherever it occurs and substituted by the word 'session'.

THAT in Paragraph 2 of Article II, the word 'simple' between the words 'a' and 'majority' be deleted, and that the words 'except as otherwise provided in this Agreement' be replaced by the words 'except when a greater majority is required by this Agreement or by the Rules governing the procedure of the Council'.

THAT the following be added to paragraph 3 of Article II of the Council's Agreement after the full stop following the word 'Committee':

'In the unavoidable absence of one or two members of the Executive Committee from a Committee Session, the Chairman shall have the power to co-opt the chairman of one or two of the Technical Committees, which may from time to time be established in accordance with the Rules governing the procedure of the Council, at his discretion, to substitute the absent Committee member or members for that Committee Session only, provided that one permanent member of the Executive Committee shall always be present and that the number of voting members attending the Committee Session shall in no case exceed three.'

Amendment to the Council's Rules of Procedure

77. The Council considered a modification proposed by the Executive Committee to the Rules of

* Upto Tuesday, 4 October 1955 Dr. N. K. Panikkar.

** The Alternate Delegate for Korea arrived after the Report was approved by the Council, thus making a total of 52 participants.

Procedure in accordance with paragraph 3 of Section XVI of the said Rules, as follows:

THAT the word 'Meeting' wherever it occurs in the English version of the Council's Rules of Procedure, be deleted and substituted by the word 'Session' and, conversely, that the word 'Session' wherever it occurs in the existing Rules, be deleted and substituted by the word 'Meeting', EXCEPT THAT the word 'Sessions' be retained in paragraph 3 of Section XI where it refers to Sessions of the Conference, and the word 'meetings' be retained after the word 'plenary' in paragraph 4 of Section XII.

THAT, in the French version of the Council's Rules of Procedure, the essential amendments be made to conform to the above amendment of the English version, taking into account that the official translation adopted by FAO for the word 'Meeting' is 'Seance', and that the corresponding translation of the word 'Session' is 'Session'.

THAT the following definitions be added to Section I of the Rules of Procedure:

'Session': A properly convened continuing assemblage of delegates which may be adjourned from day to day.'

'Meeting': A period of a Session during which delegates do not separate except for a short recess.'

THAT in paragraph (1) of Section IX of the existing Rules, immediately after the full stop following the word 'vote' be added:

'Decisions of the Council shall be taken by a majority of the votes cast, except where a greater majority is specified in the Agreement or in these Rules.'

78. No modifications having been proposed, the amendment was adopted by 16 votes to none, thus complying with paragraph 2, Section XVI, which calls for a two-thirds majority.

Parliamentary Procedure

79. The Secretary's notes on Parliamentary Procedure, which had been requested by the Council at the instance of the United States delegation at the 5th Session, were taken as read. The delegate for Pakistan proposed the adoption of the following resolution: The Council resolves:

THAT in case the Chairman should be in doubt or is challenged on a point of order not covered by the Council's Agreement or Rules of Procedure, the parliamentary authority of the Council shall be the Rules of Procedure of the Food and Agriculture Organization, where applicable, or, where

these do not apply, Roberts Rules of Order Revised (1943) as abbreviated in the loose-leaf publication, 'Parliamentary Procedure at a Glance', by O. Garfield Jones (Appleton-Century-Crofts Inc. New York).

Nomination of Technical Committees

80. The delegates proceeded to nominate the members of Technical Committees I and II for the ensuing year (recorded inside the front cover of this publication).

Council Correspondents

81. The Council approved of the use of Administrative Correspondents as the official government channel for the communication of the Council's projects, and, because these Correspondents should hold regular meetings of the members of the various panels in their country, the Council recommended that such Correspondents should be chosen from the Directorate or Department of Fisheries of the country concerned. The delegates were requested to make any changes they might desire in the list of Bibliographic and Administrative Correspondents.

Time and place of 7th Session

82. The time and place of the 7th Council Session referred to under Agenda Item No. 10 was taken up. The delegate for Indonesia repeated the invitation made by his Government that the 7th Session be held in April or May of 1957, at Bandung, and this gracious offer was accepted by the Council with thanks (applause).

83. As an outcome of this item, some discussion took place as to whether the Council should hold its meetings at two-yearly intervals as had been suggested at previous Sessions. The delegates for the Philippines, Australia, India, the United Kingdom and Indonesia believed that the Council should meet every two years, but no final decision was reached on this matter, it having been agreed that this point should be taken up by the Council when determining the time and place of the 8th Session.

Staff

84. The Council commended the Secretary and his Staff for the diligence with which they have used official and vacation time for the furtherance of the Council's business, including visits to territories within the region and attendance at extra-territorial scientific meetings which are of relevance to the IPFC.

85. It appeared to the Council that the FAO staff at the Bangkok Regional Office had to handle

the business of the Council in addition to its legitimate duties as a Regional Fisheries Office. While this did not present insuperable difficulties during the early years of the Council's life, it is now apparent that the increasing number of Member Governments, and the increasing number of assignments will not permit effective coverage of the Council's present technical and administrative requirements by the Secretariat as at present constituted. The Council recommended that consideration be given at the forthcoming General Conference of the FAO to the urgent need for appointment of an additional officer to the staff of the Regional Office at Bangkok.

86. Since the French-speaking Member Governments have been inadequately documented both at Council Sessions and in the intervening periods, it was strongly recommended that the Organization seek the means whereby permanent interpreter/translation services be made available to the Regional Office as a whole, to service all divisions both in the Bangkok office and in Regional Conferences.

Budget

87. The statement of the Secretariat on Budget and Accounts was approved. It was noted, however, that the Printing item of \$2,500 was underspent by \$1,000, owing to the proposed handbooks not being available.

88. The Council considered that an expert English/French interpreter should be provided at Council Sessions, since such a person was not usually available in the host country. The Council therefore recommended that provision be made to this end in the 1957 budget.

89. It was also evident that the task of interpreting at Council Sessions was sufficiently heavy to demand two persons, one of whom might be recruited locally. It was therefore recommended that the Council's Budget for Session expenses should be increased by \$750 to provide travel expenses for a non-local interpreter, plus wages for one additional interpreter on a local basis.

Implementation of the 5th Session Directives

90. The Council is of the opinion that the Executive Committee has made every effort to see that the directives of the Council have been complied with, despite the partial lack of response from some members of Technical Committees.

91. In this context, the Council would appreciate a prompt reply from those Governments who have not communicated their assent to the request that certain specialists should be instructed to work on Technical Committee projects as part of

their official duties. This will facilitate the co-ordination of research work within the region.

External Relations

92. The relations maintained with other international organizations, as set out in the Executive Committee's Report, was approved. The Council was concerned with the apparent lack of liaison between IPFC and UNESCO in relation to the series of meetings arranged by UNESCO in Tokyo immediately following the 6th Session, to which UNESCO had invited IPFO participants without reference to the Council. The technical aspects of the Council's relations with the UNESCO Committee and other bodies will be dealt with later in this report.

Technical Assistance

93. The Council studied a document presented by the FAO Secretariat giving a review of FAO technical assistance in the field of Fisheries, and paragraphs 73-78 of the Report of the Executive Committee.

94. The Council once again confirmed its belief in the importance of the Technical Assistance Programme of FAO to assist Governments in the full development of their natural aquatic resources, and expressed the hope that such assistance may be made more extensive in the future.

95. It was noted that the delegates of certain Governments to this Session were still concerned over the fact that it had not been possible for them to obtain badly needed FAO technical aid to assist them in their incipient fisheries programmes. It was also recorded that when the same observation had been made at previous Sessions, it had become clear that the lack of technical assistance in certain member countries was mainly due to the Governments themselves not having given sufficient priority to fisheries when framing their over-all requests for technical assistance in food and agriculture.

96. The Council, therefore, placed on record its belief that the fisheries industries are of paramount importance in the development of Government programmes concerned with food, a factor which is not always given sufficient attention by Governments themselves, and the case put forward by the fishery departments for high priority in fisheries projects was often given insufficient attention.

97. It was therefore resolved to recommend to Member Governments once again that the fisheries projects be given at least the same attention as projects in other fields at the time of compiling

requests to the Technical Assistance Board for FAO technical aid.

98. The Council also recommended to the delegates of Member Governments that on their return to their countries, they themselves should make every effort to see that their own projects were submitted to the competent UN Organization, and were not lost sight of.

99. As had been explained by the Organization at previous Sessions, FAO can in no case give technical assistance unless it receives a specific request from the Government concerned, and where requests formulated by fisheries departments are not included in the final list submitted to the Technical Assistance Board, no action whatever can be taken by FAO.

100. A statement was heard from Mr. Fiedler, who is the Officer-in-charge of Fisheries Technical Assistance at FAO Headquarters, who briefly explained the new method of programming for Technical Assistance, whereby Governments are to submit their requests directly to the respective representative of the Technical Assistance Board for their area or, alternatively, in emergency cases, to any competent FAO representative in the country concerned.

101. It appeared that, in some cases, the technical assistance given by FAO to Governments would be greatly enhanced if the Governments were to include a full statement of their detailed requirements, the lack of which has sometimes made it difficult, or even impossible, for FAO to provide adequate briefing to the expert, or for the expert himself to work properly on arrival at his assignment. It was moreover felt that it would be to the advantage of all concerned if a copy of the briefing given to the FAO experts, on taking up their assignments, could be transmitted to the responsible fishery department of the Government concerned. It was the opinion of some delegates that the experts had not, in all cases, reported regularly to the Government authorities in the country to which he is assigned, and it was resolved to request FAO to instruct all experts that such reports be sent in regularly.

102. The Council then considered the question of joint projects for technical assistance, with the participation of several countries in the region having similar problems. It was recalled that the Council had, for some years past, placed considerable importance on the possibility of embarking on joint projects, and it was hoped that it might be possible in the near future to initiate some such scheme under the joint sponsorship of several Governments.

103. In particular, the possibility of initiating joint projects to study the stocks of (a) *Hilsa*, and (b) *Rastrelliger*, was considered. It was noted that the Government of India had requested an expert on *Hilsa*, and the Government of Thailand a marine biologist whose work would include the study of *Rastrelliger*. The Council expressed the hope that other countries interested in these problems, if requiring external assistance, might make similar urgent requests in order that the technical assistance proposed to be given to India and Thailand respectively might be expanded into joint sub-regional projects. The United Kingdom has appointed a marine biologist to specialize in *Rastrelliger* studies at the Singapore Regional Research Station.

TECHNICAL ASSISTANCE

Technical Instruction

104. Paragraphs 79-84 of the Executive Committee's Report were considered, together with the reports which have appeared on the Bangkok Fisheries Statistics Training Centre held in 1952 (Contributed Publication No. 13), and the Summary Report on the Training Centre on Fish Marketing held in Hong Kong in July and August 1954, and presented as Working Paper No. 16. The FAO printed Report No. 404 on this Centre was also before the Council.

105. It was noted that arrangements had been concluded for the holding of a third Inland Fisheries Training Centre in Indonesia which, in fact, constituted an expansion of the second Fish Culture Seminar previously held in the same country during May and June in 1952 (FAO/TA Report No. 46, by W. H. Schuster).

106. The Council noted with satisfaction the success with which these Training Centres had been conducted, and the results which were already becoming apparent among workers in the region who had attended them. The Council was apprised of the formation, by the participants in the Marketing Centre, of an 'Indo-Pacific Fish Marketing Association', and of the widespread desire to continue the work initiated at the Centre. Being convinced of the urgent need for improvements in fish marketing in this region, notwithstanding the progress which has already been achieved in some territories, resolved to instruct the Secretary to express to the Governments of the United Kingdom and of Hong Kong, and to the Director-General of the Organization, the Council's sincere thanks and appreciation of the effective action taken to implement the Resolution passed at

the Council's 4th Session, recommending the holding of such a Centre.

107. The Council believed that it would be advantageous if a Sub-committee on Fish Marketing were to be formed by Technical Committee II under Panel 'C', and Governments should be invited to report to the Council, through this Sub-committee, their present and proposed plans for Fish Marketing Improvements.

108. It was also decided to request the Organization to continue its efforts to foster the training in fish marketing commenced at the first FAO Fish Marketing Training Centre with emphasis on the role of Government and private enterprise in fish marketing and financing; co-operative organization and management of fisheries; the mitigation of the harmful effects, both to the consumer and to the producer, of fluctuations in availability of fisheries products; consumer acceptance of new products; equipment and methods in fish market management; and fish handling processing and transport.

109. It was pointed out by the FAO Secretariat that, as in the case of expert Technical Assistance, no steps could be taken by the Organization to operate any training centre unless it were to receive an offer from a Member Government to act as host, and to make available the necessary local facilities. The Council believed that the Secretary should, nevertheless, take advantage of such opportunities as may arise to discuss informally the possibility of particular governments acting as hosts for possible training centres to be initiated by FAO in accordance with the Council's suggestions.

110. As no such offer had been received by FAO up to the present, the choice of a Training Centre and the time at which it might be held, would depend largely on the nature of such an offer. However, the Council believed that Member Governments should consider the possibility of offering to act as host for a Training Centre in Fisheries Administration, including statistics, co-operatives, marketing and fishery economics and that, once such an offer had been received, that the Organization make all possible steps to organize such a Training Centre at the earliest possible time, if possible, in 1956, but if not, in 1957.

111. It was believed that such a Training Centre should be of three months duration, and in case all five subjects could not be simultaneously included priority should be given to courses on Fisheries Administration and Statistics.

112. A suggestion was also accepted that the Council's Secretariat should examine the possi-

bility of organizing in the near future a one-year diploma course in Fisheries Administration attached to one of the universities in the region. It was hoped that for this course FAO fellowships as well as grants from various foundations might become available.

FAO World Survey of Living Aquatic Resources

113. The Council had before it a document from the FAO Fisheries Division (Working Paper No. 26), giving an account of the programme of the Division for a survey on a world scale of present knowledge of Living Aquatic Resources. The Council was informed that this survey is a programme to bring together, according to certain agreed principles, all relevant available data concerning the living aquatic resources and their environment with a view to:

- (a) Providing a general account of these resources.
- (b) Deducing some general conclusions concerning the theory of the survey and exploitation of resources, and the methods to be used, that would apply to individual survey projects, and would assist those engaged in such work.

114. The Council believed that such survey work should take account of all activities directed toward the discovery, description and measurement of resources, and that one of the objectives is to systematize the information which is at present being gathered. The survey programme, therefore, would be immediately valuable in assisting Governments to make full use of the information available concerning their own and comparable resources. It may also contribute to the development of theory and practice in this field.

115. The Council, therefore, offered to the FAO Fisheries Division such assistance and advice as may be requested on the gathering, compilation and interpretation of resources information.

116. The Council resolved to recommend to Member Governments their utmost interest and support in this task by supplying all available information as requested, and instructed the Secretary to afford to the Organization such assistance as may be possible to this end.

117. The Secretary was also instructed to request the Organization to inform the Council, prior to its 7th Session, of the progress made in the conduct of the survey, and particularly in the compilation of information relating to the Indo-Pacific region.

Evaluation of the Council's Work

118. The Council through a Committee of the Whole examined the Evaluation Report of its work during the past six years, paying attention to the means whereby the activities of the Council could be strengthened and made more effective in terms of the Agreement.

119. It is clear from the Executive Committee's Evaluation Report that the work performed by the Council since its formation has been extremely useful in the assembling of information on fisheries of the Indo-Pacific area. The work performed by the Secretariat in keeping essential contacts with members of the Council, in organizing its activities during and between sessions, and in the dissemination of information, has been commendable.

120. The usefulness of work already accomplished by the Council since its formation does not obscure the fact that more might have been accomplished. In fact, in the direct application of Council work to fishery development problems in the area, there have been many shortcomings. It is felt, however, that these are partly inherent in an infant organization and the procedural problems relating to Council activities have necessarily taken a large share of time both of the Secretariat and of the delegations. However, the Council has now passed that stage of development and is ready to give its full attention to its principal aims. The Council's contribution to its members would have been more effective had the response from several member countries been better.

Work of the Council during Sessions

121. At present items of a purely procedural character are taking a very large share of time allotted for Council work. There is no justification for this if it is realized that the main activity of the Council is of a technical nature. In order to achieve this, the Council resolved:

- (a) To delegate to the Steering Committee the responsibility of taking decisions on matters of a purely routine nature without bringing them to the Council for discussion. Action taken by the Steering Committee shall merely be reported to the Council.
- (b) That the opening statements of the delegates shall be filed with the Secretariat for distribution and not given verbally.
- (c) That nominations of committee members, correspondents, etc., shall be made in writing and handed over to the Secretariat. This shall be considered equivalent to polling the delegates under section X (2-a) of the rules of procedure.

- (d) Formal opening of the Council Session and procedural matters shall not normally take more than one day of Council work; if the opening is during an afternoon, the procedural items shall be completed on the forenoon following the opening session.
- (e) That the question of suitability of technical papers for publication be left to an editorial committee consisting of chairmen of the two Technical Committees who will act in consultation with the chairmen of their respective panels. If there is difference of opinion in the Editorial Committee the decision of the Executive Committee shall be final. The panel chairmen will indicate an order of priority for publication. Papers not accepted for publication should be returned to the authors as early as possible.
- (f) That as some participants at each Council session are usually new to Council work, arrangement shall be made for an informal meeting of these members with the Steering Committee at which the mechanics of Council work shall be explained to them. A brief note on this shall also be drawn up for circulation before the Session.
- (g) That the Chairmen and Rapporteurs of Technical Committees shall be elected towards the end of a Session so that they will continue in that office till the end of the next session, assuring continuity of work. The panel chairmen shall, however, continue to be elected at the beginning of panel meetings during the Session as at present. That in the absence of the Chairman of a Technical Committee at the following Session, the Rapporteur of that committee shall officiate as chairman.
- (h) Assignment notes to the Technical Committees shall primarily be the responsibility of the Chairmen of the Technical Committees. These will be drawn up in consultation with the Secretariat and approved by the Steering Committee before issue. These notes will be to the Technical Committees and not to panels. The Committees will meet and discuss all assignments and distribution of work before meeting as panels.
- (i) That at the end of each Session the Chairman of the Council shall send an explanatory letter to the Member Governments informing them of the nominations of

their representatives to offices of the Council and shall indicate that the Council expects the active co-operation and support from these nominees and their participation in the ensuing Council Session.

- (j) That if for any reason the Chairmen of the Technical Committees are not included in the delegations, every effort should be made to secure their participation in Council work by extending invitations to them to attend the Council Sessions in the capacity of experts not attached to delegations. The Executive Committee shall on behalf of the Council make a formal request to the Organization for financial assistance for this purpose.
- (k) To recommend to Member Governments that wherever possible each delegation should consist of at least two technically qualified persons to ensure its effective participation in the two Technical Committees, which sit simultaneously.
- (l) To urge Member Governments to assume responsibility for effective participation by members of the panels and to accord to their nominees travel and other facilities within the country to enable them to keep in touch with developments pertaining to the subject handled by their respective panels.
- (m) That the report of each Technical Committee shall consist of two separate documents. The first document will be a collection of factual material relating to work carried out between Council sessions and will be circulated in advance and submitted at the beginning of the Session. This document, with the contributed publications, the technical papers submitted, and the discussions arising therefrom, will be studied by the Technical Committee concerned. The second document shall be a brief summary report to be prepared at the Session and emphasizing only the main problems, the progress achieved, the work which should be continued and the new lines of work requiring the attention of Member Governments.

Work between Sessions

122. Of the many ways of improving Council work between sessions the most effective will be the strengthening of the Secretariat. The Council therefore resolved to recommend to FAO:

- (a) that Secretariat officers at Bangkok should

visit the countries of the area, and contact members of the Technical Committees and Panels and the Government representatives handling fisheries.

- (b) that at least one more technical officer who should be a specialist in subjects pertaining to Technical Committee II should be attached to the Regional Office at Bangkok.
- (c) that increased secretarial assistance at the Regional Office be provided to give more time to the senior officers to attend to technical matters.
- (d) that an English/French translator-interpreter should be attached to the Regional Office of FAO at Bangkok in order to meet the special requirements of countries whose official language is French.

123. Technical papers for consideration at Council Sessions should be submitted three months in advance leaving sufficient time for evaluation, processing and distribution.

Sub-Regional Meetings

124. The Council recommended that Member Governments should be encouraged to hold sub-regional meetings of workers on particular projects in neighbouring areas, between sessions, on subjects indicated by the Council. Executive Committee meetings could coincide with these meetings.

Constitution of Panels

125. The Council felt that there is need to re-distribute part of the work handled by the panels of Technical Committee I. As at present constituted Panel C of Technical Committee I handles Oceanography, Marine Biology, Crustacean and Molluscan Fisheries, Seaweeds and, in fact, all items of work which cannot be brought under Panels A and B. The arrangement is unsatisfactory. The Council therefore resolved:

- (a) that Technical Committee I shall consist of two Panels only dealing with (i) Inland and (ii) Sea Fisheries including marine and shell fisheries.
- (b) that a list of Experts shall be established as a consultative body, to which specialists may be co-opted by invitations extended to them by the Executive Committee (regardless of their possible membership on delegations, or official connection with the Organization). The work of this Panel shall be conducted by Consultants in the fields of Oceanography, Marine Biology, Limnology, and Freshwater Biology, who shall advise

the Council of current developments in respective fields.

- (c) that Technical Committee II shall remain as at present constituted.

Publications and Bibliography

126. The Council noted with satisfaction the accomplishment listed in paragraphs 56-58, 60, 62-64, 67, 68, 70 and 72 of the Executive Committee's Report.

127. The Council commended the Food and Agriculture Organization on the publication of the 'FAO Year Book of Fisheries Statistics 1952-1953, Volume IV, Part I' and of 'Fishing Boats of the World', but recommended that ways and means be explored to reduce the prohibitive cost of the latter volume.

128. The Council directed the Secretariat to publish in printed form such Occasional Papers as are of permanent value, and recommended that the Council's publications should be circulated as liberally as possible to ensure adequate distribution to all workers actively engaged in fisheries research.

129. The Council expressed concern about the undue delay in the preparation of handbooks and recommended that these should be published one by one, beginning in 1956, to which end the General Editor should seek such financial assistance as is necessary from FAO. It was stressed that each handbook should be written in a lucid manner so as to facilitate translation into different languages.

130. The Council noted that money appropriated for the publication of handbooks is lapsing because the manuscripts are not ready. It was recommended that such money be utilized for the publication of other works as needed and the possibility was suggested of producing advisory pamphlets dealing with the subjects which will eventually be included in the handbooks. In particular, the need for early preparation of pamphlets on the following subjects was emphasized:

- (a) Statistics. This should include:
 - (i) a definition of the minimum requirements of fishery statistics in the countries of the region,
 - (ii) a description of appropriate methods of collection, tabulation and analysis of statistical data,
- (b) the handling and processing of fishery products, and
- (c) a guiding pamphlet for the further study of the status of the middleman in the different stages of economic development of countries in the region.

131. The Council felt that the proposed handbook—'General Introduction to Fisheries Science'—would be of particular value in that this volume would assist in defining the problems of the region, and recommended that it should be produced as soon as possible, in mimeographed form initially, pending publication of succeeding volumes. It should cover as wide a field as possible and the editor should consider inviting experts in different branches of fisheries science to contribute chapters, soliciting financial assistance from FAO as necessary.

132. The Council agreed that, where arrangements could be made, suitable volumes already published elsewhere might be adopted as the Council's reference works, pending publication of the Council's own Handbooks.

133. The Council recommended that the 'Handbook on Fish Culture' by Dr. S. L. Hora be considered by the Executive Committee for incorporation into the Council's handbook series including, if desirable, the lectures on Fish Culture to be delivered at the 3rd International Inland Fisheries Training Centre shortly to be held at Bogor, Indonesia.

134. The Council decided to request FAO to engage a consultant to prepare a book on Fishermen's Co-operatives in the Indo-Pacific region. The book should contain:

- (a) general principles of Fishermen's Co-operatives and models of their working.
- (b) description of Fishermen's Co-operative Societies in the countries of the region, and
- (c) appraisal, analyses and suggestions as to the possibilities of improvement.

135. The Council noted that the FAO was examining the question of bibliographic services in fisheries science. In view of the lack of facilities for building up a bibliographic service within the region, the Council resolved to encourage in every possible way the efforts being made by FAO in this respect and to request the FAO to integrate the Council's bibliographic needs in the proposed service having world coverage.

136. The Council resolved to carry on the following specific bibliographic activities:

- (a) the preparation of a current bibliography to be submitted regularly by each country to the Secretariat as previously agreed, the Secretariat in turn to seek the collaboration of FAO in the preparation of the comprehensive subject bibliography,
- (b) to request FAO to assist in the preparation of an annotated bibliography on

the subject of each proposed IPFC symposium to be presented at the Symposium, and

- (c) to instruct the Secretariat to prepare a comprehensive list of all documents containing technical material which have been published by the Council or otherwise contributed at sessions, and to maintain this list by regular supplements.

137. The Council expressed concern that important technical papers written in languages other than the working languages of the Council, and in particular those written in Japanese, were not

available in translation. The Council resolved that lists of papers, for which such translations have been made but not published, should be prepared by Member Governments and submitted to the Secretariat for distribution to other Member Governments and to the FAO. It was also recommended that Member Governments should notify the Council of such papers as they consider should be translated so that the Council may bring this matter to the attention of organizations possessing translation facilities. The Council further decided to ask the FAO to make every effort to develop a translation service within its bibliographic and documentation programme.

TECHNICAL COMMITTEE II

Craft and Gear

138. The Council noted from the Review of the Council's Work (Working Paper No. 2-A) that its activities with regard to craft and gear had been comparatively less than in other fields, e.g., biology. This was explained by the fact that most government fishery officers are trained as biologists and have a specific professional interest in this subject. The Council was aware of the fact that craft and gear are the primary tools for the capture of fish and recommended that governments might bestow greater attention to engaging craft and gear technologists.

139. The Council studied the assignments issued at the 5th Session, together with Section 1 of the Report of Technical Committee II to this Session, and noted that the activities of the Panel during the intervening period did not provide a true record of the creditable achievements actually accomplished in the Region, information in respect of certain member countries not having been placed before the Council and it was requested that those governments which had not sent in this information should do so before the 7th Session.

140. In particular, the Council did not agree with the suggestion in the Technical Committee report that experiments involving 20 vessels and crews should be conducted over a prolonged period before a contemplated mechanization programme was started, it being the Council's view that sufficient knowledge of the merits and possibilities of mechanization are now available. Further, staff members of the Food and Agriculture Organization were available for consultation or FAO/ETAP technical assistance may be requested by Member Governments.

141. Some of the reports of national achievements should be abridged in future Technical Committee reports as they do not communicate essential experiences of use for other countries. In the discussion of 'Evaluation of the Introduction of Non-Indigenous Fishing Methods' of the above mentioned Report, it was felt that an additional item should have been added, to provide for an explanation in the instances where any such projects have failed.

142. The Council discussed the relative merits of pair and otter trawling at great length. Mention had been made in the Report of the fact that pair trawling in India has produced catches of about 2½ times greater than those obtained by otter trawling. It had furthermore been stated that Thailand is performing experiments on the pair trawling method. Although many factors must be taken into consideration, the final conclusion was that, provided both gears were adequately rigged and fishing operations efficiently executed, otter trawling would give the best results. This view was substantiated by statements from the Japanese Delegation.

143. Technical papers submitted to the 6th meeting of the Council were studied and discussed in detail, and much information of value was brought to light. The Council resolved that, at future Sessions, summaries of the discussions shall be recorded and appended to the respective papers in the printed proceedings. Such action would enable fishery workers, who had not been privileged to attend the Session, to obtain the maximum benefit available from these papers.

144. The largest investment in the fishing industry is in craft. Whereas gear has a relatively

short lifetime and is comparatively easily modified or replaced, mistakes in the design and construction of boats may be far-reaching, and possibly even disastrous. Experience has also shown that even well-developed fishing nations can benefit from improvement in vessel design. No papers covering this field were submitted but the Council, with great interest, noted that 'Fishing Boats of the World' (A. J. Heighway, 110 Fleet Street, London E. C. 4) had been published and studied an FAO/ETAP report to the Government of Pakistan on the mechanization of West Pakistan fishing boats.

145. The Council was informed that an interim report covering the work of an FAO naval architect in India might be ready before the 7th Session.

146. Especially in the case of craft, it was considered essential that professional drawings of the existing indigenous vessels should be available, and studied by a qualified naval architect, before any contemplated modifications are attempted. Unfortunately, there are few naval architects in the Region, most of whom are employed by large shipyards, shipowners, etc. It was considered that there was a need for specialized fishing boat architects who should be trained to assist governments in improving their local craft. The Council expressed the hope that the Food and Agriculture Organization should study the possibility of producing a suitable handbook on fishing boat design, similar to Mr. Chapelle's 'Yacht Design and Planning', from which a person with a good basic training in mechanical engineering could learn the technique of drawing small fishing boats, and that governments should consider the possibility of requesting FAO to organize a special training centre for fishing boat architects.

147. Having studied a paper presented by the World Meteorological Organization describing the current possibilities of obtaining weather information, the Council recommended governments to insure that use is made of all available information from local meteorological agencies for the benefit of fishermen. The Council also resolved to recommend to FAO that the World Meteorological Organization be informed of the interest of the fishery industries of the Region in this matter and to request that Organization to continue to encourage the local weather bureaus to keep in mind the requirements of fishing boats. The Council instructed the Secretariat to inform Member Governments of the facilities provided by the World Meteorological Organization, and of the desirability of equipping their fishing fleets with

facilities for the receipt and transmission of weather data.

148. It was decided that the work of Technical Committee II on Craft and Gear during the next few years should concentrate on the following phases:

- (1) Improvement of craft.
 - (a) Design and construction with due consideration of economics.
 - (b) Propulsion and mechanized handling of fishing gear.
 - (c) Safety at sea and seamanship.
 - (d) Education of craft designers and boat-builders.
- (2) Fish finding (echo sounder, loran or asdic.)
- (3) Improvement of gear.
 - (a) Material (nets, preservation, etc.)
 - (b) Relative fishing efficiency of the various types of gear.
- (4) Relation between fishing methods and craft designs.
- (5) Meteorology.

149. The Council resolved that exploration of offshore areas for location of shrimp grounds in likely localities should be undertaken by Member Governments together with the development of suitable gear and capture techniques and that the Council should be kept informed at Sessions through the Committees.

150. For the future, it would increase the value of the technical discussions if papers on specific subjects were invited from experienced workers on the recommendation of Technical Committee II. The papers reproduced must conform to the recommendations on Page 7 of the Proceedings of the 5th Session and in this respect, it was considered that Mr. Takayama's Paper No. 27 on fishing with light might form a useful model.

151. The special attention of Member Governments was invited to the publication 'Japanese Fisheries' and contributed papers by Japanese workers, and also to the Proceedings of the Mediterranean Fisheries Council which contain very valuable material.

152. Although considerable discussion took place on the assignment for the study of natural versus synthetic fibres for the manufacture of fishing gear, and information on this subject had been recorded in the technical papers entitled: 'The Use of Synthetic Fibre for Fishing Nets and Ropes in Japan' by H. Miyamoto and 'Rice-straw Net and Rope as Indigenous Materials' by S. Takayama, no conclusions were arrived at and Member Governments were requested to use every

endeavour to place substantial information in the hands of Technical Committee II, through its Craft and Gear Panel, well in advance of the 7th Session.

153. Similarly, the discussion on the use of echo sounders, not only to study depth and occasional schools of fish, but in order to study the reaction of fish towards fishing gear, revealed that the Council was still lacking sufficient information on the subject which was assigned to Technical Committee II (Craft and Gear Panel) for study and report to the 7th Session.

154. It was recommended that the Technical Papers 26, 48 and 51 be published in full. The Council further recommended that a condensed version of Technical Paper 55 should be published (Current Status of Uses of Fish Finders in Japan by S. Kawata) and that Papers, 22, 23, 24 and 25 should be postponed for consideration by the editor of the Handbook on Gear.

155. Four papers on the subject of fishing with light, together with details of the reactions and biological effects that a variety of different lights have upon the schools of fish, were studied. The results of this joint discussion are reported on elsewhere.

Food Technology

156. The Council noted that, although progress in the field of Food Technology had been slow, it was evident that the Panel under the chairmanship of Dr. J. R. Vickery had been the most successful in its achievements since the formation of the Council.

157. Technical papers submitted to the 6th Session of the Council were studied and discussed in detail. In the light of information received, it was recommended that the following papers be published in full:

- (a) Chemical Preservation of Marine Products by S. Tetsumoto, T. Okitsu and M. Fukuta (Japan).
- (b) Preparation of Galongong (*Decapterus macrosoma*) Fish Meal and its Nutritive Value by O. N. Gonzales, S. V. Bersamin and J. I. Sulit (Philippines).
- (c) Note sur la Conservation du Poisson Sale-seche sous Emballage de Polyethelene by R. Lafont (Cambodia).

158. Although the papers recommended for publication contained valuable information both on processing and storage, the Council agreed that the assignments given to the Panel at the 5th Session of the Council had not been completed, and it was decided that the study of improved methods of

processing and storing dried fish, particularly with regard to humid conditions, should be continued by the Panel. Recognizing the need for systematic investigations, it was further agreed that the work of the Panel should proceed in accordance with the following programme:

(a) Analytical data:

The customary range of moisture, salt and oil content of dried fish and salted dried fish immediately after preparation.

(Note: These will vary widely from region to region and should be obtained by each country producing substantial quantities of these products.)

(b) Methods of preparation:

- (i) In areas where rain and dull weather often interfere with the preparation of dried fish, studies of the use of simple forms of shed drying with artificial heating.

(Note: These studies will probably also involve investigations on the extent to which air temperatures during drying can be raised without impairing the quality of the products.)

During the dry months, it may be possible in certain areas to test the effects of partial drying by exposure of fish fillets to the sun, and subsequently to complete the preservation by hot smoking in bins or sheds. It is understood that this process would be economically feasible in at least one area (East Pakistan).

- (ii) The effects of impurities in the salt on the quality of salted dried fish.
- (iii) Any other important aspects of preparation which may be peculiar to certain regions and forms of processing.

(c) Keeping quality:

- (i) Careful surveys to determine the storage life of each dried fish product and to determine approximately the amount of spoilage leading to rejection; and to specify precisely the major causes of such deterioration.
- (ii) For dried fish products found to have an inadequate keeping quality, experiments to vary procedures of preparation with the aim of getting better keeping quality. Such experiments might include the effects of moisture contents lower than customary. These experiments could be carried out in conjunction with experiments sugges-

ted in (b) (i) above. In products where the storage life is terminated early by the attack of micro-organisms, the incorporation of mild, relatively harmless antiseptics should be tested.

- (iii) Investigations on the use of storage containers, preferably as large as possible, with the object of restricting the uptake of moisture by the dried fish and excluding insect attack. In these tests, the possible use of wrapping should be considered together with studies on the inclusion of small quantities of fumigants, such as ethylene dibromide, in the sealed containers to kill inherent insects and their eggs. Although normally expensive at the present stage of development, studies might also be made to develop stable technology of and economical methods for this type of storage.
- (iv) Where economic circumstances warrant it, and where large quantities of dried fish are normally stored for considerable periods of time, conduct experiments on cold storage of the products. Since normally, the higher the temperature of storage the cheaper will be the storage charges, it would be advisable to conduct experiments to determine the optimum temperature and relative humidity for the storage of dried fish of varying moisture content. The optimum temperature is to be taken to mean the highest temperature which holds the product in a satisfactory condition for any desired period of time.

(d) *Standards of quality :*

Detailed information gained from the above investigations, particularly the analytical data, together with consumer preference tests, may be used to assist in drawing up standards of quality for each product. The setting up of such standards, perhaps strengthened by measures suitable to local conditions may help considerably in raising the initial quality and keeping quality of dried fish products.

159. The Council noted with satisfaction that considerable research work was in progress in many member countries and resolved to recommend to Member Governments that full support be given to the implementation of this programme and that

competent workers be assigned to these duties as part of their full time work. It was felt that only when the objects of the programme had been fully achieved, should the Council turn to other outstanding problems in the field of Food Technology.

Socio-economics, Marketing and Statistics

160. The Council considered the history of its work in the field of Socio-economics and Statistics since the 2nd Session, and recommended that Member Governments should intensify their investigations into the economic and social aspects of fisheries. It was felt that there is, at present, a disproportion between the number of workers assigned to the study of Socio-economics and Statistics on the one hand and to the biological aspects on the other, to the disadvantage of the former.

161. The Council approved the Report of Panel C (Socio-economics and Statistics) of Technical Committee II for the period between the 5th and 6th Sessions, which reflected a valuable exchange of information which should be continued. It was noted that several Member Governments had abstained from the work of the Panel, and the hope was expressed that contributions from these countries would be forthcoming.

162. The Council, therefore, decided that the Panel on Socio-economics and Statistics should continue its work and Delegations were requested to nominate members to this Panel. It was stressed, however, that in order to achieve results, it was essential that members of this Panel be instructed by their Governments to cooperate effectively in this work during the inter-Session period.

163. The Council noted the progress reported in the field of Socio-economics and Statistics made by several governments in the region, and resolved that the work specified at the 5th Session as recorded in Part III of the Report of Technical Committee II should be a continuous assignment of the Committee during the ensuing period, as follows :

- (i) Advances in the collection of adequate fisheries statistics, including sampling survey methods in the production phase.
- (ii) Socio-economic problems affecting the production, processing and distribution of fisheries products ; their solution.
- (iii) Advances in the development of fish marketing and distribution ; development of consumption of fisheries products to improve nutrition ; the effect of consumer tastes for non-customary products and means of influencing them.

- (iv) Development of fishery extension services (i.e., the extension of scientific knowledge to the level of the fisherman and fish farmer.)
- (v) Significance of fish culture as an integral part of rural economy.

164. The following aspects of the above assignments should receive special attention during the period between the 6th and 7th Sessions :

- (a) Economic aspects of fish processing.
- (b) Retail trade in fish products.
- (c) Trade in fish and fish products between countries of the region.
- (d) Income generating effects of fishing industry.
- (e) Industrial relations in fishing industry.
- (f) Economic aspects of air transportation of fish.
- (g) Economic aspects of refrigeration.

165. It was pointed out that the study of distribution should also cover economic aspects of storage and transportation.

Statistics

(i) *Advances in the Collection of Statistics :*

166. The Council noted that the Sub-Committee on Statistics had not operated since the 4th Session, and decided to merge it with the Sub-Committee on Socio-economics into one Panel to deal with both socio-economics and statistics. The Sub-Committee on Statistics, formed at the 4th Session, was requested to pass on all the collected material to the Secretariat for transmission to the new joint Panel which, it was hoped, would have substantial contributions to make to the 7th Session. It was noted that in many countries of the region adequate fisheries statistics were still lacking.

167. The Council recommended that in order to achieve maximum utilization of shrimps, accurate records of catches by sizes and areas of capture be maintained.

Socio-economics

(ii) *Problems affecting Production, Processing and Distribution :*

168. The approach of different Member Governments of the region to these problems as set out in Section 2 of Part III of Technical Committee II Report was noted.

169. The importance of Fishermen's Co-operative Societies, as a means towards the improvement of the fishing industry, was stressed. The Council noted, however, that there are also other forms of economic organization, in addition to co-operatives,

which may lead to the improvement of the fishery industries in the region. For this purpose, the continuation of the national surveys of economic and social aspects of the fishing industry in the region was regarded as indispensable.

(iii) *Advances in Marketing and the Development of Consumption and Consumer Taste :*

170. Section 3 of Part III of Technical Committee II Report was studied and the advances in marketing practices noted.

171. It was observed that no contributions had been received from Member Governments in the development of consumer taste, except the information on fish sauce from the Philippines. It was hoped that these studies would have progressed sufficiently at the time of the 7th Session to permit of substantial contributions on this aspect. It was understood that the FAO might now be in a position to provide expert services to promote fish consumption in the region and that countries might submit requests for this type of service. The need was stressed for a better understanding of consumer taste in the region and it was felt that such expert services would contribute in no small measure to this knowledge.

172. The Council was apprised of the publication of the Survey of Fish Marketing in the Indo-Pacific Region, prepared by Mr. E. F. Szczepanik, included in the Report on the 1st International Fish Marketing Training Centre held in Hong Kong in 1954 (FAO Report No. 404) which is regarded as a valuable step forward towards a better knowledge of the fish marketing problems and of the methods of their solution. The hope was expressed that the recommendations made therein for the development and improvement of systems of fish marketing might be studied by Member Governments with a view to their adoption. It was agreed that the Survey permits of a comparative study of fish marketing practices in the countries of the region and indicates the possibilities for modification and improvement in each territory. From the point of view of the international bodies, such as FAO, the Survey clearly indicates the common problems which could be tackled by these bodies in order to formulate plans of action covering the region as a whole.

(iv) *Extension Services :*

173. Advances in the establishment of extension services as reported by Technical Committee II were noted. The Council stressed that perhaps one of the most vital activities of governments in the pursuit of fishery development is the provision of such services and that until such time as the welfare of the fisherman receives adequate attention

in the countries of the region, the productive capacity of the operatives, who are the basic factor, will remain low. The contribution of a paper on the Inland Fisheries Extension Services in Indonesia by M. Ahjar was noted.

(v) *Fish Culture in Rural Economy*:

174. The paper entitled 'The Significance of Fish Culture as an Integral Part of Rural Economy in Indonesia' was studied as was the information contained in Part III(5) of the Report of Technical Committee II.

175. It was agreed that the paper contains positive proof of the economic importance of fish culture contributing considerably towards the improvement of the fish farmers' standard of living. It was also noted that in the Indonesian experience, the solution of the fry transportation problem was particularly difficult.

176. It was recommended that the socio-economic aspects of fish culture should be included in the curriculum in the International Training Centre

in Inland Fisheries to be held in Indonesia in October 1955.

177. Technical Papers Nos. 38-40 and 43-47 were studied, and the following were recommended for publication:

No. 39 Progress of Fisheries Statistics in Japan by T. Yamamoto.

No. 40 Some Basic Problems in the Development of Fisheries Statistics in Japan by N. Oka.

No. 43 The Inland Fisheries Extension Services in Indonesia by M. Ahjar.

No. 45 Co-operative Marketing Organization in Indonesia by Eddiwan.

No. 46 The Significance of Fish Culture as an Integral Part of Rural Economy in Indonesia by M. Ahjar and R. Tasripin.

178. It was also recommended to publish Summary and Conclusions presented in Paper No. 44, The Relative Importance of Subsistence Fishing by M. Ahjar.

TECHNICAL COMMITTEE I (BIOLOGY)

Indo-Pacific Fisheries Year

179. In considering a proposal put forward by Technical Committee I, the Council agreed that the position of fisheries statistics in many of the countries of the Indo-Pacific area is extremely unsatisfactory. Most of these countries do not have sufficient personnel to collect statistical data, nor standing organizations for collection and compilation of fisheries information on an adequate scale. Since the establishment of the Council the subject has been receiving increasing attention and most countries are aware of the importance of accurate statistics. The Statistical Training Centre organized at Bangkok has also given impetus to the question of training of personnel. The position of biological and oceanographic studies relating to fisheries is in a more backward state than the actual collection of statistics. In no country is it now possible to evaluate the influence of biological, hydrological and climatic conditions on fisheries. At the 5th Session, attention was drawn to the possible influence of climatic changes on marine fauna and fisheries and the need for Member Governments to collect information on the subject.

180. Collection of regular information on both these would involve co-operation of a very large team of workers and it is not likely that such a team will be available. It was therefore suggested that efforts be made to indicate specific years for

the collection of fisheries and ancillary data in as great a detail as possible within fixed intervals of time. This suggestion was not to be taken to mean that regular collection of statistics and biological data should be shelved, but to emphasize the need for a common and simultaneous minimum programme for *all* countries of the area, at least once in five years. From various points of view it will be highly advantageous if complete data are available for all countries for the same specified year so that the fishery resources of the area as a whole may be studied in relation to environmental aspects.

181. The next International Geophysical Year is scheduled for 1957-58 during which oceanographic, meteorological and a vast amount of data relating to various countries and oceans will be collected in detail and it is likely that many countries in the Indo-Pacific region and many international scientific organizations will be participating.

182. The Council recommended to Member Governments that the first Fisheries Year for the area should be observed at the same time as the International Geophysical Year so that biological, fishery and geophysical data might be collected at the same time.

183. It was agreed that both a basic minimum programme and an ideal programme would

be outlined. Methods for assessment of coastal fishery statistics in areas with scattered communities would be defined. A sampling technique was available from India, where the margin of error did not exceed 10%.

184a. In areas where personnel were not specifically available for collection of fishery statistics, action would have to be taken to secure the assistance of agricultural, revenue and other officers to staff the programme.

184b. The Council resolved to recommend to FAO to convene a meeting of consultants on this subject, to discuss this project in detail, the standard methods to be employed and the programme for implementation.

185. The Council emphasized that the Regional Training Centre for Fisheries Administration recommended elsewhere in this Report, should include in its curriculum the training of those who would steer the collection of statistics in each country during the Fisheries Year in order that compilation might be uniform and readily comparable.

Inland Fisheries

186a. The Council accepted Section 1.2 of the Review of the Council's Work and Sections 2, 4 and 5 of the Report of Technical Committee I to this Session.

186b. The Council accepted the Hilsa report issued by the Meeting of the IPFC Hilsa Sub-Committee in Calcutta in June—July 1955 and recommended that the interested governments namely Burma, India and Pakistan should collaborate in implementing research on the lines laid down in that report as a co-operative project, with a view to reporting progress at the 7th Session.

187. Regarding fisheries in relation to river basin development, the Council considered that the publications by Miles and Job (IPFC Occl. Pap., 1954), and by Job, David and Das (Ind. J. Fisheries Vol. 2) were valuable contributions of direct interest to the region and recommended that the specific fisheries requirements in river basin development projects in the member countries should be systematically investigated, so that engineers and other river development authorities might be provided with positive directives to satisfy fisheries requirements. The Council also recommended that Member Governments should incorporate in their legislation necessary provision to ensure the concurrence of fisheries departments in the issue of licences and permits for the construction of dams.

188. Concerning pollution, the Council directed that work towards the assessment of the actual

damage to fisheries caused by pollution and the description of effective remedial measures should be pursued further by Technical Committee I, and recommended to Member Governments the active pursuit of this line of work in the ensuing period.

189. The Council recognized the great need expressed by Member Governments for an international exchange service for fish stocking material, and directed the Secretariat to render this service.

190. The Council resolved that, in consideration of the great importance of proper feeding in productive fish culture, which had been given high priority during the FAO Conference in 1953, a comprehensive study of fish nutrition be made and papers presented at the Seventh Session.

191. The Council noted with interest the report of Mr. Van Pel of the South Pacific Commission, that Chanos was breeding in the enclosed lake of Ano Ava in Tonga and in the Peleliu fish pond in the Palau Islands, and, in view of its possible significance for Chanos culture in the region, recommended that interested member countries should explore the possibilities of investigating these cases thoroughly, if necessary with assistance from FAO.

192. The Council, having considered the note on soil composition in relation to the productivity of fish ponds presented by the Government of India, recognised the importance of substratum studies in agriculture and, in view of the undeveloped nature of this subject in the region, recommended that such studies be pursued by workers in member countries and the results made available to the Council at its 7th Session through Technical Committee I. Because of the paucity of specialists in this subject in the area, the Council requested the Government of India to provide a review of the available information on this subject.

193. The Council considered the reports placed before it by Technical Committee I on fish culture in rice fields and recommended the constitution of a joint committee consisting of Mr. H. Saanin, Chairman of the Council's Inland Fisheries Panel and a representative of the International Rice Commission, to formulate a programme of experimental research on this subject which might be pursued by interested member countries on a co-ordinated basis. The Council requested the Secretariat to establish this Committee in consultation with the Commission.

194. The Council considered the notes on the Control of Weeds in Fish Ponds' presented by the Government of India, and on the 'Floating Weed Menace' by the Thai Delegation, and

observed that information on the efficacy of chemical, mechanical and biological methods of the control of aquatic weeds is becoming available. The Government of India's announcement of the publication on 'The Use of Herbicides in India' by Job, Philipose and Dutta was acknowledged with interest. The Council recommended to Member Governments that their work should be directed in the immediate future towards further field studies on the effect and the economics of selected methods or combinations of methods of weed control in individual water systems infested with weeds, and that Dr. Philipose should be invited to make the results of such work available to the Council in the capacity of rapporteur on Weed Control.

195. The Council reviewed the progress in fish culture in the region and expressed its appreciation of the active programmes that are in operation. It recommended that these activities be continued.

196. The Council, in considering the question raised by the Government of Ceylon of the introduction of exotic fishes, with special reference to predators such as Black Bass, had before it the note furnished by the Philippine Bureau of Fisheries and also FAO Fisheries Paper No. 2 on 'The Problem of the Introduction of Foreign Species into Inland Waters.' The methodical procedure adopted in the case of Tilapia by the Government of India, as detailed in the report of Technical Committee I, was recommended for adoption by Member Governments with suitable modifications.

197. The Council recognized the importance of the widely distributed grey mullet (*Mugil cephalus*) both as a wild stock and as a cultivable species in brackish water in the relatively less productive regions of the world. Although little research is being conducted on the species in the Indo-Pacific, work on its biology and culture is proceeding in other areas, and it was felt that the results of some of this work might have a more general application. The Council, therefore, appointed Mr. J. D. Bromhall as rapporteur to contact workers on grey mullet throughout the world, and instructed the Secretariat to assist the rapporteur in establishing contact with other regional fisheries organizations and with FAO. The rapporteur was requested to report to the Council at its next meeting on the state of research in this field, with a view to promoting the exchange of information between interested workers and the co-ordination of their efforts.

198. The Council, having reviewed Technical Papers Nos. 1—8 recommended the publication of Nos. 1, 3, 4, 7 and 8 in full, and Nos. 2, 5 and 6 in abstract.

Sea Fisheries

199. The Council strongly urged Member Governments to submit reports of research on *tuna* promptly, as requested by the tuna rapporteur, for inclusion in the report of Technical Committee I and nominated Mr. Joseph King of the Pacific Oceanic Fishery Investigations to succeed Dr. Royce as rapporteur.

200. The Council nominated a Special Sub-Committee consisting of Dr. A. L. Tester (U.S.A.), convener, Dr. H. Nakamura (Japan) and Mr. J. Robins (Australia) to prepare an official I.P.F.C. chart of the region for recording the distribution and catch rate of tuna and tuna-like species. The chart should be marked off in unit statistical areas, identified through a system of coding referable to latitude and longitude. The Sub-Committee should consider the size of the areas and the possibility of their further sub-division by each Member Government for local records according to a standard system. The Sub-Committee should report back to the 7th Session with a proposed draft and enumeration system. If these were approved, ways and means of duplication for the use of Member Governments would then be considered. Such charts would constitute an Atlas of the distribution of tuna and tuna-like species in the area and would be of great value for recording the catch of all pelagic species during the 'Indo-Pacific Fisheries Year'. It could serve as a basis for standard reporting on catch statistics in the future.

201. The Council was of the opinion that all the countries concerned in tuna fishing are exerting themselves to the utmost of their resources in the furtherance of research on tuna and tuna-like species. The Council noted the extensive work being carried out in Japan, and urged Member Governments to follow the Japanese example in plotting the catch and catch rate of tuna and tuna-like fishes in their respective areas.

202. During the discussion on *age determination* in tropical fishes, the Council heard a brief report of the interesting work being carried out by Japanese workers on the yellowfin tuna, and recommended that a more thorough study should be undertaken of methods of age determination in the tropics where the usual methods are difficult to apply. The Council recognized the work that was being carried out in India, Hong Kong and Ceylon. The Council urged other member countries to undertake similar investigations, and recommended that the results should be presented for discussion at its 7th Session.

203. The Council agreed that work on *Rastrelliger* is of great importance and should be continued. It recommended that the Rastrelliger Sub-

Committee be maintained, each interested country nominating a member, and that the Sub-Committee should meet in 1956, in response to the invitation of the Government of Malaya, in order to finalize a programme of research.

204. The Council noted with interest that a report on *trawling* off the Coast of Burma had been submitted by the Burmese Delegate. It was also noted that a study of the Wadge Bank trawl fisheries had been undertaken by Ceylon, and a report on this fishery was requested for discussion at the 7th Session.

205. The Council noted important experimental work in hand in Japan on the *response of fish to light* of various colours. While there was no special danger of depletion of the stock as a result of fishing with lights, it was necessary to limit the intensity of light used by each unit to prevent unfair competition.

206. The Council thanked Dr. Panikkar for acting as observer at the U.N. International Technical Conference on the Conservation of Living Resources of the Sea, and for enumerating the types of information required for a conservation programme. The Council accepted Dr. Panikkar's report (appended) as a guide for programmes concerned with the rational exploitation of resources and their conservation.

207. The Council recommended that, at the 7th Session, Delegates be prepared to state to what extent their resources would permit a study of basic productivity of the sea, preparatory to a discussion or symposium at the 8th Session.

208. The Council recommended that Technical Papers 10, 12 (including its accompanying diagrams), 27, 28 and 52 (the title of which was to be amended to read 'Experiments with the Fish Gathering Lamp' by N. Kawamoto, with suitable alterations of the text) be published in full. The Council felt that Technical Paper 9 was not sufficiently complete for publication at this stage. It was understood that Technical Paper 11 would be published elsewhere in due course, and that Technical Paper 13 did not come within the terms of reference for publication. The Council recommended that a non-controversial abstract of Technical Paper 54 be published and that Technical Paper 50 and Working Paper 25 (A Review of Current Knowledge of Rastrelliger) be referred to the Rastrelliger Sub-Committee.

Miscellaneous Fisheries

209. The Council considered that section 1.3 to 1.35 of the Executive Committee's Evaluation

Report represented a reliable summary of the work achieved in the field of Miscellaneous Fisheries, since its inception. It was noted, however, that the range of responsibility of the Miscellaneous Fisheries Panel is too wide for it to operate effectively, and it was decided that Technical Committee I should constitute a Consultative Body on oceanography, marine biology, limnology and fresh-water biology in its stead, as is reported elsewhere. This Panel would accept assignments from Panels A and B of Technical Committee I and, if desirable, from Panels of Technical Committee II for consideration in an advisory capacity, but would not itself have any continuing assignments.

210. The Council decided that the fields of *oceanography and limnology* should be part of the marine and inland fisheries programmes of Member Governments. The collection of oceanographic data will be suspended as a continuing assignment, and only such oceanographic investigations as can be related to the work of the Panels on Inland and Sea Fisheries in the sense outlined in contributed Publication No. 8, will be assigned to this item.

211. The study of *plankton* associations in Japan demonstrated a considerable breadth of knowledge of the phytoplankton but indicated that there are still some gaps in the identification of certain groups which had been collected. The Council therefore urged the UNESCO to aid in the development of a vigorous continuance of marine taxonomic studies, especially in the smaller plankton and phytoplankton groups, which are often valuable identifications of water masses.

212. With regard to the recommendations of *Plankton* considered by the Council at the 5th Session, for the standardization of plankton collecting gear as a long-range programme, it was resolved, as an immediate measure, to appoint Dr. Nakai as rapporteur and to direct the Secretariat in collaboration with him to select and provide for use by Member Governments suitable metered zooplankton and phytoplankton nets for oceanic surveys which could be used to calibrate the existing plankton nets of the area.

213. Referring to the forthcoming UNESCO meeting of Indo-Pacific regional institutions concerned with oceanography, scheduled to take place immediately following the Sixth Session, the Council, aware of the absence of any oceanographic institute or centre in many of the member countries, which can properly represent the interests of these countries, requested Dr. N. K. Panikkar, observer for the Council, to sponsor the needs of those countries at the UNESCO meeting.

214. The Council, as an international regional body responsible for the satisfactory development of an oceanographic programme in relation to fisheries, while recognizing the long-term need for considerable expansion of both the fundamental and fishery oceanographic programmes of the region, would view with misgivings any divorcement of the existing oceanographic facilities, inadequate though they may be at present, from fisheries research and development programmes.

215. Oceanographic institutions now emphasize geophysical sciences. In some countries they are financed by military agencies and their results therefore are not wholly available to civilians. Fishery research agencies must emphasize biological oceanography, in which the complex relations of hydrography to biological productivity must be elucidated. The problems of fishery hydrography cannot be solved merely by correlating physical oceanographic phenomena with abundance and distribution of fishes.

216. In general, fishery hydrographic studies must be conducted by fishery agencies, with hydrographic and fishery work carefully co-ordinated. At the same time geophysical oceanographic institutions are of essential value to fishery institutions in the developing of techniques, in conducting fundamental studies of physical oceanographic processes, and in training men to carry on oceanographic research.

217. UNESCO includes oceanographic research within the scope of its activities, while FAO concerns itself with fishery hydrography. There is thus some overlapping and some confusion as to the boundaries of each. The Council therefore recommended that FAO and UNESCO should seek a clear definition of the field of each organization's activities so as to avoid the present apparent duplication of effort.

218. The Council reiterated its endorsement of the views expressed in the report of Technical Committee I on the oceanographic needs of the region which was presented to the meeting of experts held in Manila in November 1953. It recommended that primary consideration be given to oceanographic training at two levels for the Indo-Pacific region. For those countries with existing oceanographic programmes, the need is for post-graduate training, which could be carried out in overseas countries. For countries with no existing oceanographic programme, the need is for persons with a local training in the basic techniques, methodology and theory of oceanography, with particular application to the fishery problems of his country.

219. The question of *possible faunal changes due to modification of world climate* was before Technical Committee I during the period under review, in accordance with the assignment at the 5th Session. The Council is aware that certain Member Governments have replied to the request for data bearing upon the possible relation between meteorological, oceanographic and faunal changes and modifications in their environment. Technical papers 16 and 21 from the Japanese region, and Technical paper 42 from the United States, appear to supply evidence on certain long-term changes in oceanography and associated fauna and flora. The Council instructed the Secretary to draw the attention of Member Governments to this information for consideration by those scientists of the respective countries assigned to the task, and to request that information be provided to the Council as it might become available.

220. The Council noted that the Fisheries Division of FAO has been unable to obtain unpublished information on possible climatic changes from countries outside of the Indo-Pacific region, and requests that any such information be obtained, if possible, in advance of the 7th Session.

221. The Council commended the work of the World Meteorological Organization as reported to the Session in a paper entitled 'The Role of the World Meteorological Organization in providing weather information for fishermen' as being of great potential value to fishery scientists.

222. In the field of *Seaweeds*, the Council decided to appoint Dr. S. Sudo as rapporteur, and recommended a more detailed study of seaweed resources and their utilization by Member Governments during the ensuing period.

223. In the field of *Crustaceans*, the Prawn Symposium held in connection with the 5th Session, and the recommendation arising therefrom, have contributed considerably to an appreciation of a possible development of this potentially rich fishery.

224. The Council considered the report of the Prawn Symposium and resolved:

- (a) To request Japan and Australia to keep the Council fully informed of progress in the investigations being carried on into the relationship between rainfall and other meteorological factors in relation to prawn yield.
- (b) To request Japan to keep the Council informed on the important work in progress on the rearing of prawns under controlled conditions from egg to adult, and the culture of *Skeletonema* for feeding the larvae.

- (c) That Professor Kubo of Japan be asked to prepare an illustrated standard field key for the region, and to request Member Governments to supply duplicate specimens of prawns and shrimps for his use in this work.

225. In the field of Taxonomy, the Council requested the F.A.O. to prepare and make available an up-to-date and, as far as possible, complete list of common and scientific names of fishes and other aquatic organisms. This is necessary for carrying out the work in the Indo-Pacific Fisheries Year. The Chairman of Technical Committee I was requested to re-draft the assignment on Taxonomy and present it at the 7th Session.

226. The Council recommended that Technical Papers 16, 17 and 21 which relate to a specific assignment of the 5th Session on climatic changes, are worthy of publication. Technical Paper No 19 should also be published, if possible, as it illustrates the role detailed phytoplankton and zooplankton studies can play in the identification of water masses.

Closure

227. The 6th Session was closed in a ceremony which took place at the Sankai Kaikan Hall at 15.00 hours on Friday afternoon, 14 October 1955.

228. On a motion by the Delegate for India, the Council adopted a resolution as follows :

That the Council records its grateful appreciation of the spontaneous hospitality and numerous facilities which have been so graciously extended by the Government and people of Japan to the Council, and to the Delegations of Member Governments and other participants attending the 6th Session, and that this expression of appreciation be formally communicated by the Executive Committee.

229. On a motion by the Indonesian Delegate, a resolution was passed to the effect :

That the Council expresses its thanks to Their Excellencies Mr. Mamoru Shigemitsu, Minister of Foreign Affairs, Mr. Ichiro Kono, Minister of Agriculture and Forestry, and Mr. Mamoru Hirakawa, Vice-Minister of Agriculture and Forestry, for the cordial welcome extended by them to the Delegates of the Member Governments, Observers and all others attending the 6th Session of the Council.

230. The Delegate for Pakistan proposed, and the Council adopted, a resolution as follows :

That this Council extends its deep gratitude to the Director of the Fisheries Agency and the various officers who, through their untiring care and solicitude, have contributed so much to the smooth working of the Council's 6th Session, and to the personal comfort of the Delegations.

231. The Delegate for the United Kingdom then proposed, and the Council adopted, a hearty vote of thanks to Nai Boon Indrambarya, under whose chairmanship the proceedings of the Session had been so successfully conducted.

232. The Alternate Delegate for Thailand also proposed, and the Council adopted, a vote of gratitude to the Director General of the Food and Agriculture Organization for his continued interest in the Council's affairs, and for the valuable assistance rendered at this Session by the secondment of senior officers from FAO Headquarters who have so ably assisted the Council in its deliberations.

233. The Delegate for Korea proposed, and the Council adopted, a vote of appreciation of the services of the Council's Secretariat for the manner in which it had carried out the instructions of the Council since the 5th Session, and its efficiency in servicing the 6th Session.

234. At the request of the Chairman, Dr. Cecil Miles, as Regional Fisheries Officer of FAO, expressed, on behalf of the Director General, his gratification that the 6th Session of the Council had reached a satisfactory conclusion, and had performed so much useful work directed towards fisheries development as a source of food, in a relatively short period. He also hoped that the work of the Council would continue along these lines, which the Organization would follow with keen interest, and with every possible support.

235. The Chairman introduced His Excellency Mr. Mamoru Hirakawa, Vice-Minister of Agriculture and Forestry of the Government of Japan, who extended his hearty congratulations on the conclusion of a successful session, and expressed his thanks for the Council's willing co-operation during the fifteen days of the Session. He believed that the Session had made a significant contribution to the advancement of the fisheries policy of the Member Governments, and to the furtherance of the exchange of information between countries, and he hoped that these efforts would continue in the future. He confirmed the desire of the Government of Japan to assist Delegates in every way in

their inspection tours, which will take place immediately after the Session, and hoped that it would benefit from these excursions, and carry away delightful memories of Japan. Thereupon he declared the 6th Session of the Indo-Pacific Fisheries Council adjourned.

In addition to the heavy schedule of work accomplished by the Council during fourteen plenary meetings and the numerous meetings of the Committees and their Panels, the following receptions were attended by Delegations:

Reception by the Honourable Minister of Agriculture and Forestry.

Theatre party by Japan FAO Association.

Tea party by the Delegate for India.

Garden Party by the Metropolitan Governor.

Reception by the American Delegation.

Reception by the Director of Fisheries Agency.

Excursions were made, by courtesy of the Japanese Government, to the Tokyo Metropolitan Fish Market, the Tokai Regional Fisheries Research Laboratory, the Tokyo Municipal Fisheries Experimental Station, Tokyo University of Fisheries, and Misaki Fishing Port. Two optional post-conference five-day inspection tours were also arranged to:

A. Tokyo-Bentenjima-Kashikojima-Nara-Tokyo.

B. Tokyo-Kyoto-Kashikojima-Nagoya-Gamagori-Shizuoka-Tokyo.

The following films were also shown to all participants and visitors on two evenings:

HAWAIIAN TUNA PACKERS (Honolulu), courtesy of the United States Delegation ...	25 minutes.
FAMILY AFFAIR (Tilapia Culture in the Philippines), courtesy of the Philippine Delegate ...	15 minutes.
IMPERIALEN 00000 (Oyster Culture in the Netherlands), courtesy of the Netherlands Government ...	35 minutes.
THE QUIET VILLAGE (Fisheries Extension Work in India), courtesy of the Indian Dele- gate ...	20 minutes.
SQUID FISHERY, courtesy of Kita Nihon Eigasha Corpo- ration, Japan ...	30 minutes.
SET NET FISHERY IN ODA- WARA CITY, courtesy of Odawara Fishery Management Society, Japan ...	20 minutes.
SHRIMP (Fishing Gear and Methods), courtesy of Dr. M. Fujinaga, Japan ...	17 minutes.
TUNA FISHERY, courtesy of Eiga Nihonsha Corporation, Japan ...	17 minutes.
SKIPJACK FISHERY, courtesy of Eiga Nihonsha Corporation, Japan ...	27 minutes.

INTERNATIONAL TECHNICAL CONFERENCE ON THE CONSERVATION OF THE LIVING RESOURCES OF THE SEA.

Rome, *April—May* 1955

REPORT BY N. K. PANIKKAR

Governments of 45 countries were represented at the above Conference which was convened by the Secretary-General of the United Nations in accordance with the General Assembly Resolution No. 900 (IX) adopted on 14 December 1954 which reads as follows :

The General Assembly

Considering that the International Law Commission has proposed for the consideration of the General Assembly draft articles¹ covering certain basic aspects of the international regulation of fisheries, and considering also that that Commission has not yet concluded its study of related question,

Having regard to the fact that the problem of the international conservation of fisheries involves matters of a technical character which require consideration on a wide international basis by qualified experts,

Being of the opinion that an international technical conference should be held in the near future to consider the problems of fishery conservation and make recommendation thereon,

Recalling that, by resolution 798 (VIII) of 7 December 1953, the General Assembly, having regard to the fact that the problems relating to the high seas, territorial waters, contiguous zones, the continental shelf and the superjacent waters are closely linked together juridically as well as physically, decided, consequently, not to deal with any aspect of those topics until all the problems involved had been studied by the International Law Commission and reported upon it to the General Assembly,

Having regard to the fact that the technical studies relating to the conservation, protection and regulation of fisheries and other resources of the sea are also closely linked to the solution of the problems mentioned in the preceding paragraph,

1. *Requests* the Secretary-General to convene an international technical conference at the head-

quarters of the Food and Agriculture Organization of the United Nations on 18 April 1955 to study the problem of the international conservation of the living resources of the sea and to make appropriate scientific and technical recommendations which shall take into account the principles of the present resolution and shall not prejudice the related problems awaiting consideration by the General Assembly ;

2. *Invites* all States Members of the United Nations and States Members of the specialized agencies to participate in the conference and to include among their representatives individual experts competent in the field of fishery conservation and regulation ;

3. *Invites* the interested specialized agencies and inter-governmental organizations concerned with problems of the international conservation of the living resources of the sea, to send observers to the conference ;

4. *Requests* the Secretary-General to arrange for the necessary staff and facilities which would be required for the conference, it being understood that the technical services of Governments of Member States and the technical and secretarial services of the Food and Agriculture Organization shall be utilized as fully as practicable in the arrangements for such a conference ;

5. *Requests* the Secretary-General to circulate the report of the conference for information to the Governments of all States invited to participate in the conference ;

6. *Decides* to refer the report of the said scientific and technical conference to the International Law Commission as a further technical contribution to be taken into account in its study of the questions to be dealt with in the final report which it is to prepare pursuant to resolution 900 (IX) of 14 December 1954.'

At the invitation of the Chairman of the Indo-Pacific Fisheries Council, Mr. Milton Lobell and I attended this Conference as observers on

¹ See Official Records of the General Assembly, Eighth Session, Supplement No. 9, document A/2456, paragraph 94.

behalf of the Council. This participation was in addition to our own individual assignments. No special statement or report on behalf of the Council was called for by the Conference. The formation of the Council, its main objects and membership have been mentioned in the final report adopted by the Conference.

The final report adopted by the conference is an extremely valuable document and will already be before the Member Governments. So far as the work of the IPFC is concerned, the sections of the report deserving special attention are those dealing with types of information required for a fishery conservation programme and types of conservation measures applicable in a conservation programme. These facts are generally known to all fishery biologists, but they have been very clearly classified and enunciated. The problems have been critically examined in a series of background papers by eminent fishery scientists. Many countries of the Indo-Pacific area are just beginning to undertake researches dealing with their fishery resources. In the formulation of such research programmes, those sections of the report which would be useful are reproduced below :

TYPES OF SCIENTIFIC INFORMATION REQUIRED FOR A FISHERY CONSERVATION PROGRAMME

1. Effective conservation of any resource of the sea requires scientific information, which is based on statistical records of the amount and kind of fishing and of resulting catches, and on integrated research on the biology and conditions of existence of the resource. It is therefore essential that any nation engaging in sea fishing collects adequate statistical records of fishing effort and catch, and it should also conduct pertinent biological and other investigations, to serve as a basis of ensuring the conservation of the resource being exploited. Since both the determination of the need for conservation measures and the selection of adequate and effective measures often depend on having data over a long period of time, it is most desirable that adequate records be collected, and biological and other research be conducted from the beginning of the development of a fishery.

2. Scientific information is required in order to provide answers, for a given fishery resource, to the following problems :

- (a) Whether regulation of the amount, manner or kind of fishing may be expected to produce desirable changes in the amount

of the catch or its quality? (It is important to determine whether the amount, manner and kind of fishing is such that regulation would maintain or improve the quantity or quality of the sustainable catch, because only in this case is the application of regulatory measures indicated. In order to make such a determination it is often necessary to consider also the fluctuations in the fish population resulting from the effects of environmental factors unconnected with the amount, manner or kind of fishing.)

- (b) If conservation measures are indicated, what particular measures should be adopted to produce the effects desired?
 - (c) What measures, other than control of the amount, manner or kind of fishing, can be undertaken to improve the quantity or quality of the catch?
3. The scientific information required will include some or all of the following types :
- (a) Extent of separation of the fishery resource into independent or semi-independent populations, which constitute the natural biological units of the resource to be dealt with by a conservation programme.
 - (b) Magnitude and geographic ranges of the populations constituting the resource, as a basis for conducting effectively both investigation and regulation, since these need to be applied over whatever sea areas are occupied by the populations to be conserved.
 - (c) Pertinent facts respecting the life history, (such as growth, mortality rates, migration, recruitment, etc.) ecology, behaviour and population dynamics of the species constituting the resource ; including fluctuations in abundance and variations in distribution and behaviour which are due to changes in the biotic and abiotic factors of the environment, and which are independent of the amount of fishing ; and including the inter-relationships of the community of organisms of which the exploited species forms a part.
 - (d) Effects of the amount, manner and kind of fishing on the resource and on the quantity and quality of the sustainable average catch to be obtained from it.
 - (e) Relationships of the resource to other species which are members of the same ecological community and are being exploited simultaneously by the same fishing equipment.

4. The degree of elaboration of the scientific investigations required to solve the conservation problems presented by particular resources, or in particular areas of the sea, is extremely variable. In some cases quite simple investigations will be adequate to determine the need for application of conservation measures, and to indicate appropriate measures to be applied. In other cases very detailed and extensive investigations will be necessary. The requirements of each case must be determined on scientific evidence.

TYPES OF CONSERVATION MEASURE APPLICABLE IN A CONSERVATION PROGRAMME

1. Several general types of measures may be applied in a conservation programme, under each of which there are several specific types of measures which may be used, depending on the nature of the resource and the way in which it is harvested:

- (a) Regulation of the amount of fishing, to maintain or to increase the average sustainable catch, by :
 - (i) Directly limiting the amount of the total catch by fixing a maximum annual catch.
 - (ii) Indirectly limiting the amount of the catch by closed seasons and closed areas, or by the limitation of fishing gear and ancillary equipment.
- (b) Protection of sizes of fish, the conservation of which will result in a greater average catch or a more desirable quality, by :
 - (i) Regulation of fishing gear to achieve differential capture of specified sizes.
 - (ii) Prohibition of landing of fish below a specified size, and requiring their return to the sea alive, if technically practicable.
 - (iii) Prohibition of fishing in areas where or seasons when small fish predominate.
- (c) Regulations designed to assure adequate recruitment:
 - (i) Control of the amount of fishing by any

of the means under (a) to ensure adequate spawning stock.

- (ii) Differential harvesting of different sizes of fish, by any of the means under (b) to lower the fishing rate on immature fish.
 - (iii) Prohibition of fishing in spawning areas or during spawning seasons.
 - (iv) Preservation and improvement of spawning grounds.
 - (v) Differential harvesting of sexes to achieve a desirable sex ratio in the population. (This type of measure is not generally applicable, but has been applied to some crustaceans, mammals and fishes.)
- (d) Measures for improvement and increase of marine resources.
- (i) Artificial propagation.
 - (ii) Transplantation of organisms from one biogeographical area to another, with due precaution against adverse effects.
 - (iii) Transplantation of young to better environmental conditions.

2. The determination of which of these measures should be applied in a given conservation programme will depend on the details of the life history, ecology, population dynamics, and behaviour of the species constituting the resource and on the technical nature of the fishing. The efficient application of conservation measures requires adequate prior scientific investigation of these matters. Recommendations for regulations should be made only on the basis of such investigations.

It has been clearly stated in the report that, for several Indo-Pacific fisheries, inadequacy of scientific and statistical data makes it difficult to suggest conservation measures at present. In these fisheries, it has been recommended by the Conference that scientific information required for a fishery conservation programme as indicated above be gathered on a continuing basis both at national levels and by co-operative research projects at international levels, wherever that is necessary.

RECOMMENDATIONS RELATIVE TO DATA FOR COLLECTION DURING THE INDO-PACIFIC FISHERIES YEAR

Indo-Pacific Fisheries Year

A minimum programme for the Indo-Pacific Fisheries Year should include the following fishery data in respect of each country.

A. Fisheries Statistics

1. Total fish production of a country computed regionally by suitable sampling techniques or by total enumeration where possible.

2. Total fishing population (with separate figures for active adult fishermen).

3. Fishing craft and gear employed in fishing and their distribution.

4. Break up of fish landings—indicating the major commercial species and types of fishing techniques employed to enable computation of catch-per-unit of effort in respect of total production and in respect of the major commercial species.

5. Temperature and salinity cycles of inshore waters.

In the field of inland and other culture fisheries, the following may also be added:

1. Total inland fisheries production showing separate figures for yield of ponds, rivers and

lakes and catch composition according to species. If possible, also separate figures as at 4 above.

2. Area of culturable inland waters.

3. Yield per acre under natural and artificial conditions.

In addition to the above, the following information should also be desirable.

B. Meteorological Information

Regionwise data on rainfall and major climatic factors.

C. Oceanographical Information

1. Data on temperature, salinity and nutrients.

2. Data on total plankton production to obtain an estimate of the productivity of the seas in the different regions of the Indo-Pacific.

3. Identification of water masses with a view to their association with particular types of fisheries.

4. Information of principal constituents of marine fauna and flora collected with a view to comparing the results of surveys to be made in subsequent years.

REPORT OF THE EXECUTIVE COMMITTEE TO THE SIXTH SESSION

Membership

1. The sixteen Member Governments adhering to the Baguio Agreement under which the Council was constituted, remain unchanged as set out in last year's report.

Meetings

2. The Executive Committee has met on four occasions since the Fifth Session of the Council which was held in Bangkok between January 22 and February 5, 1954, as follows:

18th Meeting at Bangkok, Thailand, February 6, 1954.

19th Meeting at Bogor, Indonesia, June 11-17, 1954.

20th Meeting at Kandy, Ceylon and Mandapam Camp, South India, March 24-28, 1955.

21st Meeting at Tokyo, Japan, September 28-29, 1955.

Travel

3. Apart from attendance at the above committee meetings, the Secretary performed the following travel:

In June 1954, in conjunction with the 19th Executive Committee Meeting, to inspect Chanos and other fisheries in North Java and Bali.

In July 1954, to open the FAO Fish Marketing Training Centre in Hong Kong.

In July 1954, to attend the 6th Meeting of the International Whaling Commission in Tokyo and to discuss the preliminary arrangements for 6th Council Session.

In September 1954, while on home leave, to visit several fisheries institutions in the United States and South America.

In October 1954, while on home leave, to attend the 3rd Session of the General Fisheries Council for the Mediterranean in Monte Carlo, Monaco and visit FAO Headquarters.

In January 1955, to assist the Secretary-General of the United Nations in representation of the Chairman at a Meeting of Experts to draft the agenda for the International Meeting for the Conservation of the Living Resources of the Sea, with consultations in Japan, Hawaii and India en route.

In April 1955, after the 20th Executive Committee Meeting, to Travancore, Cochin,

Madras, Calcutta (India) and Rangoon (Burma).

In July 1955, to Noumea, New Caledonia, to attend the 8th Meeting of the Research Council of the South Pacific Commission and make arrangements for a proposed FAO Training Centre for Pacific island fishermen, with discussions in Sydney (Australia) and Singapore en route.

In July 1955, Dr. T. J. Job, Technical Secretary, travelled to Calcutta to attend the session of the Hilsa Sub-Committee.

4. The Council was represented at the International Meeting for the Conservation of the Living Resources of the Sea organised by the United Nations in Rome from April 18 to May 10, 1955, by Dr. N. K. Panikkar (India) and Mr. M. J. Lobell (United States).

Membership of Executive Committee

5. Some difficulty was experienced at the 20th Executive Committee Meeting held at Kandy, Ceylon, in March, 1955, owing to the absence of two of the three members from their duty stations. The meeting was eventually held with only two voting members present, plus the secretary as *ex-officio* member without a vote, but up to the last minute there was a possibility of the Chairman only being able to attend.

In view of the great importance of ensuring the continuing work of the Council between Sessions, the Executive Committee has recommended, and the Government of Thailand has consented to propose at the 6th Session, an amendment to the Agreement whereby the Chairman would be empowered to co-opt the chairman of one or two of the Technical Committees to substitute for regular members unable to attend a meeting of the Executive Committee.

Staff

6. The salaries of the Secretariat staff have continued to be paid by F.A.O. under Article VI of the Council's Agreement. The present permanent staff consists of Dr. Cecil Miles, Secretary, Dr. T. J. Job, Technical Secretary, and Miss A. Jiannee, Conference Officer, clerical assistance being provided from the pool of the F.A.O. Regional Office.

Budget and Accounts

7. All expenses incurred on behalf of the Council apart from the salaries and wages above

mentioned are borne from an annual budget set aside by F.A.O. The budget allocations for 1954

are shown below alongside the actual items of expenditure:

	Expenditure US \$	Budget Allocation US \$
A. Executive Committee Travel ... ..	...	2,000.00
IPFC 1st 1954/55 Executive Committee Meeting, Bangkok, Thailand, February 1954 ... ..	...	...
IPFC 2nd 1954/55 Executive Committee Meeting, Indonesia, June 1954—expenses of Chairman, Vice-chairman and Member ...	1,800.67	...
	<u>1,800.67</u>	<u>2,000.00</u>
B. Printing ... ..	...	2,500.00
5th Session Proceedings—Sections I, II and III—printing, binding and distribution performed in 1954	1,244.82	...
5th Session Symposium—proportionate charges in excess of UNESCO contribution of \$500 (1700 copies)	102.20	...
Current Affairs Bulletin Nos. 12-14	59.77	...
Letter heads and sundries	37.32	...
FAO Information Office, New Delhi—miscellaneous and mailing expenses incurred by IPFC	80.31	...
	<u>1,524.42</u>	<u>2,500.00</u>
C. Meeting ... ..	...	750.00
Expenditure for 5th IPFC Session, Bangkok, Thailand, January/February 1954—interpretation and incidental expenses ...	538.13	...
	<u>538.13</u>	<u>750.00</u>
D. Miscellaneous ... ..	...	1,000.00
Postage and telegrams	406.03	...
Stationery and supplies	254.14	...
Equipment	274.82	...
	<u>934.99</u>	<u>1,000.00</u>

8. The budget allocation for 1955, in respect of which the accounts are not yet closed, are:

	U.S. \$
A. Executive Committee Travel	2,000
B. Printing	2,500
C. Meeting expenses	750
D. Miscellaneous expenses	1,000
	<u>6,250</u>

9. The budget allocation for 1956, subject to approval of the Conference of FAO, is identical with that for 1955, except that in case no Council Session is held in that year, Item C would be eliminated, leaving an available total of \$5,500.

10. Since it is unlikely that a Council Session will be held early in 1956, the Council may desire to make recommendations at the 6th Session in respect of the proposed budget for 1957, for submission to the Director-General in accordance with Section XI(2) of the Council's Rules of Procedure.

Implementation of 5th Session Directives

11. The Committee presents the printed Proceedings of the 5th Session. The following measures have been taken during the period to ensure that all government workers assigned to Council projects were fully aware of their obligations. The degree of success achieved is not at present known and will become apparent upon the presentation of the reports of Technical Committees I and II at the 6th Session.

12. The names of all chairmen of committees, panels and sub-committees, were circulated on February 23, 1954 with the request that retiring chairmen pass on all pertinent records to the new chairmen.

13. On March 4, 1954, Member Governments were apprised of the names of all workers nominated by delegations at the 5th Session to constitute the Council's technical committees and subsidiary groups. It was emphasized that the success of the Council's work would depend largely on energetic committee work and the meeting together of workers at the national level. (English and French).

14. On March 23, 1954, Governments were asked to present the review of the value of the Council's work and the tangible results thereof requested by the Council at its 5th Session. A reminder was sent through Administrative Correspondents on April 21, 1955.

15. On June 23, 1954, the Chairmen of Technical Committees I and II and of the newly formed Fisheries Development Group were advised to take stock of the work of their groups as one-third of the time available had elapsed. It was suggested that they should now formulate specific programmes where the Council's directives had been of a general nature.

16. On the same date governments were requested, through Administrative Correspondents, to confirm their instructions to certain specialists

to work on Council committee assignments as part of their official duties.

17. On November 11, 1954, the constitution of all the Council's committees, panels and sub-committees was reiterated to Member Governments so that they might convey the necessary instructions to these workers regarding their Council assignments.

18. On February 2, 1955, Member Governments were invited to participate in the 6th Session. Attention was drawn to the importance of continuing committee work by country workers and of the presentation of technical papers corresponding to the 21 assignments at the 5th Session which, if merely descriptive or academic, should be preceded by a statement of the value of the work to the Council. (English and French).

19. On February 14, 1955, all chairmen of committees, panels and sub-committees, were reminded of the continuing nature of the Council's work and asked that information be given to Chairmen of Technical Committees I and II as to the nature of the work being pursued in respect of each of the 21 Council assignments, throughout the region; the problems remaining to be solved, and suggestions for future lines of investigation. Additional information too lengthy for inclusion in a condensed report were invited as technical papers, which would constitute a real attack on the problems.

20. On May 16, 1955, attention was drawn to need for response from members of Miscellaneous Fisheries Panel.

21. The provisional agenda of the 6th Session was sent to Member Governments on April 29, 1955, and two additional agenda items proposed by Member Governments were communicated on August 1, 1955.

22. On May 16, 1955, members of all committees, panels and sub-committees were requested to submit reports forthwith as only four months remained until the 6th Session. They were to state the manner in which the Council's recommendations had been implemented, the progress of research on Council assignments and specify the outstanding problems for the Council's study during the subsequent period.

23. On the same date, members of the Inland Fisheries Panel were especially reminded of their general responsibilities to review achievements and recommend the future work programme.

24. Members of the Sea Fisheries Panel were asked, on June 2, 1955 (on behalf of the Panel Chairman) to report on their seven assignments, as only

one reply had been received, and that a negative one. It was emphasized that methods of approach and results obtained should be brought out in related technical papers.

25. The document 'Review of the Council's Work' prepared by the Executive Committee on the Council's instructions at its 5th Session, together with the reports submitted by eight governments and including a critique of the working of the Council's committees was circulated on August 17, 1955 to all governments, through Administrative Correspondents as well as to the known delegates to the 6th Session.

26. In addition to the above requests which are of a general nature, reminders were sent regarding the following specific projects.

Inland Fisheries

February 18, 1954. The Governments of Burma, India and Pakistan were requested to signify if they favour the establishment of an international co-operative research unit and, if so, whether they contemplate approaching FAO. (Only the Government of Burma has replied in the affirmative to both questions).

March 12, 1954. Council Resolution No. 3 on water pollution communicated to governments recommending assignment of competent scientific workers.

March 12, 1954. Resolution No. 4 on necessity for joint surveys by engineers and biologists, reports to 6th Session, in respect of river development projects.

March 18, 1954. Government action requested on further Council decisions; fish fry exchange, optimum densities and combinations and 'the food and feeding of fishes'. On April 26 Administrative Correspondents were asked to ensure reports reaching Panel chairman before June 15, 1955.

May 16, 1955. Panel members informed of FAO agenda item for 6th Session on Fish Culture in Rice Fields. It was assumed that joint work of agriculture and fisheries departments recommended by International Rice Commission was already under way. Further background information sent on May 20.

Sea Fisheries

February 24, 1954. Governments asked to appoint workers to Rastrelliger Sub-Committee (Resolution 6). Many subsequent communications regarding the projected meeting of this group.

March 18, 1954. Council's recommendations on Tuna communicated.

Miscellaneous Fisheries

March 11, 1954. Resolution No. 2 on changing world climate communicated to governments with request that work be commenced (English and French). On October 29, panel was apprised of desire of certain governments for a specific questionnaire. On December 21 certain governments were requested to supply information on changes outside the region.

March 22, 1954. Attention of governments drawn to research programme on prawns leading to symposium. Outline of proposed headings sent on October 13, 1954.

November 22, 1954. Information on recent publications relating to work given to Panel.

April 18, 1955. Executive Committee expressed concern over lack of action by Member Governments on repeated recommendations on recording of oceanographic data and requested action through Administrative Correspondents. A number of fixed stations suggested.

Craft and Gear

March 22, 1954. Regarding research on craft and gear used in the prawn fisheries leading to the Symposium.

Food Technology

March 22, 1954. Attention of governments drawn to research on processing of prawns leading to the Symposium.

Socio-economics and Statistics

June 29, 1954. Relative importance of subsistence fishing suggested as suitable subject for research of panel in preparation for 6th Session.

July 12, 1954. Panel reminded of obligation to study the significance of fish culture in rural economy.

Technical Committees

27. It is suggested that the effectiveness of the Council's technical committees as a result of the reorganized programme adopted at the 5th Session, be discussed by the Council in the light of the above Secretariat action, the resulting reports still to be received, and the evaluation report presented as a separate document.

Council Correspondents

28. The Executive Committee has, during the current period, adopted the policy of addressing the Council's Administrative Correspondents as the official government channel through which the Council's projects should be communicated. In most cases, these correspondents have complied with their obligation to pass such matters on to the competent authority concerned and to communicate the result to the Council, either through the Secretariat or through the technical committee concerned, as appropriate.

29. Administrative Correspondents have, moreover, in a few countries, complied with the Council's suggestion that they should hold regular meetings with the Council's panel and sub-committee members in their territory in order to ensure that the sub-committee members are, in fact, engaged in the Council research projects entrusted to them and that they maintain effective contact with their respective chairman. It is not, however, known to what extent the panel and sub-committee members have maintained such contact, and it is suggested that the technical committee chairmen inform the Council in this respect at the 6th Session.

30. Administrative Correspondents have also been regularly circularized requesting the submission of information suitable for publication, for publication in the Council's quarterly Bulletin, and some replies have been received.

31. Until recently, the Bibliographic Correspondents had over a period of years failed to reply to the repeated requests of the Secretariat that information be supplied on fisheries publications appearing in their territories. The policy has been adopted, with some success, of sending at quarterly intervals a form for completion by each correspondent.

32. There has been no action by the UNESCO correspondents during the period and it is suggested that the continuation of these nominations be suspended.

External Relations

33. Contact has been maintained during the Period with several organizations pursuing objects similar to those of the Council, as follows:

34. *UNESCO*. A proportional payment of U.S. \$500 was received from UNESCO towards the printing of the joint Plankton Symposium held in connection with the 5th Session. Printing has been completed and copies are available at this Session.

35. Contact has been maintained at a regional level by the Secretariat with the UNESCO Science Co-operation Offices at New Delhi and Djakarta, and UNESCO was represented at the 20th Session of the Executive Committee at Kandy, Ceylon, at which the regional oceanographic programme was discussed.

36. The Committee is informed that, with the approval of the General Conference of UNESCO at its 8th Session, a meeting of experts was held at the headquarters of FAO at which draft terms of reference were drawn up for a proposed UNESCO International Advisory Committee on Marine Sciences for submission to the Executive Board of UNESCO in November, 1955.

37. In the meantime, the Committee is informed, an interim Advisory Committee will meet in Tokyo on October 24 and 25, 1955 by invitation of the Japanese Government. A regional meeting of representatives of Institutes in Marine Sciences will also meet on October 17 and 18, while a Symposium on Oceanography will take place from 19-22 October.

38. While neither the Council nor the Secretariat was advised as to the mutual convenience of these dates immediately following the 6th Session of the Council (which may involve some modification of the post-conference fisheries inspection tours organized by the Japanese Government for IPFC delegates on these same dates), it is understood to be the intention of UNESCO to invite IPFC observership at these three meetings, albeit that no official invitation has yet (September 1, 1955) been received.

39. The Executive Committee therefore suggests that the Council may wish to discuss which parts, if any, of the proposed programme of the Council might legitimately be passed on to the Advisory Committee thus lightening the workload of the Council, which would subsequently be in a position to draw on the scientific knowledge accumulated by the Advisory Committee for practical application in the fisheries programmes.

40. It is the understanding of the Executive Committee that the mutual value of the Advisory Committee and the Council, each to the other, will be that UNESCO will, through the Committee, foster much of the fundamental work which scientists engaged in fisheries development find themselves unable to carry out because it is not of immediate application to the fisheries; that these scientists engaged in fisheries development will now be in a position to draw to the attention of UNESCO situations in which fundamental

knowledge is lacking ; and that with the existence of two such bodies engaged in the fundamental (UNESCO) and applied (FAO) fields respectively, it may be possible for each to devote itself more effectively to its own field of action.

41. *United Nations.* The Council was represented by Dr. N. K. Panikkar (India) and Mr. M. J. Lobell (U.S.) at the United Nations International Conference on the Conservation of the Living Resources of the Sea which was held in Rome from April 18 to May 10, 1955 and also by the Secretary, acting on behalf of the Chairman, at the preliminary meeting of experts held in New York in January, 1955 to assist the Secretary-General in the drafting of the Agenda.

42. It was the object of this meeting to give effect to the Resolution 900 (IX) of the General Assembly calling for appropriate technical and scientific recommendations to be referred to the International Law Commission in its current studies relating to territorial waters and the legal status of the continental shelf and its superjacent waters.

43. Substantial recommendations were made in relation to the objectives of Fisheries conservation, the types of scientific information required for a conservation programme, types of conservation measures, existing international agreements and the application of available measures to other international fishery conservation problems. Copies of the final report of the Conference are available for consultation at the 6th Session.

44. Contact has been maintained with the Economic Commission for Asia and the Far East in respect of its Water Development programme and its Inland Waterways Sub-Committee.

45. The Secretariat contributed a chapter on the effects of river development on the fisheries in the manual published by ECAFE, available for consultation at the Session.

46. The Inland Waterways Sub-Committee of ECAFE has proposed the international standardization of regulations regarding shore marks and buoys in inland waters, also available for consultation.

47. *F.A.O.* The existing relations between the Council and its parent body have remained unchanged during the year and close liaison has been maintained with the Fisheries Division in Rome.

48. The Annual Report which the Council must under its constitution submit to the Conference of FAO was prepared by the Executive Committee for the period 1954-55 and submitted by the Secretariat through the Director-General. Copies

are distributed at this Session as Working Paper No. 12.

49. The FAO International Rice Commission, at its 4th Session, passed a resolution suggesting joint action between the government departments concerned with rice production and fisheries with a view to elucidating the advantages and disadvantages of utilizing flooded rice fields for fish culture operations, and that this matter be studied by the Council.

Members of the Inland Fisheries Sub-Committee have been requested to report to the Council accordingly and a special item has been included in the 6th Session Agenda which will no doubt lead up to fruitful discussions, effective research and authoritative information on the subject based on controlled experimentation.

50. The Council was represented by the Secretary at the 3rd Session of the General Fisheries Council for the Mediterranean, held in Monaco in October, 1954. A copy of the Proceedings is distributed at this Council Session. The activities of the GFCM are summarized in Working Paper No. 11.

51. *Other Organizations.* The Secretary represented FAO (but not the Council) at the 6th Annual Meeting of the International Whaling Commission which took place in Tokyo in July, 1954. The 7th Meeting was held in Moscow in July, 1955. One of the principal results of these two meetings has been the gradual reduction in the capture of blue whale units from 16,000 to 14,500 by 1957, the shortening of the season for the killing of blue whales, and the bringing of helicopters and other aircraft within the jurisdiction of the Commission. The Director of the FAO Fisheries Division has discussed with the Norwegian Fishing Industry the possibility of making available to other countries certain proteins from whale meat which are now wasted.

52. The Council was represented by the Secretary at the 8th Meeting of the Research Council of the South Pacific Commission in Noumea, New Caledonia, in July, 1955, at which the details of a fishermen's training course to be jointly organized by the Commission and FAO in 1956 were discussed.

53. The Secretary visited the operational headquarters of the Norwegian Foundation for Underdeveloped Countries in Quilon, India, in April, 1955.

54. The 2nd Session of the Pan Indian Ocean Science Congress took place at Perth, Australia,

in August, 1954. The Council was not invited to be represented.

55. A 2nd International Seaweed Symposium was organized at Trondheim, Norway, in July, 1955, by the Norwegian Institute of Seaweed Research. According to information received from FAO, papers were based on the present position of seaweed research and seaweed exploitation, including the chemical composition of seaweeds, practical uses, processing, ecology and botany.

Publications

56. Sections I and II of the 5th Proceedings and the Plankton Symposium Papers have been published (the latter jointly with UNESCO). They have been widely distributed and copies are available at the 6th Session.

57. The greater part of the typescript of the Register of Institutions is with the press and will appear in 1956.

58. The Council's Current Affairs Bulletin has appeared regularly at quarterly intervals.

59. No manuscripts of Handbooks have been made available to the Secretariat by the General Editor. The budget allocation for printing could not therefore be fully spent.

60. The Council's publications are currently distributed to some 500 institutions throughout the world.

61. A sales policy, approved by the Organization, has resulted in the Council's publications becoming available for purchase by interested individuals who were previously unable to acquire them on an exchange basis, at reasonable prices.

62. Special Publication No. 3 'Economic Marine Algae of Tropical South and East Asia and their Utilization', by J. S. Zaneveld is in the proof stage.

63. The revised List of Scientific and Other Periodicals published in the Indo-Pacific Area was printed and copies distributed by FAO.

64. The FAO Yearbook of Fishery Statistics 1952-53, Vol. IV, Part I, has been published.

65. The book on the 'Fishing Boats of the World' containing useful contributions from the region has also been published.

66. *Occasional Papers*. The following Occasional Papers have been issued:

- 1954. 'The Status of the Fisheries in River Basin Development'
- 'FAO Expanded Technical Assistance Programme in Fisheries'

1955. 'International Legislation sought on Sea's Resources'

'Sampling Methods used in Japanese Fisheries Catch Statistics'

'A short history of the fisheries laboratories in Indonesia'

'Selected bibliography on fisheries published in Japan during the Year 1954'

'Current Bibliography for India'

'Current Bibliography for Indonesia'

67. *Library Accession List*. A list of library accessions from 1st January 1954 to 30th June 1955 is furnished in Working Paper No. 13.

Bibliographies

68. Current country bibliographies have been supplied by correspondents for Japan, India, and Indonesia and are available as Occasional Papers 55/4, 55/5 and 55/6 respectively.

69. Little progress has been made on the Council's projected Sector Bibliographies since the circulation of that for the Western Sector at the 2nd Session.

70. A bibliography of Indian Fisheries which, in conjunction with Rao's 1938 bibliography, will in a great measure perform the function of the Bibliography of the Western Sector, was published by the National Institute of Sciences of India and is distributed at the 6th Session.

71. The question of the Council's future bibliographic programme is discussed in the Review of the Council's Work (Working Paper No. 2-A) and is recommended for study by the Council.

72. A bibliography on Tilapia by P. Chimits appeared in FAO Fisheries Bulletin for January to March, 1955.

Technical Assistance

73. The Organization has continued to provide technical assistance to those governments which have accorded a sufficiently high priority to their fisheries projects at the national planning level.

74. Mr. J. Alan Tubb (Australia), until recently Vice-chairman of the Council has assumed duty in Burma and will carry out a general survey of the inland waters with a view to advising on development.

75. Mr. Einar Kvaran (Iceland), Marine Engineer, and Mr. J. Saemundsson (Iceland), Fisheries Engineer, continued to work as a team advising the Government of Ceylon.

76. Dr. Shao-wen Ling, until recently engaged in freshwater fish culture technical assistance in Thailand, has transferred to Ceylon in a similar capacity.

77. Mr. P. Ziener (Norway), Naval Architect, continued to assist in the programmes of the maritime States of India for the improvement of fishing craft. Mr. G. Illaguson (Iceland) is carrying out experimental fishing on the Coromandel Coast in a seiner provided by the United States International Co-operation Administration. The following additional appointments are in progress: Mr. C. R. Bjuke and Mr. C. G. Bjuke (Sweden), Fish Harbour Specialists, a second Naval Architect, a Fishery Technologist, a Fishery Engineer, a Fish Marketing Specialist, an Inland Fishery Biologist and a Fish Fleet Manager.

78. Discussions are in progress for the services of a Food Technologist and a Marine Biologist to assist the Government of Thailand. Arrangements have been concluded for an experimental shipment of *Tilapia melanopleura* to Thailand from the Belgian Congo.

Technical Instruction

79. The Fish Marketing Training Centre recommended by the Council at the 5th Session was successfully held in Hong Kong in July/August, 1954. The Secretary assisted the Governor at the opening ceremony. 30 participants from 10 Member Governments attended.

80. Mr. P. Lusyne (Belgium) is at present in India assisting the Government in the organization of a training course for fishermen on a national basis in accordance with the Council's recommendations at the 5th Session.

81. A training course for Pacific Island fishermen was discussed by the Secretary at the meeting of the South Pacific Commission Research Council in Noumea, New Caledonia in July, 1955 and will probably take place in the latter part of 1956.

82. Arrangements have been concluded for the holding of a second Inland Fisheries Training Centre in Indonesia with a duration of six weeks as from October 31, 1955. There will be places for 20 participants named by Member Governments.

83. The Council will no doubt now wish to make further suggestions for future regional Training Centres. The Committee believes that there is an urgent need for the training of fisheries administrators.

84. A proposal that participants from the region attend the Fisheries Administration Training Centre currently operating in Copenhagen, Denmark, was unfortunately not successful.

Council's Agreement and Rules

85. As has been mentioned under (5), above, a proposal has been put forward under item 5 of the Agenda for the 6th Session to enable the Chairman to co-opt the chairmen of technical committees to substitute for absent members of the Executive Committee. This will avoid the danger that the Executive Committee might, in certain circumstances, be unable to meet for lack of a quorum.

86. It has been further suggested that the word 'meeting' be substituted for the word 'session' throughout the Agreement, so as to conform to universal parliamentary practice and to recently formulated FAO standards; and that measures be taken to amend the Agreement so that the voting majorities specified in the Rules of Procedure do not contradict the Agreement. These amendments are dealt with in Working Paper No. 3.

87. Similarly, the words 'meeting' and 'session' should, with certain exceptions, be transposed in the Council's Rules of Procedure and a proposal to this effect is contained in Working Paper No. 4. The provision relating to voting majorities is added to Section IX.

Parliamentary Procedure

88. In accordance with the desire expressed by the Council at the 5th Session (p. 6 of Proceedings) brief indications on parliamentary procedure were drafted by the Secretariat and are given as Working Paper No. 5. A recommendation is made for a motion to the effect that in cases which are not covered by the Council's Rules, those of the Food and Agriculture Organization shall apply or, where these are not applicable, the Council's parliamentary authority shall be Robert's Rules of Order as abbreviated by O. Garfield Jones in a loose-leaf publication of Appleton-Century-Crofts Inc., New York.

Documents Issued

89. In addition to the documents and publications mentioned elsewhere in this Report, 988 letters, 27 circulars and 50 cables were issued by the Secretariat during the year 1954.

REVIEW OF THE COUNCIL'S WORK

PART I—INTRODUCTION

The present analysis arises from the Council's directive at its 5th Session recorded on page 6 of the printed Proceedings, that the Executive Committee draw up a full and complete review of the work of the Council, including the present status of its resolutions and recommendations, and the results, both direct and indirect, that have followed.

The time for such a stock-taking of the Council's achievements is particularly appropriate, falling as it does in the year of the tenth anniversary of its parent Organization, the F.A.O., which, at its third Session held at Geneva in 1947, recommended that action should be taken to initiate the formation of regional councils for the scientific exploration of the sea in parts of the world not actively serviced by similar bodies, giving primary consideration to the following areas . . . South-western Pacific and Indian Ocean . . . The Fourth Session of the Conference of F.A.O. held in Washington in 1948 stated that "these Councils would be concerned principally with the work of formulating problems, deciding priority of approach and co-ordinating the efforts of Member Governments in the research programme formulated."

At a meeting of the representatives of certain governments in the area convened by the United Kingdom Special Commissioner for South-east Asia in 1947, it was recommended that the F.A.O. should take the initiative in the formation of such an international council to be constituted by the governments of countries having an interest in the fisheries of Asia and the Far East.

In pursuance of the above recommendation, a formal meeting was convened by the Director-General of the Organization at Baguio in the Philippines in February, 1948, at which an Agreement for the constitution of an Indo-Pacific Fisheries Council was drawn up between the governments of Burma, China, India, Netherlands, the Philippines, United Kingdom and United States. The Agreement became effective as from November, 1948 when the fifth acceptance was notified to the Director-General, and a total of 17 Governments have now adhered to the Agreement, with one withdrawal. Meetings have since been held in Singapore, Australia, India, the Philippines, and Thailand. The Sixth Session is scheduled to take place in Tokyo, Japan, as from September 30, 1955.

While your Committee has, in part II of this Report, provided an analysis of that part of the Council's work which comes within the purview of the Committee, it is difficult to arrive at very precise conclusions as to the extent to which governments may have put into execution the Council's recommendations at the national level, nor is it easy to gauge to what extent the action taken by Member Governments in respect of fisheries development is the direct result of Council discussions, although where such development has occurred it has corresponded closely with the Council's suggestions.

It is, indeed, only the Member Governments themselves who are in a position to make a full appraisal of the immediate benefits which have accrued to them from Council membership, while the ultimate advantages can only be expressed in terms of better living standards, to which the Council is only one of many contributing factors and which could become only partly manifest in the short period represented by the life of the Council. This is especially true in the field of fisheries, where the operatives are among the most conservative branches of society.

Nevertheless, certain trends are evident. For instance, although fish culture has been practised in Asia at the cottage level since time immemorial, it has always been subject to a high mortality and the recent application of scientific principles to the collection, transportation and raising of fry in several countries has been encouraged by the Council with highly satisfactory results.

Rapid progress in mechanization of fishing from small indigenous craft as discussed by the Council is resulting in more economic operations in many areas of the region and in the field of fish marketing, which has received the Council's attention, a trend is evident towards the improvement of distribution systems and there is evidence of a gradual tendency towards the suppression of the traditional practice of artificially depressing the prices paid to the fishermen through arbitrary action by financiers.

The replies of Member Governments are appended to this report and are analysed in Part III. They show a consensus of opinion that the Council is reasonably performing the functions for which it was created.

In most cases, emphasis is placed on the value of the Council's role as a clearing house for information, on the advantages afforded by personal relations between senior fisheries officers and by inspection tours on the occasion of Council Sessions, and on the Council's intervention in the technical instruction programme of F.A.O. The view is expressed that at the recent Council Sessions there has emerged a successively more crystallised concept as to the functions of the Council and that, while the effect on the industry is necessarily of a long-term nature, the Council has developed an approach which is already exerting a healthy influence on fisheries policy, especially in the more under-developed countries of the region.

The Committee feels, however, that the potential value of the Council to its Member Governments might be much greater. Only three governments report that specific steps have been taken to implement the Council's recommendations in respect of their own fisheries activities.

Another important phase of the Council's programme from which governments have not as yet received full benefit is the organization of co-operative research. In particular, Sub-committees have been formed to design appropriate programmes of investigation in respect of the Rastrelliger (mackerel) and the Hilsa fish. The only meeting which it has been possible to convene was that of the Hilsa group in Calcutta in 1952.

No co-operative programme was formulated at that meeting, but rather a recommendation for the constitution of a unit to carry out the work, although it was not clearly stated who should bear the cost. It is hoped that, before the 6th Session, the group will again have met to map out a workable co-operative programme for the investigation of the Hilsa stocks between the governments concerned.

A similar plan for co-operation in respect of Rastrelliger is proposed, but as no less than seven Member Governments are involved, it has not yet been possible to convene a representative meeting to define a programme of research, notwithstanding the generous offer of the governments of the United Kingdom and the Federation of Malaya to hold the meeting in Penang. It is possible that Member Governments supporting such practical co-operative measures will brief their delegates to the 6th Council Session as to their probable participation in such a meeting, and an attempt should be made at the 6th Session to draw up a concrete working plan.

The Executive Committee also believes that, after examining the present report and the opinions of Member Governments as to the value of past and future work, the Council should once again turn its attention to the solution of the difficulties which have been encountered in respect of the work by committees in the intervals between Council Sessions, which is reviewed in Part IV.

PART II—WORK OF THE COUNCIL'S COMMITTEES

1. Technical Committee I (Hydrology and Biology).

The first Session in Singapore (March 1949) was largely taken up with matters of a procedural nature such as the Rules of Procedure and the terms of reference of the Council's two technical committees. Progress achieved on the different committee activities is recorded below.

It was agreed that Committee I should, during the ensuing period, explore the opportunities for collaboration and co-ordinated research by Member Governments of the Council and report thereon to the Council in the study of: (a) Tuna resources, (b) Clupeoids, Engraulids, Scombroids and Carangids, and (c) the development of fish culture in fresh and salt water. At the 2nd Meeting, it was reported that three special *ad hoc* Sub-committees had been formed to report on these aspects, plus four additional Sub-committees on (d) Plankton, (e) Hydrology, (f) Taxonomy and

(g) Seaweeds. Other Sub-committees were established in subsequent years for (h) Hilsa, (i) Chanos and (j) General Biology. Progress in respect of these matters during the ensuing years has been as follows:

1.1. Sea Fisheries Panel (Chairman—Mr. E. H. Dahlgren—U.S.)

1.11. Oceanic Fisheries—Tuna.

At the 2nd Session, the Tuna Sub-committee proposed that its efforts should at first be concentrated on a sufficiently restricted field to permit early progress and stressed the importance of determining whether the species of Pacific tuna were segregated into racial populations, to which end morphometric data should be standardized and published.

In response to resolutions of the Council at its 3rd and 4th Sessions, additional information on tuna was forthcoming from the Governments of

Australia, Japan, the Philippines and U. S. territories as a result of which an expanded report on the Yellowfin Tuna is nearing completion. The remaining governments of the Region reported that no work had been done on the ecology of tuna.

At its 5th Session, the Council again recommended that continuing efforts be made by governments to obtain morphometric data and information on the ecology of tuna, to undertake tagging operations and to initiate exploratory fishing for tuna. No doubt the report of Technical Committee I to the 6th Session will indicate to what extent these programmes have been adopted in the countries of the Region so that the Council may decide as to the past, present and future benefits of this programme, or recommend a modification of it, to Member Governments of the Council.

The tuna resources of the Indian Ocean are even less known than those of the Pacific and might profitably be the subject of research by the governments whose territories adjoin that ocean, in addition to the investigations at present being undertaken there by vessels of nations geographically farther removed, on which it is hoped that the Council will be fully informed at the 6th Session.

The following papers on Tuna have been presented to the Council:

1. 'A Survey of the Pelagic Fisheries of the World: Part I—General Considerations' by H. S. Rao, 1949.
2. 'A Survey of the Pelagic Fisheries of the World: Part II—The Biology of Pelagic Fishes', by N. K. Panikkar, 1949.
3. 'Methods of Biological Research on Pelagic Fisheries Resources', by O. E. Sette, 1949.
4. 'Some Recent Advances in the Study of the Biology and Racial Division of Pacific Tunas', by M. B. Schaefer, 1951.
5. 'Pacific Oceanic Fishery Investigations—Statement of Programme', by O. E. Sette, and M. B. Schaefer, 1951.
6. 'Preliminary Report on a comparison of the stocks of Yellowfin Tuna', by W. F. Royce, 1953.
7. 'Distribution and Migration of Tunas in Japan', by H. Nakamura, 1954.

1.12. Inshore Fisheries

The Sub-Committee on herrings, anchovies, mackerels and horse mackerels organized by Committee I under point (b) above was designated as the 'Neritic Pelagic Fisheries Sub-Committee'.

After a period of three years during which this Sub-Committee produced no report, it was directed, at the 3rd Session, to survey the programme of research bearing on pelagic neritic fish stocks and recommended that Member Governments furnish information on their programmes in connection with chub mackerels (*Rastrelliger*), Sardines (*Sardinella*) and other clupeids and anchovies.

During the period between the 3rd and 4th Sessions, it was reported, maturity scales were prepared by the Indian Central Marine Fisheries Research Station and measurements were taken of a number of specimens of *Rastrelliger* from India and Indonesia, but the results of these activities of the Sub-Committee are not yet available to the Council. It was recommended that a programme for research on these mackerels be undertaken through a central agency.

On the basis of the Sub-Committee's work, a questionnaire was drawn up at the 4th Session and distributed to governments in accordance with Resolution 24.3 (8), so that the methodology of investigation of these fisheries might receive attention at the 5th Session.

Although some of the replies to the questionnaire were of a negative character, they provided preliminary information on the nature of the stocks and the status of research, and the conclusion was reached that the central area extending from the Indian Ocean to Netherlands New Guinea was lacking in personnel, equipment and funds for these investigations. Interchange of information and personnel was recommended, as was also the adoption of the methods in use in Australia and Japan. Governments were moreover strongly advised to take steps for the development of the statistical services indispensable to such a programme paying special attention to the trends of production, especially those following on the introduction of mechanized fishing and the Sub-Committee was to formulate suitable sampling techniques and standardized procedures.

The Council, at its 5th Session, confirmed the need for continuing this work and suggested that particular emphasis might be placed on gauging the extent of the neritic pelagic fish stocks, efforts to be concentrated for the time being on *Rastrelliger*. To this end, consequent on the regrouping of the Council's work into panels, a Sub-Committee on *Rastrelliger* was formed by Panel 'B' (Sea Fisheries) which, it was recommended, should meet to design an appropriate research programme.

Attempts were made during 1955 to convene a meeting of the Sub-Committee for this purpose, but it was not possible to obtain adequate partici-

pation. It has been suggested that a definite date be fixed at the Council's 6th Session for such a meeting, after consideration of the available information. It must be kept in mind that an adequate study of the *Rastrelliger* fishery must also involve contributions by the Craft and Gear Panel of Technical Committee II. Papers presented to the Council having a bearing on these fisheries are :

8. 'Development of Pelagic Fisheries', by J. D. F. Hardenberg, 1949.
9. '*Rastrelliger kanagurta* (Ruppell)—Its Fishery and Biology : Summary of our knowledge—Study Programmes', J. Durand, 1949.
10. 'Studies on the Life-history, Bionomics and Fishery of the White Sardine, *Kowala coval* (Cuv.)', R. V. Nair, 1952.
11. 'A Contribution to the Biology of the Silver Belly, *Leiognathus splendens* (Cuv.)', H. L. Arora, 1952.
12. 'The Oil Sardine Fishery of India : I—A Review', by Indian Delegate, 1953.
13. 'The Oil Sardine Fishery of India', by R. V. Nair, 1953.
14. 'The Neritic-Pelagic Fisheries of Japan', by Nakai, Z. *et al.*, 1954.

1.13. Sea Fisheries—General.

Other items placed on the programme of work of the Sea Fisheries Panel between the 5th and 6th Sessions are : Methods of age determination for tropical species, and reports on practical investigations on fishing with lights. The results of these studies are awaited, no information as to the activity of the Sea Fisheries Panel during the most recent period being available to the Secretariat at the time of writing.

The old distribution of work on the Sea Fisheries having fallen into two Sub-Committees, dealing with Tuna and Neritic-Pelagic fisheries, the other aspects such as trawling and line fishing for demersal and reef fishes have not been specially dealt with by the Council.

Papers presented :

15. 'The Over-fishing of the East Australian Trawl Fishery', by W. S. Fairbridge, 1952.
 16. 'Fisheries of Sind Coast', by M. R. Qureshi, 1954.
- 1.2. Inland Fisheries Panel (Chairman—Mr. K. Kuronuma—Japan).

The Sub-Committee on Fish Culture at the 2nd Session stated that it would communicate a report when further information had been received from governments. At the same time, it recommended

that precautions be taken by governments to prevent the intentional or accidental importation of undesirable species and that such importations and transplantations be reported to the Council.

At the 3rd Session, an analysis of the species cultivated in Ceylon, East Pakistan, Malaya and Hawaii was presented, together with a table showing the area of cultivable inland waters in the region. It was recommended that Member Governments initiate or intensify their programmes of investigations, including the survey of cultivable waters, studies of fish food, breeding and growth, compatible combinations and optimum densities of different species under cultivation and the consideration of fish seed resources.

Reports were also requested from Member Governments on their experience with herbicides for the elimination of noxious plant growths and on the pollution of natural waters.

At the 4th Session, it was reported there were signs of a more scientific approach by Governments to the problems of fish culture, although final solutions were often lacking. Reports were submitted on the introduction of exotic species into several countries and on the trade in fish fry between several territories. Weed control had received special attention in India and the Philippines, and considerable information had been gathered on the factors causing the pollution of natural waters and possible solutions.

In the meantime, the Council's Special Publication Nos. 1 and 2 on 'Fish Culture in Brackish Water Ponds in Java', by W. H. Schuster and on 'Fish Culture in Indonesia', had appeared, the latter based on the curriculum of a first Fish Culture Seminar organized in Indonesia on the Council's recommendation in April/May, 1951, and a second Seminar on the same subject organized by F.A.O. on an international basis, also on the Council's recommendations, had been held in May/June, 1952.

At the 5th Session, it was recommended that specific problems relating to the pollution of waters should receive attention of Member Governments as also the conservation and exploitation problems arising from River Development Projects; results of work done on the basis of the Council's recommendations regarding stocking densities and combinations of species; the food and feeding of fishes; and, as the specific task of a *Chanos* Sub-Committee constituted at the 4th and 5th Sessions, the biology and culture of the milkfish, including exploration for fry and breeding investigations.

A Sub-Committee on Hilsa fish (*Hilsa ilisha*) was formed at the 4th Session and representatives

of India and Pakistan met in Calcutta in September, 1952, when the present knowledge regarding this fish was summarized and the contributions have been made available in printed form in the 'Journal of the Asiatic Society' (Vol. 20, No. 1, pp. 1—79, 1954). Certain recommendations were formulated for co-operative research which, owing to their costly nature, have not been implemented by Governments. The Government of India has, it is understood, offered to receive research workers from the other countries concerned, i.e. Burma, Pakistan, at an Indian centre. The further report of this Sub-Committee is awaited through Technical Committee I, at the 6th Session.

The question of fish culture in flooded rice fields has received the Council's attention and was discussed by the International Rice Commission (IRC) in October, 1954. It was recommended that the matter be studied jointly by Agricultural and Fisheries Research Stations in member countries and that a joint committee of the IRC and the IPFC be formed to deal with these problems. At the request of FAO, an item has been included in the Agenda of the 6th Session to which the special attention of Member Governments has been drawn.

One of the more encouraging results of the close personal contacts established by the fisheries officers of different countries at Council Sessions has been the initiative taken by governments for the exchange of suitable cultivable species, of which the most spectacular has been the rapid propagation of *Tilapia mossambica* which, after its initial discovery as an aquarium escape in Indonesia, was taken to Malaya and thence has been distributed directly and via Thailand to many countries within and outside the Region. The Council has, nevertheless, encouraged governments to introduce such exotic species only after it has been shown by an exhaustive study that such transplantations are not likely to prejudice the locally cultivable species. In particular, advice was given to the Government of India along these lines at the 5th Session.

No information has reached the Secretariat on the progress of the work of the Inland Fisheries Panel during the period between the 5th and 6th Sessions.

The following papers have been presented at Council Sessions on Inland Fisheries and Fish Culture (including the pollution of natural waters, and Hilsa):

17. 'General Review of the Fish and fish Culture in the Continental Waters of Indo-China and the Projected Programme of Work', by L. Lemasson, 1949.

18. 'Notes on Fish Fry Industry of China', by S. Y. Lin, 1949.
19. 'Physiological Aspects of Adaptation to Estuarine Conditions', by N. K. Panikkar, 1951.
20. 'Application of the Principles of Fish Culture to Estuarine Conditions in Singapore', by D. W. Le Mare, 1951.
21. 'Physiological Requirements of Eggs, Larvae and Fry during Transportation', by S. P. Basu, 1952.
22. 'An Investigation of the River Godavari and the Effect of the Paper Mills Pollution at Rajamundry', by S. V. Ganapathi, and P. I. Chacko, 1952.
23. 'Methods and Problems of Collecting Eggs and Fry for Transplantation', by H. R. Rabanal, 1952.
24. 'A Provisional Survey of the Introduction and Transplantation of Fish throughout the Indo-Pacific Region', by W. H. Schuster, 1952.
25. 'The Fitness of Ecological Niches into Which Fish are Introduced at Various Ages and the Survival of the Transplanted Fish', by Soong Min Kong, 1952.
26. 'Fish Culture in Pakistan', by N. Ahmad, 1952.
27. 'Fish Seed Industry in India', by T. J. Job, 1952.
28. 'Notes on the Fishery of the Cyprinid Fish, *Thynnichthys caillanti* in Indonesia', by H. Saanin, 1952.
29. 'Preliminary Report on Air Transport of Live Fish in Sealed Tins under Oxygen Pressure', by K. F. Vaas, 1952.
30. 'Sur la Pisciculture au Cambodge', by R. Lafont and Dom-Saveun, 1952.
31. 'Biology of Hilsa', by S. L. Hora, 1953.
32. 'Hilsa Investigations', by N. K. Panikkar, 1953.
33. 'A Preliminary Biometric Study of Certain Populations of Hilsa, *Hilsa ilisha* (Ham.)', by T. V. R. Pillay, 1953.
34. 'Studies on the Rate of Growth of Milkfish of 'Bangos' *Chanos chanos* (Forsk.) under Cultivation', by H. R. Rabanal, R. S. Esguerra and M. M. Nepomuceno, 1953.
35. 'International Fish Seed Exchange', by T. J. Job, 1953.
36. 'Chinese Systems of Pond Stocking', by S. Y. Lin, 1954.
37. 'Feed of Bangos Fingerlings', by P. G. Padlan, and H. R. Montalban, 1954.
38. 'pH in Pond Fertilization', by D. V. Villadolid *et al.*, 1954.

39. 'Do Chinese Carps Spawn in Japanese Waters?', by K. Kuroshima, 1954.
40. 'Paddy field Prawn Fishery of Travancore-Cochin', by M. K. Menon, 1954.
41. 'Water Hyacinth and its Control in Fish Ponds', by N. Ahmad, 1954.
42. 'Migration et Reproduction des Poissons d'Eau Douce du Cambodge', by Sao-Leang and Dom-Saveun, 1954.
43. 'Occurrence of Chanos Fry in Thailand', by J. Thiemmedh, 1954.
44. 'Pisciculture au Viet Nam', by Cao Thien Buu, 1954.
45. 'Densité Optimum de Peuplement et Associations des Espèces Compatibles', by Nguyen Nhu Nghi, 1954.
46. 'On Occurrence of Chanos Fry in Indonesian Waters', by H. Saanin, 1954.
47. 'Investigations on the Racial Characteristics and Biology of the Hilsa of the Hooghly River', by T. V. R. Pillay, 1954.

1.3 Miscellaneous Fisheries Panel (Chairman—Dr. Tham Ah Kow—U. K. [Malaya]).

The Miscellaneous Fisheries Panel was constituted at the 5th Session in an effort to consolidate the many sub-committees which had grown up in previous years, in order that, in view of the scarcity of suitably qualified experts in these different fields, the Council's work be concentrated on only one or two aspects at each Session, thus allowing of more thorough treatment. The work of this group is, therefore, rather complex, combining that of the old Sub-Committees on Hydrology, Plankton, Minor Fisheries (sponges, coral, invertebrates) the taxonomy of these groups and taxonomic problems of a general nature not covered by the other panels.

1.31 Oceanography and Limnology

At the 2nd Session, the Council instructed the Secretariat to locate sources of supply of oceanographic equipment (which was obtained and circulated) and recommended that surface temperature and salinity observations be carried out from commercial vessels plying to member countries as well as from small vessels operating in inshore waters, and that the Secretariat should be responsible for their reception, reduction and publication in atlas form as is done by the International Council for the Exploration of the Sea.

As a result of the latter recommendation, it was reported at the 3rd Session that surface salinity observations had been received by the committee only from Indonesia in respect of the Java and

Banda Seas. It was recommended [in Resolution 20.1 (1)] that Member Governments initiate or continue the collection of salinity and temperature observations for regular transmission to the Secretariat and compilation of the data in an atlas, the form to be determined by the Committee. Governments were also [in Resolution 20.1 (3)] recommended to develop hydro-biological investigations in estuarine and neritic waters.

Salinity maps compiled by Mr. P. Ch. Veen for Indonesian waters were published and circulated at the 5th Session and some surface temperature observations were taken in the engine rooms of commercial vessels plying out of British North Borneo in 1952 and 1953. These were passed on to the Sub-Committee. The total number of observations is, as yet, quite insufficient to attempt to compile an atlas. Moreover, any action along these lines, to be useful, should constitute an advance on the atlases already published by the Royal Netherlands Meteorological Institute. The Executive Committee now feels that, even if a sufficient volume of temperature and salinity data were to be forthcoming, the task of preparing an atlas could only be undertaken if additional staff were supplied to the Secretariat for this special purpose.

The prospect of establishing a Regional Oceanographic Unit was brought up at the Council's 4th Session and was discussed at a meeting of oceanographers called by UNESCO and FAO in Manila immediately prior to the 8th Pacific Science Congress in 1953. Although the establishment of an Institute has been dropped, UNESCO has under study the possibility of appointing an oceanographer for the Indo-Pacific Region with similar aims in view, to work in close collaboration with the Council. It is hoped that this project will have progressed sufficiently to allow of further information being made available at the 6th Session.*

The Miscellaneous Fisheries Panel was, at the Council's 5th Session, requested to study advances in the collection of oceanographic data pertinent to fisheries programmes and their application to population surveys, development and/or conservation and the further report of Panel 'C' of Committee I on these matters is awaited at the 6th Session.

The following is a list of papers on Marine and Estuarine Hydrology presented at Council Sessions:

48. 'Oceanography in the Indonesian Archipelago', by M. W. R. Krauss, 1949.

* UNESCO has also recently constituted a 9-member Advisory Committee on Marine Science on world basis.

49. 'Summary to Date of the Hydrological Work of the Fisheries, C.S.I.R.O.', by D. J. Rochford, 1951.
50. 'Hydrology of the Estuarine Environment', by D. J. Rochford, 1951.
51. 'Preliminary Observations upon the Release of Phosphate from Estuarine mud', by W. Stephenson, 1951.
52. 'A Comparison of the Hydrological Conditions off the Eastern and Western Coasts of Australia', by D. J. Rochford, 1952.
53. 'Estuarine Problems in South-east Asia', by J. D. F. Hardenberg, 1951.
54. 'A Study of Drift in Malacca and Singapore Straits for Salinity Determinations', by R. A. Robinson, H. Tong and Tham Ah Kow, 1953.

The doubt has been expressed by some Member Governments as to whether the collection of salinity and temperature data in the manner contemplated, perhaps with un-uniform methods, will contribute in the foreseeable future to the food supply.

1.32. Plankton

The principal concern of the Council at its 2nd Session was the standardization of collecting methods, and several technical contributions in this field have, at different times, been presented to and published by the Council. No report was forthcoming from the Sub-Committee at the 3rd Session, at which were recommended (a) systematic surveys of plankton, (b) studies of seasonal distribution and (c) examination of the relationships between plankton intensity and occurrence with hydrological factors, and the interrelationships between plankton organisms and important fishes and between the different plankton organisms themselves. Resolution 20.2 was adopted recommending that Member Governments furnish information on their plankton investigation in marine, brackish and fresh waters for compilation and recommendations by the Sub-Committee while Resolution No. 15 requested the Government of India to prepare a revised bibliography on plankton for the Western Sector, which appeared as Occasional Paper 51/3.

Considerable progress was evident at the 4th Session in the work of the Sub-Committee during the period, although few plankton workers were present. As a result of information received from five countries of the Region, it was evident that plankton investigations varied in intensity and effectiveness owing to lack of personnel and equipment. It was recommended that plankton lists be

compiled, even though these be restricted for the time being to the shorter lists of 'indicator species'. For these purposes, a list of specialists available for consultation on the different classes was made available (p. 69 of Proceedings), and recommendations as to standard procedures were drawn up.

In order to promote greater interest in these programmes, Plankton was chosen as the subject for a symposium at the 5th Session. Through the co-sponsorship of UNESCO, planktonologists from within and outside the region were present and a large number of technical contributions became available. More definite recommendations as to standardization were made. No specific task was allocated for the ensuing period in respect of Plankton.

The following technical contributions on Plankton have been studied by the Council:

55. 'The Organization and Utilization of Plankton Investigations', by H. Thomson, 1949.
56. 'The Plankton Calendar of Singapore Straits with Suggestions for a Simplified Methodology', by Tham Ah Kow, 1953.
57. 'Phytoplankton Studies in Eastern Australia', by E. J. F. Wood, 1951.
58. 'On the Methodology of Marine Plankton Collection, with a Suggested Classification', by Z. Nakai, 1954.
59. 'On the Nutritional Relationship between Plankton and Fish in Indonesian Fresh-water ponds', by K. F. Vaas, 1954.
60. 'Some Factors Controlling Algal Production in Salt Water Lagoons', by V. K. Pillai, 1954.
61. 'Hydrology and Seasonal Fluctuations of the Plankton in the Hooghly Estuary', by N. Dutta, J. C. Malhotra and B. B. Bose, 1954.
62. 'Studies on the Blue-green Algae in Japan', by T. Harada, 1954.
63. 'Observations on the Distribution and Fluctuations of Planktonic Larvae of Mandapam', by R. R. Prasad, 1954.
64. 'A Preliminary Study of the Plankton of the Chilka Lake for the Years 1950 and 1951', by M. P. Devasundaram and J. C. Roy, 1954.
65. 'The Role of Planktonology in Fisheries Development', by Tham Ah Kow, 1954.
66. 'A Preliminary Study of the Hydrology and Fauna of the Vellar Estuary (South Arcot Dt., S. India)', by K. Ramamurthi, 1954.
67. 'Variations in Zooplankton Abundance in the Central Equatorial Pacific, 1950-1952', by J. E. King, 1954.

68. 'Feeding Habits of the Pond-smelt, *Hypomesus olidus* and the Plankton Succession in Lake Suwa' by Y. Shiraishi, 1954.
69. 'On the Plankton Research in Japan with an Annotated Bibliography', by S. Motoda, 1954.
70. 'On the Plankton of Three Fresh-water Fish Ponds in Madras City, India', by P. I. Chacko and B. Krishnamurthy, 1954.
71. 'On Carp Fry Mortality in Nursery Ponds and the Role of Plankton in Their Survival and Growth', by K. H. Alikunhi, H. Chaudhuri and V. Ramachandran, 1954.
72. 'Preliminary Observations on the Biology of Boreo-Arctic and Subtropical Oceanic Zooplankton Populations', by C. J. Fish, 1954.
73. 'Notes on the Utilization of Zooplankton for Food in Thailand', by S. W. Ling and M. C. Kosol Suriyong, 1954.
74. 'Tropical Fresh-water Plankton', by Professor A. Thienemann, 1954.

1:33. Crustacea

The field of the old General Biology Sub-Committee was defined at the 4th Session as relating to Mollusca and Crustacea and to minor fisheries such as sponges, beche-de-mer, turtles and commercial corals, and that for the 5th Session technical papers be invited on the Prawn and Shrimp Fisheries. Much interest was shown in the contributions presented and the subject of Prawn and Shrimp Fisheries was allocated as the subject of further study by the Miscellaneous Fisheries Panel during the ensuing period and for a symposium at the 6th Session, which should include trawling in deep and shallow waters, life history and all aspects of utilization and processing with suitable economic evaluation of each and, if possible, models of gear and samples of the products.

The following papers have been read on Mollusca and Crustacea :

75. 'The Life-history and Bionomics of an Indian Penaeid Prawn *Metapenaeus dobsoni*, Miers', by M. K. Menon, 1952.
76. 'Studies on the Growth of *Katylsia opima* (Gmelin)', by K. V. Rao, 1942.
77. 'Les Espèces du Genre *Scylla* à Nha Trang (Viet Nam)', by R. Serene, 1952.
78. 'The Grapsoid Crabs of the Malayan Mangrove Swamps', by M. W. F. Tweedie, 1954.
79. 'Prawn Fishery of East Pakistan', by N. Ahmad, 1954.

80. 'The Shrimp Industry of Singapore', by Tham Ah Kow, 1954.

1:34. Seaweeds

The Council requested, at its 2nd Session, that Member Governments undertake further taxonomic research on the algae of the Region. The work of the Sub-Committee having been handicapped by the loss of its Rapporteur, Mr. Chyung Moon Ki, it nevertheless produced a short bibliography and an account of studies in progress in Australia, Indonesia, the Philippines and Japan, including a list of 43 workers in different groups of seaweeds. At the 3rd Session the Sub-Committee was asked 'to continue its activities', that information be supplied to it on critical factors in the manufacture of alginic acid and agar, and recommended taxonomic studies on the economic genera *Gracillaria* and *Hypnea*.

At the 4th Session it was pointed out that this information came under the heading of trade secrets and that the only information available was that contained in scientific publications, a list of those from Australia being supplied. It was not possible to make any report on *Gracillaria* and *Hypnea*. It was agreed that Dr. J. S. Zaneveld should revise his papers on Economic Marine Algae of Malaysia with additional information to be supplied by Member Governments, and this has been done.

The Council, believing that the development of the seaweed industry was restrained for lack of reliable methods for measurement of the seaweed crop, proceeded to obtain information on this matter from seven Member Governments and from the Seaweed Research Institute of Scotland. The Sub-Committee was thus able to present substantial documentation at the 5th Session and to recommend that Member Governments of the Council carry out studies based on the methods used by the Scottish Institute, so far as they are applicable to tropical conditions.

No specific task other than that mentioned under 1:33 was laid down for the Miscellaneous Fisheries Panel for presentation at the 6th Session, but the reports of Member Governments on the results of the work undertaken as a result of the Council's recommendations are awaited.

The Council has given consideration to the following papers on Seaweeds and their utilization (note that these papers also concern the Food Technology Panel of Committee II).

81. 'The Economic Marine Algae of Malaysia and their Applications : I.—Cyanophyta and Chlorophyta', by J. S. Zaneveld, 1949.

82. 'The Economic Marine Algae of Malaysia and their Applications: II.—The Phaeophyta,' by J. S. Zaneveld, 1949.

1.35. Taxonomy

The desirability that the names of economically important fishes be standardized was considered by Technical Committee I between the 1st and 2nd Sessions and the Council expressed the belief, at the latter Session, that priority should be given to the Clupeoids and Scombroids.

The Chairman of Technical Committee I during this period carried on considerable correspondence with the International Commission on Zoological Nomenclature, which believed that the indispensable first step was to draw up lists of the economically important fishes the names of which should be stabilized. The Council suggested that opinions might be invited from Member Governments as to the possibility of their naming institutions and individuals to draw up such lists.

At its 3rd Session, the Council recommended that Member Governments make available to the Taxonomy Sub-Committee identification keys of local common fishes, with vernacular names, and that the Sub-Committee should utilize these in the preparation of general field keys for the Council.

A special report to the 4th Session by the Sub-Committee further examined the proposal to submit to the International Commission suggestions for standardized names, and drew attention to the difficulties arising from the lack of workers in the region having time and facilities for taxonomic studies.

The Fisheries Division of FAO had in the meantime drawn up a check list of the Scombroids, and it was now believed that a similar list was urgently required for the Clupeoids. (Note: As a result of the Council's recommendations, Mr. R. Velappan Nair of India has published 'A Key to the Common Clupeoid Fishes of India', *J. Zool. Soc. of India*, June, 1953. A Check list of Indonesian Fishes, by W. H. Schuster and R. R. Djajadiredja was published by the Indonesian Government in 1952. Many other check lists are available.)

The Executive Committee was asked to take action for the preparation of a special handbook on the 15 most important groups of fishes. Dr. J. D. F. Hardenberg, at that time working in Indonesia, agreed to be the author of such a handbook and has drafted three chapters relating to the several groups. Dr. Hardenberg has since left his assignment in Indonesia.

At the 5th Session, the Council only briefly examined the question of taxonomy and reiterated the need for simple field keys. It was decided that each of the Panels of Technical Committee I would in future deal with the taxonomy of the groups with which it was concerned and that problems relating to taxonomy as a discipline would be referred to the Miscellaneous Fisheries Panel.

2. Technical Committee II (Technology)

2.1 Craft and Gear Panel (Chairman—Mr. M. J. Lobell—U.S.A.)

The programme of Committee II as regards Craft and Gear was, at the First Session (1949) stated to be 'increasing the efficiency of methods of fish capture by the adoption of up-to-date methods, including mechanization, modifying these wherever possible to conform with existing conditions', and 'the survey of fishing grounds for both demersal and pelagic fishing outside territorial waters'. As a result, the Committee was requested to investigate the extent to which surveys had been made and to report to the 2nd Session in respect of the following:

- (a) local boats and gear,
- (b) non-indigenous gear,
- (c) net efficiency and preservation.

At the 5th Session (1954), the above objectives were, for the next few years, expanded as follows:

1. Introduction and appraisal of mechanized fishing methods for small, indigenous craft.
2. Introduction and appraisal of non-indigenous gear.
3. Design of small fishing boats for the region.
4. Appraisal under fishing conditions of net and rope preservation methods.
5. Exploration for new shrimp resources.
6. Use and effect of fishing with lights.
7. Use of indigenous materials for nets and gear.

2.11 Catalogue of local fishing methods

The Committee reported, at the 2nd Session, that 'one of its activities had been the survey of local boats and gear', but no report was presented. The Council recommended that Member Governments should provide information on fishing methods and gear and that a suitably qualified person be selected to collate the data so obtained, which should then be published.

It was not, however, until the 3rd Session in 1951 that a group of three workers of the Philippines (Mr. A. F. Umali), the United Kingdom (Mr. T. W. Burdon) and Viet-Nam (Mr. Tran Van Tri) undertook to prepare this catalogue, and

it was recommended at the 4th Session that this work be continued, but that plans for a handbook on Gear Technology should be postponed.

The question of the taxonomic classification of fishing methods has received the attention of the Council and several alternative keys have been prepared. The Council resolved (at the 5th Session) that the work to-date should now be passed to the editor of the projected handbook on Gear Technology.

A 'classification of fishing boats' was at the 3rd Session delegated to a worker from the United Kingdom and this was presented at the 4th Session. Plans for a catalogue of fishing boats were dropped, brief descriptions of particular types of boats were to be included in the classification of gear.

2.12 Non-indigenous Gear

A questionnaire was prepared at the 2nd Session and circulated to governments, seeking information on the types of non-indigenous fishing gear which had been introduced. Member Governments were, moreover, requested to summarize for the 3rd Session, the results of research work on new materials for fishing gear. At the 3rd Session a formal resolution recommended that Member Governments who have carried out such projects should furnish the Secretariat at the earliest opportunity with full information.*

At the 3rd Session (1951) information had been received from three governments and one or two additional references have since been received. Two workers of the Philippines (Messrs. Manacop and Rasalan) undertook to collate this and the study is still awaited. Since it is known that a very large number of introductions of non-indigenous gear has recently been made in the territories of Member Governments of which the Council has no official record, the Committee believes that the above mentioned monograph, to be useful, should not be restricted to the limited information collected from only three Member Governments in 1951, and should emphasize the evaluation of the results.

2.13 Harbour Facilities

The Council at its 3rd Session adopted a resolution drawing attention to the problems created by the lack of proper harbour facilities for fishing craft and recommending action in connection with this problem.

2.14 Gear Preservation

At the 2nd Session, a questionnaire was developed on methods in use for the preservation

of gear. At the 3rd Session it was reported that replies had been received from five territories and that two workers in the Philippines had undertaken to collate this. At the 4th Session, replies were stated to have been received from North Borneo, Australia, India, Indonesia and Singapore. A bibliography of gear preservation was presented as Technical Paper No. 33.

At the 5th Session, further replies had been received from Australia, Cambodia, the twelve maritime States of India, East and West Pakistan and these were consolidated on pp. 98-101 of the Proceedings. It was recommended that Member Governments should now undertake experiments in order to arrive at conclusions as to the comparative effectiveness, under fishing conditions, of the methods described and their possible improvement.

Technical Papers dealt with by the Council in its proceedings on Gear Technology:

83. 'Marine Fisheries of Pakistan with a Review on Trawling', by M. R. Qureshi, 1952.
84. 'Indigenous Marine Fishing Gear of Thailand', by S. Charernphol, 1950.
85. 'Report on Non-indigenous Fishing Gear — Results of the 1st Series of Experiments in the Operation of "Masu Ami" (a common Japanese Trap Net) in Thai Waters', by S. Charernphol and T. Bamrajarinpai, 1950.
86. 'Indigenous Marine Fishing Gear of Thailand—Supplementary Note', by S. Charernphol, 1951.
- * 'La Pêches au Filet sur le Grand Lac du Cambodge' by B. Charpy, 1951.
- * 'Procédés de Pêche, au then des Vietnamiens', by Nguyen Luong Khuon, R. Serene and M. Morechand, 1951.
- * 'Frame Trawl Fishery of Laguna de Bay', by P. Manacop and Santiago Capco, 1951.
- * 'A Fish Corral Used in Philippine Waters', by S. B. Rasalan, 1951.
87. 'An Attempt at Classification of Fishing Methods', by C. J. Bottemanne, 1951.
88. 'A Consideration of the Classification of Fishing Gear and Methods', by T. W. Burdon, 1951.
89. 'The Experimental Introduction of Power Fishing Vessels within India and Ceylon', by K. Chidambaram, 1952.
90. 'A Proposed System for Cataloguing the Boats Used in the Fishing Industries of

* Un-numbered papers were not published in the Proceedings.

South and East Asia', by C. A. Gibson-Hill, 1952.

91. 'Fishing with Day Net in the Tonle-Sap (Cambodia)', by Sao-Leang and Dom-Saveun, 1952.
92. 'A Contribution to the Knowledge of Fishing Gear in Viet Nam', by Tran Van Tri and R. Serene, 1952.
93. 'The Efficacy of Some Net Preservatives on Cotton Twines', by J. I. Sulit and P. Panganiban, 1954.
94. 'The Classification of Fishing Gear and Methods in Japan', by S. Takayama, 1954.
95. 'Fishing Craft of East Pakistan', by N. Ahmad, 1954.
96. 'Fishing Craft and Tackle of Saurashtra', by K. R. Srivatsa, 1954.
97. 'Trawl Fishing in Indian Seas from 1948 to 1953', by K. Chidambaram, 1954.

2.2 Food Technology Panel (Chairman—Dr. J. Vickery—Australia)

A report was submitted by the Fisheries Technology Committee at the 1st Council Session (1949) suggesting (a) a survey of processing and handling industries keeping in mind possible mechanization and prevention of wastage, (b) gradual establishment of experimental and demonstration stations, and (c) gradual adoption of sanitary measures. As a result, the Council requested Tech. Committee II to investigate the extent to which surveys had been made of processing industries and to seek reports on canning, packaging, refrigeration and by-products.

In considering local processing methods, it was considered that some of these because they produce 'most unattractive products and involve considerable wastage', command a low price and have a small outlet. It was agreed to place this item on the Agenda for the 2nd Session.

At the 2nd Session (1950) two original papers and one contributed publication were presented from what was then French Indo-China, but the agenda item was only taken up by the Council at the 3rd Session (1951), at which two further papers were received from Cambodia, three from the Philippines and one on seaweed utilization from India. As a result, Technical Committee II agreed that 'through preliminary formulation by members of suggestions, the Committee at the next Session could then arrive at an agreement...' The Council did, however, recommend that Monsieur Lafont (France) be invited to prepare a 'classification scheme' which was presented at the 4th Session,

based on published material received from Member Governments, and that each Government designate a food technologist to collaborate in drafting suggestions for a hand-book.

Consideration of these matters at the 4th Session was limited to the observation that the Council's work in this subject relates chiefly to the project for preparing handbooks, and for technical instruction'. One paper was, however, presented by the Philippines on fermented fish products and one on seaweed utilization, and the Committee was asked to give attention to the seaweed industries. The Sub-Committee was to be the Council's liaison with the F.A.O. Committee on Fish Handling.

At the 5th Session, the Council expressed its disappointment that little progress had been made and that there were few food technologists present. It was believed that two publications on food technology should be prepared rather than one; the first, a handbook, dealing with the Principles of Fish Handling and Processing and the second, a special publication on the 'Best Methods of Fish Handling and Processing Suitable for the Region' and that the latter could be issued as a series of pamphlets on individual aspects.

The Panel would study, during the period between the 5th and 6th Sessions, improved methods of producing and storing dried fish and, in particular, methods suitable for use in humid or rainy weather.

Technical Papers presented on Food Technology:

98. 'The Problems of Fish Storage and Refrigeration in South East Asia', by W. B. Braxton, 1949.
- 'Experimental Canning of Fish at Estancia, Philippines', by C. Martin, 1949.
- 'Preliminary Report on Studies of Salted Fish Paste', by J. I. Sulit and S. B. Santiago, 1949.
- 'Vitamin A and Oil Content of some Philippine Fish Livers', by C. Butler, 1949.
99. 'An Experiment in Fish-salting', by J. Westenberg, 1950.
100. Fishery Products of Indo-China—a Compilation of Literature up to the Japanese Invasion', by J. Westenberg, 1950.
- 'Forme d'Utilization des Produits de la Pêche au Cambodge', by R. Lafont, 1950.
- 'Studies on the Salt Concentration of Dried and Smoked Fish', by V. Uyenco, P. Rodriguez and R. Taruc, 1951.

- 'Utilization of some Philippine Fisheries Products', by A. M. de Vera, 1951.
- 'Chemical Composition of Philippine Market Fishes', by J. I. Sulit *et al*, 1951.

101. 'Mechanics of *Bagoong* (Fish Paste) and *Patis* (Fish Sauce) Processing,' by U. Uyengco, I. Lawas, P. R. Briones and R. S. Taruc, 1952.
- 'Fish Processing Methods', by R. Lafont, 1952.
102. 'Situation de l'Industrie du Poisson Sec au Cambodge', by Dom-Saveun, 1954.
103. 'On the Food Value of Fish Sauces', by R. Lafont, 1954.
104. 'Fish Landings and the Refrigeration Industry in Japan', by S. Watari 1954.

Seaweeds.

105. 'Utilization of Seaweeds in India' by F. Thivy, 1951.
106. 'Utilization of some Philippine Seaweeds', by J. I. Sulit, O. B. Navarro, and R. C. San Juan, 1952.

2.3 Socio-economics and Statistics Panel (Chairman—Mr. D. W. Le Mare—U.K.)

2.31. Statistics.

Attention of Member Governments was drawn, at the 2nd Session, to the importance to their fishery departments of the availability of authentic, accurate information of the factors of production and distribution, and on the volume and composition of the catch as landed and in its marketable form and this was substantially repeated at the 3rd Session as Resolution 21.3(2).

It was recommended that a Fisheries Statistics Training Centre should be organized, that a statistical handbook for fisheries workers be prepared 'forthwith', and that Statistics should form a separate item on the Agenda of future Council Sessions.

A statistics working group consisting of Monsieur Royer (France), Mr. Burdon (U.K.), Mr. Sukhatme (India) and Dr. Kesteven (F.A.O.) met on several occasions and formulated valuable suggestions (pp. 39-40, 3rd Proceedings, pp. 77-79, 4th Proceedings).

In particular, the attention of Member Governments was drawn to the lack of fisheries statistics in many countries in the region and to the fact

that, even where figures were available, no information was given as to the methods employed; hence, not only was it not possible to arrive at standard methods of statistical collection, but also, as a result, the accuracy and comparability of the data were open to question. The obstacle to progress was the lack of trained personnel and Governments were recommended to set as an eventual objective the establishment of a complete statistical service in order that they should be placed in possession of current information on the condition of the industry.

The terms of reference of this working group were :

- (1) The study and development of the application of statistical methods to fisheries work and the use of sampling methods in particular.
- (2) The planning of a school in statistics.
- (3) Assistance in the preparation of a statistical handbook.
- (4) Preparation of a recommendation to Member Governments as to their minimum immediate requirements in statistics and the methods which might be employed in meeting those requirements.

The working group fulfilled each of these requirements and circulated to Governments prior to the 4th Session (1) a 'Draft Statement of the Statistical Programme', on which suggestions for improvement were invited, and (2) a questionnaire in the form of a check list requesting a detailed description of the organization of statistical services for fisheries in each country.

A new Sub-Committee on Statistics was constituted at the 4th Session (Rapporteur—Mr. A. Katamsi—Indonesia), to which the replies to the questionnaire received from Australia, Netherlands New Guinea and India were forwarded. No further report was received from this Sub-Committee, and the question of Statistics was not discussed by Technical Committee II at the 5th Session.

Following the Council's recommendation, a Fisheries Statistics Training Centre was conducted by F.A.O. in Bangkok in the latter part of 1952. Concern has been expressed that the Council has since its 4th Session given less attention than heretofore to Statistics. In view of the vital significance of the development and application of

* Resolution 20.3(2) of the 3rd Session also recommended that this group prepare a series of instructional pamphlets for biologists on statistical methods, and undertake the guidance of intensive pilot studies in India, Pakistan, Thailand, Viet Nam and the Philippines.

fisheries statistics to the proper understanding and management of the industry, the Council may wish to re-constitute the special Sub-Committee of experts to collate the information passed to the old Sub-Committee and to advise the Council further with regard to its statistical programme.

Technical Papers submitted to the Council on Statistical Methods:

- ‘Pilot Statistical Study of a Fishing Community in Thailand’, by W. Chindaprasert, 1951.
- 107. ‘A Survey of the Sea Fisheries of India’, by D. V. Bal and S. K. Banerji, 1951.
- ‘Fish Population Studies along the Malabar Coast’, by B. S. Bhimachar and G. Venkatraman, 1951.
- ‘Sample Survey for the Estimation of Total Catch of Fish on the Malabar Coast’, by P. V. Sukhatme and K. Chidambaram, 1951.
- ‘Sampling Methods used in Japan Fisheries Catch Statistics’, by T. Yamamoto, 1954.
- 108. ‘On the Inshore Fish Population of the Straits of Singapore’, by D. W. LeMare and Tham Ah Kow, 1951.

Numerous statistical publications have also been made available to the Council.

2.32. Socio-economics

At the 3rd Session, Committee II was requested ‘to survey the programmes in progress in the region in connection with the socio-economic conditions of the fishing industry and to consider whether recommendations may be made for the co-ordination and improvement of these programmes’. In Resolution 21.3(1), technical papers were invited on this subject and attention was recommended to the problem of indebtedness in the industry.

At the 4th Session, a Symposium on Socio-economics was held. Technical Committee II reported that it had not been able to carry out any work in this field but drew attention to several technical papers presented which might form a basis ‘for the vigorous development of the work in this field’. No further progress was reported at the 5th Session and it was decided that ‘the work assigned at the 4th Meeting..... be the continuing assignment of Panel C during the ensuing period.’

Papers presented to the Council on Socio-economics:

- 109. ‘An Outline of a Preliminary Survey into the Socio-economics of the Fishing Industry of Hong Kong’, by J. Cater, 1949.

- 110. ‘A Programme of Socio-economic Research for the Fisheries of South East Asia’, by G. L. Kesteven, 1949.
- ‘Outlook for Industrialization of the Philippine Fisheries’, by C. Martin and H. E. Warfel, 1950.
- ‘Sur l’Interêt des Co-operatives d’Achat et de Vente des Produits de Pêche’, by Dom-Saveun, 1951.
- ‘Indebtedness among Fishermen’, by K. N. Anantaraman, 1951.
- ‘Socio-economics’, by N. Ahmad, 1952.
- ‘Socio-economic Problems of the Fishing Industry in Uttar Pradesh (India)’, by D. S. Sonbaht, 1952.
- ‘A Summary of the Movement of Fishery Organization in Indonesia’, by C. M. Charidjie Kasuma, 1952.
- ‘Socio-economic Uplift of the Roak Fishermen in Allahabad District, Uttar Pradesh (India)’, by B. S. Kaushiva, 1952.
- ‘Investigations of Indebtedness in a Fishing Village in Madras State’, by K. N. Anantaraman, 1952.
- 111. ‘Note sur les Relations entre Employés et Patrons-pecheurs a Nha Trang (Viet Nam)’, by Tran Van Tri and Nguyen Chan, 1952.
- 112. ‘Campaign against Indebtedness among Fishermen of Bombay State’, by S. B. Setna, 1952.
- 113. ‘The Socio-economic Programme with Special reference to Conditions in the Indo-Pacific Region’, by G. L. Kesteven, 1952.
- 114. ‘Some Important Socio-economic Problems of the Fishery Industries of Japan’, by N. Oka, I. Konuma, K. Yamamoto and M. Abe, 1954.

2.33 Marketing and Distribution

The Council, at its 3rd Session, assigned the study of the fisheries trade to a working group of France (Monsieur Lafont), India (Mr. Ranganathan) and the U. K. (to be named); this assignment was repeated at the 4th Session. No report has been received to date from this working group.

Fish Marketing and Financing was specified as the subject for a Symposium at the 5th Session and several informative papers on marketing organizations were presented, on which only brief discussion was possible owing to the priority given to another Symposium held in connection with the same Meeting. However, the Council at this Session ‘recognized that priority in the Socio-economic field should be given to the improvement of marketing’ and that the initial effort should be

towards group formation (including co-operatives, with credit from Government, the latter withdrawing gradually as the industry is able to take over.

It was agreed that there had not been sufficient time for adequate discussion of the Symposium Papers, and papers were invited from Member Governments for presentation at the 6th Session on (a) advances in fish marketing and (b) development of consumer tastes.

A successful training centre was conducted in Hong Kong in July/August, 1954 with participation by workers from nearly all Member Governments.

Papers presented on Marketing and Distribution :

- (98) 'The Problems of Fish Storage and Refrigeration in South East Asia', by W. B. Braxton, 1949.
115. 'Fish Marketing in Batavia', by G. L. Kesteven, 1949.
'Fish Marketing', by E. J. F. Wood, 1950.
116. 'Problems of Fish Marketing in the State of Orissa', by G. N. Mitra, 1954.
117. 'A Note on Marketing and Preservation of Fish in Saurashtra', by K. R. Srivatsa, 1954.
118. 'Fish Marketing and Financing in Australia', by Commonwealth Fisheries Office, Sydney, Australia, 1954.
119. 'The Hong Kong Fish Marketing Scheme', by Department of Agriculture, Fisheries and Forestry, Hong Kong, 1954.
120. 'A Preliminary Report on Lanmadow Fresh Fish Market', by U Ba Kyaw, 1954.
121. 'Etude sur la Commercialisation des Produits de la Peche Maritime', by Tran Van Tri, 1954.

3. Fisheries Development Working Group (Chairman—Mr. M. J. Lobell—U. S. A.)

This Inter-Committee Working Group was constituted at the 5th Session and its report is awaited.

4. General Business

4.1. Survey of Institutions

This very early project of the Council (1st Session Res. 7(5), 2nd Session Res. 16, 4th Session Res. 14) has been completed and the Register is in the hands of the printers. It was agreed at the

2nd Session that the Register should be reviewed annually.

4.2. Register of Projects

This was to be prepared following the completion of the Register of Institutions. The Committee however believes that the Council may wish to clarify its ideas as to the function of this register, the type of questionnaire to be circulated and the likely response from Member Governments.

4.3. Bibliographies

4.31 Sector Bibliographies

It was agreed, after study by a special Sub-Committee at the 2nd Session, that general bibliographies for each of the sectors (Western, Central, Other) were to be compiled by the Secretariat in the alphabetical order of the authors' names and indexed subject-wise, the indexes to be prepared by specialists. It was also suggested that the specialists should prepare a review of the more important papers.

A 'Bibliography of Fisheries of the Western Sector' containing some 2,300 references was prepared by the Secretariat and circulated in mimeographed form as Working Paper No. 7 at the 2nd Session with the object that Technical Committees might assist by proposing persons by whom the subsequent steps of the work might be undertaken.

The Executive Committee has on several occasions expressed its desire to comply with the Council's wishes that the Bibliography of the Western Sector be completed as planned and that those for the remaining Sectors be commenced and has requested that the Council determine to whom this work shall be allocated in view of the increasing obligations placed on the present secretariat staff.

Much supplementary material has become available—e. g. the bibliography for India for the period 1938—1950 accompanying Sub-Section III (Fish and Fisheries, by Dr. N. K. Panikkar) of the work 'Progress of Science in India—Section VII—Zoology' published by the National Institute of Sciences of India, New Delhi, which follows on H. S. Rao's bibliography in 'Progress of Zoology in India during the past twenty-five years' and in various subject bibliographies mentioned below.

The work entailed in compiling and printing the Western Sector bibliography and organizing those for the remaining Sectors, while at the present stage largely mechanical, would require the

whole-time services of a competent clerical assistant or librarian.

4.32 Current Bibliographies

It was the intention of the Council, as expressed in several Resolutions, that the Sector Bibliographies should be kept up to date (i.e. after 1951) by Current Bibliographies, the responsibility for which would lie with Member Governments through a panel of experts functioning in each country channeling its information to the Secretariat through a country Bibliographic Correspondent.

The Secretariat has no information regarding the formation or functioning of such panels of experts. Bibliographic Correspondents have, however, been named by all Member Governments who have furnished some information to the

Secretariat. This, supplemented by such references as may have come to the Secretariat's attention, has been printed in the Council's quarterly Current Affairs Bulletin and Occasional Papers.

4.33 Subject Bibliographies

There has at different times been considerable discussion regarding the status of subject bibliographies. At the 2nd Session, it was stated (Res. 15) that 'the Council will indicate from time to time the subjects in which work may be started in all sectors...', and that apart from the selected bibliographies appended to the Council's handbooks and other publications, these should be printed as library cards.

At the 3rd Session, the preparation of the following subject bibliographies was approved. The status of each is given :

<i>Subjects</i>			<i>Assigned to</i>	<i>Status</i>
(a) Plankton of the Western Sector (revised).	...	...	India.	Prepared by N. K. Panikkar. Issued on 1951 as Occasional Paper No. 51/3.
(b) <i>Chanos chanos</i>	...	...	Indonesia.	An annotated bibliography was prepared by W. H. Schuster. Issued as Occasional Paper No. 52/3 (1952). For an addendum prepared by the Subcommittee see pp. 71-72 of 5th Proceedings.
(c) Tuna Fisheries	...	...	U. S. A.	It was indicated that the existing bibliography by B. M. Simada published as Fish and Wildlife Service Bulletin No. 55 should be used.
(d) Hydrology	...	...	Australia.	Prepared by T. W. Burdon (U. K.). Circulated in 1952 as Occasional Paper No. 52/2.
(e) Fishing Gear	...	...	...	Prepared by K. Chidambaram.
(f) Fisheries Products and Processing	...	...	India.	...
(g) Marketing of Fisheries Products	...	...	...	Supplied at the 5th Session. Printed on p. 93 of Proceedings.
(h) Weed Control [4th Session Res. No. 24.3 (12)].	...	...	U. S. A.	By C. A. Gibson-Hill. Technical Paper No. 34 at 4th Session.
(i) Fishing Boats	...	...	...	Anon. Issued as Technical Paper No. 33 at 4th Session.
(j) Fishing Gear Preservatives	...	...	...	By T. V. R. Pillay, published in Journal of the Zoological Society of India, Vol. 3, No. 1, pp. 141-158; (1951).
(k) Fish Culture in India	...	...	...	By S. Jones, published in the Journal of the Zoological Society of India, Vol. 4 No. 1, pp. 89-99 (1952).
(l) Hilsa	...	...	...

At the 4th Session, however, a report was adopted in the sense that, in future, subject bibliographies should only be published if they are annotated and accompanied if possible by a review article, since, it was argued, if they were mere lists of references, they would duplicate the subject indexes to the sector and current bibliographies. The result, for the time being, having been a cessation of the bibliographic activities, the Council might now wish to reconsider this policy.

4.4 Handbooks

At its 3rd Session, the Council proposed to issue a series of handbooks [Res. 16 (1)].

The Secretariat was asked to undertake the

General Editorship (Dr. G. L. Kesteven personally undertook this function, at the request of the Executive Committee, on transfer to F.A.O. Headquarters, Rome, in 1952).

Each Member Government was requested to nominate one person to act on the General Editorial Committee on Handbooks (no nominations received). This Committee was to prepare the prospectuses and a panel of authors was to be established.

At the 4th Session, it was resolved that 'technical editors for the handbooks be found as soon as possible, that large-scale collection of data and detailed consideration of prospectuses be postponed until such editors are available' and

that the Secretariat should proceed with the preparation of a 'Handbook of Field Procedures'.

Special attention was given both at the 4th and 5th Sessions to the prospectuses on the volumes on Food Technology. In addition to the Handbook, a separate Special Publication would deal with processing and handling methods.

A synopsis of the Handbook on Field Methods was approved at the 5th Session and the preparation of the series of handbooks was placed in the hands of Dr. Kesteven for implementation over a period of several years.

The further report of the General Editor of Handbooks is now awaited.

4.5 Technical Assistance and Technical Instruction

4.51 Technical Assistance

The Council has at the last three Sessions studied at some length the F.A.O. programmes for Technical Assistance and Regional Training Centres and has made valuable suggestions of which cognizance has been taken by the Organization.

Queries have from time to time been raised at Council Sessions as to the apportionment of F.A.O. Technical Assistance experts to certain countries and not to others. As was explained in Occasional Paper No. 54/2 (1954), such assignments are only made at the direct request of Member Governments. While it is true that certain countries standing in urgent need of expert assistance from outside have not been able to obtain it, it has now been made clear in this and other documents that such requests for technical assistance in the field of fisheries has been given low priority by government co-ordinating agencies.

Also, it is axiomatic that high-level technical assistance is not likely to be profitable in countries which still lack an adequate staff of trained fisheries workers to assist the expert, absorb his instruction, implement his programmes and be fully capable of continuing the work at a comparable level on the completion of the expert's assignment.

4.52 Technical Instruction

The Chairman and Secretary were requested in Resolution 18 of the 3rd Session (a) to keep Member Governments informed as to training courses available and (b) to assist host governments in developing details of training courses undertaken in their territories.

This policy has been maintained in the case of training centres which have been organized by F.A.O. on the recommendations of the Council in Inland and Brackish-water Fish Culture (2 centres), Fisheries Statistics and Fish Marketing.

4.6 Co-operation

The Council has been represented at the Meetings of numerous international bodies and reciprocally, has had the opportunity of welcoming observers from these organizations at its Sessions. Several resolutions refer to these aspects.

4.7 Films

Resolution 17 at the 3rd Session requested Member Governments to provide the Secretariat with a list of fisheries films. Some information was received in 1952 and was made available at the 4th Session, together with a list of motion pictures in the film library of the U. S. Fish and Wildlife Service. A comprehensive list of films from all sources was prepared by F.A.O. Fisheries Division and produced as Working Paper No. 20 at the 4th Session. Further information on available films has appeared in the Council's Quarterly Bulletin. Administrative Correspondents have now (1955) been asked to supply supplementary lists of films on fisheries produced since 1951.

4.8 Miscellaneous Recommendations to Member Governments

The council has made numerous recommendations to its Member Governments in the course of its five Sessions. Those which are concerned with technical matters have been dealt with above under the respective headings. Those which are of a general nature are listed below:

2nd Session: 'Member Governments to keep the Secretariat informed each year (in January) of all technical fishery programmes being undertaken together with copies of statistical and other reports sent to F.A.O. Headquarters'. This information has not, in practice, been requested by the Secretariat at the commencement of each year, but just prior to the Council Sessions for incorporation in the report on the status of fisheries programmes and of the industry. The response has been fair. The reports could be more valuable if more information were given on actual developments in the fishery industries and consequent improvements in nutrition.

3rd Session: 'Member Governments to channel current fisheries information to the Secretariat, through administrative correspondents'. The Secretariat has developed a system whereby Administrative Correspondents are reminded of this obligation some time prior to the appearance of each *Current Affairs Bulletin*. While information has been received fairly

regularly from some correspondents, others have not replied.

Member Governments to initiate or develop the training of adequate fisheries personnel'. While there is little positive information as to the implementation of this resolution by Member Governments, it is evident that certain countries have adopted a definite programme for training at home and abroad, while others standing in urgent need of trained fisheries personnel have either neglected to do so or have not been able, for various reasons, to take full advantage of the services of such personnel on the completion of training.

Positive recommendations on fisheries development (which are contingent on the

formation of such administrative, research and development personnel) were adopted by the Council and appear on pp. 24-36 of the 3rd Session Proceedings.

Reference has been omitted to numerous Resolutions of the Council relating to purely procedural matters.

In addition to the above, many Resolutions relating to the organization of the Council's work, including the difficult problem of obtaining more effective and continuing contributions by the technical committees and sub-committees in the periods intervening between Sessions and the nature of technical papers contributed, are considered to be of such manifest importance to the future of the Council as to warrant special treatment in the final section of this Report (Part IV).

PART III—STATEMENTS OF MEMBER GOVERNMENTS

In accordance with the second requirement of the Council, Member Governments were requested, in a letter dated March 23, 1954, to make concise statements assessing the influence of the Council's work on the fisheries of each country, including an indication as to the most beneficial development of the Council's future activities. A reminder was sent to Administrative Correspondents on April 21, 1955.

Replies have been received from eight Member Governments, as follows:

Cambodia
Ceylon
India
Korea
Netherlands (for New Guinea)
Pakistan
Philippines
United Kingdom (for Malaya, Singapore & Hong Kong)

The text of these reports are attached as Appendix II. Replies have not (August, 1955) been received from the remaining eight Member Governments of the Council. (Replies were subsequently received from Australia, France, Indonesia, Japan, Thailand, U.S.A. and Vietnam.)

There is a general consensus (i.e. four or more Governments in each case) that the Council has had a strong influence in the constitution of government fisheries policies in the region and that its recommendations have generally played a significant role in:

- (a) promoting the establishment of increasingly effective fisheries departments charged

with promoting more efficient exploitation of the resources,

- (b) improved efficiency of government fisheries personnel through attendance at training centres,
- (c) dissemination of information within the region,
- (d) valuable personal contact between senior fisheries officers at Council Sessions and on-the-spot study of fishing methods and gear, processing, marketing and the problems of the host country. This has led to clearer thinking and close personal co-operation both during and after the Sessions which would not otherwise have been possible,
- (e) devising and co-ordinating policies.

Individual Member Governments stated that they have derived particular benefit from the Council's programmes in fish distribution and marketing, processing methods, and fish culture, especially in respect of the growing facilities for the exchange of cultivable species both intra-regional and inter-regional.

It was further suggested that Member Governments might make statements regarding the future development of the Council's activities, and in this connection only two suggestions have been put forward by several governments in common. One is that the Council's work should have a more effective bearing on the development of the fishing industry with emphasis on projects which might be expected to give quick results.

One Government believed that the factors most likely to achieve this aim are : technical assistance ; technical instruction ; handbooks and other information on fish handling, processing and storing, and on the most suitable small craft, including mechanization. Another expressed the belief that long range research on the availability of fish stocks and the productivity of the sea should not be the concern of the Council.

In this connection, one particularly valuable criticism, while expressing satisfaction at the progress made in respect of fish culture and food processing, records the belief that the Council should increase its efforts in the socio-economic field with a view to obtaining the effective improvement of the low status of fishermen in some countries in the Region, for which concrete recommendations are still lacking ; to improve primitive and unsanitary marketing conditions ; and to continue the Council's valuable earlier work on statistical programmes which, it was

felt, had lapsed. It was moreover felt that there should be a wider exchange of information on capture methods and finally it was recommended 'that a full-time group of internationally recognized authorities in each field should be created to direct and improve the fishery industries in each of the member countries '

The other suggestion which received wide support (three governments) was for the encouragement of joint action by neighbouring countries in respect of programmes which are of concern to more than one government (tuna, hilsa, rastrelliger, sardine, shrimps, oceanography etc.), one expression of this requirement being for the 'stimulation and co-ordination of selected investigations by territories according to regional needs'.

One government expressed the desire to see an expansion of the Secretariat staff to include specialists to advise on such subjects as fish culture and fish marketing.

PART IV—ORGANIZATION OF COUNCIL WORK

The Council's Objectives

The tasks of the Council as laid down in its Constitution are : to identify the problems of development and proper utilization of the living aquatic resources ; to encourage and co-ordinate the application of improved methods ; to encourage and co-ordinate research ; to recommend and where appropriate undertake co-operative projects ; to recommend measures for standardization ; to assist Member Governments to locate equipment ; and to report on problems recommended to it for study.

The Council's Agencies

The organs of the Council for the performance of these tasks are :

- (a) The Council in Session
- (b) The Chairman and the Executive Committee
- (c) The Secretariat
- (d) The Technical Committees

Items (a), (b) & (c) merely form the administrative machinery which collectively identifies the problems, agrees on the priority in which they should be attacked, specifies the manner in which knowledge may be most readily acquired, receives and co-ordinates the results, thereupon making specific recommendations to governments regarding the solution of the problems, and establishes new targets.

It will be seen that a process is thus established, of which the raw material is information and that the resulting product is contingent on the quantity

and quality of the stuff which is fed to the Council machine.

This raw material, the result of enquiry and research, can only be made available through the continuing work of large numbers of individuals in the territories throughout the region working simultaneously on the common problems.

Member Governments of the Council have agreed to assign workers in their national institutions to collect the results of current investigations on the specified problems and make them available to the Council through established channels.

These channels are the Council's Technical Committees (d) upon the proper functioning of which the value of the Council's work will depend.

Committee Work

Notwithstanding the analyses of the Council's work made at the 4th Session (Proc. pp. 49-52) and the 5th Session (Proc. pp. 42-45) it has again become apparent during the period between the 5th and 6th Sessions that the Technical Committees have worked at varying levels of efficiency. These observations to which there is little that is new to be added, are recommended for re-reading, so that the Council may now, on the basis of the information provided in the preceding Sections of this report, itself make a critical review of the status of its pending resolutions and give its attention to the unanswered doubts and queries in regard to the functioning of the Council's working groups to

which end some additional remarks are appended below.

The Council has, at several of its Sessions, expressed the wish to avoid the proliferation of Sub-Committees. This has resulted in an attempt to work through six panels only, in the hope that the committee work would in this way become effective.

At the same time, experience over the past year shows that, where one of these panels is expected to deal with many aspects, some or all of them are likely to be neglected. This is especially true of the Miscellaneous Fisheries Panel of Committee I, the Socio-economics and Statistics Panel of Committee II, and to a smaller extent the Sea Fisheries and Inland Fisheries Panels which have, respectively, constituted Sub-Committees for Rastrelliger, Chanos and Hilsa.

This appears to confirm the wisdom of the Council's original plan whereby the six panels would function only at the Council Sessions as a convenient way of despatching business on several subjects each represented at the Session by a very small number of specialists, whereas the actual continuing work would continue to be done by Sub-Committees.

As in all parliamentary bodies whether they actually meet or not, effective work depends almost exclusively on good organization and it is strongly recommended that the Council's best interests can only be served if workers proposed as Chairmen or Rapporteurs only accept such nomination if they are able and willing to undertake the rather exacting tasks of group leadership.

Personal enquiries by the Secretary as to the failure of some committee members to perform the tasks allotted to them has often elicited the reply that workers 'are fully engaged on their own programmes'. While the heavy workload devolving on understaffed fisheries institutions throughout the Far East is fully appreciated, it is submitted that this statement reflects a misconception of the Council's function.

The Council's Worksheet

So long as the Council is considered by individual workers as an extraneous body demanding work which is unrelated to country programmes and is therefore a nuisance, the Council will to that extent fail in its objectives. It is therefore submitted that delegates of Member Governments should only cast a vote in favour of new items on the Council's worksheet when it is clear that at least some Member Governments are in a position to contribute effectively to that item through the assignment of work to individuals authorized to devote a

substantial part of their time to it in the course of their official duties.

If the item is one in which a majority of the fisheries departments of governments represented at the Session subsequently express a lack of interest, this would constitute grounds for the belief that the Council should have declined to adopt the item into its worksheet in the first place or have postponed its consideration for a subsequent Session.

This does not mean that the adoption of any item must be contingent on the ability of every Member Government without exception to embark on the necessary programme of investigation, since it is known that in some countries fisheries administration is still in its infancy; it does mean that delegates have a right and responsibility to express critical opinion as to the general practicability of a measure, or to qualify a supporting vote with the statement that while the government is interested, it is presently unable to engage in the work.

In these circumstances it may be assumed that when a line of action is adopted by the Council, a majority of Member Governments are already interested in the results and will therefore integrate it into their own programmes, if they have not already done so. It should also be safe to assume that the results of the work so assigned will be made available to the Council through the established channels at least three months prior to the next Council Session.

In this connection, attention is invited to the view accepted at the 1st Session, that the basic structure of the Council's biological and hydrological programme must be related to national projects of research and development for which the Council would propose measures of co-ordination and integration aimed at ensuring that, wherever possible, the projects are complementary to one another and yield a maximum amount of information of common value from the existing resources of personnel and equipment.

Committee Reports

A note should perhaps be interpolated here as to the nature of the information which the members of Sub-Committee should submit to their Chairmen. They should report concisely on the local aspects of the particular problems assigned to the Committee; the measures which have been adopted to solve those problems; the degree of success or, in the case of failure the reasons therefor; and suggestions for the continuation of the work.

The lengthy exposition of information which is extraneous to the specific task allotted should be avoided but important items may be mentioned

briefly at the end as suggestions for future committee activities.

A distinction must here be made between (A) the reports of the Technical Committees on the progress made during the year on the Committee assignments and (B) those of the Technical Committees *at the Session*. The objects of these two types of reports are quite different and should not be confused.

Type (A) reports will constitute a rather complete review of the work performed in the region, the new knowledge available and the results achieved on each subject assigned for the attention of either of the two Technical Committees. They may be maintained at manageable size by reference to technical papers prepared by specialists for presentation at the Session in accordance with the criterion suggested elsewhere in his report. Such reference should mention the conclusions arrived at insofar as they are cogent to the programme and, while brief, should avoid sending the reader to the papers themselves. Confusing references to papers by the numbers assigned to them at the Session should be avoided. As mentioned elsewhere, Type (A) reports may also make reference to conclusions reached in published works which throw light on the subject dealt with.

The practice of the Technical Committee limiting itself to making a brief, non-committal statement and appending the Sub-Committee reports, to which other appendices and sub-appendices may be attached, is also confusing and should be avoided.

Type (A) reports will be accepted by the Council but *not* adopted.

Type (B) committee reports fall into a different category. Their principal and perhaps sole object is that they should form an integral part of the final report of the Council Session with as little rearrangement as possible by the Secretariat. They will, therefore, be based on the information made available to the Council at the Session through the type (A) reports, related Technical Papers and such new information as may come to light during the Session. Against this background, the Committee will prepare, at the Meeting, a report which will be limited to a brief reference to the information made available to it, an equally brief appraisal of the results achieved, its consequent recommendations to Member Governments as to the precise action required and, finally, recommendations to the Council itself as to further action along the same lines or the inclusion of new items of work for the subsequent period.

Type (B) reports prepared at the Council Session should therefore consist of a series of numbered

paragraphs each containing some cogent idea connected with the Council's work programme. In them, the Committee may recommend to the Council specific Resolutions, although such action is not essential because the adoption by the Council of a type (B) report converts the Committee's recommendation into an act of the Council. The proposal of specially worded Resolutions by the Committee has, however, the advantage that these may be individually re-affirmed by the vote of the Council on each Resolution.

Type (B) reports are therefore for adoption by the Council subject to amendments, which may be made by the Council itself at a plenary meeting or by reference back to the Committee.

The first drafts of sections of type (B) Committee reports will presumably be prepared in the first place by the competent Panels and approved at a full Committee Meeting. It is suggested that where such drafts obviously concern other panels, they be referred to such other panels for comment and return before being submitted to the full Committee Meeting.

Committees and panels should, when preparing these reports, avoid the danger of becoming sidetracked into generalities and should endeavour to confine themselves to the Council's assignments except insofar as they may have important suggestions of their own to make to the Council as to new business.

The report of the Executive Committee to the Session is for acceptance rather than adoption, and any suggestions made therein for action should therefore be specifically confirmed by the Council.

Technical Papers

In order that the Council may, in the short time at its disposal at Sessions, concentrate on the problems in hand, it is suggested that the object of technical papers submitted to the Council should be to elucidate the problems which have been specified as the objects of research during the period, although they may deal with matters which have been raised at any previous Session of the Council which have not been disposed of and are of a continuing nature.

Conversely, it should be accepted that the object of the Council in inviting technical papers is not, at this stage, the publication of a journal on miscellaneous fisheries subjects. Attention is drawn to the Council's views on the subject of technical contributions recorded on page 50 of the 4th *Proceedings* and particularly to the belief that the preponderance of purely descriptive papers and the lack of more advanced analytical papers concerned

with the identification of the problems are not conducive to the achievement of the Council's objects.

Assuming the adoption of this criterion, a technical paper will endeavour to give as complete an exposition of the existing knowledge on the particular aspect dealt with as may be conveniently possible, including reference to information contained in published works, on the assumption that the Council has neither access to these works, nor the time to review them in Session. A reference bibliography should also be appended.

Since the technical papers submitted will thus deal almost exclusively with matters specifically assigned to the Committees, they will, in fact, be an extension of and form a background to the Committee reports. They should be compiled with the full knowledge and, as necessary, in consultation with the competent working group, and they will often reflect the results of Council research in more detailed fashion than is possible in the Committees' concise reports.

An effort should therefore be made not only to keep the Chairman of the respective Technical Committee and Sub-Committee informed as to the object of the paper but also to complete the paper for transmission to the Chairman and if possible the members of the competent working group at least four months before the Council Session so that reference to the substantial results may be made in the main Committee report.

This distribution will be facilitated if the paper is prepared in the form of a stencil, which practice has been common in the past but has been recently neglected. The stencil and one copy should at the same time be sent to the Secretariat. This will also have the effect of relieving the small Secretariat staff of the task of cutting several hundred pages of stencils, for which it is insufficiently equipped.

Technical papers may be submitted in either of the two official languages of the Council, English or French and a separate abstract in English should be prepared.

The preparation of the stencil presupposes that the paper will have been previously edited. While it is fully appreciated that only a minority of the countries in the region have English or French as an internal working language, it is believed that facilities exist in most countries for proper screening.

Attention is called to the 'Note to Authors' given on the back cover of Sections II and III of the Proceedings of the 2nd Session, which should be adhered to.

Recommendations

1. That the functions of the Council's Technical Committees, Panels and Sub-Committees be again examined. The duties of members of Technical Committees I and II between Sessions as defined at the 2nd Session should be clarified.

2. That action on Council decisions at Sub-Committee level should be the responsibility of Member Governments rather than of individuals. Delegates should be encouraged to communicate the extent to which accepted items will be integrated into national programmes.

3. That Member Governments of which the fisheries agencies are still inadequately staffed for the carrying out of fisheries research and development work, be once again encouraged to provide for the training and engagement of competent personnel.

4. That the work of each Sub-Committee be concentrated on one aspect during each period, which should then be the subject of extensive research by as many of the most competent government agencies as may be necessary. The aspect should be formulated as a problem to which Member Governments seek a solution and not as a general subject. Specific headings in the form of a questionnaire should be prepared at the Session as a general guide.

5. That the number of items assigned to Committees (and therefore the number of Sub-Committees) be restricted to those commonly accepted by delegates as being of vital importance to fisheries development. Items as to the immediate interest of which there is not substantial agreement should be deferred.

6. That the task of the Sub-Committee members assigned by governments to this work as a part of their official duties should be not only their own intensive work on the problem including the analysis of published material, but also information on that performed by other government laboratories and agencies.

7. That the individual reports of the Sub-Committee members be compiled into one co-ordinated document by the Sub-Committee Chairman in a form suitable for inclusion in the body of the report of the respective Technical Committee on the work performed between Sessions.

8. That technical papers should be principally directed towards the elucidation of the items under study by the Sub-Committees. Merely descriptive papers are still necessary where information is lacking but there should be increasing emphasis on the formulation and analysis of existing problems,

methods of investigation and reviews of the status of knowledge on a particular subject.

9. That at the 6th Session the unfinished portions of the existing assignments set out earlier in this report be re-examined in the light of the above criteria.

10. It has been suggested by some Member Governments that as the increasing administrative load on the Secretariat permits only a minimum of intervention in and guidance of the work of the Technical Committees, experts should be attached to the Bangkok staff for this purpose. Consideration should now be given to the financial implications of the employment of such experts and of the incidental clerical assistance which would not only be necessary in these circumstances but the lack of which has now been felt for some time.

11. The work performed in accordance with the Council's recommendations can only be properly

and intelligently co-ordinated if all the material, including technical papers, is submitted well in advance of the Council Session. Again during the current period, with few exceptions little attention has been paid to the deadline established by the Council with this end in view. Only if the individual workers assigned by Member Governments perform their tasks promptly and conscientiously, can the Council have before it an orderly array of information as the basis for the proper discharge of its constitutional functions.

Failing this, the Council, while no doubt performing a relatively useful role, will only discharge a fraction of the international task of which it is capable, as envisaged in the Baguio Agreement.

12. Finally, notwithstanding the unavoidable length of this report, it is to be hoped that the Council will find it possible to arrive at constructive conclusions with a minimum of detriment to its technical discussions.

APPENDIX I—SUMMARY OF RESOLUTIONS

<i>Session</i>	<i>Page</i>	<i>Nature of Resolution</i>	<i>Status</i>
INLAND FISHERIES			
1	20	Collection by Committee I of information on fish culture.	General directive, no deadline.
3	12-13	Committee I to survey cultural practices and programmes and propose measures for improvement.	ibid.
3	13	Recommends government programmes for fish culture.	No report but many governments proceeding along these lines.
2	16	Control of exotic introductions. Report to Secretariat on all new introductions.	Few reports received.
3	13	Committee I to receive and analyze information on control of noxious weeds and prepare a handbook.	Reported that work was proceeding in India and the Philippines (p. 71, 4th Proceedings) but no real control measures available. No handbook.
4	17	U.S. to furnish bibliography on weed control.	Furnished (p. 96, 5th Proc.).
3	13	Governments to furnish information on pollution of waters. Committee I to codify information.	
4	17-18	Ibid.	Much information received, analyzed (pp. 61-66, 5th Proc.).
5	17	Governments to explore and report on actual extent of damage.	Awaited.
4	18	Governments to report on investigations of fish food organism.	No reports from governments. Paper on feeding of fishes invited for 6th Session.
4	18	Governments to report on densities and combinations of fish species.	Information at varying levels from seven countries analyzed (pp. 66-67, 5th Proc.).
5	9	Optimum combinations of compatible species to be a continuing assignment.	
4	18	Questionnaire on fish fry exchange.	Many replies received. Analysis by Secretariat passed to Committee I. Secretariat awaits indents from interested governments.
4	18	Acreage of cultivable waters.	Completed (p. 40, 3rd Proc., p. 68, 4th Proc.).
5	8/17	Calls attention of governments to fishery problems arising from water impoundment.	Action by governments not known. Secretariat contributed chapter to publication of Flood Control Bureau of ECAFE.
5	9	Introduction of Tilapia.	Recommendation made.
4	18	Co-operative Hilsa programme recommended. Small regional unit recommended. Technical Assistance to be considered.	The Hilsa Committee met in 1952 and accumulated much information and again in 1955. Committee I will report.
4	16	Governments to exchange information on Chanos.	No report as to exchange of information. Information supplied to FAO (p. 82, 4th Proc.).
5	11	Biology and pond culture of Chanos to be studied by Committee. Governments to state if technical assistance desired.	Report and technical papers awaited from Sub-Committee. No information on technical assistance.
SEA FISHERIES			
1	19	Committee I to assess Tuna Research.	Continuing assignment. Committee agreed to concentrate on requests for morphometric data.
3	13	Governments to supply morphometric data on Tuna.	Data used by Dr. Royce (U.S.) in technical papers.
4	16	Certain governments to supply morphometric data.	Data supplied.
4	16	Governments to supply information on ecology of Tuna.	Data supplied.
5	11	Tuna morphology, ecology and exploration to be a continuing assignment.	
1	19-20	Committee I to assess research on certain other marine groups.	No information.

Session	Page	Nature of Resolution	Status
SEA FISHERIES—(Contd.)			
3	13-14	Governments to report on programmes on sardines and mackerel.	Considerable information received and reported on by Committee (pp. 72-76, 5th Proc.)
4	17	Questionnaire of sardine and mackerel issued. Recommends governments request technical assistance.	" "
5	12-74	Efforts to be concentrated on Rastrelliger mackerel. Rastrelliger Sub-Committee formed. Detailed recommendations made regarding programme (p. 74).	Committee Report awaited.
MISCELLANEOUS FISHERIES			
2	16-17	Hydrology data to be sought by governments from commercial and on-shore vessels. Secretariat, if possible, to collate.	Limited information received from one or two vessels. Not sufficient to collate and Secretariat not equipped for this. Information passed to Sub-Committee. Tabulation and charting left in abeyance by Sub-Committee (pp. 53 & 57-59, 4th Proc.).
		Secretariat to locate sources of supply of instruments.	Sources located.
3	11	Repeats above (2/16-17)	
3	11	Paper on Japanese <i>Hydrographic</i> work to be circulated.	Circulated.
3	11	Governments to study estuarine <i>hydrology</i> .	
4	15-16	Collection of <i>hydrology</i> data should be accelerated in Central Zone.	'It was found difficult to obtain a fully documented account of hydrological programmes' (p. 15, 4th Proc.). Mr. Veen has now retired from Indonesia.
		Indonesian Government to be asked to allow Mr. Veen to survey existing oceanographic stations, contact shipping lines and collate data in monthly charts.	
4	8	Council's interest in <i>oceanography</i> Symposium of 8th Pacific Science Congress in Manila.	Attended by Executive Committee and others.
4	14-15	Study of <i>Oceanographic</i> Institute. Governments urged to strengthen <i>oceanography</i> programme to the point where useful in production of food.	Institute project in abeyance. Little information.
		Reduction of data, documentation and consultative service, co-ordination and standardization on an international basis. FAO to be consulted on availability of technical assistance funds.	Pending.
		Committee I to examine and report at 5th Session on need for <i>Oceanographic</i> collaboration by (i) direct contact between institutions (ii) an international institution, (iii) appointment of oceanographic personnel attached to the Secretariat.	No Technical Assistance funds immediately available.
		Liaison to be maintained with UNESCO.	Report to 5th Session did not specifically examine these points. UNESCO is considering appointment of an oceanographer in the region.
5	13	Governments urged to publish <i>hydrology</i> data and apprise Council.	Maintained. One list published (Indonesia). (Secretariat Note: It is believed that such data, if sufficiently abundant to be useful, could [because of its bulk] only be profitably published after reduction).
3	12	Governments to furnish full information on <i>plankton</i> investigations. Sub-Committee to compile and make suggestions.	A rather full report presented on basis of limited information received (pp. 54-55 & 67-70, 4th Proc.), including valuable notes on the purpose of plankton investigations with emphasis on indicator species.
4	15-16	Dr. Vaas (freshwater) and Mr. Esguerra (marine) to continue correspondence on <i>plankton</i> and report at 5th Session on standardization and suitable programmes.	Correspondence continued, results reported (pp. 20-23 & 83-92, 5th Proc.), supplemented by 5th Session Symposium. Voluminous and reiterated recommendations on standard methods and means for consultation are now available for government plankton workers to follow. Council should now follow the <i>results</i> .

Session	Page	Nature of Resolution	Status
MISCELLANEOUS FISHERIES (Contd.)			
4	13	<i>Plankton</i> Symposium at 5th Session.	Held.
3	14	Information sought on manufacture of <i>Seaweed</i> products. Taxonomic studies of <i>Gracillaria</i> and <i>Hypnea</i> .	Workers referred to standard publications (see Committee II). No studies in progress. Information was given on Japanese workers (pp. 32-33, 3rd Proc.). Completed, with printers.
4	16	Mr. Zaneveld (Netherlands) to prepare monograph on <i>seaweed</i> .	
4	16-17	Governments to report on methods of <i>seaweed</i> survey. FAO to direct similar enquiries outside the region.	Information gathered from two countries, others state no investigations. The basic information on survey methods is thus available to governments, and economic outcome should now be interest of Council, including processing angle (Committee II).
4	16	One minor fishery to be taken each year. <i>Prawns and Shrimps</i> chosen for current period.	Two papers at 5th Session.
5	13	Work to continue on Prawn and Shrimps and Symposium to be held at 6th Session.	Symposium arranged.
1	14	Committee I to discuss standardization of <i>taxonomy</i> with International Commission for Zoological Nomenclature.	Chairman of Committee had correspondence (2nd Proc., p. 18). No concrete action taken by Council.
3	13	Committee I to continue discussions with ICZN.	
2	18	Committee I to determine priorities for <i>taxonomic</i> studies. Possibility of assigning subjects to country institutions to be discussed at next Session.	Clupeoids and Scombroids recommended for early study (ibid).
2	17	Governments recommended to undertake <i>Taxonomic</i> research on seaweeds. Hardenberg and Durand to be assisted in <i>classification</i> of <i>Rastrelliger</i> and <i>Pangasidae</i> .	Not known. Not known.
3	13	Governments to make available identification keys for preparation of general field keys.	Pending.
4	17	Field <i>keys</i> of common group to be prepared by competent workers with Standard List of English Names. Weber and de Beaufort's <i>names</i> recommended for fishes irrespective of later synonymies.	Not known. (Can this be scientifically justified? Sec.)
4	17	<i>Taxonomic</i> monograph on 15 important groups of fishes to be proceeded with.	Author (Dr. Hardenberg) has drafted 3 sections.
4	17	UNESCO to be contacted re: scholarships abroad in <i>Taxonomy</i> .	Recommendation passed to UNESCO.
5	13	Reiterates need for field keys.	No general keys made available for publication by Council. Many keys prepared for use of trained biologists, one however available as a basis.

CRAFT AND GEAR

1	20	Committee to investigate extent of <i>surveys</i> of local <i>boats</i> and <i>gear</i> for 2nd Session. Governments to make further surveys.	A standard form of description agreed at 2nd Session.
2	8	Questionnaire on gear preservation.	Sent. Data from 5 countries.
3	14/38	Philippines (Umali, Datingaling) to collate data.	No report.
3	14	Governments to inform on <i>gear preservation</i> and do research.	Research undertaken in Philippines and Indonesia. Two papers only received.
4	20	Governments once more asked to inform on <i>gear preservation</i> .	Data from several countries collated by Secretariat for 5th Session.
2	8	Questionnaire on <i>non-indigenous gear</i> .	Sent.
3	14	Governments to keep Secretariat informed on <i>non-indigenous gear</i> introduced.	Some response but not representative.

Session	Page	Nature of Resolution	Status
CRAFT AND GEAR—(Contd.)			
2	21	Governments to send working papers on research on <i>new</i> materials for gear. Person to be selected to collate the data on gear. Collected information on gear to be published.	No information received. No decision at 2nd Session.
3	14	Philippines (Umali), U.K. (Burdon) and Viet Nam (Tran Van Tri) to propose catalogue of gears. Governments to send data by August 1, 1951.	Plans for a handbook on Gear Technology postponed [4th Session Res. 25.1 (7)]. Several alternative 'classifications' received.
4	19	Philippines (Umali) and Viet Nam (Tran Van Tri) to continue work on gear classification.	Classification considered completed pending preparation of handbook (5th Session Res.).
3	14	Classification of fishing boats by U.K. (Gibson-Hill).	Completed.
4	20	FAO to be asked to supply <i>ETAP</i> Fisheries Engineers.	Requests from countries will be given favourable consideration.
3	16	Governments to improve approaches to fishery harbours.	Known that actions were taken by certain countries.
FOOD TECHNOLOGY			
1	20	Committee to explore surveys of processing industries. Quality standards to be considered at 2nd Session.	General directive. No action at 2nd Session.
3	15	Classification of food processing methods by France (M. Lafont). Governments to send published material by August 1, 1951.	
3	15	Each Government to designate a food technologist to draft suggestions for a handbook.	Some nominations made. No progress reported.
3	14	Certain governments to supply information on processing.	This information stated to be 'classified'. Council referred to standard works (4th Proc. p. 56).
5	14	Two handbooks to be prepared.	Referred to General Editor.
5	14	Committee to study preservation in humid, tropical climate.	Technical papers awaited at 6th Session.
SOCIO-ECONOMICS, MARKETING, STATISTICS			
2	21	Governments urged to collect accurate statistics.	
3	15-16	Ibid.	
2	21	India, Indo-China and U.K. to meet and formulate scheme for guidance of governments.	Met several times and valuable recommendations made (3rd Proc., pp. 39-41, 4th Proc., pp. 77-79). Singapore survey cited as a model (Contributed Publication No. 29, 4th Session).
3	16	<i>Statistics</i> training course approved.	Held, Bangkok, 1952.
3	16	<i>Statistics</i> to form a separate item on future agenda.	Item included.
3	12	<i>Statistics</i> group (France, U.K., India, FAO) to prepare pamphlets on statistical study of fisheries phenomena. Intensive pilot studies to be commenced in India, Pakistan, Thailand, Viet Nam, and Philippines.	Not received. No information.
2	21	Use of <i>Metric System</i> recommended.	
3	15	Trade survey by France (Lafont) India (Ranganathan) & U.K.	No report received.
4	19	Same group to advise FAO Fisheries Division on Trade statistics.	No report. Reference made to data in FAO Statistical Yearbook (4th Proc., p. 19).
3	15	Governments to submit papers on <i>Socio-economic</i> problems and indebtedness. Committee to submit proposals at 4th Session.	Several papers submitted. No submission by Committee (4th Proc., p. 76). Papers will furnish basis for vigorous development of this work. Development awaited.
4	20	Committee to concentrate on improvements in marketing.	Symposium at 5th Session. Further papers invited for full discussion at 6th Session. Awaited.

<i>Session</i>	<i>Page</i>	<i>Nature of Resolution</i>	<i>Status</i>
SOCIO-ECONOMICS, MARKETING, STATISTICS—(contd.)			
4	20	Contact FAO on <i>Marketing</i> specialist.	Replied. More specific request from governments would receive favourable consideration.
4	13	Fish <i>marketing</i> training centre.	Held, Hong Kong 1954.
5	102	Priority to improvements in <i>marketing</i> including co-operatives. Government credit to be gradually withdrawn.	Results awaited at 6th Session.

FISHERIES DEVELOPMENT

5	15	Inter-Committee Working Group for Fisheries Development constituted (Australia, Netherlands, France, India, U.K. and U.S.)	Chairman (U.S.) advised on Feb. 24, 1954. Report awaited.
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GENERAL

1	15/34	Terms of reference laid down for Council's Committees.	—
2	6	Constitution of Committees. Persons likely to be delegates at next Session to serve. Committee members recognised as correspondents for liaison with technical workers.	Member Governments advised.
2	8	Council to establish project priorities.	—
2	8/9	Collaboration with South Pacific Commission.	—
2	9/37	Bibliographic programme.	See Working Paper 2-A.
		Register of Institutions.	In press.
1	14	Survey of Institutions etc.	"
2	9/37	" "	"
4	9	" "	"
3	9	Handbooks.	Prospectus only.
2	22	Governments to keep Secretariat informed in January of each year of all technical fishery programmes and progress thereon together with names of workers.	Some Governments inform Secretariat prior to each meeting on important projects. Others have failed to report. Names of workers have not been communicated.
3	10	Current news to be channeled through the Secretariat.	See Current Affairs Bulletin. Information not consistently channeled to Secretariat and only in reply to specific requests.
3	17	Regionalization.	Dropped at 4th Session.
3	8	Bibliographies.	"
3	9	Handbooks.	"
3	10	Governments to emphasize training of personnel.	Many governments have organized such courses. FAO has organized regional centres on Council recommendations.
3	16	Secretariat to assist governments in obtaining equipment.	Advice given as required.
3	16/17	Rules for presentation of technical papers.	Authors do not as a rule observe these rules.
5	7	Rules for scope of technical papers.	" "
4	8	UNESCO correspondents.	Nominated.
5	7	Recommends increased scope of technical assistance, joint request for technical aid and attachment of specialists to Regional Office staff.	Scope is increasing. No joint requests yet received (see Hilsa project in which Pakistan might join with India). Request communicated to FAO but it has not yet been possible to attach specialists to staff, for financial reasons.

APPENDIX II

STATEMENTS BY MEMBER GOVERNMENTS

STATEMENT OF THE AUSTRALIAN GOVERNMENT

The various organisations connected with fisheries in Australia have indicated that although the IPFC has had little direct influence on Australian fisheries the scientific meetings of the Council have been a valuable factor in emphasising the possibilities of our warmer estuaries and lagoons. The exchange of expert views has provided perhaps the most useful contribution from an Australian point of view. In addition, the publications of the Council over a wide field of general fisheries have been of considerable benefit.

Work of IPFC and Australian Territories

Influence of IPFC on Australian Territories.

It cannot be said that the Indo-Pacific Fisheries Council up to the present time has had any appreciable effect on the Fisheries of the Territory of Papua and New Guinea. Results of work given in some papers published by the Council, however, if put to practical use in the Territory, may in a few years completely change the way of life of a large proportion of the native population. The activities of the Council have stimulated interest in the Indo-Pacific region on a considerable scale but only those countries with an established controlled fishery have benefited in a practical manner.

Until a plan of fishery development in New Guinea is in operation, it is not possible to state specifically what lines of development of the Council's future activities will be most beneficial, but broadly the needs in New Guinea are:

- Sea Fisheries:*
- (a) Providing assistance (not always financial) in procuring gear, such as nets, cordage, etc.
 - (b) Technical instruction on methods of preserving fish on a large scale by salting, drying and smoking, and developing methods of distribution.
 - (c) Increase in vessel size and mechanization of part of the fishing fleet.
 - (d) Development of a mobile refrigerator to carry from several hundred pounds to one ton fish.

Fresh Water Fisheries: In the highlands, the introduction under expert supervision of fish and

suitable food organisms, could in a few years, provide a large supply of fish for both natives and Europeans.

At only a short distance from the coast, there is practically no trade in fish and difficulties in transport preclude any appreciable development for many years. Low level ponds could be profitably constructed inland some distance from rivers.

If fish production can be demonstrated in numerous small ponds, it is probable that natives on their own initiative will take up the work. Lack of development in fisheries in many places is because of local customs which will not change until there is a completely new development such as pond culture which only indirectly affects established customs.

WORK OF IPFC AND AUSTRALIA

In some minor respects, the work of IPFC is being used in Australia. For example, the work on Tilapia has created interest, because of a demand for suitable fish for stocking inland ponds.

As the population of Australia is mainly in the southern (temperate climate) latitudes, and most Australian fisheries are concentrated in the same latitudes, much of the present work of IPFC can have little influence on these fisheries. But as development of northern (tropical) waters progresses, there are certain problems which might be encountered. In this respect, work on tuna in tropical and sub-tropical latitudes might bring direct benefit to Australia's fisheries.

As regards suggestions as to the lines along which the development of the Council's future activities would be most beneficial, it is felt that no suggestion designed specially to benefit Australian fisheries should be made at this stage.

As previously mentioned, Australia is interested in tuna stocks in the northern waters, exploratory operations are being planned for these species, and benefit could be drawn from reports of similar activities in other parts of the region. In general, though, it is felt that any suggestion emanating from Australia at present should have in view the benefit of the majority of countries in the area. In this regard the Australian viewpoint is that priority should be given to those activities which might be

expected to produce tangible results in the way of increased production in the short run.

While fully appreciating the value of long-range scientific work, it is felt that the Council's work should place greater emphasis on the practical side of fishing.

STATEMENT OF THE CAMBODIA GOVERNMENT

It must be stated that the work of the Indo-Pacific Fisheries Council has had a beneficial effect in our country. In fact, it is owing to the annual meetings of the Council that Cambodia has been enabled to bring together a very important documentation from which it has consistently profited, notwithstanding that its National Fisheries Service is still in the phase of organization. It is on the basis of the technical and scientific information so collected that we have successfully directed the organization of our Service towards future progress. Moreover, the advice and suggestions of the different Member States have enabled us to undertake several investigations previously untouched which will undoubtedly contribute to the gradual improvement of the exploitation of our aquatic resources.

STATEMENT OF THE CEYLON GOVERNMENT

It was apparent that until an adequate staff was available to carry out an integrated programme of fishery development, no significant measure of progress could be achieved. Particular attention was given to this problem in the early months of 1950 at the instance of the Ministry and Dr. Kesteven, Fisheries Representative of the FAO in South East Asia. These proposals were examined by the Government which accepted them almost in their entirety.

The re-organization of the Department has been directed towards effecting by governmental action, in a variety of ways, the complete re-organization of the fishing industry. The industry functions at a low level of efficiency, chiefly on account of the primitive methods followed in every operation, whether it is fishing, processing or marketing. It has been necessary that Government should introduce a degree of mechanization in capture and marketing methods, at the same time improving the standard of living of the fishermen and their families. In order to provide an administrative structure under which this progress might be achieved, the activities of the Department were apportioned under three divisions, viz. Administrative, Development and Research. The first deals, on the one hand, with all matters relating to administration, establishment,

accounts, legislation and its enforcement, registration, licensing and statistics, and on the other hand with the activities emanating from the welfare of the fishing population which specifically includes finance, insurance schemes, roads, settlement of disputes, fishermen's stores and the dissemination of knowledge and propaganda regarding progressive means of improving the industry. The Development division involves Co-operative organization and training and cultural operations in brackish and inland waters; on the secondary industrial side, it deals with all activities such as refrigeration, ice-making, processing and transport. The Research division deals with all types of research both pure and applied. The biology and hydrology branch will cover the bionomics and ecology of marine, brackish and fresh water fishes and their commercially important products and hydrographical, hydrological and biometric work; while the technology branch works on the problems of fish processing and preservation and the utilization of marine produce.

In accordance with the resolutions passed at the 3rd Session of the Indo-Pacific Fisheries Council on the survey of the research programme on pelagic fish stocks, an officer of the research division has been nominated to participate in the programme of international research on the species of *Rastrelliger*.

With the appointment of an Algologist to the Fisheries Department the study of the Genus *Gracilaria* has been taken up and results of investigations carried out reveal that extensive beds of *Gracilaria confervoides* and *Gracilaria lichenoides*, are available and that this material can produce Agar of good quality in commercial quantities, research work is being continued on methods of extraction and purification of raw material. This follows from resolution No. 10 of the 3rd Session of the Indo-Pacific Fisheries Council. Interested trade representatives have been informed of this work which has been published in the Ceylon Trade Journal.

The Statistical Officer, Mr. G. N. deSilva, attended a course of instruction at the Indo-Pacific Training School for Fishery Statistics at Bangkok. The techniques of collection of statistical information on many of the phases of the industry were touched upon with practical demonstrations. This should be followed up with further training courses, the aim being to make the statistical reports and the statistical collection systems uniform in the South East Asian Region, as suggested at the Fisheries Conference in New Delhi in 1948. Mr. C. Kandasamy, Divisional Fishery Inspector attended a training course in fish marketing sponsored by the Indo-Pacific Fisheries Council at Hong Kong in July, 1954.

DECLARATION DU GOUVERNEMENT FRANCAIS

Enfait le travail du Conseil Indo-Pacifique des Pêches n'a pas eu une très forte influence sur les pêches dans les territoires français. Cela tient surtout à ce que les territoires français situés dans la zone Indo-pacifique : les Etablissements Français d'Océanie et la Nouvelle Calédonie n'ont pas pu bénéficier jusqu'ici d'un effort considérable dans le développement des pêches de la part du gouvernement français car ce dernier a dû employer ces moyens à des actions plus urgentes dans ses territoires africains.

Toutefois une impulsion nouvelle est actuellement donnée aux recherches concernant la pêche en Nouvelle Calédonie qui pourra de ce fait bénéficier plus efficacement des travaux de Conseil et leur apportera en contre partie une contribution plus active. Mais cela ne signifie pas que la France n'ait retiré jusqu'ici aucun bénéfice de l'action du Conseil. Les informations qu'il a rassemblées, les études et actions réalisées sous son impulsion, spécialement en ce qui concerne la pisciculture, ont constitué pour elle une aide précieuse pour le développement des pêches dans ses territoires tropicaux.

Le gouvernement français souhaite que dans l'avenir le rôle du Conseil en tant que foyer de renseignements et organisme de synthèse de résultats soit maintenu et développé.

STATEMENT OF THE INDIAN GOVERNMENT

In India, the Central and some of the State Governments have been implementing, since 1946, certain well-considered programmes for the development of fisheries in the country. In addition to other work, the Central Government have established two Fisheries Research Stations, with a number of Sub-Stations, for undertaking research on problems connected with marine and inland fisheries. A Central Deep-Sea Fishing Station has also been established for undertaking exploratory fishing, charting of fishing grounds, training of personnel and similar other work. These Stations are working according to definite programmes. The State Governments also have taken action along several lines for developing their fisheries.

As India has had a proper programme of work and trained personnel for the development of fisheries, the effect of the work of the Indo-Pacific Fisheries Council on the fisheries of the country has not perhaps been as well-marked as in some countries in the region where development was at a somewhat lower level. In India also, the Indo-Pacific Fisheries

Council have, however, contributed, to an appreciable extent, in the planning of new programmes and in modifying the older programmes. The recommendations and resolutions of the Council and the discussions in the various sessions have been carefully taken into account in formulating new programmes of work and in modifying the existing ones.

Among the benefits directly derived by India from the work of the Council, the following may be mentioned :

- (1) The contacts established, through the Council, with fishery workers and specialists in the region have been of considerable value. The advice of the Secretariat of the Council has also been very helpful.
- (2) Valuable information on fisheries matters has been obtained through technical papers, proceedings of sessions and symposia, hand-books, special publications and news bulletins issued by the Council.
- (3) We have participated, with advantage to us, in the seminars on fish culture, statistics and marketing.
- (4) The undertaking of co-operative research programmes, on which India has been very keen, is likely to prove beneficial not only to us but also to some other countries in the region. Programmes of work on the Hilsa and Rastrelliger have been initiated and, though progress up-to-date has not been very substantial, it is expected that these will prove of considerable benefit.
- (5) The introduction of the culture of *Tilapia* in some countries of the region, with varying results, had been undertaken without preliminary trials and investigations. Before deciding on the culture of this fish in India, thorough investigations are being undertaken, in consultation with the I.P.F.C., who appear to have appreciated the cautious attitude of India in this matter. On the basis of data already obtained, the culture of *Tilapia* in certain parts of India has been recently recommended.
- (6) India has been pressing for the establishment of a Centre in the region for training fishermen in mechanised fishing. As the Council was unable to undertake this work and recommended the establishment of training centres at sub-regional or national levels, India, in consultation

with the Council and with the help of an F.A.O. expert, has already started one centre near Bombay and is proposing to start two more centres shortly in Madras and Travancore-Cochin. The curriculum and equipment, etc. for the centres have been decided in consultation with the Secretariat of the Council and F.A.O.

- (7) Though India has been implementing a programme for the mechanization of indigenous fishing craft for several years past, the consideration of the question of boat designs and of their modifications, wherever necessary, has now been included in the programme, as recommended by the Council. The services of a Naval Architect provided by the F.A.O. are being utilized for this purpose.

Though in the early stages, the work of the Council was mostly of the nature of surveys, codification of existing knowledge and conditions, etc. in various countries of the region, it is gratifying that this has now been re-oriented on more practical lines that are likely to help the fishing industries in the region. It is necessary that more and more attention be paid in future to work of this kind. Dissemination of information, exchange of data and other related work will no doubt have to continue but it will be of great help if more emphasis is placed on programmes of training and other work that will directly benefit the fishing industries and the fishermen in the region.

Some of the lines of work to which special attention may be paid are mentioned below :

- (a) Assistance in the form of equipment, including vessels, for co-operative research and exploratory programmes like those on the mackerel and the hilsa etc.
- (b) Assistance in the form of equipment and experts for undertaking fishery development in large reservoirs already constructed or in the course of construction as a result of river valley projects.
- (c) Culture of fish in paddy fields.
- (d) Development of suitable methods for fishing in large estuaries, like those of the Ganga, Brahmaputra, etc.
- (e) Establishment of a regional oceanographic institute with assistance from some specialized agencies of the United Nations.
- (f) Improvement and standardization of cured fish.
- (g) Organization of fish marketing, specially on co-operative basis.

STATEMENT OF THE INDONESIAN GOVERNMENT

In various respects, the work of IPFC is being taken into serious consideration in Indonesia ; this is to be seen, for instance, in the setting up of the National IPFC Committee soon after the 5th (Bangkok) Meeting. The constitution of this National Committee was confirmed by the Minister of Agriculture. Besides IPFC matters, the Committee considers domestic fisheries problems, both as regards the administrative and technical aspects.

Indonesia regulates its administration in the field of fisheries through two separate departments ; the Sea Fisheries and that of Inland Fisheries, both in the Ministry of Agriculture. Certain well-considered programmes in the development of the fisheries in the country have been set up with governmental, as well as technical aid, eg. :

- (a) ' Special-Welfare-projects ', (R.K.I. = *Rentjana Kesedjatherdan Istimewa*) of the Republic.
- (b) Technical aid from I.C.A.
- (c) Technical aid from the Colombo Plan, embracing the building of fishing-boats, equipment to fisheries-stations, educational matters (fellowships), etc.

In its concern for the betterment of people's diet, including fisheries, the government, among other things, has established :

- (a) ' Nutrition Board ', (*Panitya Perbaikan Makanan Rakjat*), now headed by the Minister of Health, of which the Minister of Agriculture is a member.
- (b) ' Committee for the increasing of Agricultural Products ' (including marine and inland aquatic products, the *Panitya Penambah Hasil Bumi*) which is an inter-departmental organisation headed by the Secretary-General of the Ministry of Agriculture.
- (c) The importance of the cooperative way of operation and better return to fishermen in accordance with better conditions of living is still felt as one of the final goals in which all means of development of all kinds of fisheries actually must result.

Both permanent organizations consider that animal-protein, which is considerably lacking in the people's diet (8 kg. per head per annum) at present can be derived quickly from aquatic resources by means of improvements besides the efforts taken in other fields.

The Laboratory ' for the investigation of people's diet ', the so-called *Balai Penjelidikan Makanan*

Rakdat, is still aiming at the goal of having a consumption-quantity of 20 kg. per head per annum, which requires a considerable amount bearing in mind the 80-million population. The present actual catch from all kinds of aquatic resources is approaching the 600,000 ton figure; the potential capacity assures Indonesia in its self-support spirit in respect of animal protein supply.

The resolutions, recommendations and discussions during various Sessions, as well as certain important papers and publications of IPFC have been taken into account in facing fisheries problems.

Among the benefits derived by Indonesia out of the Council's work, the following are worth mentioning:

- (a) More trained and broad-minded personnel as a result of organized training centres and seminars:
 - (1) Statistical Training Centre in Bangkok.
 - (2) Fish Marketing Training Centre in Hong Kong.
 - (3) Seminar/Training Centre in Inland Fishery (Indonesia).
- (b) Communications between Indonesian fishery workers and other experts and specialists. The advice of the Council's Secretariat has been of considerable value.
- (c) The possibility of obtaining valuable information out of the various important papers, publications, and symposia.
- (d) The contact with Rome (FAO) experts through the Council.
- (e) The National IPFC Committee has discussed the possibility of introducing the Otoshiami (a trap net), in connection with the modification of this important non-indigenous gear to the usual SERO, a stationary bamboo-trap gear (a programme for 1956 by the Sea Fisheries Department). The principle of movable operation of this trapping system of gear will be technically of great importance and shall be proved by preliminary experiments.

One most important significance in the line of evolution of the Council's work in the past is the gradual change from activities along the line of surveys (earliest stages) to the trend of having discussions on practical use of fisheries science, data and methods, in its goal for achieving improvements in the region. This is of great importance for future targets in the development of the Indonesian fisheries.

Special interests to which the Council may pay more attention can be stated as follows:

- (a) The continuation of arranging educational projects as Training Centres or Seminars in the region (as it is in conformity with the efforts of Indonesia in its education).
- (b) The importance of fish culture in rice-fields, which can be felt as beneficial to the large part of the Indo-Pacific region with its respective large number of population, taking into consideration the fact of the extreme importance of rice and fish in the main diet of this part of the world. Further study, even a sub-committee formed by the Council, dealing with this important combined culture for a number of years will be of great value. On similar lines the Council has special sub-committees on *Hilsa*, *Chanos* and *Rastrelliger* etc.

STATEMENT OF THE JAPANESE GOVERNMENT

Japan highly appreciates the Indo-Pacific Fisheries Council for its work of promoting the exchange of data and information on the fisheries which had been hardly available to any of the member countries before its establishment.

The international cooperation through the machinery of the Council has contributed to make clear various bottle-necks which had impeded the development of the fisheries of many countries, thus enabling these countries to adopt more advanced methods for further development of their national fisheries.

However, it is the view of Japan that most IPFC activities will not prove effective in a short span of time because of the nature of research and there should be more time before the influence of IPFC activities on the fisheries of this country can be definitely evaluated.

It is the desire of Japan that the operation of the Council will be re-examined from time to time so that its activities can be carried on successfully in accordance with its objectives.

STATEMENT OF THE REPUBLIC OF KOREA GOVERNMENT

Suggestions

It is suggested that a special group of world known fisheries specialists be established under IPFC to direct the development of the fisheries industry of each of the member countries by regular periodic visits to each nation (their expenses to be appropriated from the budget of IPFC).

Method of Fish Catching

It is recommended to study progressive and improved methods of fish catching by collecting various materials from the specialists of each Member Government of IPFC. Looking back over the previous results of discussions and study from the 1st through the 5th Session of the Council, it is thought that the encouraging and leading of each country to adopt improved and internationally accepted methods of fish catching has not yet been achieved. In other words, what we have already attained has been hardly more than listening to each member country's fish catching problems. The present situation in Korea is that the fishermen are only following the results of research and investigation by the local fisheries laboratory.

Method of Culture

More detailed and exact methods for the culture of fish in the frigid waters should be studied multilaterally, and this is Korea's main interest in this field. It is believed that 80 per cent of the activities of IPFC have been devoted to fish culture. Most of the bulletins dealt with at each Session have been concerned with this field, and, accordingly, fish cultivation has been a main subject of discussion at each session. Especially tropical fish culture has been a focus of attention and it has made remarkable progress. The Government of the Republic of the Korea, as a Member Government of IPFC, is satisfied with the achievement.

Method of Processing

The study of processing the sea foods suitable to the tastes of each nation in different geographical situations is necessary, because the member countries are situated in different climatic conditions over wide areas, some in the frigid zone, and most of them between the tropical and sub-tropical zones. Even until the 4th Session after the creation of IPFC, the methods of processing the marine food products were not considered to be important, and a sub-committee for the study of the marine food products was not formed until the 5th Session. It is believed that research in this field will be speedily improved and it has also to be studied scientifically because this problem directly affects the economic utilization of food sources for mankind.

Rehabilitation of Economy of Fishing Villages

A concrete way has to be found for the poor fishermen to maintain their independent living. A committee has been established by the Council in order to study the economy of the fishing villages and it has made a great contribution. But concrete recommendations in this respect still have not been found.

The fishermen continue to exist under poor and unimproved living conditions.

Fish Distribution and Marketing

In recognizing the generally poor sanitary facilities as a serious bottleneck to the smooth distribution of fisheries products from producers to consumers, and in providing for training of specialists of the Member Governments to improve such conditions, the 4th and 6th Sessions of the IPFC rendered a great service to member countries. It is recommended that such projects be continued to improve the primitive and unsanitary fish market facilities, and that studies concerning the provision and improvement of transportation facilities be continued accordingly, to insure the fisheries products to be distributed and marketed in a fresh condition.

Fisheries Statistics

Since the first research meeting concerning fisheries statistics held by the decision of the 3rd Session of the Council, great results were gained, but it is felt now that the project has been discontinued. To obtain a proper understanding of the fishing industry, continuous attention to securing exact fisheries statistics has to be maintained in the future.

Recommendation

It is apparent that intensive research into practicable methods for developing all the aspects of the fishing industry has to be undertaken. Accordingly, as indicated at the beginning, it is recommended that a full time group of internationally recognized authorities in each field should be created to direct and improve the fisheries industry in each of the member countries, suggesting immediate action or giving advice whenever necessary.

STATEMENT OF THE NETHERLANDS GOVERNMENT

To assess the influence of IPFC activities from the creation of this Council in 1948 till the present time on the fisheries of Netherlands New Guinea in a few words, would be a difficult task.

Since 1950 when a Fisheries Division was established in this Territory, one delegate and later two delegates attended the Council's Sessions.

From these sessions, a great many data were assembled, which contributed in no small way to the planning and executional stage of the development of the territories fisheries.

Before 1950 the fisheries research in Netherlands New Guinea was still on a very modest level. At

present there are positive signs of a gradual expansion and development. Many investigations and experimental fishing projects were carried out by the Fisheries Section, often directed by results of similar experiments obtained from IPFC papers and discussions.

A very important item of IPFC and its Sessions lies in the possibility of close contact with experts and executives of other countries, both inside and outside the area. From these contacts valuable relations have resulted.

Through their delegates to the Council's Session at Manila in 1952 and also at the last Session at Bangkok in 1954, the Government of the Netherlands expressed its desire to bring the activities of the Council in more direct relation to the fishing industries of the different countries in the area, in other words, the Council was advised to keep in mind, that its work should be of immediate benefit to the millions of fishermen in the area.

In its opening statement at the Council's last Session the delegation for the Netherlands demanded priority for work having a direct bearing on the fisheries industries and to projects which might be expected to give results in a reasonably short time.

The following projects, of which can be expected short time results, should be mentioned :

1. The program for technical assistance and instruction. These programs should be continued and expanded and if necessary, more funds should be provided.
2. The program concerning the preparation of handbooks on fish handling, processing of fisheries products, storing of dried fish, in particular describing suitable methods for use in hot and humid climates.
3. The distribution and exchange of data concerning the smaller types of most suitable fishing craft and mechanisation of these craft.
4. Specific information about the production of ice, the storing of fish and fish products, especially for the fisheries of hot and humid climates.

STATEMENT OF THE PAKISTAN GOVERNMENT

A. Influence of IPFC activities on Fisheries in the Indo-Pacific Region

1. Co-ordination with FAO and other organizations like UNESCO and other sister Councils.
2. The discussions at the Sessions help in co-ordinating the fishing activities of different countries

situated in the region. The delegates meeting there exchange ideas, gather information from other countries and also collect data which becomes very useful in increasing exports.

3. Joint programmes are evolved by mutual discussions. One example is the 'Hilsa Investigation programme' which is being worked out jointly by Burma, Pakistan and India. The Hilsa fisheries are common to and are of great importance to these countries. Research and investigation carried out so far individually are important but will be of greater value on co-ordination.

Other joint programmes of such a nature, can be carried out on tuna, sardines, shrimps, etc. Oceanography and mechanized fishing are other projects, which can be of great advantage, are also being organized by IPFC.

4. The office of IPFC supplies very valuable information on fisheries and at times is responsible for getting valuable data from other countries, and informs all the Member Governments of different fishing activities in the region.

5. The Sessions held in different countries of the region provide opportunities to the delegates for observing the methods of fishing marketing and other aspects of the fish industry etc.

6. IPFC has been responsible in recommending to FAO some training programmes. As for example :

- (a) Fish Culture courses in Indonesia.
- (b) Fisheries Statistics course in Thailand.
- (c) Fish Marketing course in Hong Kong.

These were very useful practical courses in the region sponsored by FAO/ETAP on the initiation of IPFC. Some other courses on mechanized fishing, training of fishermen, etc., have also been recommended by the Council.

7. The Bulletin published by the Council is a very useful publication which gives a review of the fisheries of the region and also movements of the Officers of FAO and IPFC.

B. Review of recommendations of IPFC and their implementation

IPFC was created under an agreement signed at Baguio (Philippines) in 1948. Mr. A. M. Khan, Deputy Secretary, Ministry of Food and Agriculture, attended as an Observer from Pakistan but Pakistan was not one of the signatories of the Agreement. The first Session of the Council was held at Singapore in 1949; no delegate from Pakistan attended that Session. Pakistan was, however, represented regularly from 1950 onwards.

2nd Session, Cronulla, Australia (1950)

The resolutions passed at the 2nd Session mostly concerned collection of data and stressed the survey of fishery resources in the region. As implementation of these resolutions, a survey of the fishery resources of East Pakistan was conducted by Dr. G. L. Kesteven, FAO, Regional Fisheries Officer for Asia and the Far East and Dr. S. W. Ling of the same Organization and a report was submitted to the Government of Pakistan. A survey of the fishery resources of the Mekran Coast was conducted by Fishery Officers of Pakistan and a report was submitted to the Government.

Another problem on which information was asked for in this Session concerned the introduction of non-indigenous gear. A report 'On trawling in Pakistan' and details regarding the vessels and gear were submitted to the Council at this Session.

During and after the Session fishing activities, specially purse seining and Danish seining were studied at sea, and canning, liver-oil production factories were visited at Eden and Melbourne. Oyster culture operations were observed near Cronulla. After return from Australia a proposal to get seven fishing boats, mechanized gear and traps were sent to the Colombo Plan in order to introduce mechanized fishing in Pakistan. This proposal of the department was, however, not implemented.

3rd Session, Madras, India (1951)

Important resolutions :

- (a) IPFC/51/20.3(3) Hilsa investigations (p. 12 of the 3rd proceedings).

Considering the importance of fisheries for *Hilsa* in Burma, India and Pakistan a Sub-Committee was formed. Later a meeting of this Sub-Committee was held at Calcutta, where different aspects of the problem were considered. Work done individually so far was reviewed and papers were presented by workers from Pakistan and India. It was resolved that a programme of work should be evolved, a unit formed for these investigations, and F.A.O. approached through IPFC for funds and technical assistance. It was also decided that the workers from all the three countries should meet at Calcutta for finalizing such a programme. Pakistan on her own has started investigations in the Indus river and preliminary work in East Pakistan is also being done. Government of Pakistan has agreed to participate in the joint programme, for *Hilsa* investigation which has been sanctioned by the Food and Agriculture Council for West Pakistan and a scheme for East Pakistan has also been sanctioned.

These investigations will to a great extent help in reviving the *Hilsa* fisheries which are very important to Pakistan besides India and Burma.

(b) *Fish Culture*.—On the recommendations of IPFC at the same Session, Mr. W. H. Schuster was deputed by FAO for a period of three weeks to East Pakistan to survey freshwater fishery resources and recommend ways and means to increase fish production specially in paddy fields. The recommendations are being implemented. *Tilapia*, an exotic fish, recommended by Mr. Schuster, was obtained from Thailand and introduced in East Pakistan where it has established itself. Some other exotic fishes of proved value are being imported for East Pakistan and Punjab as an experimental measure.

(c) Resolutions regarding control of weeds, pollution of water etc., are being implemented.

(d) Work on the taxonomy of important fishes as recommended has been taken in hand. A small book on 'The Fishes of Karachi and the Coasts of Sind and Mekran' is in the press and is expected to be released shortly.

(e) *Gear Technology*.—As per resolutions of the Council it was planned to have two research vessels and different types of mechanized gear. The gear has been received but the vessels could not be procured till now. Attempts are being made to procure these two vessels under the Colombo Plan. One 65 feet purse seiner-cum-shrimp trawler has been received through FOA of U.S.A. and the same Organization is also providing a small inshore fishing boat. A survey of the indigenous methods of fishing has been conducted, and a report will be submitted to the Council in October, 1955.

Thus it will be seen that IPFC has been giving guidance to Pakistan and other countries in improving their fishing methods.

(f) *Mechanization*.—Under a resolution it was recommended by the Council that the fishing boats should be mechanized in the Indo-Pacific region and on the recommendation of IPFC a Naval Architect was provided for Pakistan by FAO who worked for two months under instructions from Mr. Jan-Olof Traung of FAO, measuring the fishing boats. Later tank tests were conducted at Rome and Sweden. The final report is expected soon. The mechanization of fishing boats will be very helpful in increasing production of fish in Pakistan and giving better returns to the fishermen.

Other important items considered at this Session were Socio-economic problems and regularizing the collection and compilation of statistics. These problems are being tackled.

(g) *Marketing*.—Special importance to marketing of fish has been laid on improving the marketing facilities for fish as it has been considered that marketing in the Indo-Pacific region is in a very bad state. On the recommendation of IPFC two experts were obtained from FAO to survey the marketing conditions in East Bengal. Messrs. Nils Jangaard and Harald Fibiger in 1952 toured extensively that region and submitted their report to the Government of Pakistan on 'Fish Marketing in East Bengal'. A scheme has been received from the East Bengal Government for transport of fish from Sundarbans area. Marketing of the fish so collected will be manipulated from Khulna.

4th Session, Quezon City, Philippines (1952)

Besides the problems as discussed above, special attention was drawn to the following problems:

1. *Handbooks* be written by specialists on the following subjects and for the preparation of such handbooks data should be provided by all the countries of the region:

- Fish culture,
- Food technology,
- Administration and Development,
- Fishery Statistics,
- Gear classification,
- Food processing,
- Fishery Biology,
- Marine Biology and Limnology,
- General Introduction to Fishery Science.

These handbooks will be of great use to the workers in the region as a lot of information will be available. These will be all the more important as such books are not available anywhere. The data has been collected for some and was supplied for some items in 1952.

2. Other items which were given special attention were:

- (a) Fisheries relating to crustacea and molluscs,
- (b) Neritic Pelagic fisheries which is the mainstay of our fishermen,
- (c) Control of noxious weeds,
- (d) Fish culture,
- (e) Hilsa investigations by Burma, Pakistan and India.

3. On the technological side seaweeds as a source of food and raw material for by-products were considered. Information was asked for from Japan, U.S.A. and Australia. A working group was formed to consider this aspect thoroughly under *Gear Technology*. A working group was formed to classify the indigenous fishing gear which may be a guide for all countries of the Indo-Pacific region. Special attention of all Member Govern-

ments was drawn to the Socio-economic aspect of the fishermen and they were asked to give priority to the marketing of fish.

The delegate from Pakistan observed otter trawling, indigenous fishing specially by bright lights, oyster culture, biological and technological research stations, training school for officers and fishermen.

5th Session, Bangkok, Thailand (1954)

Eleven resolutions were passed by the Council. Out of these No. 2 related to the survey of fishery resources of all the countries in the region. Special attention was drawn to the faunal changes occurring rapidly and it has been requested that the factors governing these changes may be studied and a report submitted at the next Session.

With the arrival of the new fishing vessel in January, 1956 the work envisaged in the resolution will be taken up and a report will be submitted. Some data have already been collected by *MFV ALA* and are under compilation.

In resolution No. 3, Member Governments have been asked to study the problem of pollution in the streams and other waters and that remedial measures should be taken to save the fish.

The matter has been taken up.

Resolution No. 4 draws the attention of the Member Governments to the adverse effects of dams to the migratory fishes. It is advised that proper action should be taken to safe-guard the fisheries of the rivers when planning a dam and that suitable fish ladders should be provided.

This problem has been engaging the attention of the Government specially in the case of Lower Sind Barrage which will effect the migration of Hilsa (*Hilsa ilisha*). Since the fish ladders have been constructed their efficiency will be studied and if not found suitable, other remedial measures will be suggested.

In resolution No. 5 it is suggested that fish culture should be intensified to increase production and along with this the craft and gear should also be improved.

Fish culture is at present practised in the Punjab and East Pakistan. In 1953 *Tilapia* was introduced in East Pakistan and in 1954 round Haleji lake near Karachi. The results in East Pakistan are promising and a greater number of *Tilapia* is being obtained for that region. For regions in West Pakistan different types of exotic fishes are being obtained from India, Thailand and Indonesia. These will be cultured in fish ponds near Haleji lake and then distributed to Punjab and other places.

Resolution No. 7 puts emphasis on the training of personnel in mechanized fishing and FAO has been requested to start Centre(s) for imparting practical training to personnel of different countries so that the fishing craft and gear may be improved and trained fishermen may be available to use improved types of nets.

We have already done the preliminary work on the mechanization of boats in collaboration with FAO. The final report is expected early in 1955 and then the actual work will be taken in hand.

Other problems to which attention has been drawn are :

(i) *Study of Plankton :*

This problem is now being studied only in creeks since no suitable vessels are available with us but it is planned to extend it to the sea on the arrival of suitable boats and equipment.

(ii) *Pelagic Neritic Fisheries :*

Studies on mullets and sardines are being carried out and investigation of Tuna has started.

(iii) *Hilsa Investigations :*

Schemes for the investigation on Hilsa have been sanctioned by Food & Agriculture Council of Pakistan to start work simultaneously in both wings. Government of Pakistan have shown their willingness to join the projected joint research on 'Hilsa' sponsored by the Government of India.

(iv) Reports are being prepared for submission to the Council on the following :

- (a) Methods of curing,
- (b) Description of the fishing gear,
- (c) Marketing of fish,
- (d) Information on Tuna,
- (e) Hilsa investigations,
- (f) Symposium on prawn fisheries.

C. Suggestions

1. More attention should be given to the practical aspects of fisheries. There is great dearth of technicians in the region. Priority should be given to the training of fishermen in mechanized fishing. The difficulty is about language. It is suggested that an officer should accompany the fishermen who may be benefited by the training and serve as interpreter.

2. There is great need of appointing one specialist on fish culture in the Regional Fishery Office of Asia and the Far East at present located at Bangkok. He should be available to all countries for short periods whenever his advice is sought.

A specialist on fish marketing should also be on the Staff of the Regional Fishery Office for consultation and advice.

3. Member Governments should be asked to provide funds to their delegates for post-session tours so that they may gain practical knowledge of the fisheries of the country where the session is held.

4. Adjacent countries having common problems be asked to coordinate and evolve joint programmes for different aspects of fishery problems on the lines as has been done in the case of Hilsa Investigations. A similar programme can be evolved on the exploration of fishing in the sea.

5. Each country should try to hold meetings of their fishery workers at least once a year to discuss their problems and to chalk out their own programmes.

6. Adjacent countries should also hold meetings for the discussion of common problems at least once a year. The time should be fixed after 6-8 months after the session of IPFC so that the recommendations of the Council may be reviewed and ways and means to implement these problems may be discussed.

STATEMENT OF THE PHILIPPINES GOVERNMENT

Membership in the Indo-Pacific Fisheries Council has made it possible for the Philippine fisheries specialists to have direct contact with different fisheries specialists of other member countries in the Indo-Pacific area. The contact has promoted interchange of technical information and experiences. New ideas found adaptable under Philippine conditions have been assimilated.

The regular Sessions have given the local technical men the opportunity to see for themselves laboratories, methods and techniques, field practices and development programmes which have broadened their outlook. These things which they have observed for themselves have, in many instances, influenced the change of existing development programmes towards the right direction. Furthermore, the implementation of resolutions of the Sessions has made it possible for us to give greater incentive to increase the production from fisheries. This is especially true in the case of the expansion of fishpond areas and the promotion of fresh-water fish culture.

The introduction of fresh-water species for fish culture purposes, especially of Tilapia obtained from Thailand in 1950, and the subsequent wide distribution and popularization of this fish for cultivation

in backyard fishponds and inland fish farms are among the tangible results gained through this country's membership in the Indo-Pacific Fisheries Council. The culture of Chanos in fresh-water ponds and the fertilization of pond water to increase production per unit area now under experimentation locally have been influenced by successful practices along this line observed by our delegation in India. Investigations on the improvement of the preparation of fish paste and fish sauce were inspired by the results of researches on *nouc mam* in Cambodia. The efforts exerted in pushing fisheries development programmes and researches on the different phases of fisheries science have been influenced by membership of the Philippines in the Council.

It may be mentioned also that training centres and seminars which have been held under the auspices of FAO and certain Member Governments as hosts were observed to be useful, not only in the methodology and techniques assimilated by the trainees and later adopted in their respective fisheries agencies but also in the promotion of goodwill among member countries. Even if the Philippines has not as yet had a chance to be a host country in an FAO project of this nature, it has been for the past few years admitting trainees in fisheries from the neighbouring countries, namely, Thailand, Burma and Indonesia.

STATEMENT OF THE GOVERNMENT OF THAILAND

Thailand has benefited from the Indo-Pacific Fisheries Council as follows :

1. The Secretariat of the Council has been of assistance in establishing contacts between the Thai Fisheries Department on the one hand and fishery workers of the region and fisheries institutions outside the region on the other.

2. Fisheries information collected by the Council on technical and socio-economic matters and on methods of tackling the problems, has been very valuable.

3. Thailand is proud of its progress in fresh water fish culture development and attributes this in part to FAO technical assistance and to the Fish Culture Training Centres arranged by the Council. The junior fishery officers who have received this training have been enabled to carry on active work in fish culture technique and extension.

The training of fisheries personnel for the member countries is therefore believed to have been one of the noteworthy achievements of the Council.

4. The proposed handbooks to be written by specialists on fish culture, food technology, administration and development, fisheries statistics, fisheries biology, fisheries science etc. will be of great value to workers in the region.

5. The formation of the Hilsa and Rastrelliger Sub-Committees will be most stimulating to the fisheries programmes of member countries through the creation of mutual understanding and will be of positive benefit to the fisheries concerned.

6. The recommendations of the Council have made the Member Governments aware of the existence of the fisheries problems and the necessity for the proper management and utilization of the resources.

7. It is recommended that means be sought to expand the Council's permanent staff by the addition of specialists to meet the varying needs of the member countries, so enabling the Secretariat to engage in technical problems in addition to the heavy administrative duties with which it is at present fully occupied.

STATEMENT OF THE UNITED KINGDOM GOVERNMENT

(FEDERATION OF MALAYA AND SINGAPORE)

The Indo-Pacific Fisheries Council has not, as yet, had any marked influence on the fishing industry in the Federation of Malaya and Singapore. The Council and its activities have, however, had a marked and beneficial influence on the staff of the Fisheries Department which it would have been extremely difficult to achieve, had the Council not existed. With the passing of time it may confidently be expected that this influence will be transmitted to the fishing industry, but it must be realised that it will be over many years since, in fisheries generally, we are handling a natural resource and Nature is slow. Secondly, fishermen, by the nature of their calling, are among the most conservative of people and are not easily influenced. However, the influence is just noticeable and will, no doubt, be cumulative.

In the first place, the Sessions of the Council have permitted the establishment of personal relations between members of the staff of the Department of Fisheries and workers in other territories. This soon began to prove its value and at the various Sessions of the Council different officers have attended, so that six of the total complement of nine officers have now attended Sessions of the Council. These Sessions have been followed by

personal correspondence, largely on minor matters, which amount to practical 'hints and tips', although in one respect, where Malaya has been outgiving, the matter has developed to major proportions. This has been the distribution of the fry of *Tilapia mossambica* to all the territories and countries of the Council, with the exceptions of Japan and Indonesia, and includes Australia and the United States. In fact, if anything, the Fisheries Department, Malaya, has given more than it has received at this demi-official level and has had great pleasure and not a little pride in being able to do so. As well as this correspondence, we have welcomed visitors for short periods, from all the territories and countries of the Council without exception. These visits were not in the form of official missions, but were arranged with Government approval at a demi-official level. Perhaps they were the more enjoyable because of this.

There was one activity of FAO to which we were introduced by the IPFC, which has proved of considerable value. This was the attendance of Fisheries Officer, Mr. M. L. Parry at the powered fishing boat conference in Paris. He gained information of considerable value and made contacts with engine manufacturers which the Department is now putting to practical effect. Another five years should find the results of this widespread in the industry.

Two activities of the IPFC proper have proved of value. The Fish Culture Seminar arranged in Java, which was attended by the Assistant Director of Fisheries, Mr. Soong Min Kong. He gained some useful information at this seminar and we are beginning to see results in the pond culture industry in Malaya, of some of the principles he learnt. He has a number of experiments in hand to see to what extent other principles may be adapted to Malaya. Among these, are the rearing and breeding of *Puntius javanicus*. This species was imported from Bogor, has been established in experimental ponds and has now commenced breeding.

The other activity, which is of specific value to the Department, was the Statistics Course held in Bangkok. Six members of the staff, four from the Federation and two from Singapore attended. These officers were of all grades and while the two most senior officers found the course somewhat elementary, the others gained considerably.

While the activities of the Governments of North Borneo, Brunei and Sarawak are not so great as those of Malaya in respect of the fishing industry, the Director of Fisheries, Malaya, has passed on information of value to those territories, as and when desirable and applicable.

STATEMENT OF THE UNITED KINGDOM GOVERNMENT

(HONG KONG)

The IPFC came into being following the Fisheries conference convened by the Commissioner General for South East Asia in January, 1947. At that conference pressing problems of practical importance to the fisheries of the region were fully and frankly discussed and the need for an international organization concerned specifically with Indo-Pacific fisheries was freely acknowledged. At that conference the importance of fish as a major protein item in the diet of millions of people of the area was in the forefront of discussions, as was also the urgency of increasing supplies by scientific appraisal of resources and technological improvements in methods, gear and vessels. Stepping up the production of rice and fish rather than rice alone was, in the opinion of the conference, the way to improved nutrition. In this connection special emphasis was placed on pond culture of fish and the raising of suitable species in paddy fields under irrigation.

The British point of view was clearly expressed at this conference which included a representative of Hong Kong and domestic issues were more definitely defined at the unofficial conference of fisheries officers held in Singapore in September, 1948. The inaugural meeting of the IPFC was held at Baguio in the Philippines in February, 1948, and was attended by Dr. Herklots and Mr. S. Y. Lin as Hong Kong representatives. Since then sessions have been held in Singapore, Australia, India, Philippines and Thailand. Preparatory to the last Session in Thailand opportunity was taken during the 8th Pacific Science Congress at Manila to discuss the proposal to form an Oceanographic Institute associated with the IPFC. Hong Kong was represented at these sessions with the exception of the second and third and presented papers on two occasions.

The IPFC is a practical organization with activities directed to improvements in fish supply of the region and the stimulation of domestic policies concerned with fisheries developments of Member Governments. The nature of the organization is such that close cooperation in technical work is effected through the panels of enquiry set up by session resolutions and the Council maintains administrative continuity and co-ordinates development policy in the interests of the region as a whole.

It is difficult to assess the influence of IPFC on Hong Kong fisheries policy except to say that both my predecessor and I have taken very careful note of the views and opinions expressed by

workers of the region at IPFC Sessions. Our own policy is but two years old following the appointment of a fisheries officer who attended the IPFC Sessions in Manila in 1952. This does not mean that our policy was based on that of other territories but, as we were starting from scratch, the current views of other workers were very important to us. Above all we gained confidence in putting forward a policy based on the assessment of the local position and in keeping with the administrative and scientific appraisal of fisheries problems for the region as a whole.

The Council, therefore, has had a strong influence in devising and co-ordinating policies. It has acted as a clearing house for diverse views on fisheries matters. It has brought workers of the region together to the conference table to discuss practical problems of fisheries developments and ways and means of effecting such developments. It has allowed them to study on the spot the fishing industries, methods, gear, scientific services and problems of the host territory. This has led to clearer thinking and closer cooperation which, in my opinion, are the main benefits we have derived from association with IPFC. Workers of the region now know each other and are working along similar lines on common problems. Each region has its own peculiar difficulties but the information services of IPFC are bridging the gulf of isolation and keeping administrators informed of new developments.

It is true to say that the outlook of IPFC emerged more clearly at the last Session in Bangkok, and further, that the Council is now getting down to an approach which is acceptable to all territories. We cannot expect considerable improvements in the short period of the life of IPFC. I am certain it is working on sound lines and will ultimately exert considerable influence on fisheries policies and the extension and administration of the fisheries of the region.

It is also difficult to suggest lines along which the development of the Council's activities would be most beneficial. I believe that IPFC will do more for member countries by confining activities to its present policy of:

- (1) Stimulating and encouraging member countries to carry out efficiently the programme best suited to the region concerned;
- (2) Devising standards for efficient statistical enquiry and collecting, compiling and publishing reliable statistical data;
- (3) Exchanging information on methods of production, marketing, processing and all matters concerned with fisheries and

marine and fresh water fisheries extension;

- (4) Setting up panels of enquiry into problems of general concern to the region as a whole;
- (5) Inviting assistance of specialists in the region to co-operate on special enquiries as at (4);
- (6) Confining activities to practical problems of fisheries of the region and leaving in the meantime to the governments concerned the question of long range research on the availability of existing fish stocks and the productivity of the sea.

Ultimately I believe that IPFC in its policy of co-ordination of research programmes will be faced with the need for the establishment of research stations additional to those possessed by Member Governments. This will lead at a later date to the establishment of an Oceanographic Institute to serve all territories. There is much yet to be done before governments will be interested in such costly developments and present policy should be restricted to that of a bureau of fisheries information for the Indo-Pacific region.

STATEMENT OF THE U.S.A. GOVERNMENT

In reply to the request for a statement assessing the influence of IPFC activities on the Fisheries of the United States, the executive committee will want to know that the direct influence on United States fisheries has been very slight. This is to be expected because most of the United States fisheries are located in continental United States, which is far removed from the area where the Council is active. There are, however, numerous ways in which the Council has indirectly influenced the United States fisheries. Among these are (1) the development of information on the high seas tuna fisheries and oceanography in the Western Pacific area; and (2) valuable studies of fish cultural methods and general principles which may be applicable to more temperate waters.

With regard to the future course of the Council, in view of the need of the member countries of the IPFC to increase production of protein foods, the United States considers that the Council's future activities will be most beneficial if it fosters researches which will lead to increased protein food production as quickly as possible. Such projects should have priority over, but should not eliminate from consideration, basic research which have an increase in knowledge as the immediate aim.

STATEMENT OF THE VIET NAM GOVERNMENT

Les avantages que la Viet Nam a retirés des travaux accomplis par le C.I.P.P. peuvent être résumés comme suit :

1. *CIPP organisme de co-ordination.*—Le C.I.P.P. constitue le centre de relations entre les pays membres et les organisations internationales telles que FAO, UNESCO, WMO, et des pays membres entr'eux. Par l'intermédiaire du C.I.P.P., les services des Pêches du Viet Nam ont eu des contacts étroits, utiles et efficaces avec les services similaires des autres pays.

Exemple : Grâce au système des échanges internationaux d'alevins (international fry exchange) le service des Pêches Continentales du Viet Nam a pu importer de la Thaïlande le Tilapia, et de l'Indonésie des carpes de variétés puncten et sinyonya.

2. *CIPP—organisme de centralisation des information et des travaux en matière de pêche.*—Les échanges de renseignements, de communications, et de publications dans le domaine de la pêche entre les différents pays, par l'intermédiaire du CIPP, ont permis à certains d'améliorer, leurs méthodes de travail et en conséquence d'intensifier leur production. Cette confrontation de méthodes employées et des résultats acquis offre d'énormes avantages pratiques ; elle évite à plus d'un technicien de perdre son temps sur un problème déjà résolu ailleurs.

Citons, par exemple, la normalisation de la classification des engins de pêche ; ce système est actuellement employé au Viet Nam dans l'étude des engins locaux.

En Pisciculture, la méthode d'élevage préconisée par la Thaïlande s'est avérée beaucoup plus efficace que celle pratiquée ailleurs ; aussi le Viet Nam l'a-t-il adoptée.

3. *CIPP—instigateur des cours de perfectionnement pour les techniciens de pêche—*

(a) *Pisciculture.*—Les techniciens vietnamiens

au retour des stages de perfectionnement effectués en Indonésie et en Thaïlande, se sont mis immédiatement à propager, parmi les paysans, le procédé de reproduction des carpes utilisé en Indonésie et la méthode thaïlandaise d'élevage du Tilapia. Leurs efforts ont porté fruit : actuellement, il y a au Viet Nam une telle ruée vers les terres à vocation piscicole que le prix de ces terres ne cesse d'augmenter ; et le long des routes, on voit se creuser chaque jour de nouveaux étangs d'élevage. La devise, lancée par le Gouvernement en vue d'encourager la population rurale à se procurer un apport supplémentaire de protéines animales : 'Que chaque famille ait son poulailler, sa porcherie, et son étang d'élevage', se réalisera sans doute dans un proche avenir.

(b) *Statistiques.*—Au point de vue statistiques, la compilation des dossiers d'enquêtes, étant en cours d'exécution, ne permet pas encore à nos agents d'en tirer des conclusions pratiques. Toutefois, l'enseignement cucilli au Centre d'étude de Statistiques, organisé sous l'égide du CIPP, a été mis déjà en application.

(c) *Marketing.*—En matière de commercialisation des produits de la pêche (fish marketing), un premier essai d'application du système de Hong Kong est sur le point d'être effectué dans une province du Viet Nam.

En résumé, l'influence de CIPP sur les pays dont la Pêche est encore peu développée est très appréciable.

Cependant, il serait souhaitable que le CIPP s'occupe davantage de ces pays leur apportant une aide technique en personnel et en matériel, afin qu'ils puissent augmenter leur productivité.

REPORT OF TECHNICAL COMMITTEE I TO THE 6TH SESSION

Chairman : DR. N. K. PANIKKAR

0. INTRODUCTION

In accordance with the Resolution No. 1 adopted at the 5th Session, the work of Technical Committee I has been re-organized during the year into three panels (A. Inland Fisheries, B. Sea Fisheries, and C. Miscellaneous Fisheries including Hydrology, Plankton, etc.).

The interval between the 5th and 6th Sessions of the Council was utilized by the committee to review progress achieved in the various fields of work recommended for detailed examination by the Council at its 5th Session. Owing to various reasons the work of the committee did not progress beyond fact finding on topics referred to it, but a stage has been reached when ideas are developing on co-operative projects in certain fields. The pre-occupation of members of the committee with their own national programmes, departure of members of the committee and especially panel chairmen owing to changes in their own individual assignments and absence of any progress in certain fields of study have all contributed to the somewhat slackness in pace at which Technical Committee I has been able to deal with the various problems. It is hoped that the Council at its sixth session will make an objective examination of how the work of the committee could be made more effective. The difficulties were partly dealt with in the report of the Technical Committee to the 5th Session. The point of view was expressed there that the increase in the number of sub-committees has probably reduced the effectiveness of work of Technical Committees. The interval between the 5th and 6th Sessions has shown that re-grouping in panels has not very much helped to advance the pace of work and, as indicated in the Assessment Report of the Executive Committee, there is even reason to think that grouping of subjects under panels, not infrequently results in neglect of aspects of study which otherwise might have been developed.

The committee notes with satisfaction the overall progress in scientific work in various fields of fisheries in the many countries represented on the Council. Substantial contributions to work falling within the scope of Technical Committee I have appeared in several new studies on the fishery biology of Indo-Pacific fishes. New serial publications devoted to fisheries have also appeared from the area.

1. COUNCIL RESOLUTIONS

1.1 *World Faunal Changes*.—Resolution No. 2 accepted by the Council at its 5th session invites Member Governments to give consideration to the great changes that have occurred in faunal distributions throughout the world's seas, as being of major significance in relation to world fisheries production and requests Member Governments to explore means by which evidence of such faunal changes and phenomena related thereto might be fully documented. The replies received from the various Member Governments on this question have clearly indicated that, although the subject is important, material for an assessment of such changes is not currently available. A paper on this subject, 'Fisheries Research Methods of Gathering Evidence of Basic Changes in Marine Faunal Distribution' by A. R. Margetts, has been contributed by the Government of the United Kingdom. As regards the countries of the Indo-Pacific, the major obstacle is that faunistic surveys so far carried out have been so inadequate that even though changes might have been taking place, convincing information on such changes cannot now be brought forward. The most essential requirement is to begin collecting data on an accepted pattern so that the changes, if any taking place, could be noted in future years. Unless data have been gathered for several years it would probably be impossible to form conclusions.

Taking into account this resolution and the fact that the question of fisheries production itself is not receiving adequate attention by many member countries, a suggestion has been made by the Chairman of Technical Committee I to institute Indo-Pacific Fishery Years at fixed intervals of time so that at least during these years data on fisheries production and ancillary information on oceanography, marine biology and, if possible, faunal distributions could be collected *at the same time* in the countries of the Indo-Pacific area. The project requires the co-operation of all countries. While those countries having organizations to collect sea fisheries statistics will find nothing new in this proposal, countries without adequate scientific and statistical services could at least at fixed intervals of time concentrate on a project of this type to collect data pertaining to them. It was further suggested that the first Indo-Pacific Fishery Year may be held in conjunction with the International Geophysical Year, 1957-58

when fairly extensive oceanographic and meteorological observations are proposed to be made by many countries. The Executive Committee has placed this subject on the Agenda of the 6th Session of the Council for discussion. If this proposal is accepted, the Council would probably have taken the first step in obtaining data for an over-all picture of fisheries production in the area in relation to climatic and oceanographic factors.

1.2 *Water Pollution*.—Resolution No. 3 accepted by the Council drew attention of Member Governments to the information on this subject already assembled and requested Member Governments to explore ways and means for further study of actual extent of damage which may be caused to fish populations by industrial or other pollution. It would appear from the reports received that the importance of the subject has been realized by member countries and that steps are being taken by some of them to protect the fishery resources (for details, see Inland Fisheries Section). The major obstacle in the study of pollution problems is that the participation of specialists belonging to several disciplines is required and the pollution problem is itself often very specific, requiring examination with reference to any one pollution problem at a particular place. Even in such a study the problems of methods of approach and collection of standing data do not seem to have reached any satisfactory advance in most of the Indo-Pacific. The Technical Committee would certainly like to consider this problem in greater detail than has been done.

1.3 *River Basin Development*.—Resolution No. 4 accepted by the Council drew the attention of Member Governments to the urgent need for conserving and exploiting the fishery resources associated with river basin projects by rectifying the adverse effects on the resources caused by dams and other obstructions through preventive, remedial and restoratory measures and developing fish production in the reservoirs and ancillary waters. The subject has been brought to the notice of the Member Governments both by the actual resolution and by the subsequent paper on the subject drawn up by Dr. Miles and Dr. Job of the IPFC Secretariat. Details are dealt with under the report of Inland Fisheries Panel.

1.4 *Rastrelliger*.—Resolution No. 6 accepted by the Council invited Member Governments to give their urgent consideration to the problem of *Rastrelliger* fisheries and at the earliest possible opportunity to nominate experienced workers to form an *Ad Hoc* Committee of the Sea Fisheries Panel in Technical Committee I for designing an appropriate research programme. In pursuance of this resolution nominations to the special Sub-Com-

mittee on *Rastrelliger* were received from the following Governments:

Ceylon—P. Canagaratnam
India—N. K. Panikkar
Indonesia—Amiruddin Nasution
Philippines—P. R. Manacop
Thailand—Tuanthai Bamrajarinpai
Viet Nam—Tran Ba Loc
U.K. (for Malaya)—D. W. Le Mare

The Malayan Government had very kindly extended an invitation to hold a meeting of this Sub-Committee in March 1955 at Penang, but as effective participation by the nominees could not be assured at this meeting, the session has had to be postponed. In the meantime the Council would further like to examine the problem of designing an effective co-operative programme of research on *Rastrelliger* and give such guidance as may be considered necessary to the Technical Committee I and the Sub-Committee.

1.5 *Age determination in Tropical Fishes*.—The Council directed that the Technical Committee I take whatever action is practicable to assemble information on current methods used in the age determination of fishes in tropical areas and on the basis of the information obtained to report to the Council at its sixth Session.

The methods used in age determination of fishes fall into two categories: (a) Length frequency studies, and (b) study of growth checks in scales, otoliths, vertebrae or other hard parts of fishes. The view has often been expressed that the utility of these methods in tropical waters is very limited owing to absence of sharply defined winters or summers which results in long spawning seasons and continuous growth. Recent studies have, however, shown that these methods can be employed with considerable success in working with tropical species as well, provided sufficient care is bestowed in the interpretation of results. Growth checks in scales and otoliths have been found in many tropical species, but it remains to be established how far they are strictly annual. During the early years of life of many species, length frequency studies have been found to be quite useful and reliable if sampling is adequate both as regards largeness of samples and freedom from selectivity of samples.

Age determination studies of several of the more important marine fishes were begun in 1952 by the Fisheries Research Unit of the University of Hong Kong and are still in progress. A preliminary note on the biology of *Nemipterus virgatus* (Houttuyn) by Li Kwan Ming, appeared in the *Hong Kong University Fisheries Journal* No. 1, December 1954, and in this paper consideration was given to age deter-

mination with reference to the formation of 'breaks' in scale formation occurring annually in this species.

A report is currently being prepared on an age determination study of the Wave Sea Bream, *Taia tumifrons* (Tanaka and Schlegel). An attack on the problem has been made by scale and length-frequency studies and by reference to the early growth rate of an allied fish *Paragyrops edita* Tanaka. It is concluded that 'breaks' in scale formation occur annually and are probably the result of a winter decrease in growth rate. Peterson curves drawn from samples taken each month since October 1953 are for the most in accordance with estimates of age derived from scale studies. A comparison of the results obtained in Hong Kong and by Japanese investigators working on *Taia tumifrons* taken south of Japan and in the Yellow and East China Seas shows that, whereas there is general agreement in most cases as to the numerical values for body length appropriate to successive year classes, there is inconsistency of opinion as to the relationship between year class and age class. This work will be published in the *Hong Kong University Fisheries Journal*, No. 2, December 1955.

2. INLAND FISHERIES

2.1 River Basin Development.—With increasing industrialisation and consequent harnessing of waters for irrigation or power in many of the South and East Asian countries, the question of protection of fisheries in these waters is of paramount importance. Though occasionally regulation of waterflow may be beneficial to fisheries, any interference with the natural equilibrium of the planktonic and other life in the waters affects them adversely and it is extremely important that a country about to undertake such projects should learn from previous experience in that country itself or elsewhere. Some aspects of these problems are of a general nature and common to the region as a whole. Stress on this was, therefore, placed during the fifth Session of the Council, when it was also pointed out that instead of blindly adopting fish saving devices like fish-ladders (most of which have proved to be unsuited for the tropics), each water development project has to be assessed beforehand with reference to its possible effect on fish life.

In a paper on the status of fisheries in River Basin Development, Miles and Job (IPFC Occasional Paper, 1954) have pointed out that, though the impoundment of water above the dam, controlled irrigation and regulated flow of water etc. are favourable to fishes, the physical barriers to migration provided by the dams, fluctuations in the water level or the control of floods (which may affect those species which take advantage of floods for spawn-

ing), elimination of spawning and feeding grounds, changes in nutrients of water, pollution and damage to bottom by dredging etc. are all harmful to fish life. Of these the obstruction to migration is perhaps the most important and though strongly marked 'catadromous' or 'anadromous' fishes like the salmon are not common to South and East Asian waters, yet long-range migrations with motives other than spawning are noticed in many, such as pre-spawning feeding excursions and so on. Much work, however, has to be done to investigate these migrations fully.

The adoption of devices like fish ladders or lifts should be based on the individual requirements of a dam. Besides these, protection should also be given to fishes congregating in the reservoirs above the dams, which otherwise would be excessively exploited by the fishermen. In many places these have been converted into fish sanctuaries closed for fishing (e.g. Cauvery, Kistna, Godavari and Tungabhadra rivers in India). Restoratory and developmental measures like transplantation of breeders or fingerlings, extension of fish stocking to the new bodies of water opened up by the barrage schemes (which incidentally assists anti-malarial efforts), and the prevention of extensive fishing and of stream pollution should also receive attention in such programmes.

India.—The two major development plans at present are the Damodar Valley Project and the Hirakud Dam Project. The Central Inland Fisheries Station undertook extensive surveys and other related investigations on the existing fishery conditions in the two rivers, the Mahanadi and Damodar, prior to taking up the development schemes. During a study of the fish and fishery problems relating to the Hirakud Dam, Job, David and Das [*Ind. J. Fisheries*, Vol. 2 (1)] investigated the 15-mile stretch of the Mahanadi at the site of the dam and studied the major economically important fishes (approximately 24 species out of a recorded total of 103) with special reference to the seasonal movements and breeding activities for consideration of the fishery requirements to be provided in the dam. The majority of species were found to be sub-mountainous in character and their range of migration short. Others, however, like the carps, *Catla* and *Rohu*, were medium-range migrants. A few long-range migrants present were of no significant fishery value. As regards the spawning requirements of fishes the dam was found to cause little obstruction to the spawning facilities of the majority of species. However for the 'feeding' and such other migration that are as important as the spawning migrations, facilities have to be provided. Fish ladders, etc. do not seem to give a

complete answer for this purpose. The power-cum-navigation channel may be useful for fish to travel up to the reservoir. The mahseer sanctuaries at Huma and Meriapara and the associated nurseries would be eliminated after the completion of the dam by drying up or by flooding, though this can be prevented by directing sufficient water through the left arm of the river there, which will also prevent the fishery here from drying up. There is also the danger of the fishes accumulating gradually below the dam and discharge region and getting exploited to depletion level and these waters should therefore be 'closed' for fishing. It is also suggested that the entrances to channels, turbine intakes and siphons should be screened to prevent fish getting destroyed.

Besides these, the authors have also suggested many remedial and restorative items such as utilisation for fish culture of the increased stretches of confined and semi-confined waters meant for irrigation, the reservoir itself sustaining a perennial crop; the conversion of the larger pits from where earth has been removed to construct the dyke, into large fish ponds; fishery legislation limiting fishable river stretches, size of mesh, erection of traps etc. and the construction of perennial pools in places where the water dries up in non-monsoon season.

The Damodar Valley Corporation has undertaken a well-organized fishery development scheme in the reservoirs with major carps. The experience gained in Tilaiya Reservoir where the fish stock planted in 1952 has started yielding good results, is expected to be advantageous in the other two reservoirs at Maithon and Panchet Hill Dam.

The Madras Fisheries Department has been stocking Mettur Reservoir (on Cauvery) for the past many years with some of the major carps, and these are being exploited for the last five or six years on a commercial scale. The enforcement of rigid rules restricting mesh sizes of the drift and gill nets used, rescue of juveniles and their stocking in the reservoirs, prohibition of fishing below the dam are some of the factors responsible for this. The smaller reservoir at Bhavanisagar at the foot of the Nilgiris is now being similarly developed.

* Similar experiments in stocking and exploitation are going on in Hyderabad State (at Osmansagar and Nizamsagar). In some reservoirs naturalisation of some of the major Gangetic carps stocked earlier is reported to have taken place.

Reservoirs in Uttar Pradesh, Madhya Pradesh and Vindhya Pradesh are also being stocked and the results are reported to be encouraging.

Japan.—Widespread industrialisation based on water resources has taken place in Japan, and it can be said without exaggeration that no river flows for any considerable distance without being obstructed by a dam. In the census taken in 1953 it was found that the total number of dams came up to 6,093 (*Vide* statement below), and many more have been added since then.

Many of the more important fishes in Japan are long range migrants, such as the anadromous *ayu* (*Plecoglossus altivelis*) and the catadromous eel (*Anguilla japonica*). So, all developmental schemes have been drawn up with stress on these fisheries. Devices for transportation of fishes are an essential part of all dams, and 10% of the dams in Japan are

Dams and Fish Ladders in Japan

Kind of Dam	Without fish ladder	With fish ladder
Power generation	550	355
Irrigation	3,171	225
Drinking water	18	14
Tide protection	6	-
Industry	45	6
Flood control	1,443	7
Lumber pool	24	-
Others	205	-
Total	5,462	637
Grand Total	6,093	

found to have fish ladders or fish ways or bucket carriers, etc. It cannot, however, be said that all these devices are as effective as intended, although a few are extremely effective carrying as much as 60% of the *ayu* population up the river.

Recent investigations on the failure of some of the devices have indicated the following reasons:

1. Most of the fish ways are designed by mechanical engineers who have no knowledge of fish biology. The devices therefore look fine and efficient, but are seldom made use of by the fish.
2. The available knowledge of the biology of fishes concerned is often far from complete.
3. The fish ladders are poorly handled by the laymen, who are not conservation-minded. 'Fish ladders' are very often converted into 'Fishing ladders'.
4. Lack of proper planning and distribution of ladders. Sometimes one finds a fish ladder near a dam where no fish approach as a result of the construction of a newer dam further down, which, however, has no ladder to carry the fish over.

The failure of the ladders thus has necessitated in Japan the use of tank-trucks which collect the *ayu* fry and elvers from the estuary waters and transport them to the upper part of the rivers. Since this is more reliable than the fishway, both the fisherman and the scientist are now more interested in the methods of fry-fishing and its transportation rather than in the perfection of fishways.

Since diversion of water is an inevitable consequence of dams, the fact that the decreased size of the stream has correspondingly less capacity to support fish life has come in for much study. The need for prevention of fish from getting into the diverted channels has also been recognized. Screens, electric or mechanical, are being used for this, even though these have so far not shown entirely satisfactory results.

The use of fish-refuge-pools in rescuing these fishes was tested in the Veda Branch Station, Fresh-water Fishery Research Laboratory (Kuronuma, K., and E. Okubo, 'Fish and Aquatic Insects Entering Water Diversion and an Experiment of Fish Refuge Pool' *Bull. Fr. W. Fish. Res. Lab.*, 1955). A small pool was constructed along the diversion canal with narrow (intake and outlet) passages connecting two bodies of water so that the fish diverted into the channel are able to enter the pool. At least 30% of the fish diverted have at present been known to be rescued thus. This technique has the further merit that it is quite inexpensive and has no intricate mechanism.

The utilization of reservoirs for fish culture is not as widespread in Japan as it should be, their fish production potential being considered much less than that of natural expanses of water. Un-natural fluctuation of water level, low fertility of water, and above all, in Japan the high turbidity of these waters with the consequent lessening of value as a biological medium are mainly responsible for this. Individual instances of other obstacles also exist. In one case the impounded water after sustaining a fishery for 4 to 5 years had turned 'barren' and because of the undue propaganda given to this fact and the resultant cold-shoulder treatment by the fishermen, the researchers did not have the opportunity to study these waters. Also in many cases before impounding, the areas would not be cleared of the trees, shrubs, etc. and stems still remaining at the bottom of the lake would cause damage to the fishing nets used. The last is being solved now by the use of echo sounder which within a matter of seconds indicates the nature of the ground and even floating or drifting matters in middle layers.

Investigations on the hydrological conditions of reservoirs have been undertaken in two lakeside Fisheries Stations—the work has been in progress only for seven years. The hydrographical study of Lake Sagami by T. Shiraishi and others ('Limnological Survey of Lake Sagami, a reservoir' *Bull. Fr. W. Fish. Res. Lab.*, 1953) has given data of considerable significance and further studies along these lines are in progress.

A fresh series of studies in Lake Hiraoka, the main-flood reservoir in river Tenryu, has been started since September 1954 by Kuronuma in which, instead of a base-station, a house-boat (8.6×3 m.) equipped with ordinary lake survey apparatus is used to carry four workers. Among the results obtained are:

1. No stratification of water has been found in the reservoir which is 8-36 m. deep. This may be due to constant moving of entire body of water.
2. The turbidity of water indicated by photo-electric cells is very irregular in its vertical distribution, which is contrary to ordinary expectations.
3. The survey by use of the same instruments show clearly the diffusion of clear tributary water into the muddy reservoir water.

It has been tentatively concluded that the turbidity is the result more of silting than of any growth of plankton.

The capacity of the body of water to sustain fish life has not been reduced since impoundment.

Indeed in many cases it has been found to have increased. The two major species of fish, *Cyprinus carpio* and *Carassius auratus*, have shown relatively larger population density as judged from gill net catches, as also have the two Cyprinids (*Zacco platypus* and *Z. temmincki*). There is thus evidence of abundant natural food available in the water and there is a recommendation to introduce some species of piscivorous fish to utilize these forage fish which are otherwise wasted. The rainbow trout seems most fitted for this, since the temperature conditions of the reservoir are suitable for the trout species.

The lack of shallow beds or aquatic plants in the reservoir has also revealed some difficulties, as for instance, in the spawning of the wild gold fish. These are now found to deposit eggs on floating debris like wood-pieces or leaves or twigs. In the peak spawning season any piece of wood left in the water overnight was found to be densely deposited with eggs. This reveals the need of some 'fish-nest' or egg catching material, and also points out the lack of need for any fry catching or re-stocking technique for this species here.

Associated with the study of Hiraoka reservoir, similar experiments are being done in connection with Sakuma Dam project in the same river. The knowledge and experience are expected to influence the planning of two more dams that are coming up below Hiraoka reservoir within a couple of years. Since the two big dams now present have no fish carrying devices, this is a menace, since the river is well noted for the population of *ayu* and eels, which will now be stopped at the first dam. More attention is being paid to this problem.

The fish conservation problem is now being viewed in a new light. Hitherto these problems were settled by monetary compensation being paid by the sponsors of the project (Government or private enterprise) to the fishermen's co-operatives. Since this does not solve the fundamental problem of maintenance of fish stocks, the compensation money is now being used for 'facilities for maintaining fish production' under which come hatcheries (for warm water species like carps, eels etc. as well as for cold water species like trouts), a fisheries station, more fishing gear and maintenance of tanks for *ayu* fry and elvers, tank-trucks for transportation of fry, etc. The amount also covers the running expenses on these for ten years.

Philippines.—A survey was conducted by a team including Mr. Marcelino Sabado of the Bureau of Fisheries in the northern part of Luzon Island at the site of Ambuklao Hydro-Electric Dam and it was found that there was no fishery of importance there that would be impaired by the construction

of the dam. On the other hand the reservoir of the dam may present possibilities of improving the fish resources of the area, which may serve for stocking suitable species of fish and around which hatcheries, nurseries and pond projects may be established.

2.2 Water Pollution.—The problem of the pollution of streams and water ways by factory and other wastes and the consequent harm to the fisheries of these waters, was discussed during the Bangkok session of the IPFC and after a study of the material supplied by the various Member Governments in answer to a questionnaire issued, it was decided that work should be directed towards an investigation and assessment of the factors that govern such pollution. The following additional information has now been received.

Ceylon.—The extent of the damage to fisheries by water pollution is considered to be negligible since the country is not industrialised to any large extent. The only instance so far noticed was the discharge of spent wash from arrack distilleries into Dummara Madora Ela, a stream 31 miles south of Colombo (A detailed report of this is to be presented at the 6th Session). Occasional damages, however, have also been reported from Lake Beira in Colombo and Nanthikadel lagoon in Mullaitivu. But it is not definite if mortality in these cases is solely due to pollution.

India.—Investigations undertaken by the Central Inland Fisheries Research Station on the effect of factory effluents on fisheries of the Sone river, a tributary of the Ganga, at Dehri-on-Sone was completed. In the case relating to a paper and pulp mill on Sone it was found that mainly organic substances in the water effluents are responsible for the fish mortality by the depletion of oxygen. Mass destruction of fish was also noticed whenever the liquors were renewed in the digestors. A redeeming feature of the whole set-up, however, is that no pools are deep enough to hold fishes in summer, while in winter pollution is not felt so much, because of heavy rains and large flow of water. No conservation or remedial measures have been taken as yet.

Similar investigations are now being conducted in relation to a Sugar Mill on a tributary of the Ganga at Balarampur in Northern U.P. Results are awaited.

Sewage pollution in the tidal Kulti estuary, 24 miles from Calcutta, is also being investigated. The estuary collects all sullage from the city. The oxygen content in the water goes down as low as 0.6 p.p.m. Plankton in the estuary is insufficient except perhaps in January. Recovery processes are

almost nil, since the twenty mile stretch remains a confined septic pool.

Japan.—With the rapid postwar development of industry in Japan the water pollution problems are acute as regards both sea water and fresh water. Citing the evidence collected by the Fisheries Agencies alone, fish damage by this cause amounted to 1 million yen in value in 1951 and 619 factories were found to be responsible for this (of which 26% were paper mills, 17% starch factories, 15% chemical plants and 13% wastage from mining). Pollution by discharge of sewage from cities and towns also contributed to this, but these factors could not be ascertained with the same degree of exactness as in factory effluents. Indeed the difficulty in pinning down the entire responsibility of fish damage to these has been the cause of much controversy between the fishermen and the management of the factories when it came to the question of compensation. The question is being settled now as follows:

When a pollution arises and the cause of the damage clarified, the compensation money to be paid covers not merely the damage of fish but also for some devices (such as sedimentation pools) to prevent future damage of the sort. Recently an iron work company has been experimenting on a device to absorb the 'ill effect matter' from the effluents and this is expected to prove successful. Until such time, however, the compensation scheme seems ideal for protection of fish resources, though only a factory with large capital can satisfy the fishermen's claim.

Ordinances such as the Law of Fisheries Resources Protection, Law of Mining, Law of Rivers, Law of Public Welfare, etc. are intended to keep public waters clean and unpolluted, but these are seldom applied with enough rigidity to be effective.

The source of water pollution, however, is not merely from factory and other effluents. The popular use of many insecticides by farmers, such as D.D.T., Folidor, B.H.C., Parathion and the recently imported Dieldrin, Toxaphene, Aldrin, etc. which are sprayed in many fields are also said to cause immense harm to fish life. The recent questionnaire collected information on 41 such cases in fresh water and 48 in sea water. In view, however, of the labyrinthine character of irrigation channels, the accurate checking of this is extremely difficult.

The problem, however, is now being tackled at a scientific level and as a result the optimum requirements for the properties of water to keep the fish life normal are known. The so-called standard quality of water has been proposed on the basis of physical and chemical characteristics of water—organic factors (B.O.D., dissolved oxygen content and oil content), pH value, chemical factors (chloride,

toxic metals, phenol and free chlorine), physical factors (transparency, colour, suspensoids, cestone, temperature, odour and taste) and bacteriological factors. The standard water formula, though defined by fishery scientists, has not yet found wide implementation. It is, however, widely advertised and is expected to form the basis of the long-awaited Law of Water Pollution.

Meanwhile the Tokyo Aquicultural Research Group has formed a sub-committee on water pollution with the aim of consolidating the research data gathered so far, and further accelerating work on it. The Government agencies are continuing their efforts to come to an agreement among themselves and finance further research programmes to gather accurate, ample and applicable data, which will expedite the Water Pollution Bill.

The Survey of a 100 km.-stretch of Sagami river now taking place is of great significance in this light. The surveyors include 6 chemists and 4 biologists besides experts on fishery science, sanitation, recreation, agriculture, power generation, forestry and industries. The waters are now being used for diverse purposes besides irrigation, power generation and recreational fishing, and have not yet been polluted on account of the absence of any significant factory on it. A few small towns along it, however, have their sewage emptied into it, but this has not caused any significant pollution. The survey, however, is comprehensive and, besides monthly chemical and seasonal biological studies of water, also takes into consideration the topography, climate, human habitation, forest formation, farming, power generation and scope of development of industries in the area.

Pakistan.—No serious water pollution problem has arisen as yet, though the discharge of a paper mill at Chittagong is feared to deplete the fisheries in course of time, if unchecked.

Philippines.—Progress along this line in Philippines has previously been reported to the Fish Culture Sub-Committee and no further significant work has been done as the problem has no immediate bearing on the local fisheries, though some sporadic problems do arise from time to time.

2.3 *Stocking and Compatibility.*—The Council at its 5th Session considered the question of the compatibility of different species in fish culture and, since the work should necessarily be of a long term nature, decided that work should be continued on optimum combination of compatible species and their different size groups.

Hong Kong.—The area devoted to fish culture in the New Territories, Hong Kong, exceeds 460 acres, and is increasing annually. Most of this

acreage consists of brackish-water ponds near the coast and bordering the creeks which extend into low-lying mud flats. Investigations into fish culture in Hong Kong are being concentrated on these ponds.

Seven species of fish are commonly reared together in the brackish-water ponds of the New Territories. They include the Grey Mullet (*Mugil cephalus*), the Common Carp (*Cyprinus carpio*), four species of Chinese carps—Big Head (*Aristichthys nobilis*), Grass Carp (*Ctenopharyngodon idellus*), Mud Carp (*Cirrhina molitorella*) and Silver Carp (*Hypophthalmichthys molitrix*), and a Bream (*Parabramis pekinesis*). Fry of the Grey Mullet are caught when entering freshwater streams from the sea in the early months of the year and are stocked in the ponds in very large numbers. The Common Carp is bred locally but all the other species are imported from China, where they bred in the West River and its tributaries.

It is well known that the long-established technique of culturing several species of Chinese carps together in the same pond allows very high production levels to be attained. The introduction of the Grey Mullet into this combination has been a comparatively recent but highly successful experiment and it is anticipated that an analysis of the present methods of fish culture employed in the ponds of the New Territories will form a basis for the improvement of local techniques and their adaptation to other areas of the Indo-Pacific region.

The research programme undertaken by the Fisheries Research Unit of the University of Hong Kong includes the following main lines of investigation:

1. Stocking densities of compatible species.
2. Growth rates and productivity, in relation to natural and artificial feeding.
3. The environment provided by the ponds.
4. Parasitism and disease.

Implementation of this programme, especially with regard to items 1 and 2, has been hindered to some extent by the lack of reliable information, and research has of necessity been concentrated on items 3 and 4. A bi-weekly hydrological survey is made of selected ponds and samples of plankton are also taken at regular intervals. 'A Preliminary Note on the Fresh-water Plankton of Hong Kong' by Ti Chow was published in the *Hong Kong University Fisheries Journal*, No. 1, December 1954 in which the various 'blooms' of phytoplankton appearing at intervals in the ponds were described.

Precise records of pond culture techniques can be obtained only when fully controlled experiments are possible. To this end several acres have been set aside by the Government of Hong Kong for the setting up of an experimental inland fishery

station. It is planned to construct ponds in the near future and it will then be possible to embark upon the complete programme of research into brackish-water fish culture outlined above.

It is clear that the responsibility of supplying the Indo-Pacific region with Carp fry rests at the present time with Hong Kong. The Chinese carps are extremely popular wherever they have been introduced and there is no doubt that their culture could be considerably increased and extended much further afield than at present. Two pre-requisites would appear to be essential in order that this can be achieved. Technically, there is a need for a simple and inexpensive method of bulk transport of fry by air and a series of experiments, at present incomplete, was begun in the summer of 1954 by the Fisheries Research Unit of the University of Hong Kong to determine the practicability of using polythene containers in which to transport the fry, under oxygen pressure and using various chemicals and drugs. Administratively, there is a need for a considerably improved liaison between actual and potential buyers and the fry exporters in Hong Kong, and in this respect the setting up of a Centralized Distribution Service, proposed through the I.P.F.C., would seem to be a major step towards the full exploitation of inland fisheries resources throughout the Indo-Pacific region.

North Borneo.—There were only four fish ponds in the Colony before 1948, used for carp culture. During the period between 1948 and 1952, 11 ponds were established and, apart from raising the Chinese Carps three additional species, Ikan Nile or Tilapia (*Tilapia mossambica*) and Sepat Siam (*Trichogaster pectoralis*) from Singapore, and the Kalui or Goramy (*Osphronemus goramy*) from Segama River were introduced by the Fisheries Department and adapted themselves well in the ponds.

The building of ponds in the interior areas was at first slow due to the fact that the cultivation of fish is a new sort of livelihood to the indigenous peoples. However, 62 new ponds were completed in 1953, many of which are considered too small for ordinary stocking of fish. However, in order to encourage them to venture into the new enterprise all the pond owners are supplied with fry.

With the exception of one pond in Sandakan, which is stocked with common carp (*Cyprinus carpio*); one other mixed with Tilapia, Big Head (*Aristichthys nobilis*) and Grass Carp (*Ctenopharyngodon idellus*); and 4 others mixed with Tilapia, Kalui and Sepat Siam for experimental purposes; the rest of the ponds are stocked with Tilapia.

The yield of Tilapia in the Colony in fresh-water ponds is not yet possible to determine, however,

yield in brackish-water ponds has been calculated within the range of 800-1200 lb. per acre per annum. The growth rate of this fish was found to be 130-140 mm. and about 83 gr. (3 oz.) on the average per year.

The culture of carps was established in Sandakan and Jesselton before the war, but no comprehensive data, so far, on their productivity and growth rate are available.

The growth rate of Big Head was reported on one occasion from a pond in Sandakan to be about 5 kg. per year.

The result of the culture of Kalui (*Osphronemus*) was found not very satisfactory, as the fish is a slow breeder. Considering the fact that the Kalui could be grown up to a rather large size, it may be advisable to rear it in small quantities together with Tilapia. The growth rate of Kalui in ponds is shown in the following table :

Age (month)	Length (mm.)	Weight (gr.)
3-4	56	-
6-8	105	-
16-18	150	-
26-28	300	-
34-38	305	1,200

India.—Experiments on the compatibility of the major carp fingerlings were in progress at the Central Inland Fisheries Sub-station at Cuttack for the past three years. Fifteen different combinations in 6 densities (from 1,000 to 6,000 acre) were tried. No artificial feeding nor manuring after stocking was resorted to. The work was wound up in April 1954 and the data are under critical study. A fresh series of experiments on similar lines, but with artificial feeding with oil cakes has been started since August 1954 and this is now in progress.

Further work on pond culture of fishes were also carried out at Cuttack and part of the results in the form of a paper was read before the 5th Session in connexion with the Plankton Symposium.

Studies on the compatibility of Tilapia fry with the fry of the major Indian carps were studied in 1954-55 when a 6-month period of experimentation was over. The results obtained are now being confirmed by further experiments.

Observations on the adaptability of *Tilapia mossambica* were made by Panikkar and Tampi (*Indian Journal of Fisheries*, Vo. I) along with studies on food and feeding, sex differentiation, breeding habits and larval stages of the fish. The fish was found to have remarkable adaptability to a wide range of salinities, and mortality was noticed only in cases of sudden transference from fresh water to water of

high salt concentration. A gradual change from fresh water to sea water in three stages during the course of a week found all the fish healthy and capable of reproduction in the normal way. Though vegetable feeders under natural conditions, Tilapia are seen to take to artificial diet in tanks and ponds. Thus the extreme adaptability to varying salinity and to food, together with the rapid breeding and growth of these fishes, makes Tilapia an ideal fish for culture in India in ponds as well as coastal lagoons. These authors have also stressed the value of Tilapia as a forage fish and to explore the possibilities of using other species of Tilapia for fish culture in preference to *Tilapia mossambica*.

Utilization of rice fields for culture of Tilapia is also being studied. Experiments on this line are now in progress at Narakkal and Ernakulam in South India.

The question of introduction of Tilapia to India was discussed by the Fisheries Research Committee of the Government of India. After an examination of the various suggestions and results of researches, the Committee recommended as follows :

In view of the fact that carp culture is highly organised in many parts of India, particularly in the Indo-Gangetic plain and in view of the possible adverse effects, which indiscriminate introduction of Tilapia may have on carp culture, the Fisheries Research Committee set up by the Government of India in the Ministry of Food & Agriculture resolves that :

- (1) Tilapia may be introduced only in areas where scope for carp culture is limited and from where this fish may not, by natural causes, spread to the adjoining areas ;
- (2) for the present, Tilapia culture may be taken up only in the following region :
 - (a) in the western slopes of the Western Ghats and the coastal strip between Cape Comorin and south of and excluding river Tapti,
 - (b) in the districts of Tinnevely, Madura and Ramnad in Madras State south of and including river Vaigai ;
- (3) Tilapia should not be introduced in the closed basins, such as, Manipur and Kashmir Valleys ;
- (4) Tilapia should not be introduced in other parts of the country until the question has been reviewed after more detailed scientific investigations and surveys have been carried out during the next two to three years ;
- (5) all data collected in connexion with the culture of Tilapia should be made

available by the authorities concerned to the Secretary, Fisheries Research Committee; and

- (6) steps should be taken to eradicate *Tilapia* from areas in which it may have been introduced already, but which are included in clause (2) above, excepting in experimental centres approved by the Union Ministry of Food & Agriculture.

Cambodia.—Fish culture here is confined to the rearing of Trey-pa (*Pangasius* spp.) and Trey-po (*P. larnaudii*). But the Government have expressed its unwillingness to participate in any joint scheme such as the fry exchange, since the fry were delicate and limited in supply and also because of the lack of qualified workers.

Japan.—Though no significant progress has been made in the technique of fish culture in this country for the past two years, work along these lines is in progress in many institutions including the Veda Branch Station of Fresh Water Fisheries Research Laboratory (Nakamura, K., *et al.*, 'Fish Production in Seven Farm Ponds in Shiroda Plain, Nagano Prefecture with Reference to Natural Limnological Environment and Artificial Treatment', *Bull. Fr. W. Fish. Res. Lab.*, Vol. 3, No. 1, 1954). Here seven ponds of 1-3.5 ha. surface area were studied as to fish production with artificial manuring in some and feeding in others. It was found by these authors that the production and rate of growth of fish (especially common carps), depend to a large extent on the size and number of fish at stocking, though the definite relation between the two is not clear. Broadly, the lower the density of fish, the greater the growth. The total weight of the fish at stocking did not seem to have much effect on the final crop. The relationship, however, would be at least partially overshadowed by the characteristic productivity of the pond. Also, the production of fish in a pond stocked with two or three kinds of carps, was found to vary between 220-375 kg./ha., when no artificial measures were taken and thus total productivity for any given pond seems to be invariable from year to year.

The results of these experiments all conducted at laboratory level could not of course be applied as such to natural and confined waters where so many complex biological factors come into play. They have therefore to be investigated first.

Studies on the compatibility of fishes have been going on in Japan for long and it is quite a common practice that the mullets (*M. cephalus*) are cultivated along with eels or common carps or even wild gold fish in the same unit of field. However, laboratory studies aimed at a proper combination of compatible

species have not borne fruit convincing enough in terms of applicability to actual practice. More critical study along these lines is needed.

Steps have also been taken of late to spread information regarding the use of rice fields for fish culture. A paper on 'Carp Culture in Rice Field as a Side Work of Japanese Farmers' is being presented at the 6th Session.

Malaya.—Culture of *Tilapia mossambica*, *Cyprinus carpio*, *Trichogaster pectoralis* and *Osphronemus goramy* is fairly widespread. *Puntius javanicus*, *Catla catla*, *Labeo rohita* and *Cirrhina mrigala* have of late been introduced with success.

Experiments in the monosexual culture of *Tilapia mossambica* were started in August, 1954 near Penang, with the co-operation of pond owners. Ponds approximately 40' × 50' × 2' deep were stocked with 5-10 cm. male *Tilapia* and were harvested after four months when some of them attained a length of 23 cm., the majority being 19-20 cm. The ponds were heavily manured with organic manure from pigsties and the fish were not fed. The experiments are being continued in 1955, and will give an indication of what the Malay kampong type of ponds will yield when properly managed. Whilst the use of pig-manure would be abhorrent to the Malaysians by reason of their religion, they could be persuaded to use cattle, goat and poultry manure.

Whilst the Chinese system of stocking a pond with the usual four varieties of Chinese carp is said to achieve the ideal in that the fish have complementary feeding habits and thus utilise all available food resources in a pond (both vegetable and animal), practical fish culturists in Malaya often meet with the presence in quantities of fresh-water shrimps in their ponds. These could obviously be profitably utilised by a predatory fish. *Oxyeleotris marmoratus* has been suggested as a suitable fish for this purpose, as it will breed in ponds and is highly prized for food, fetching twice the price of Chinese carp.

A consignment of Indian carp, consisting of three species, namely *Catla catla*, *Cirrhina mrigala* and *Labeo rohita*, was received from Calcutta in July 1953. The fish arrived by air in oxygen-filled four-gallon kerosene containers, and were first kept in a pond measuring 40' × 40' × 2' and later released into a pond 50' × 70' × 3'. Both the *Catla catla* and the *Labeo rohita* have done well and their growth rate is certainly comparable to that of the Chinese carp.

A supply of *Puntius javanicus* and *Si-nyonya* was received from Indonesia in July 1953. These were first kept in a concrete tank 20' × 20' × 2' and were later introduced into a pond 70' × 50' × 3'.

The fish were air-freighted from Bogor in jerrycans partially filled with oxygen. The growth rates of these fish are being studied. *Puntius javanicus* is likely to prove popular to the Malaysians as it is similar to their river-fish, the Lampan.

A slightly different form of culture has prospered over the past five years, that of cockle culture and many areas of foreshore are now under active cultivation, so that the markets are well supplied with this shellfish. The price has fallen from S.\$35 per picul (133 lb.) five years ago to S.\$5 per picul.

Philippines.—Studies on the stocking densities in Chanos fish ponds are of early origin in the country. The culture of this fish is done in areas of 10 to 2,000 hectares and feeding is mainly with filamentous green algae. Supplementing the food with artificial feeding is rare and the ponds are of sufficient shallowness to permit adequate and continuous light for supporting a blanket growth of these algae. Under these conditions the stocking intensity was found to vary from 500 fish/ha. (1 fish/20 sq. meters) to as much as 2,000 fish/ha. (1 fish/5 sq. meters). On an average 1000-1500 fish are being stocked/ha.

Kind of stocking	Stocking Rate in No./ha.	Duration of culture to attain marketable size.	
		Fertile ponds (50%-100% growth of algae)	Infertile ponds (less than 50% algae)
Sparce ..	500-1,000	2-4 months	6-12 months
Medium stocking ..	1,000-1,500	3-8 months	8-12 months or more
Dense stocking ..	1,500-2,000	6-12 months	over 12 months

No specific studies on compatibility of various species have been undertaken, but the combination culture of Chanos and *Penaeus monodon* has been found to be feasible and has become a regular feature in estuarine fish farms. The combination has been

found to be advantageous both biologically and economically. Chanos is a surface feeder whereas *Penaeus* is a bottom grazer. Based on these experiences a stocking scheme as shown below has been drawn up.

Stocking rate for Chanos (per hectare) number	Stocking rate for <i>Penaeus monodon</i> in combination with Chanos stock (per hectare)		
	I class ponds (80-100% blanket growth of algae)	II class ponds (50-80% blanket growth of algae)	III class ponds (less than 50% blanket growth of algae.
2,000	0	0	0*
1,900	600	0	0
1,800	1,200	0	0
1,700	1,800	0	0
1,600	2,400	0	0
1,500	3,000	0	0
1,400	3,600	800	0
1,300	4,200	1,600	0
1,200	4,800	2,400	0
1,100	5,400	3,200	0
1,000	6,000	4,000	0
900	6,600	4,800	1,400
800	7,200	5,600	2,800
700	7,800	6,400	4,200
600	8,400	7,200	5,600
500	9,000	8,000	7,000
0	10,000	9,000	8,000**

* Monoculture of Chanos only

** Monoculture of *Penaeus monodon* only

The introduction of small but rapidly multiplying freshwater fishes like *Trichogaster* spp. and *Tilapia mossambica* has presented a new problem of overcrowding of fish resulting in stunted growth. The introduction of a carnivores of the right kind at the appropriate stage of growth and under proper management to balance these forage species and thus produce the right poundage of fish is urgently needed.

2.31 *Introduction of predators.*—The large-mouth black bass, *Huro salmoides* was introduced in the Philippines by Alvin Seale in 1908 from Folsom, California. It was first stocked in Trinidad Lake in the vicinity of Baguio City and in Bontoc, Mountain Province in 1910. Baguio City has an altitude of 5,000 feet above sea level with a normal air temperature at its mean maximum of 73.5°F. and a mean minimum of 58.9°F. Out of the same batch were taken the fish that were stocked in the Burnham Park Lake in Baguio City, which has since then become the main source of all stock transplanted in all other places in the Philippines. In 1912, the fish was introduced in lower altitude in the town of Los Banos, Laguna Province, which has an altitude a little above sea level. In 1913, some fish were planted in Lake Lanao in Mindanao which has an altitude of about 700 meters above sea level. In 1925, another batch of the stock from Baguio City was planted in the same lake. During the incumbency of Dr. Herre as Chief of the Division of Fisheries, some black bass were kept in an octagonal pond in the compound of the former Bureau of Science (now Institute of Science and Technology), Manila, which has an elevation of 3 meters above sea level. At the same time a few black bass were being maintained for display at the Manila Aquarium. The fish in the Bureau of Science compound were observed to be surviving under conditions in lower altitude, but no evidence of reproduction was found. In 1927, fish from the Bureau of Science pond were planted in one of the crater lakes in San Pablo, Laguna Province, which has an elevation of 96 meters. This was done to see if they would reproduce and multiply in a place of slightly higher elevation than Manila. In August, 1928, some fish from Baguio City were stocked in a small lake in Sabangan, Bontoc Province, which has an elevation of 1,037 meters. No transplantation of this fish has been made until lately when in March, 1952, 6 black bass surviving out of the 12 ranging from 100 mm. to 130 mm. taken from Burnham Park Lake were introduced in Mangataram, Pangasinan Province, which has an elevation of 23 meters. In May of the same year, 4 of the 6 fish were caught and observed to have attained a length of 225 mm. to 261 mm., ranging in weight of from 250 to 350 grams. No further follow-up has been made of this batch.

At the moment, only those that were stocked in the Burnham Park Lake, Baguio City and Sabangan, Bontoc Province, are thriving and breeding.

Limnological survey of some of the Philippine lakes by Staff Members of the Division of Fish Culture and Fisheries Biology in 1954-55 confirmed the absence of black bass in areas of lower elevation originally stocked with these fish. No survey has yet been made of Lake Lanao. Observation and recent findings thus far show that black bass does not thrive and multiply in natural conditions at lower altitudes. However, in controlled ponds of lower altitudes they survive but do not reproduce.

Black bass were also introduced into a lake at Dalat (Viet Nam) without the knowledge of the fisheries service. Subsequent efforts in 1954 to locate the descendants of these introduced fish were unsuccessful.

Thailand.—Useful results have been obtained from some experiments conducted on 470 *Tilapia* (130 mature male, 130 mature female, 10 hatching female and 220 fingerlings) sent on 30th April 1955 to the Republic of Korea in response to a request of UNKRRA. After the long journey of nearly 36 hours, only one hatching female was found to be dead. Experiments on endurance and adaptability of the fingerlings (3-5 cm.) and mature fish (10-15 cm.) yielded the following results:

- (a) 5 of each were put in a rectangular concrete tank, 2-3 meters, with 20 cm. of water. The following morning, with the temperature at 19°C, three fingerlings were found dead and the adults appeared sluggish.
- (b) One hatching female was put in a glass case and 8 in a wooden tank and both enclosed by a glass house inside which the temperature was controlled and maintained at 22-25°C. (nearly 4 to 5°C above room temperature). The following day the eggs in the glass case were found to be hatched in greater numbers than in the wooden case.
- (c) All the remaining fish were put into rectangular concrete tanks 5 × 9 m. with 60 cm. of water and a 20 cm. layer of mud at bottom. The tanks were enclosed by a glass house and both contained equal number of fishes. Temperature was maintained at 24-28°C. At night heat was supplied from a boiler for 4 to 5 hours.
- (d) On the first morning they were fed with rice bran, the fish came to the surface to feed and appeared normal. On the third day the mature fish had turned purple indicating the desire for mating. Next

afternoon fishes were found with eggs in their mouth. Breeding experiments conducted out of doors (temperature ranging from 20 to 24°C) also indicated that spawning could take place under those conditions.

2.4 *International Fry Exchange*.—Consideration and discussion of an international fish fry exchange between countries of the Indo-Pacific region were held during the 4th and 5th Sessions and a questionnaire was issued to assess the need and resources of surpluses of fry in the various countries. Only 10 Member Governments replied. However, they were unanimous in agreeing on the need for such an exchange and that they would take an inventory of the available fish stock as well as potential demands, and arrange proper and economic distribution of the fry by negotiations with international airlines, shipping services and customs to facilitate safe and speedy transportation.

Cambodia.—The Government have expressed its unwillingness to join the fry exchange scheme since the fry of *Trey-pra* (*Pangasius* sp.) and *Trey-po*

(*P. larnaudii*), the two prominent fish cultured, are delicate and limited in supply and also because of the lack of qualified workers for undertaking this.

Hong Kong.—Hong Kong has in 1953 exported nearly 22,000,000 fry of Chinese carps which constitute the dominant culture fish. The species are *Ctenopharyngodon idellus*, *Hypophthalmichthys molitrix*, *Aristichthys nobilis*, *Cirrhina molitorella*. Black carps (*Mylopharyngodon piceus*) and bream (*Parabramis pekinensis*) are imported. There is a good deal of entrepot fish seed trade in Hong Kong. The Chinese carps are imported from Canton and exported to Taiwan, after a part being retained for local use. There is trade also in the common carp *Cyprinus carpio* bred locally, black carp and bream imported from Canton, and grey mullets (*Mugil cephalus*) collected from local coastal waters.

The figures given below are as accurate as can be obtained at the present time and give a fairly reliable indication of the relative numbers of different species of carps which are retained in Hong Kong or exported each year.

Species	Hong Kong	Taiwan	Singapore	Bankgok	Total
Big Head ..	200,000	900,000	750,000	60,000	1,910,000
Grass Carp ..	200,000	8,000,000	3,000,000	150,000	11,350,000
Mud Carp ..	900,000	2,000,000	150,000	..	3,050,000
Silver Carp ..	200,000	6,000,000	200,000	70,000	6,470,000
Total ..	1,500,000	16,900,000	4,100,000	280,000	22,780,000

The Chinese carps are extremely popular wherever they have been introduced and there is no doubt that their culture could be considerably increased and extended much further afield than at present. Two pre-requisites would appear to be essential in order that this can be achieved. Technically, there is a need for a simple and inexpensive method of bulk transport of fry by air and a series of experiments, at present incomplete, was begun in the summer of 1954 by the Fisheries Research Unit of the University of Hong Kong to determine the practicability of using polythene containers in which to transport the fry with oxygen and using various chemicals and drugs. Administratively, there is a need for a considerably improved liaison between actual and potential buyers and the fry exporters in Hong Kong, and in this respect the setting up of a Centralized Distribution Service, proposed through the IPFC, would seem to be a major step towards the full exploitation of inland fisheries resources throughout the Indo-Pacific region.

India.—Fry of the carps *Labeo rohita*, *Catla catla* and *Cirrhina mrigala* are offered in reasonable quantities for exchange. About 1,000 each of sorted fry of the Chinese carps are needed from outside for experimental purposes.

Indonesia.—A country well advanced in fish culture, Indonesia has *Cyprinus carpio* (red, green and yellow), *Puntius javanicus*, *P. orphoides*, *Osteocheilus hasselti*, *Helostoma temmincki*, *Trichogaster pectoralis*, and *Osphronemus goramy*. Chinese and Indian carps are, however, needed to begin with for experiments.

Malaya.—The fry of *Tilapia mossambica* and *Cyprinus carpio* in unlimited quantities and *Trichogaster pectoralis* and *Osphronemus goramy* in limited numbers are available for exchange. Fry of *Tilapia* and *Trichogaster* have been supplied in large quantities to Ceylon, West Africa, British West Indies, Israel, Honolulu, California, etc. The species

required from other countries are the Chinese carps, *C. idellus*, *A. nobilis* and *H. molitrix*.

North Borneo.—The country has little fish culture at present. Anyway the fry needed from outside are *Puntius javanicus*, *Helostoma temminckii* and *Cyprinus carpio*.

Philippines.—Preliminary survey and assessment of fish seed resources by Mr. G. J. Blanco of the Bureau of Fisheries showed that besides *Chanos* fry the following are available though seldom for export: *Scatophagus argus*, *Megalops cyprinoides*, *Elops hawaiiensis*, *Lates calcarifer*, *Anodontostoma chacunda*, *Mugil* spp., *Glossogobius giurus*, *Choronophorus* spp., *Eleotris melanosoma*, *Ophiocara aporos*, *Ryacichthys aspro*, *Sicyopterus* spp., *Epinephelus* sp., *Teuthis* sp., *Lutjanus* sp., *Penaeus monodon*, etc.

Thailand.—Tilapia fry are available in unlimited quantities for exchange. Among the species required from outside are the fry of Chinese and Indian carps.

2.5 Fish Culture in Rice Fields.—Most countries of the Indo-Pacific area are interested in the question of fish culture in rice fields. Rice cultivation being widely prevalent in the area, the use of fields for growing fish along with paddy or at times when there is no crop, may prove to be an important contribution to the food production in rice growing areas. Techniques of considerable practical application have been developed in Japan, Indonesia and possibly other countries. This is a subject on which the Technical Committee would like to bestow more attention and eventually a symposium on the subject could be organized.

Japan.—Lantern slides showing the techniques have been prepared and demonstrated at the meeting of the International Rice Commission in Tokyo in October 1954. Various reports on the subject were presented at this meeting; these and other background papers will be available at the 6th session of the Council.

Hong Kong.—Work along this line has been confined to three experimental localities and to one species, the common carp. Tilapia was unable to survive the whole winter in the shallow waters. The project, however, has not met with much approval at the hands of the average farmer for the following reasons:

1. Individual holdings are small, often less than one acre;
2. Under normal conditions, water supply is barely adequate for rice culture. The provision of higher bunds is too costly for the peasant farmer. Also, without such high bunds fish will be lost during floods;

3. The two rice crops, with 120 days for maturation of each, necessitates a holding pond for the fish for which the land cannot be sacrificed.

Under these conditions, the solution has been to concentrate pond culture alone and to expand the long established practices of carp culture and culture of grey mullets.

North Borneo.—The culture of Sepat Siam (*Tri hogaster pectoralis*) in rice fields has failed several times in the past years in Beluran (1950), Inanam (1951) and Keningau (1951). The failure was due to the inability to control the flow in the field, due to the primitive nature of the irrigation systems. Experiments are in progress in two fields, 200 and 50 acres in area.

India.—Some preliminary work has been done in Mysore on fish culture in rice fields. The results have been published (Iyengar, H. D. R., *Ind. Journ., Vet. Sci. & Animal Husbandry*, Vol. 23, 1953), but these results have only shown the further need for large-scale planned experiments. These are proposed to be carried out in Mysore, Tanjore and other parts of India. Experiments are already in progress for the improvement in prawn farming in paddy fields in Cochin; the preliminary results obtained have been reported at the last session. Tilapia are also being tried for these experimental fields.

Philippines.—No systematic or planned experiments have been undertaken. However, being an agricultural country, Philippines has great potentialities in this aspect of fish culture. The total area now cultivated with rice which could be used for fish culture amounts to 516,000 ha. The recent import of Tilapia has given impetus to an exploratory investigation of unirrigated and rain-fed paddy fields by Mr. Tomas D. Sotelo, Fishery Officer in charge of Laong Provincial Fresh Water Propagation Ponds. The results are encouraging in that it was found that even in the absence of any irrigated fields some low-lying fields could be made use of and rain water impounded for duration of four to six months of the year. The experiments conducted in a field of 279 sq. meters (0.0279 ha.) had 4,000 fingerlings averaging 1.5 cm. in length and later 60 breeders. In 8 months 3,200 table-sized fish measuring 14.2 cm. long and 10,758 fingerlings of various sizes were produced, besides 3½ cavans of rice. It is interesting to note that an adjacent field of area 450 sq. meters, not used for fish culture, yielded only 2½ cavans of rice. More systematic experiments are being planned.

2.6 Mullet Culture.—The Grey Mullet, *Mugil cephalus*, is an important food fish widely distributed throughout tropical and semi-tropical regions of

the world, and in certain areas, notably in the Mediterranean, S.E. Australia, and along the Atlantic Coast of America, large fisheries are based upon it.

In Hong Kong, a method of culturing *M. cephalus* in the brackish-water ponds of the New Territories has been developed which in the last twenty-five years has been successfully imposed upon the traditional practice of carp culture which dates back for over 4,000 years. The extent of this success may be judged from the fact that *M. cephalus* is stocked in far greater number than any of the carps. Grey Mullet fry appear in thousands at the mouths of fresh-water streams in the early part of the year and are caught in lift nets and transferred immediately to the ponds. There the ecological demands of *M. cephalus* are such that there is little or no interference between it and the Chinese carps with which the ponds are also stocked, and very rapid growth of all species is possible.

The potentialities of the Grey Mullet as a pond fish in the Indo-Pacific region would appear to be very great. Not only may it become a significant source of animal protein in heavily populated areas, but it may also play a very important part in the reclamation and development of land at present mangrove swamp or salt marsh. In Hong Kong, the highly successful technique of culturing *M. cephalus* together with the Chinese Carp in brackish-water ponds, points the way in which it may contribute significantly to the food economy of any country where the fry are available. Before its full exploitation becomes possible, however, it is essential that our knowledge of many aspects of its biology, at present little understood, should be improved. This is especially true of its spawning habits and early developments, and it is towards a more complete understanding of its reproduction that enquiries in Hong Kong were begun in the spring of 1954 and are continuing. 'A Note on the Reproduction of the Grey Mullet, *Mugil cephalus* Linnaeus', by J. D. Bromhall, was published in the *Hong Kong University Fisheries Journal* No. 1, December 1954, and in this paper it was suggested that the Grey Mullet may be influenced in its precise spawning period either by the moon or by the tide or both. Research into the biology of *M. cephalus* in Hong Kong is continuing but it is clear that similar investigations will be necessary throughout the region of the Grey Mullet before a picture approaching completeness is obtained.

3. HILSA INVESTIGATIONS

The Hilsa Sub-Committee met at Calcutta from June 30 to July 4, 1955, and reviewed in detail the available information and recent researches on Hilsa

in the Indo-Pacific region since the last session of the Council. In this light the problems confronting the fishery at present were considered as also the nature of work to be organized in future. The following were the significant points in the discussion:

1. The need for further work on Hilsa was stressed in view of the marked periodic fluctuations in the fishery, of the widespread belief that the fishery is getting depleted and of the lack of adequate knowledge of the resources as also of obstacles to effective management of the fishery.

2. Since Hilsa is common to India, Pakistan and Burma and since this fish is a migratory species, the possible inter-relationship between the Hilsa stocks in the three countries should be studied. There is to be integration of scientific effort without wasteful duplication.

3. Collection of biological information relating to the species, elucidation of the causes of fluctuation in the fishery, and determination (and, if necessary, solution) of problems of depletion are to be the immediate aims of investigations. For this work on (a) morphometric comparison of geographically and bionomically representative samples, (b) study of migratory patterns with aid of size-frequency data, tagging experiments, etc. (c) investigation on the spawning stock, pattern of recruitment, availability of food, effect of salinity, temperature, migrations, mortality as also assessment of fishing intensity, have been suggested.

Though a number of papers have been published on Hilsa and its fisheries, only a few deal with aspects of direct significance to this programme.

Burma.—Research on Hilsa is practically at the initial stage. There is no statistical data available, though the fishery is indicated to be extensive. The country, because of limitations in personnel and economy, was unable to actively participate in and implement research programmes. The Government, however, have promised all help to other member countries in conducting investigations in adjoining waters.

India.—A detailed study of the morphometrics of Hilsa in River Hooghly was completed. It was found that there are two runs of the fish in the river, one ascending it in winter months and the other during the south-west monsoon. In view of the wide disparity in sizes of these two, they may possibly be representatives of two different stocks. From a detailed study of the morphometric data, however, it has been found that the fish in Hooghly consist of a homogeneous stock, and the two runs of fish are not distinguishable by any meristic or non-meristic characters. From a comparative study of samples

from Hooghly and Chilka Lake the morphometric characters that would be of help in distinguishing stocks were selected. These were found to be :

Meristic characters :	No. of post-pelvic scutes, Total No. of vertebrae.
Non-meristic characters :	Standard length, height of body, length of head, thickness of caudal peduncle, body thick- ness.

A study on the normal variations in the morphological and physiological characters of the blood of Hilsa was also conducted [*J. Asiat. Soc. (Science)*, 20(1), 1954].

Studies on the biology of the stock were also undertaken. The frequency distribution of ova showed two distinct spawning seasons, one starting with the monsoon and extending to November, the other being from January to February. Also the fish spawn several times during the season. From length-frequency distribution it is seen that the fish ascending the river in winter months are those that have attained maturity for the first time (about 1½ years old). The monsoon run is of mixed age-groups, older groups predominating. The males mature at 16-17 cm. and females at 19-20 cm. There is significant difference in growth-rate and maximum length attained in the two sexes. There is a predominance of males in the winter samples, though the sexes are equal in the monsoon run. The former may be due to selective fishing. The females move in deeper waters beyond the reach of the surface nets.

Based on observations on fishermen's catches, it is concluded that Hilsa ascend rivers only for spawning and the lower estuaries and coastal areas form the permanent habitat of the fish. It is also suspected that migration of the fish in the Gangetic Delta from January to February is influenced by rise in water temperature.

Investigations on food and feeding show this to be a plankton feeder. The spawners moving upstream do not feed.

Researches on Hilsa in Allahabad University have shown that the fish occur in Ganga River stretch near Allahabad throughout the year. This seems to support the view that the stocks at higher and lower reaches of the river are separate. The Fisheries Division of Damodar Valley Corporation found, during the abnormal abundance of Hilsa in 1954, a rich hitherto unobserved fishery in a tributary of the Ganga at Gorakhpur. This extended migration is considered to be due to pressure of population.

Statistics of Hilsa landings are available only from particular localities. These, however, are helpful in indicating the trend of the fisheries.

The investigations on the probable role of Hilsa in the maintenance of cholera endemicity, undertaken by the Indian Council of Medical Research, have shown that cholera vibrios as such are not found in guts of Hilsa. There is possibility, however, of cholera vibrios ingested by the fish turning non-virulent, but becoming virulent again under favourable conditions.

Pakistan.—Pending Government sanction for proposed schemes, little work could be done excepting some preliminary observations. Statistics on the export of the fish are available from certain parts of the country.

Future Work.—Under existing circumstances the investigations have to be pursued following a uniform methodology, subject to individual limitations in each country. To begin with, the sub-committee would attempt at the standardisation of methodology and working directives. When data accumulate in national centres in due course, a more active international programme may be required. The sub-committee recommended that appropriate means of organising and financing such an agency should be explored. The committee formulated a draft plan of co-operative research on Hilsa, taking into account the special situation in Burma.

Full set of papers relating to the sub-committee meeting on Hilsa including the draft plan of a co-operative research programme and a design of a sampling programme for the collection of catch statistics of Hilsa are appended to this report. The Technical Committee and the Council would no doubt like to examine the draft programmes and, with such modifications as may be necessary, recommend their acceptance.

4. CHANOS INVESTIGATIONS

During the two years of existence of the Chanos Sub-Committee, important strides have been made in the study of biology and culture of Chanos. Detailed accounts of the culture and techniques were obtained from Indonesia, Philippines and Taiwan. Researches on acclimatisation and related problems were made in India. The search for the fish fry in Thailand has now proved successful. Keen interest has thus been created in this fish in the member countries as also even in non-member countries within the geographical range of this species.

Spawning of Chanos under controlled conditions.—An interesting observation has recently been repor-

ted by H. Van Pel, Fisheries Officer, South Pacific Commission at Nonmea that the Milkfish can spawn in enclosed waters. This was observed for the first time in a salt water lake on a small island in Tonga Archipelago. The lake has no direct link with the sea, the salinity being kept up presumably by the porous nature of the soil through which the sea water seeps in. It is suggested that a detailed report on the subject be requested from Mr. Van Pel.

The finding is of great significance in Chanos culture, especially in view of the several fruitless attempts made in the past to induce Chanos spawn in confined waters. A tricky and often expensive aspect of all fish pond projects is the collection and transport in healthy condition of fish fry from coastal centres to the interior. The capacity of the fish to spawn in the pond itself thus removes a great impediment. The case, however, should be studied with caution and it should be established beyond all doubt that no remote or temporary connexion even exists between the lake and the sea at any time of the year. The hydrological and ecological features of the lake should be thoroughly studied as also the occurrence of spawners, their breeding habits and the season of appearance of the fry in the sea outside.

Rearing of Chanos in fresh water.—It has long been established that the Milkfish, by virtue of its wide adaptability to changes in water, is ideally suited as culture fish for the Indo-Pacific region. Further studies on the Milkfish in fresh water are now reported from many countries.

In the *Philippines*, where attempts on rearing the fish in fresh water have been sporadic but successful, the fish enjoys special popularity, some attributing a more delicate flavour to those grown in fresh water.

In *India* Chanos culture in fresh water is becoming increasingly popular. From results of researches at the Central Marine Fisheries Station in India, it would appear that Chanos may not be very successful in fresh waters which are deficient in calcium and chlorides. The latter are present in fresh waters near coastal areas, but not far inland. In some impounded waters in India (Mettur) and in some places in Java, Chanos culture has not been successful. Further field trials are necessary before these views can be finally accepted.

Now that Chanos culture has spread to many Asian countries and experiments on them are being variously conducted, it would be profitable to learn of the environment selected and experience gained. The more experienced countries may provide data on the following points:

(1) The requisites on the lay-out and construction of the fish ponds.

(2) The conditions necessary with regard to the soil, vegetation, fauna, physical and chemical characteristics of water.

(3) The nature of most easily available or culturable food for the fish.

(4) Nature and solution of the problems generally met with, such as the predators, growth of unfavourable animals like *Cerithids*, *Gastropods*, etc. in ponds.

Report on new finding and contributions.—More information on the occurrence of Chanos fry in Indonesian waters is being reported (Saarin, H., 'On the Occurrence of Chanos Fry in Indonesian Waters', Report to IPFC 6th Session).

The stocking densities of the Chanos fish ponds in the Philippines are being reported for the first time. The stocking rates range from 500 to 2,000 fish per hectare of pond area. The conditions controlling this have also been described. Compatible combination of Chanos and *Penaeus monodon* as practiced in the Philippines have been worked out and reported.

The preliminary survey of Chanos fry found in the Philippines and the normal yearly production and value of each is being completed. The grounds are widespread, and the peak of the fry season is one per year unlike as in Indonesia where two peaks are reported (Rabanal, H. R., Progress Report on Inland Fisheries in the Philippines', IPFC 6th Session).

5. FOOD AND FEEDING OF FISHES

The need for further detailed work on the food and feeding of fishes was stressed during the 5th Session. These studies in recent times have ranged from simple analysis of stomach contents to the consideration of complexities of environments that induce the feeding of fish and from simple chemical analysis of fish food to the physiological demands of the fish. In spite of the importance of this subject, few contributions of outstanding merit have been published. Work of general interest and importance has appeared in other countries among which may be mentioned the paper by W. J. Koster ('Outline for an Ecological Life History Study of a Fish', *Ecology*, 36, 1, 1955) reviewing our knowledge of ecology of fishes of inland waters especially of the U.S.A. and Canada.

Although the Council made special reference to inland fishes, in the following account are also included results of investigations on marine species.

India.—No special studies on the food and feeding habits of the fishes have been undertaken in

India during the past two years, but information on food has been gathered under general studies on the biology of various fishes of commercial importance. The stomach contents of the ribbon fish which constitutes an important fishery along the south-east coast of India have been analysed by M. S. Prabhu (*Ind. J. Fish.*, Vol. 2, No. 1, 1955), and it was found that the fish was a carnivore and there was wide range in the items of food and the degree of feeding among the immature and spent fish. While the immature individuals fed mainly on young prawns and clupeids without any seasonal variation, the mature and spent fish fed voraciously, even to the extent of cannibalism (at a time when there was no dearth of other food). Individuals just prior to spawning, however, showed a slackness of feeding. Though there is thus active and voracious feeding by the fish after spawning in July to about February, indications are that there is some vague selectivity about it, since some species were preferred to others, the fish favouring small prawns, young *Anchoviella* and *Leiognathus* spp.

The thread-fins (*Polydactylus indicus*) which form a significant fishery on the Bombay and Saurashtra coasts have been the subject of study by K. H. Mohamed (*Ind. J. Fish.*, Vol. 2, No. 1, 1955) who based his observations on the trawler catches landed at Bombay. The thread-fins were predominantly predatory in habits. The crustaceans constitute the largest item of food, especially in the juveniles; the larger fish showed a more pronounced piscivorous diet, bottom or underwater shoaling fishes like *Harpodon nehereus*, *Coilia dussumieria* and small sciaenids and elvers forming favourite items.

Bhimachar and Seshappa (*Ind. Jour. Fish.*, Vol. 2, No. 1, 1955) in the course of their studies on the Malabar Sole found that the food consisted mainly of bottom organisms. Immediately after the south-west monsoon, however, up to March when the species occurs at all levels in shoals, the fish also feeds on planktonic polychaetes, sometimes to the exclusion of all other items. *Pronospia pinnata* was found to be the most favoured single species of polychaetes. Next to polychaetes in significance came amphipods (mainly *Cheiriphotis megachelis*) and lamellibranchs (mainly species of *Pholas*, *Nucula*, *Tellura*, *Arca* and *Cardium*). No starvation was indicated during spawning time and no difference between the diet of male and female or of juveniles and adults. These studies on food and feeding of the soles, according to the authors, also throw some light on their migratory movements. As a bottom feeder it particularly favours polychaetes during the post-monsoon months. With the onset of the south-west monsoon, however, the inshore sea bottom is highly agitated and most of the

bottom fauna disperse. Then the soles move into deeper waters. In August or September, with the cessation of monsoon conditions, the mud settles and the polychaetes recolonise the bottom. The soles are now found to return to the inshore waters and form shoals. This is the main fishery season.

Japan.—In a study of the stomach contents of the carps Nakamura (*Bull. Jap. Soc. Sci. Fish.*, Vol. 21, No. 2, 1955) found that the common carp fry feed mainly on Chironomid and other insect larvae, while *Carassus auratus* feeds mostly on detritus; decaying planktonic green algae, copepods, daphnians and ostracods also constitute important items of food. The crucian carp, however, prefers organisms of smaller size. The difference in feeding habits, according to the author, is well reflected in the fact that the 'survival rate of crucian carp is always higher than that of carp and yearlings of the crucian carp grow faster than the others' and while there is unevenness in growth of carps in general, the crucian carps grow evenly.

Studies on the newly introduced snake-head have been undertaken by two biologists, Koizumi and Nishikawa ('Ecology of *Channa argus* Cantor with its Feeding Habits and Environmental Condition', *Rep. Gifu. University*, Gakinglibu, No. 2, 1954). The paper reports that the 2 mm. long fry feed on mostly plankton and later the fish eat carp and wild gold fish besides cyprinids, loach, shrimp, tadpole and aquatic insects. A fish of 25-35 mm. was found to take per day 5-10 fish of 10-15 mm. length, while fishes 250 mm. and larger consumed two or three 30-100 mm. fish. The fish feed most actively during the colder months, April (15°C) to October (13 to 14°C) and lies dormant in mud for the rest. The fish is found to need less oxygen and has greater haemoglobin content. It can withstand a wide range of pH values. The usefulness or harm of the fish has been summed up by the authors in that they are not to be introduced in waters where native fishes are propagating, and since they have greater powers of adaptation, they may be introduced to the somewhat polluted and unutilised waters.

The amount of food consumed by fish in unit time is important in fish cultural practice, but since most of the experiments on this are done in the laboratory the results can be applied to natural conditions only with caution. The methodology needed in tackling these problems has been set out in a paper on the food intake of *Sardinops melanosticta* by Yonida, Y. and Y. Yoshida (*Bull. Jap. Soc. Sci. Fish.*, Vol. 21, No. 2, 1955). Two species of phytoplankton—*Skeletonema costatum* and *Thalassionema nitzschoides*—which predominate in the stomach contents were chosen as food indicators and these were

counted in the stomach and intestine of samples taken at regular intervals. Interesting results have been obtained from this study.

Philippines.—Comparatively little work is being done along these lines in Philippines and most of what is undertaken comes as part of other investigations. The nature of food taken at different stages in the cultivation of Chanos is being studied by examination of stomach contents and these are later expected to be correlated to the availability of food in the ponds. This will be of help in planning their culture. Similar work is being carried on also for *Tilapia mossambica*.

6. SEA FISHERIES

1. *Neritic-pelagic Fisheries*.—Mr. E. H. Dahlgren, Chairman of the Panel on Sea Fisheries left the area in April 1955; this has resulted in lack of adequate contacts being maintained by the panel.

The Council at its 5th Session reviewed the data supplied by Member Governments in answer to the questionnaire and found that the composition of these fish stocks appeared similar in most of the countries of the Central Sector, the dominant group being *Clupeidae*, *Scombridae*, *Sciaenidae*, *Carangidae* and *Polynemidae*. The Council, however, confirmed the need to continue work in terms of the Resolution C. 52/24.3(8) and suggested that particular stress may be placed on discovering the extent of these fish stocks.

It was, however, felt that since numerous species came under this study and since the scientific personnel available to most of the member countries is somewhat limited, more definite results would be gained if work was limited to a few important fisheries alone. Special emphasis was placed on the Indo-Pacific mackerel comprising species of *Rastrelliger* which formed valuable fisheries in most of the member countries of the Central Sector. This did not, however, mean that other fisheries should be neglected.

2. *Sub-Committee on Rastrelliger*.—To promote co-operative research on *Rastrelliger*, a sub-committee was suggested, at the last Session and nominations were invited from Member Governments. Ceylon, India, Indonesia, Philippines, Thailand, United Kingdom and Viet Nam have nominated their representatives on the sub-committee. Countries like Australia and U.S.A. expressed their great interest in the venture though they were unable, on account of the distance of their countries, to participate in it and further they have no fisheries for *Rastrelliger*. Burma and Indonesia expressed their support but regretted that active technical personnel were not available to them for nomination, but

Indonesia nominated an Observer to be present at the meeting of the committee.

A preliminary meeting of the sub-committee was scheduled to be held at Penang in March 1954 at the kind invitation of the Malayan Government to frame a programme of research work on *Rastrelliger*. But difficulties were encountered by many Member Governments in sending competent officers to the meeting and the attendance indicated was not sufficient to warrant a special meeting. The committee is, therefore, yet to meet, but in the meanwhile, a tentative agenda for the meeting has been agreed upon, which includes review of existing information on *Rastrelliger*, its distribution of populations, compilation of catch statistics, study of the fishing grounds, fishing seasons, of migration, food, life history and bionomics, besides studies on fishing methods and gear, processing and marketing of products. The draft agenda would be a useful basis for discussion prior to the designing of a research programme.

3. *Rastrelliger Fisheries*.—Much material relating to the mackerel fisheries has been collected by the sub-committee on Neritic-Pelagic Fisheries during the former years based on replies received to the questionnaire issued after the 4th Session of the Council. A digest of this information is given below:

India

Fishing grounds.—Within a belt of 10 miles along the west coast of India; minor fisheries on the east coast within 5 miles. The chief fishing centres are on the west coast of India at Ratnagiri, Malwan, Karwar, Malpe, Tellicherry, Calicut and Cochin.

Methods of capture.—In the Konkan area by shore-seines, drift and cast nets operated at 5 to 10 fathom depths. In North Kanara area by shore-seine at 3 to 6 fathom depths. In South Kanara shore-seine and drift and cast nets operated in 5 to 10 fathoms. In Malabar area by seine nets from dugout canoes at about 8 fathoms.

Fishing season.—The active season from October to February or March. Subsequently the shoals break and disappear from Kanara and Malabar waters. During the rainy season, a few large mature mackerel are caught in inshore waters at irregular intervals.

Migration.—Practically nothing is known of the movements of mackerel in the Arabian Sea, except perhaps that they appear early in the south and follow a northerly course at the beginning of the season and in a reverse direction at the close.

Spawning season.—From June to September. The spawning is intermittent, extending over a long time.

Appearance of young stages.—Juvenile specimens 4 to 5 cm. long are commonly encountered in July-August. Early in 1955 (March) very young stages of 2.5 cm. were recorded in the waters off Vizhingam in Travancore. Slightly larger specimens were recorded at Madras during summer months—April-May (Rao & Basheruddin, *Curr. Sci.*, 1953).

Past duration of fishery.—The mackerel fishery is one of the oldest and has probably been in operation for centuries.

Depletion or increase in fisheries.—Owing to erratic appearance of mackerel shoals, there have been fluctuations in the annual landings, but these were never below the economic earnings of fishermen. There are no indications of any positive decline due to overfishing, but at intervals of two years the fishery seems to reach its lowest ebb, the total landings in such years falling far below the average figures.

Notes on marketing and utilisation.—As the supplies of ice are inadequate, only a fraction of the catch is sold fresh. The bulk of the landings is cured and sent to the interior or even exported to Ceylon. There are no organised wholesale or retail markets and very few fishermen's co-operatives. There is no price control or facilities for cold-storage. The marketing conditions in general are unsatisfactory and call for the introduction of better methods in handling. In the Bombay State, where fish carrier launches have been introduced, distribution of mackerel is more effective. More than 2,000 tons of fresh mackerel are transported from Kanara to Bombay annually. The only by-product is manure, formed by drying the guts and gills removed before curing. When there is a sudden high mortality in impounded mackerel the entire stock is dried and converted into manure.

Work now in progress.—Investigations on the mackerel have been greatly elaborated during the year. The Central Marine Fisheries Station has undertaken a detailed research scheme all along the coast-line of India. The programme includes: (1) statistics of mackerel landings; (2) racial studies on the mackerel with special reference to the problem whether the mackerel found on the east and west coasts belong to the same population or to independent or semi-independent population; (3) survey of the extent of the fisheries and search for the eggs and larvae of the fish, particularly along the west coast;

(4) study and survey of local mackerel fishery at the various centres.

Proposals for a preliminary tagging programme to study migration are also under examination.

Japan

The mackerel fishery here is constituted by *Pneumatophorus japonicus japonicus* and *P. japonicus tapeinocephalus*. There is no report of *Rastrelliger*.

Malaya

Fishing grounds.—Coastal waters to a distance of about 20 miles from shore.

Methods of capture.—By large lift net (pukat tangkul) operated in 15 to 25 fathoms waters. It is a 30 fathom square net made up so as to hang by its corners in a deep bowl. Progressively finer mesh is used towards the centre from 1½" to 3/8" bar, with cotton two-ply twine of 20/6 and 20/8. The net is worked by five boats. *Rastrelliger* is also caught by the encircling gill net plied especially at night in 5 to 8 fathoms of water.

Fishing season.—The seasons are hard to deduce from the records of past years. Records have been imperfectly kept and further investigations must be done before conclusions are drawn about seasonal occurrence. The north-east monsoon hampers fishing from November to March.

Spawning, migration and appearance of young stages.—Have not been recorded systematically.

Past duration of fishery.—Uncertain, believed at least since the turn of the century.

Depletion or increase in fishery.—No indication of any decline in fishery from records available.

Notes on marketing and utilisation.—Usually sold fresh and is in great demand. Occasionally *Rastrelliger* is also boiled and sold. This practice is common on the west coast.

Netherlands New Guinea

Fishing grounds.—Humboldt Bay, Manokwari inlet and some inlets along the Geelvink Bay coast.

Methods of capture.—Fished with hook and line at depths of 20 to 40 meters. A purse seine has been designed by the Fisheries Section for experimental fishing.

Fishing season.—The fishing is carried out the year round if weather conditions permit. No specific information available.

Spawning, migration and appearance of young stages.—No information available.

Past duration of fishery.—At least 50 years.

Depletion or increase in fishery.—No specific data.

Notes on marketing and utilisation.—No information.

Philippines

Fishing grounds.—The coastal waters up to the 35 fathom line.

Methods of capture.—Purse seine (kubkub) operated from non-powered indigenous craft but towed by motor launch up to 34 fathoms. (b) Fish corrals (backlad) up to 10 fathoms. (c) Bag net (basnig) up to 35 fathoms. Operated by non-powered or powered indigenous craft with the aid of mantle and electric lights.

Fishing season.—Caught monthly all the year round.

Migration.—No study made.

Spawning season.—Studies are in progress. No conclusions have been arrived at.

Appearance of young stages.—Juveniles have been found in the monthly commercial hauls varying in different months and seasons of the year.

Past duration of the fishery.—As far as could be ascertained the fisheries have been in operation since 1920.

Depletion or increase in fishing.—In certain areas like the Visayan Sea and Malampaya Sound, there had been some marked fluctuations with a tendency towards decline in the overall catches.

Notes on marketing and utilisation.—Mostly sold in fresh state, sometimes dried and sometimes hot smoked.

Thailand

Fishing grounds.—East and west sides of the Gulf of Thailand about $\frac{1}{2}$ to $3\frac{1}{2}$ km. away from the shore for traps and $3\frac{1}{2}$ km. or farther for seines.

Methods of capture.—By Poh or bamboo stake traps and seines. Vessels employed are mostly old sailing boats converted into motor vessels. Fishing is done at a depth of 6 to 10 meters for traps and above for moveable gear.

Fishing Season.—From October to March on the east coast and April to September on the west.

Migrations.—Probable directions are first from inner Gulf approaching the west coast and going up to the north to the inner part of the Gulf or down to the south and then back to its original

source in the Gulf; or, secondly, from the inner Gulf approaching the east coast and back to the Gulf.

Spawning season.—From February to May on both sides of the Gulf.

Appearance of young stages.—During April and May.

Past duration of the fishery.—No record.

Depletion or increase in fishery.—There is marked decrease in the catch.

Notes on marketing and distribution.—Fish from the fishing grounds are either brought to the nearby landing centres by motor vessels equipped with insulated holds and then by rail to Bangkok or by motor vessels from the fishing grounds directly to the Central Market in Bangkok. Arriving at Bangkok the fish are sold by auction, and distributed to the markets. They are partly salted and partly sold fresh; few are used for 'fish sauce'.

4. Other Pelagic Fisheries :

Australia.—Research into sea fisheries in Australia for the past year has been directed to: (1) Planning of a programme of long lining for demersal fish on the edge of the continental shelf in S. Australian waters. (2) Study of the movements of Australian salmon *Arripis trutta* and the ruff *Arripis georgianus* in S. Australia and W. Australia and the reproduction cycles of these fishes; (3) Biometrical study of the trawl fishes of New South Wales; (4) Biology of the flat-head and other trawl fish in Victorian fishery; (5) A study of the movement and general biology of the principal estuarine and inshore fishes of Eastern S. W. Australia; (6) Analysis of data relating to biology of barracuda (*Thrysites atum*); and (7) Study of the age and growth of the giant perch (*Lates calcarifer*).

Hong Kong.—The largest single fishery in Hong Kong is that based on five species of the Golden Thread, and this group, in particular *Nemipterus virgatus*, the most abundant and economically important species, has been investigated in some detail. A paper entitled 'An Account of the Golden Thread Group Fishery in Hong Kong and a Preliminary Note on the Biology of *Nemipterus virgatus* (Houttuyn)' appeared in the *Hong Kong University Fisheries Journal*, No. 1, December 1954. In the same issue 'A Note on the Reproduction of the Grey Mullet *Mugil cephalus* Linnaeus', by J. D. Bromhall, described the efforts being made in Hong Kong to elucidate as much as possible of the biology of this species, which is of world-wide, as well as of local importance. Special emphasis has been

placed on its reproduction, spawning, embryology, and larval development in Hong Kong, and in this note a theory was put forward, with some evidence to support it, that the spawning periods of *M. cephalus* are in some way influenced by the moon or the tides, or both. A second paper is currently being prepared in which further progress will be reported.

Research on the Golden Thread continues but efforts are now being concentrated on other marine species. The Wave Sea Bream (*Tautus tumifrons*) has been selected for study with particular reference to age determination and the results of investigations to date will be published in the *Hong Kong University Fisheries Journal*, No 2. The Anchovies, *Stolephorus*, *Sardinella* and *Ilisha*, have been chosen for biological studies in view of their importance in the salt fish industry. Research will shortly commence into the fishery and biology of the Yellow Croaker, *Pseudosciaena crocea* (Richardson). This fish migrates through Hong Kong waters seasonally, and on the success or otherwise of the Croaker season depends to a large extent that of the fishing year as a whole. Special emphasis will be placed in this study on an investigation of the factors influencing its migration.

India.—Investigations on the oil sardines, *S. longiceps*, of the West Coast were continued by the Sub-Station of the Central Marine Fisheries Station at Calicut. A comprehensive programme of work on a regional basis is under implementation. There was a very successful fishery for oil sardines in 1953-54 after a comparative failure of several years, but recently remedied partially as already reported to the Council. The 1954-55 fishery has not been as good as in the former year. An interesting correlation found during the investigations at Calicut is that a successful oil sardine fishery is found to follow an intense blooming of the diatom *Fragilaria oceanica*. The spore formation in this diatom has a four-yearly cycle and it remains to be established whether the fishery would show similar four-yearly trends (Nair & Subramanian, *Curr. Sci.*, 1955).

The choodai fishery, composed of *Sardinella albella* and *S. gibbosa* on the south-east coast of India was investigated by K. V. Sekharan (*Ind. J. Fish.*, II (1), 1955). The fishery is for small sardines, of the 0-year class, the proportion of older fishes in the catches being small. Shore-seines, hand-nets (with torches) and gill nets are the main type of gear used. *S. albella* and *S. gibbosa* spawn at about the end of the first year of their life. A very interesting problem is here raised as to whether the total yield will increase if the catches of young ones are completely prohibited. These and related problems are under study.

The fishery for the ribbon fish, *Trichiurus* along the east and west coasts of India was investigated by M. S. Prabhu (*Ind. J. Fish.*, II (1), 1955). The fishery is composed of 2-4 year classes and has a restricted spawning period, June-July. The fish spawns only once a year and post-larvae 7-8 cm. long are found by the end of July. The species spawns first during its third year.

The biology and fishery of horse mackerels (*Carangidae*) of the west coast of India were studied by Chacko and Mathew (1955). These carangoid fishes (species of *Caranx*, *Decapterus*, etc.) constitute an important fishery on the west coast up to the 12-fathom line and occur all the year round. Boat-seines, drift-and cast-nets and lines are used for their capture. It is a more or less steady fishery accounting for an annual yield of one lakh of maunds.

Work has also been in progress in India on the percoid fisheries near Mandapam and on the Malabar Sole fishery on the West Coast of India. The results have been published in *Indian Journal of Fisheries*.

Among new aspects of work started in India, special mention may be made of the trawl fisheries between Bombay and Kathiawar where mechanized fishing operations have been in progress during the past few years. Studies are now specially directed to fishery biology and fishing grounds for the Dara (*Polydactylus indicus*), the Rawas (*Eleutheronema tatractylum*) and the Ghol (*Sciaena diacanthus* and *Sciaena* spp.).

Results of the deep sea fishing operations of *S. T. Meena* have been published (Govt. of India, Ministry of Food & Agriculture publication, 1955).

6.5 Oceanic Fisheries.—The Indo-Pacific Fisheries Council at its fifth Session reviewed the work done on Tuna so far and suggested that work be continued on this with stress on (1) compilation of morphometric data, (2) tagging experiments and (3) exploratory fishing. Tuna fishing, however, is still far from advanced in many of the countries of the Indo-Pacific region, since they do not as yet possess facilities for oceanic fishing, cruises. Enquiries addressed to member countries resulted in replies only from some of them. The situation is summarised below:

Australia.—Studies on the ecology of tunas have been proceeding slowly. Since February 1954 several oceanographic cruises have been made off South East Australia, but work has mainly been devoted to identify the water masses and movements of the blue fin tuna *Thunnus maccoyii* by D. L. Serventy.

Netherlands New Guinea.—No cruises were performed since *Hollandia*, the tuna exploratory

vessel was under repair. Some preliminary exploratory fishing for tuna did take place, but data are not sufficient for publication.

U.S.A.—Tagging of tunas by the California Department of Fish & Game to study the migrations and inter-relationships of the stock is expanding. 1,456 albacore were tagged and released off California in August-September 1954 and there is also an ambitious programme of tagging skipjack and yellowfin off Central and South America. Another study is being undertaken to correlate the occurrence of albacore to environments and its abundance in offshore waters. This is co-ordinated with the efforts of the Pacific Oceanic Fishery Investigations and the Oregon Fish Commission. Studies on the life history of tuna is also in progress, particularly as regards age and growth. The Oregon Fish Commission is also going ahead with research plans on the age and growth of tunas and is also sponsoring the analysis of oceanographical features of the west coast by the University of Washington.

The work of the Inter-American Tropical Tuna Commission has stressed importance on the collection and analysis of present and past catch statistics of yellowfin and skipjack off Central and South America. In addition, extensive studies are being carried on the life histories of bait species as well as on the yellowfin and skipjack. The relationship between changes in environment and changes in the population of these two tuna fish is also being investigated.

Four major projects are underway in the Pacific Oceanic Fishery Investigations. In three of these the techniques of oceanography, plankton study and fishery exploratory work are used in combination to discover the distribution and abundance of (1) yellowfin in equatorial waters, (2) skipjack resources in Hawaiian Islands and surrounding areas, (3) albacore stocks in Central North Pacific. The fourth is a project directed towards discovering a substitute for live bait to overcome limits imposed on the tuna fishery by the need for fish bait.

(1) The survey phase is almost complete. Yellowfin tuna concentrations in equatorial waters have been discovered and their distribution studied. Special attention is now being given to (a) improvement of longline fishing gear, (b) collection of time-series of oceanographic data in the equatorial current system for correlation with fluctuations in abundance of yellowfin tuna.

(2) Studies on skipjack population in the vicinity of Hawaiian Islands were continued with a view to increasing the catch of the local fishery by extending the short season and the now restricted area of fishing. Scouting expeditions during the past

year indicate skipjack population to be wide-spread, with schools extending hundreds of miles beyond the range of local fishery. Also the 1954 catches of Tuna in Hawaiian shore showed an increase over the 1953 figures.

(3) Studies on the distribution and abundance of albacore in relation to the transition zone between the north equatorial current and west wind drift, were commenced in 1955.

(4) Research on artificial baits is being continued.

Indonesia.—General notes on the taxonomy, distribution and fisheries of Tuna and Tuna-like fishes from Indonesian waters have been drawn up by J. R. Pattinasarany.

Hong Kong.—Oceanographical research in Hong Kong is of very recent origin and was initiated by the Fisheries Research Unit of the University of Hong Kong in March 1954 when the research trawler *F. R. V. Alister Hardy* began a series of monthly surveys of local waters. The sea area has been divided into fifty-two stations by a four-minute grid, and each month samples are taken from the surface, 10 metre and 20 metre levels and analysed in terms of temperature, chlorinity, dissolved oxygen, and pH value. In addition, surface plankton tows are taken at each station, and recently the water analysis has been extended to include an estimate of phosphate content.

The present political situation is such that a detailed analysis of extra-territorial waters by the research vessel is not possible. However, commercial vessels co-operate in taking weekly surface samples across the Pearl River estuary, in the fishing grounds between Hong Kong and Hainan, and into the China Sea as far east as the Formosa Strait. The accumulation of such data should allow an assessment to be made of the influence of the Pearl River on local waters, and enable a picture to be drawn of the general condition of extra-territorial waters of the China Sea.

The hydrological programme will shortly be expanded to include an investigation of the topography of the sea-bed and of the nature of bottom deposits. In addition, a project is at present under consideration whereby it is hoped to be able to compare the relative fertilities of different bodies of water of distinct chemical and physical characteristics lying to the east and west of the Colony.

7. MISCELLANEOUS FISHERIES & GENERAL BIOLOGY

7.1 *Oceanography.*—In accordance with the resolution adopted at the third Session of the IPFC, requests have been made by the Secretariat to the

various Member Governments to furnish the temperature and salinity data relating to their waters. Though replies were received from many, the information available were extremely meagre, so the Council at the 5th Session recommended that countries should be asked to publish such data as are available and apprise the Council of the existence of such publications. However, the majority of countries in the region are not equipped for any oceanographic work, especially since work along this line to be of help to fisheries, should be done systematically on surface and deeper waters.

Response from Member Governments as to the present state of oceanographic and related work has been far from encouraging and from what was received the following points are indicated:

Australia.—Extensive and comprehensive hydrological programme of the Division of Fisheries of the C.S.I.R.O. is continuing. Many more volumes of their well known 'Oceanographic Station List' have appeared in 1954-55.

Burma.—Little work has been done beyond negotiations for securing a fisheries research vessel and the services of an oceanographer from Japan.

Ceylon.—Hydrological data for the Wadge Bank are being collected, but owing to lack of staff, general hydrological work for the waters around Ceylon had to be postponed. Steps, however, are now being taken to improve the situation and special funds have been called for the purchase of salinometer, etc. Temperature and salinity records, whenever available, are being kept.

India.—Oceanographic work done in India in recent years has been summarised and reviewed by Panikkar and Rao (*A.I.O.P. Proc.—Verb., No 6*). Much helpful assistance has been rendered by the Indian Navy specially with *I.N.S. Investigator* which gave facilities to scientists going on board and collecting meteorological and oceanographic data. Records of salinity at different depths have also been kept by the Marine Survey of India. A laboratory for physical oceanography has been established at Cochin. Studies on physical oceanography have also been made by the Meteorological Department (which now has 26 Indian coastal observatories functioning), by the Departments of Geophysics, Geology and Zoology of the Andhra University (where extensive oceanographic programmes have been undertaken with the aid of a mine-sweeper placed at their disposal by the Defence Ministry); by the Central Marine Fisheries Research Station where work relating to temperature and salinity observations are continuing. The Survey of India (Geodetic Branch) is actively engaged in taking tidal observations. Besides these, general marine bio-

logical studies are being carried out by the Central Marine Fisheries Station to obtain a clear picture of oceanographic conditions in relation to Fisheries. Aspects of marine biological work are also being handled by many other State Fishery Departments and Zoology Departments of various Universities.

Hydrological studies by the Central Marine Fisheries Station have been limited to inshore waters, pending arrival of a research vessel. But the assistance of Merchant Navy vessels have been enlisted to obtain a general picture of salinity and temperature distribution in the Bay of Bengal and Arabian Sea.

Investigating the waters of Gulf of Mannar and the Palk Bay at Mandapam, South India, Jayaraman (*Ind. J. Fish., Vol. I, 1954*) found that the salinity shows a regular seasonal cycle corresponding to the south-west and north-east monsoons. The main salinity values for the year was 7.4 ‰ in Gulf of Mannar and 9.0 ‰ in Palk Bay. Highest values were obtained in May-October and the lowest between November and April, corresponding to the monsoons. This is explained by the fact that the south to north current during south-west monsoon brings in large amounts of 'oceanic' waters from the Indian Ocean and South Arabian Sea, which have high salinity (24.5 to 35 ‰). In shallow waters there is further increase in salinity by evaporation. The maximum point of 35.6 to 37 ‰ is obtained towards the end of September or early October. During north-east monsoon the northern waters (of low salinity) lowers the value up to 24.0 to 27 ‰ until February when the strength of the influx ceases.

Surface measurements revealed a difference of only 1 ‰ between surface and bottom salinity values. The dissolved oxygen content values are steady during most of the year (3.5 to 4.5 ml./l.) and surface bottom differences are not appreciable. The oxygen values are far below the saturation limits. Phosphate values were low, 0.15-0.30 mg.P/l. in Gulf of Mannar and 0.12 to 0.25 in Palk Bay and there was little seasonal fluctuation. Nitrates showed much wider variations, even to the extent of total absence occasionally. This may be partly due to the activity of denitrifying bacteria. Silicates showed the usual inverse relationship with salinity except in June-October in 1952, when this deviation was probably influenced by the swarming of *Noctiluca* then observed.

An integrated oceanographic programme on temperature, salinity, currents and plankton production was launched by the Andhra University, Waltair. The results have been published recently in *Andhra University Memoris on Oceanography*,

Vol. I. Based on these results La Fond has recently discussed the question of upwelling of waters on the East Coast of India (*Curr. Sci.*, 24, 1955). This programme is being continued.

Indonesia.—Hydrological work in Indonesia was confined to fresh-water lakes and marshes. Oceanographic researches on the Java Seas are being continued, but lack of personnel has resulted in the curtailment of programmes. Extensive surveys covering many lakes in Java, Sumatra and Bali and Celebes were carried out.

Malaya.—The construction of the Regional Marine Fisheries Research Institute is nearing completion. Future hydrological work will be carried out by this research unit. A research vessel *Manihine* is expected to arrive shortly from U.K. and work is expected to commence soon after this.

Philippines.—Compilation of temperature data was started in 1953, although unfortunately observations on salinity were neglected. Oceanographic observations were started at shore-based stations at strategic points, but due to lack of facilities these were often interrupted and incomplete. Oceanographic surveys are, however, now being carried on on board the Bureau of Fisheries Otter Trawler, *M. V. David Starr Jordan* where observations on temperature, salinity, nutrient salt contents, etc. of water samples are being recorded. Of the five areas surveyed in this way, Manila Bay has been the most comprehensively studied.

Whilst the difficulties faced by various Member Governments in this connexion are appreciated it is also clear that the present approach will not lead to the objective of preparing a complete atlas of temperature and salinity for the region. In view of the increasingly important role which physical, chemical and biological oceanography is assuming in fisheries exploitation, it is suggested that the Council should be apprised of the present unsatisfactory trend in respect of programmes of oceanographic investigations in the region as a whole and that the Council should be invited to give serious consideration at its 6th Session to the advisability of adopting a more practical approach to the problem, such as the establishment of a limited number of definite stations in member countries in the Indo-Pacific area or the establishment of an oceanographic institute.

7.2 Plankton :

India.—A comparative study of the plankton of the inshore waters of the Palk Bay and the Gulf of Mannar revealed that (1) during several months there was a relatively high standing crop in the Palk Bay, (2) the phytoplankton cycles showed differ-

ences and the total annual production was higher in the Palk Bay, (3) the total annual production of zooplankton was greater in the Palk Bay and in several months when the zooplankton was high in the Gulf of Mannar, it was low in the Palk Bay and *vice versa*, (4) differences in the distribution of copepods and chaetognaths have been noticed, and (5) the relationship between phyto-and-zoo-plankton and the hydrological conditions and the plankton has been discussed briefly.

Further studies on the marine inshore plankton were made at Mandapam, South India, by Prasad (*Ind. Jour. Fish.*, Vol. I, 1954). The standing crop of plankton was of higher order in 1950 than in 1951 and the two peaks occurred in February-March and September-October. The phytoplankton cycle showed more than one mode; the peak in February-March, however, appeared to be the result of the bloom of a single species. In 1950 it was *Rhizosolenia alata* and in 1951 *R. imbricata*. The April-June and August-November peaks were contributed mainly by diatoms. The zooplankton has a bimodal cycle, with a peak in February-April and another in October. It is interesting to note that while investigators at other coastal stations in India have reported a unimodal copepod cycle, here the copepods showed two modes. Observations on the fish eggs and larvae in the plankton show a direct correlation between plankton level and abundance of those species which feed directly on plankton.

The structure, life history and ecology of *Hornellia marina*, *gen. et sp. nov.*, a flagellate recorded from the inshore waters at Calicut, have been studied by Subrahmanian (*Ind. J. Fish.*, I, 1954). The flagellate occurs in swarms, at times causing a green discolouration of the sea, often accompanied by large scale mortality of fishes and other marine organisms.

Studying the inshore plankton off Visakhapatnam coast, Ganapati and Murti (*Ind. J. Fish.*, II (1), 1955) observed two maxima in plankton production, a preliminary one in 'spring' and a secondary one in 'autumn'. The dinoflagellate maximum was found to be followed by the diatom peak, which in turn was followed by the copepod peak. The early maximum is considered to be the result of upwelling of the nutrient-laden deeper waters, whereas the secondary maximum is due to the influx of river water. An interesting feature is the succession, from the north to south, noticed in the blooming of phytoplankton on east coast, as opposed to blooming on the west coast in a reverse direction.

Philippines.—Due to limited facilities and personnel, not much has been accomplished. Fish culture staff of Dagatdagatan Salt-water Experimental Station at Malabon worked on seasonal dis-

tribution of plankton in Dagatdagatan lagoon. The results are being published. Besides these, plankton studies in fish ponds and lagoons have been made by H. R. Rabanal and others, while the fluctuations in plankton of the estuarine waters of Navotas and Malabon were studied by S. Bersamin. M. Abagon and S. Bersamin have also studied the chlorophyll ratio at Kamit, Cavite.

7.3 Miscellaneous Fisheries :

Hong Kong.—On the north-west coast of the New Territories there is a very shallow bay occupying an area of about 30 sq. miles which nowhere exceeds 3 fathoms in depth and which is for the most part less than one fathom deep. Hydrological and climatic conditions are favourable for the growth and reproduction of certain species of oysters, and one of these, the Pacific Oyster, *Ostrea gigas*, has been cultured there for over 150 years.

The quantity of oysters passing through the Hong Kong markets has been very much reduced following the loss to China of the extensive beds along the West Coast of Deep Bay, and together with this there has been an increased demand for dried oysters and oyster products from overseas. In the year 1953-1954 the total local production amounted to about 14,000 piculs of shucked oysters (1 picul = 133.3 lb. or 1.2 cwt.), valued at HK\$1,400,000. To this must be added the value of the shells, the weight of which was approximately 126,000 piculs. These were sold to the lime manufacturers at the rate of HK\$110 for 140 piculs of shell, which amount after burning would produce 80 piculs of quicklime.

Local and overseas demands for fresh and dried oysters, and for oyster sauce, are such that production in the Deep Bay oyster beds is inadequate, and the introduction and development of new culture techniques, as well as research into the biology of *Ostrea gigas*, has been made a major project. The local method of oyster culture is inefficient and lends itself neither to high productivity nor to research, consisting as it does of scattering rocks and stones on the sea bed on which the spat settle and harvesting the mature oysters by divers or with the use of tongs. A pilot scheme, in which the 'hanging drop' method of oyster culture was employed, was launched in the spawning season of May and June 1954 and its success led to the initiation of an expanded programme this year in which three separate areas of Deep Bay have been set aside for experimental purposes. The proposed programme of investigation follows three main lines of research :

- (a) Experimental technology.
- (b) The biology of *Ostrea gigas*, including an investigation of its predators, parasites and disease.

- (c) An analysis of the physical and chemical environment provided by Deep Bay.

In addition, exploratory surveys are being undertaken in the Colony with a view to extending the area in which oysters may be cultured. The object of this is not only to increase productivity generally, but also, where possible, to bring some measure of prosperity to areas at present impoverished. To these ends the possibility of introducing edible oysters from Japan is also being explored.

Hong Kong is relatively poor in marine algae. Seaweeds are found only along the exposed and rocky south and south-west coasts of Hong Kong Island and along the eastern coast of the New Territories, and their growing season is limited to a period extending from the end of November to the end of July, after which time they completely disappear from the shores. During the growing period seaweeds become locally abundant and are harvested for use as food, medicine and in industry, the most important genera being *Ulva*, *Porphyra*, *Sargassum*, and *Gloiopeltis*.

A review of the taxonomy of the marine algae of Hong Kong and a seasonal ecological survey of the most important genera and species have been initiated. It is hoped to publish the results of this work in three parts :

- I. The Chlorophyceae
- II. The Phaeophyceae
- III. The Rhodophyceae

'Notes on the Marine Algae of Hong Kong : I. The Chlorophyceae' by B. T. Chiu has already appeared in the *Hong Kong University Fisheries Journal*, No. 1, December 1954.

At each suitable low spring tide from November to July, an ecological survey is being made along the south and south-west coasts of Hong Kong Island. The results so far obtained from these surveys indicate that all the marine algae are annuals, with the possible exception of *Sargassum* and species appear successively throughout the season, persisting in most cases for a period of one to three months. The manner in which such algae propagate is completely unknown.

India.—Studies on the bionomics and fishery of *Metapenaeus dobsoni* have been continued on the west coast, and the results published [Krishna Menon, *Ind. J. Fish.*, Vol. II (1), 1955]. From the size frequency studies it is found that males and females have differential growth rates, the male growing to about 70 mm. in the first year, 90-95 mm. in second year and about 110 mm. in the third year, while the female grows to 75 mm. in the first year, 100-105 mm. in the second and 120 mm. in the third,

Breeding period of the prawns along the Malabar coast is fairly long from September to March or April.

Work on various aspects of prawn fisheries of India is being reported at the Symposium.

Investigations on the Palk Bay squid, *Sepioteuthis arctipinnus* have been completed by Rao (*Ind. J. Fish.*, Vol. I, 1954). The squid supports a minor fishery around Mandapam. 1-, 2-, 3-year classes are found in the catches of males, while the females do not seem to live beyond the second year. The male attains maturity at 67.5-112.8 mm. when they are 6 to 14 months of age, and the female at 102.5 to 112.5 mm. between 12 and 14 months. The main food items are smaller fish and crustaceans, though cannibalism is common. Spawning commences in January and lasts till June. The eggs are always deposited in shallow inshore waters and lagoons. The fishery thus is regular and seasonal from February to June.

The wedge clam (*Donax cuneatus*) of Palk Bay was the subject of study by Nair and the results are being published (*Ind. J. Fish.*, Vol. II (2), 1955).

An unusual feature during the period was the revival of the pearl fishery in the Gulf of Mannar, for the first time since 1926-28. Systematic surveys conducted by the Madras Fisheries in 1954 showed the possibility of a fishery and a successful oyster fishery was conducted in the second quarter of 1955.

Further work is in progress in the Mollusc Research Unit of the Central Marine Fisheries Research Station at Madras on the growth of clams and oysters with special reference to optimal conditions for spawning and setting of spat.

Indonesia.—Systematic studies of prawn and shrimps are in progress and are reported to the symposium at the 6th Session.

Malaya.—Study of prawns and shrimps around Singapore is going on.

Pakistan.—Studies on the habits and habitats of prawns are in progress.

Philippines.—A comprehensive report of the crustacean and molluscan fisheries is being presented at the 6th Session. Studies on early life history and rate of growth of *Penaeus monodon* have been undertaken by Delmundo and Rabanal and results are being reported to the Symposium. The blue-crab, *Neptunus pelagicus*, is being cultivated in brackish-water fish ponds (both experimental and private). The scheme originated accidentally since the early crab

larvae, especially megalops, get into the ponds along with the seaweeds (*Gracillaria*) which are introduced as subsidiary food for Chanos. The young larvae are now being collected on a large scale in much the same way as the fry of Chanos or *Penaeus*.

The window pane shells (*Placuna placenta*) and different species of oysters (*Ostrea malabonensis*, *O. iredalei*, *O. palmipes* and *O. cucullata*) are cultivated widely. Specific studies on this, however, are not as common as on others ('Kapis Farming in Bacoon Bay' and 'Stick (Patusok) Method of Oyster Culture in Dagatdagatan' by G. J. Blanco).

Numerous fresh-water and marine molluscs grow naturally without being cultivated and afford many people a good source of livelihood. These abound in bays or exposed beaches with sandy or muddy bottom, on reefs or any rocks in shallow waters. Likewise exploitable fresh-water molluscs are found in all major river systems. The maximum 'crops' of these seem to be in the months July-October.

The goby fry (ipon) fisheries of North Luzon and north Mindano constitute an important segment of Philippine fishery, these fry and juveniles being exploited generally as source of fish protein. The conservation of these, therefore, needs particular attention. A report on the assay of the goby fry ipon fisheries of the Laog River and its adjacent marine shore, Ilocos Norte Province has just been published by Blanco.

8. CONSERVATION OF LIVING RESOURCES OF THE SEA

The problem of conservation of fisheries was examined in great details at the United Nations Technical Conference on the Conservation of the Living Resources of the Sea, held at Rome in April-May 1955. The problem of over-fishing and excessive exploitation is of immediate concern to many areas where fishing operations have been extensively developed. The sea fisheries of the Indo-Pacific area are now in a stage requiring more exploratory fishing and expansion. However, the danger of depletion does exist in a few fisheries. Therefore it is of paramount importance that all fishery work should have in view this question of safeguarding the stocks to obtain maximum sustainable yield. For this it was suggested at the Conference that scientific information on the following points are to be recorded in the various countries for the implementation of a fishery conservation programme when the need arises.

1. Statistical records of the fishing efforts and fish landings in each country, along with biological and ecological investigations in the area.

2. Information on the need or desirability of regulations on the amount, manner or kind of fishing to improve the quality and quantity of the catches, and, if found necessary, the nature of measures to be adopted.

3. Biological information on the extent and nature of fish populations and investigations on the life history, ecology, behaviour and population dynamics of the species constituting the fisheries, relationship of the resources with other members of the same ecological community—all of which would be helpful in arriving at the nature of the specific conservation problems that may confront the individual

nations and the most suited measure that would solve it.

The full report of the Conference is an extremely valuable document. The Technical Committee I would no doubt like to study this report and recommend that scientific investigations carried out by the member countries might be oriented in accordance with the classified criteria adopted by the Rome Conference on types of scientific information required in a conservation programme and the types of conservation measures that might be applied. *The relevant portions of the report are issued separately at the 6th Session of the Council.

REPORT OF THE TECHNICAL COMMITTEE II TO THE 6TH SESSION

Chairman : DR. M. R. QURESHI

0. INTRODUCTION

It is gratifying to note that response from the members of the Panels was very good although some others failed to respond. The preparation of the Committee's report would be greatly expedited in the future if the members of Panels would submit their reports before the established deadline.

A general review is given of the various activities carried out in the region which indicates fairly considerable interest taken by different countries of the region in developing fisheries. The report has been based on the assignments decided upon at the 5th Session.

Detailed information may be found in the technical papers indicated under various items.

Progress during the year is summarised below :

It would have been the wish of Technical Committee II to have circulated this report to delegations in advance of the Session ; this has not however been possible owing to the lateness of receipt of some of the Panel reports.

I. CRAFT AND GEAR

Chairman—Mr. M. J. Lobell

At the 5th Council Session held in Bangkok in January–February, 1954, the following were declared to be the continuing assignments of the competent Panel over the next few years :

1. Introduction and appraisal of mechanized fishing methods for small, indigenous craft, including the respective merits of inboard and outboard engines.
2. Introduction and appraisal of non-indigenous gear.
3. Design of small fishing boats for the region.
4. Appraisal under fishing conditions of net and rope preservatives.
5. Use and effect of fishing with lights.
6. Use of indigenous materials for nets and gear.
7. Exploration for new shrimp resources.

The work performed in the territories of Member Governments on these aspects are given below, together with the critical appraisal and suggestions of the Committee, in so far as information has been forthcoming.

APPRAISAL OF MECHANIZATION OF FISHING FROM SMALL, INDIGENOUS CRAFT

The introduction of mechanical devices to provide greater efficiency in the fisheries is making steady progress within the Indo-Pacific region. The basic means for employing such devices are known and the possible benefits which may be derived from mechanization are realized. But mechanization, which has been so successful in the western world, first requires solutions to a myriad of problems, many of which are unique to the Indo-Pacific region. Bitter experience has already shown that it is usually quite impossible to transplant fishing equipment and techniques piecemeal from one part of the world to another in spite of the brilliant success these might have had in the area where they were developed. Almost always, changes of varying magnitudes must be made to adapt new methods to local conditions. In the Indo-Pacific countries, basic data are often lacking to provide guidance for technicians and administrators in putting a program of mechanization into action. Often, too, governmental services are not well organized to attack and solve the special problems arising. The system of trial and error has many advantages, especially when well supervised by competent technicians ; but such experiments are much more likely of success if pains are taken to carry out prior studies, even though limited, and to provide a favourable atmosphere of conditions receptive to changes.

As a first requisite, as much as possible should be known of the type, abundance and availability of the fish populations to be utilized. Obviously, if the resources are limited to species which live in areas, such as coral reefs, where mechanized operations are impossible, no attempt should be made to mechanize actual fishing operations. But, quite possibly, the use of engines for propulsion might be well justified to carry catches to market, to enable fishing operations at greater distance from port, to allow more time to be spent on the fishing grounds and to operate more units of catching effort. Where fish are sparse, economic considerations appear—can catches support mechanization of fishing? Here again, the answer might be found in a mother-ship type of operation where power is used to put

many small, unmechanized fishing units on appropriate grounds and to transport catches to port.

A great deal can be learned from analysis of existing fishing materials and gear—oftentimes simple steps in modifying local methods give spectacular results where attempts at introduction of entirely new methods fail.

When the characteristics of the resources are known and the existing types of fishing analyzed, it should be possible to make a preliminary decision as to whether or not mechanization is advisable; and, if so, at what level; propulsion only, propulsion and fishing, etc. At this point, competent advice concerning the adaptability of local-type craft for engine installation should be sought. In some instances, with practically no change in hull design and only minor adjustments in arrangement, it is possible to obtain fairly adequate results with small engines. In other cases, design modification of considerable extent may be required. Again, it may be inadvisable or impossible to mechanize certain types of craft; and in such cases, expert services are required to develop designs which take into consideration local needs or even, to some extent, local idiosyncrasies or wishes of the fishermen. But the primary requisites of mechanization in such cases must be given priority.

The type or characteristics of engines to be installed is governed primarily by technical considerations such as weight, horsepower, size, type of fuel to be used, ease of operation, simplicity, servicing facilities, availability of spare parts. Almost equally important is initial cost, cost of operation, and upkeep and potential usable life.

The next logical step would be to construct a significant number of craft of approved design, install engines suitable for the work to be done, outfit with the type of gear to be employed and design adequate practical fishing tests to provide concrete figures on operating costs, catches, and income. The experimental craft should be fished by regular professional fishermen. In order to obtain direct comparisons, fishing craft of the original indigenous type should be operated over the same period, in the same area, on the same species and preferably by the same fishermen. Such an experiment might be set up with 10 improved boats and ten original type craft fishing the same type of gear in the same region. For this, 20 crews would be required. These should be interchanged from time to time in order to minimize the effects of differences in the level of professional skill. During the test period, which should cover a significant number of months of operation, detailed figures of costs, running time, catches, income and economic balances should be

secured. The data collected should be sufficient to indicate if mechanization of the particular fishery is feasible. Naturally, due consideration must be given to many factors besides actual costs and income. Quite probably some sort of a chain reaction may be generated which involves handling, unloading, processing, marketing, transportation, and distribution problems. Oftentimes markets are so delicately adjusted that even small additional catches result in greatly depressed prices. For this reason the test must be very closely supervised by competent personnel.

If, after careful analysis, it is found advisable to stimulate large-scale mechanization, then definite steps must be taken to provide a suitable climate. Some sort of a directing organism must be set up to arrange, co-ordinate and supervise. Financing methods must be studied, credit facilities set up; depots for spare parts, shops for repair, stations for maintenance, training courses for fishermen, distribution points for fuel and other necessary adjuncts provided for. Inspection, keeping of records and control must be included. Technical services must be available to attack and solve accessory problems which may arise in marketing and use of the catches.

It cannot be over-emphasized that the original stages of project for mechanization must be carried out by an organization geared for this purpose—adequately staffed, intelligently directed, and well financed. While political considerations often must be considered, these cannot over-ride technical and economic facts—if they are allowed to do so, failure is sure to result. Sometime during the later stages it may be necessary, due to the magnitude of operations, for the original organization to relinquish some of its activities. These may be taken over in part by co-operatives, by credit institutions such as banks, or by private enterprise. Whatever these developments, ultimate supervision and guidance should be the responsibility of the fisheries service of the country.

Reports provided from several countries indicate that action in various degrees and at various levels is occurring.

Burma

It is reported that a program for mechanizing small fishing craft is included in an over-all fisheries development scheme. Both inboard and outboard motors are being considered.

Pakistan

In this country a comprehensive plan appears to be taking shape and includes:

- (a) A classification plan for fishing craft.

- (b) Technical assistance from FAO in selecting the most appropriate lines, construction, etc. of fishing craft.
- (c) A demonstration of five inboard engines for testing.
- (d) A plan for following up results of successful tests.
- (e) American aid in procuring fifteen engines of five and ten h.p.

India

Considerable progress is being made, particularly in Bombay. Here, a co-ordinated program encouraged by liberal subsidies—50% subsidy, 50% loan for three to five years—has resulted in an increase from nine motorized boats in 1950-51 to over 400 (late 1955).

In the State of Saurashtra, a beginning has been made and plans are under way to supply engines at subsidized prices to fishermen, 40 boats having so far been mechanized.

It was found in Madras State that local craft were largely unsuitable for mechanization. Designs were developed for suitable craft and the Department of Fisheries has built 12 vessels which are used for demonstrations to encourage fishermen to go ahead. Arrangements are being made to deliver these original craft to fishermen and fishermen's co-operative societies and to build additional ones.

Although mechanization for propulsion only has been considered previously, power is now being demonstrated for shooting and hauling gear in Madras State, under the guidance of an F.A.O. expert.

Under the Indo-U.S. Agreement for the promotion of the above programs of expansion and modernisation of marine fisheries, 367 marine diesel engines have been procured.

Hong Kong

By the end of March 1955 the power-driven fishing fleet in Hong Kong numbered 750 vessels. Of these about 719 junks were converted from sail to mechanical propulsion. This represents about 12% of the total number of junks engaged in fishing and probably about 50% of existing junks considered suitable for the installation of engines.

The 719 primitive types which have been mechanized comprise 161 trawlers, 230 liners, 253 purse seiners, 9 gill-netters and 66 collectors.

Commencing in 1950, developments were slow but steady; by 1952 the value of mechanization and the possibilities of it with junk-type fishing craft were clearly appreciated, so much so that in the

1953-54 season engines were installed in 402 native craft, i.e., about 56% of the total number of junks mechanized since 1950.

The benefits under Hong Kong conditions of mechanization are :

(1) The range of fishing operations and time available for fishing are extended.

(2) Marketing can be planned with the minimum of interference to fishermen.

(3) More of the labour of the fisherman and his family can be applied to the business of fishing; this is of considerable importance in improving the economic position of a fishing community, 90% of whom are owner-operators.

(4) Danger from bad weather and typhoons is reduced.

The landings of fish at Government wholesale markets have steadily increased since 1946 but the greatest increase has coincided with the period of active mechanization commencing in 1950. As indicative of the trend, the total fish landings increased from 32,952 tons in the 1953-54 season to 40,874 tons in the 1954-55 season. These increased landings are attributed to mechanization and particularly to :

(1) The addition of 19 motor deep-sea trawlers to the fleet.

(2) The greater number of mechanized junks in operation.

(3) The extended range and greater activity of mechanized native trawlers.

There is no doubt that the earning power of the owner-operator fisherman has been greatly improved by the change from sail to diesel power for propulsion and fishing. A detailed analysis of factors leading to increased landings is rendered difficult in the absence of prewar statistics and more time must elapse before it is possible to disentangle the various factors that have contributed to increased landings over the past five years.

A sampling analysis made by the Marketing Department of 21 fishing vessels of various types before and after mechanization indicates that the minimum increase in catch is twice and the maximum four times. Apart from these direct benefits, the provision of large sums of money by both Government and private enterprise for loans at low rates of interest for mechanization has weaned the fishermen from the traditional sources of loan money with crippling interest rates. Loan money is fed back through the Fish Marketing Organization which compels the fishermen to market through that Organization if he accepts cheap loan money.

Ceylon

There are 5,500 Outrigger Canoes or *orus* in use in Ceylon, with the exception of the Northern Province. They are fast, making up to 10 knots in a good breeze, extremely seaworthy and can be used for fishing with handlines, trolling lines, drift nets and live bait. It is doubtful whether the sailing qualities of the boats themselves can be improved; they are ideal beach-landing craft, and the installation of engines, even if desirable, would be almost impossible in the narrow dugout hulls. The gear in use is adequate for the purpose and could hardly be improved upon. It would seem, therefore, that fishing from *orus* is not by any means inefficient and that, although motorboats would have a decided advantage in calm weather seasons, a man who invests in a powered craft could use that money to invest in several *orus*. The only way to determine the relative merits is to have powered boats fishing alongside the indigenous craft.

There are two types of rafts in use in Ceylon, the larger of which are known as the *katamaran* and are approximately 25 ft. in length and consist of five logs of *lunuminella* wood, pegged and lashed together to form a narrow raft. These boats, of which there are some 1,250 in use, almost exclusively in the extreme north of the Island, are equipped with a large triangular sail and centreboard. They are extremely seaworthy and, while rather slow, still manage to move in the very lightest breeze. A distinguishing mark of the *katamaran* is the specially shaped prow or 'beak' as the fishermen call it, which gives increased sea-kindliness. These craft carry a crew of two or three men and are used for drift-netting in shallow waters.

There are also some 3,500 *theppams*. The *theppam* is a smaller edition (under 10) of the *katamaran*, which however rarely carries any form of sail. The fisherman paddles out to sea during the night and drifts his nets in the early hours of the morning. A more primitive form of water transport could hardly be imagined. Slow and clumsy, they become in time so waterlogged that each fisherman has to own two or even three, using one while the others dry in the sun; in addition, only two nets can be carried; hence there is an extremely low return compared with the time and effort involved. However, any large-scale change-over from a long established fishing method will be extremely slow, not only on account of the tendency of fishermen to stick to their old established methods but also because they may have a considerable amount of money invested. If a light, economical, easily beached type of small powered craft could be introduced to replace these rafts, not only would the catching power be greatly augmented by virtue of

the extended fishing time and increased net carrying capacity, but the fishermen would also be saved great physical hardship.

In Jaffna, there is a small but thriving fishery using longlines. The boats used are open dugout canoes equipped with a removable outrigger. The men sail these to areas some 10 or 20 miles away. The boats perform well in a breeze but, as there are frequently long spells of calm weather, these craft often spend an excessively long time in travelling to and from the grounds. If they could be mechanized or a type of motorboat introduced to give independence of the weather, the catching power of this fishery could be greatly enhanced.

There is an important trap fishery in the Jaffna area, employing over 1,000 men and 200 boats. The traps are stake nets in shallow water which are frequently shifted and may be set as far as 20 miles away. If these boats could be motorized, the attendant increase in range and independence of the wind would give a similarly substantial increase in production. The Government is, with the assistance of an F.A.O. expert, making considerable progress in the mechanization of the Jaffna boats.

Australia (Papua and New Guinea)

No attempts have been made to mechanize indigenous craft such as dugouts and *catamarans*.

Philippines

Although mechanization is proceeding in the Philippines, certain problems have arisen in this connection. Chiefly, mechanized propulsion is used to run to the fishing grounds and back to port.

Concern is expressed over possible loss of employment of many men if mechanization proceeds too rapidly. Financing is also an outstanding problem.

RELATIVE MERITS OF INBOARD AND OUTBOARD ENGINES

Very little factual information has been provided although it is known that outboard engines are widely employed in some parts of the Indo-Pacific region.

In *Pakistan*, experience with outboard engines indicates that 2 h.p. units are best suited for outrigger canoes, 4 h.p. for 25 foot *Hora* boats and 10-12 h.p. for 35 foot craft. The 4 h.p. engines are considered the most appropriate.

In the *Philippines* the industry is more inclined to the use of inboard engines because the nature of the fishing grounds is such that outboard motors are not usable, due to rough weather during a great part of the year. In addition, it has been found that

outboard engines do not hold up the arduous service; nor do they provide sufficient power for towing heavy nets. The only merits reported for outboard engines are greater simplicity in construction and greater ease in operating and repair. They are also lighter, more portable, and cheaper to acquire than most inboard engines. The cost of fuel and lubricating oil, on the other hand, is higher than for inboard oil engines.

In *Burma* experiments are planned to test the relative merits of inboard and outboard engines.

In *Australia* it is considered that outboard motors would be the logical choice for installation in dugout canoes with outriggers and for catamarans.

In *India* it has been found that inboard engines are most suitable since outboard motors break down under hard service conditions.

Hong Kong, with thousands of wooden junks packed tightly in narrow anchorages and shelters, has considered outboard petrol motors to be dangerous and their use on junk-type vessels has been prohibited. It is believed that this is a wise measure both in the interests of the fishermen and the fishing community. The mechanization drive has been with inboard water cooled diesel engines as being more suitable for junk-type fishing vessels. Engines range in h.p. from 5 upwards and are readily available in the local market. It is not possible to comment on this item from local experience but in general it is believed that the outboard motor is unsuitable for local conditions. It is likely that *Hong Kong* will continue to pursue a policy of mechanization with inboard diesels.

EVALUATION OF THE INTRODUCTION OF NON-INDIGENOUS FISHING METHODS

Since World War II, considerable activity has been apparent in the introduction of non-indigenous fishing methods in the Indo-Pacific countries. These introductions have been carried out by private enterprise independently, by private enterprise with government backing, by various inter-governmental technical and economic assistance organizations, and by other means.

Projects have varied greatly. In some instances complete vessels, crews, and fishing apparatus have been imported under various types of arrangements. In other cases, only vessels have been brought in. In other instances, fishing experts only. In still other projects, only fishing apparatus.

Because factual data is largely lacking, it is impossible to strike a balance of the results obtained from all of these widely-scattered initiatives.

General conclusions, however, can be drawn from such information as is available.

(a) While many enterprises have failed in an economic sense, valuable information has been brought to light concerning the marine resources and their potentialities.

(b) In many cases even though actual fishing may have been successful, the project has failed because of other factors such as:

(i) Lack of handling, processing, and marketing facilities.

(ii) Even if these facilities exist, there is often a lack of demand for the new type of product, although it fills an apparent need for cheap, wholesome animal protein.

(iii) Resistance on the part of the local fishermen to adopt new methods, or their inability to acquire new equipment.

(iv) Often, it has been difficult, if not impossible, to adequately train local fishermen to operate non-indigenous types of gear and vessels.

Because each case is different it is impossible to give any hard and fast rules for procedure. Certainly before any definite action is undertaken some attempt should be made locally to appreciate all of the different factors that may influence the proposed project.

Information received from the Philippines indicates that three types of non-indigenous fishing gear are now in regular use. These are pole and longline gear for tuna and tuna longlines, Japanese drive-in nets and trawls (Japanese type beam trawls and US-type, V-D otter trawls).

The adoption of these methods has resulted, on the one hand, to a temporary general increase in catches and stabilization of fish supply. On the other hand, due to characteristics of the resources and uncontrolled fishing, there has been a rapid deterioration and depletion of the stocks levied upon (a direct effect of unregulated, intensive fishing by highly effective gear on stocks which are not capable of supporting this strain). It would be interesting to know, in cases of this sort, what level of sustained yield the resources could have supported, were indigenous gear only used.

As an example of the cross currents that may come up in connection with the introduction of new methods which may stabilize the supply, it was pointed out that stabilization adversely affects the income of investors in the extensive bangos (Milk-fish) industry. Previous to the introduction of these efficient appliances, the fresh fish market was controlled entirely by the owners of bangos ponds—

during inclement weather oftentimes bangos were the only fish available for sale. With greater, stabilized catches, it was no longer possible for pond operators to control prices and markets.

On the other hand, even though the fishpond operators, fishcorral operators and fishermen using indigenous methods were prejudiced economically by introduced methods, consumers, as a whole, profited greatly by having abundant fresh fish at all seasons and at comparatively stable and reasonable prices.

A report from *Burma* states that trawling was introduced in 1954 with very satisfactory catches. Two Japanese trawlers, 280 and 100 gross tons respectively, are operating. It is noted that operations can be intensified profitably provided that the available market for sea fish can be improved. These operations are discussed by U Ba Kyaw in *Technical Paper No. 25* presented at this Session.

In *Pakistan*, the Central Fisheries Department (Karachi) reports that it is operating two non-indigenous type fishing craft. One is 76 feet B.P. steel hulled and powered with 150 BHP diesel (it is used as a trawler). The other is a 67 foot, wooden hulled, refrigerated hold vessel, propelled by a 120 BHP diesel engine and used for a variety of fishing purposes.

Trawling experiments reported on indicate that down to 25 fathoms operations with this method may not be profitable because the quality of the bottom fish is not acceptable to the consumers.

Flat type cotton shrimp trawls of 100 foot and 70 foot semi-balloon trawls are being used. Some new shrimp grounds have been found which are inaccessible to fishermen with indigenous equipment. It is expected that shrimp trawls of various sizes will open up new fields for commercial fishing, especially for fishermen owning powered launches.

In *India*, exploratory and experimental deep sea fishing operations with powered vessels are at present being conducted by the Government of India off the Bombay-Saurashtra Coast and by the Government of West Bengal in the Bay of Bengal. These operations are aimed at assessing the suitability of different kinds of fishing vessels, gear and methods for Indian conditions, besides charting fishing grounds in offshore waters and training personnel in powered fishing methods.

In December, 1953 the two cutters of the Deep Sea Fishing Station, Bombay, which had been employed hitherto for Danish trawling, were converted for bull trawling operations under Japanese technicians and yielded very encouraging results. These trawlers are now fully manned by Indian

personnel. The average catch of nearly 1,350 lb. of fish per hour of bull-trawling is about two and a half times that obtained by otter trawling. 'Mother-craft' fishing is being tried in Travancore-Cochin with some success. This involves the towing of a number of indigenous boats into offshore waters by means of a powerful tug or mother craft and after completion of fishing operations these being towed back. In addition, mother fishing vessels, Danish trawlers and Reekie boats are being employed in Madras, Bombay and West Bengal for experimental powered fishing. Three bull-trawlers have recently (middle of 1955) been supplied under the American Aid Programme for West Bengal and will commence fishing operations after the monsoons.

Under the Norwegian Aid, experiments on fishing with purse seines, drift-nets and lines etc. are being carried out from 30 ft. dories on the Travancore-Cochin coast. So far, purse-seiners have been found more efficient than other types of fishing gear. Experiments in connection with beaching of mechanised craft with the help of shore-winches are being continued. Nylon nets have become very popular as they are more durable and land much larger catches than the cotton nets. There is a great demand at present for nylon yarn. In Bombay State, hemp twine nets are also very popular.

Indian personnel are being trained in powered fishing methods on board the vessels of the Government of India and of West Bengal. Similar training is being given on the three schooners of the Norwegian Project in Travancore-Cochin.

Instruction in new techniques of fishing such as the use of flat trawl, shrimp trawl, nylon bottom nets, improved types of gill net and drift net is now part of a programme undertaken at Madras and Tellicherry under an F.A.O. expert. A centre to train Indian fishermen in the handling and maintenance of mechanized vessels has been inaugurated on the 9th August, 1955 at Satpati (Bombay) under the guidance of another F.A.O. expert. Two more centres in Tuticorin and Cochin will be established early in 1956.

In *Indonesia*, a fishery technician was made available by the U.S. foreign aid programme in July, 1953 in order to investigate the possibilities for tuna long-line fishing. Most of the difficulties listed here were experienced, and attempts are being made by the Government to overcome them. Although the original plan was to use one of the two American-built tuna clippers already in Indonesia, these did not become available for a variety of reasons and attempts were made to carry out longline operations from a smaller (27 meter) locally constructed vessel

which was not however available until October, 1954. Four longline hauling machines were then ordered.

In the first trial voyages, it became apparent that fishing operations could not be carried out with the available crew but a crew of Majang fishermen subsequently showed signs that they might fairly readily adopt the longline method. It is, however, estimated that a number of years must elapse before sufficient keen, trained personnel will become available for its general extension to the fisheries.

By this time, the lines originally imported at the commencement of the scheme had deteriorated to such an extent that they could be used only for float lines and further delay was incurred owing to the need to construct new gear from material air-freighted from Japan. Gaffs, spears and harpoons were fabricated from steel rod in the Fisheries Service machine shop.

Japanese records show that at least five areas in the Indonesian Archipelago show an abundant catch potential (from 11 to 30 fish per 100 hooks as against an overall average in the Japanese industry of 3 fish per 100 hooks). It therefore appears indubitable that there is a case for extending the Indonesian operations, provided the difficulties encountered can be overcome so as to carry out economically feasible fishing operations and so obtain a product which is sufficiently cheap to enter the local and export markets, and more especially to provide much needed animal protein in the inland areas.

Three later voyages of from 5 to 8 days each were accomplished on the fishing grounds with every indication of future proficiency, 6,280 kg., mainly of tuna and shark, having been obtained in 18 fishing days and sold in the Djakarta Fish Market for 26,485 rupiahs. Maximum catch was slightly more than 3 tons in four fishing days.

On the basis of the above experiments, it was considered that the construction of three additional vessels was justified and this is proceeding in the Djuana Shipyard in Central Java, taking into account the inadvisability of extending the operations faster than the ability of the local fishermen to learn and of the market to absorb the new product.

It will, however, be necessary to solve the problem of obtaining fishing equipment at present unavailable in Indonesia; import restrictions and the limited Government fisheries budget makes foreign sources vague and hazardous and it will therefore become necessary for the Sea Fisheries Service to explore the possibility of fabricating their own major components.

It has also been recommended, in view of the difficulties encountered, and the necessity to encour-

age private operatives, that once it has been satisfactorily demonstrated that economically profitable operations are feasible, the Sea Fisheries Service withdraw from the operations in favor of private enterprise, since only when boat owners and operatives are working on a share basis can satisfactory production be obtained.

In *Australia* non-indigenous gear is used in all commercial fisheries (diving for trochus shell from outrigger canoes is a possible exception).

Considerable activity is taking place in *Hong Kong*. A 30 foot mechanized junk, powered with a 10 H.P. diesel engine and with a power-operated deck winch, was built and is being operated as a demonstration, survey and training vessel. Plans for a model purse seiner have been under consideration to supply the need for more modern craft of this type.

In *Thailand* work has been going on for several years to introduce and test various kinds of non-indigenous fishing methods. The Japanese *otoshi ami* has been very successful, for it has many advantages over the indigenous bamboo stake trap. Adoption by local fisherman has been gradual due principally to difficulties in financing a change-over. Large-scale experimentation with Japanese bull-trawling gear indicates that certain possibilities exist, provided that various marketing problems can be overcome to utilize new species and additional quantities of market fish. Extended experimental fishing with nylon gill nets at the Marine Fisheries Station near Rayong has proved so successful as compared with the indigenous nets that local fishermen are changing over rapidly. It is expected that practically all gill nets used in Thailand will be nylon in the course of a few years.

In *Hong Kong*, following the promotion of mechanization of the local fishing fleet, the Fisheries Division of the Department of Agriculture, Fisheries & Forestry has succeeded in overcoming the reluctance of the Chinese fisherman to accept non-indigenous fishing methods and gear.

The old Chinese method of purse seining involved the use of two sailing vessels. This was clumsy and expensive and fishing operations depended largely on fine weather. Trials were carried out by the Fisheries Division using only one vessel until a satisfactory method was evolved and demonstrated to fishermen. In purse seining with one mechanized vessel, the net is operated by one boat and two sampans. During fishing one end of the net is held by a man on the sampan and the net is shot by the mechanized junk going at full speed to encircle the spot of the bright light sampan. When the junk meets the sampan the purse line is hauled in quickly. This method has now been adopted by the majority

of mechanized purse seiners resulting in the following improvements :

- (1) A reduction in manpower. Nine persons are now able to operate the net where 12 were formerly needed.
- (2) It is no longer necessary to tow the partner boat to the fishing grounds ; this not only reduced the speed of travelling but was also contrary to Marine Regulations.
- (3) In rough weather collisions between two boats are avoided.
- (4) A wider range of activity is possible as the mechanized boat is able to extend its fishing grounds.
- (5) The net can be shot and hauled in any direction and the position adjusted by propelling the boat ahead or astern.
- (6) The number of fishing units has increased as many fishermen have mechanized their partner boats which are now operated individually as single units. This has resulted in increased catches.
- (7) The cost of operations has been reduced, particularly in maintenance and crew's wages.

Shrimp beam trawls were originally designed for operation by small wind-driven vessels and the nets used were small. With the introduction of mechanization, the Fisheries Division set out to improve the design of the net. Experiments up to the present time have been largely devoted to replacing the old type bamboo beam and stone sinkers with galvanized iron piping and metal skates, and comparative tests with both the native style and the improved gear have resulted in consistently higher catches with the latter. The advantages of the improved gear over the old would appear to be as follows :

- (1) The increased weight and the arrangement of beam and skates ensures that the net tows efficiently, and the increased size of the net opening, from 14' x 4" in the old net to 14' x 1'2" in the improved net, has led to better catches.
- (2) Whereas the bamboo beam frequently breaks in rough weather, thus closing the net, the galvanized iron beam does not do so and this ensures that the net remains open for the entire tow.

It is anticipated that further development will progress towards increasing the length of the beam and modifying the design of the net, and using nylon instead of cotton. Experiments along these lines are continuing with a view to producing a larger and more efficient net, an aim now made possible by the extensive mechanization of the shrimp fishing fleet.

DESIGN OF RECOMMENDED CRAFT FOR SMALL BOAT FISHERIES OF THE REGION

In *India*, an F.A.O. naval architect is engaged in evolving suitable designs for mechanized fishing craft for different sections of the Indian Coast. A few types have already been built for Madras, Saurashtra and Andhra and are now under trial.

A motor surf boat designed by the F.A.O. expert and built by the Madras Government is likely to become the prototype of an extremely useful fishing vessel which might revolutionize fishing from the hundreds of miles of surf-beaten coast of the States of Madras, Andhra, Travancore-Cochin and Orissa. There are some 21,000 *catamarans* along this coast which might eventually be replaced by the mechanized beach landing boats.

Madras State has, with similar FAO technical assistance, been constructing suitably designed mechanized boats and demonstrating their use to fishermen. These boats will be handed over to fishermen and fishermen's cooperative societies. A similar procedure is being adopted in Travancore-Cochin under the guidance of Norwegian experts.

No information has been received from other territories on the boat design programmes recommended by the Council.

APPRAISAL UNDER FISHING CONDITIONS OF NET AND ROPE PRESERVATIVES

Little work has been done this year on gear preservation methods and no reports on appraisal under fishing conditions have been received from Member Governments. It is suggested that the work of compiling into one document of the considerable information already available to the Council, together with an evaluation of the effectiveness of the various methods (many of which may be merely empirical) be allotted to a competent worker for presentation some time before the 7th Council Session. The present Committee has been unable to perform this task because the material is scattered and has not been communicated by the previous Committee, which stated, at the 4th Session, that a form for the simplification of the collection of data was under consideration.

The material available for this review paper is therefore as follows :

1. Material from five territories of which the collation was undertaken by Messrs. Martin and Datingaling at the 3rd Session.
2. Material from North Borneo, Australia, India, Indonesia and Singapore stated at the 4th Session to be in the hands of the Committee.

3. The papers listed in the bibliography on Gear Preservation presented at the 4th Session as *Technical Paper No. 33*.

4. Information from Australia, Cambodia, twelve Indian States, East and West Pakistan recorded in the Committee's report to the 5th Session.

5. Information from Indonesia contained in *Technical Paper No. 23* presented at this Session, which however is descriptive and contains no appraisal of the methods under fishing conditions.

6. Other information, including that which may be obtained by correspondence at the personal level, and subsequent publications, including recent Japanese studies on the antiseptic of cotton yarns with protein sols, copper compounds and various polyvinyl latexes (IPFC Occasional Paper 55/4).

PRACTICAL INVESTIGATIONS ON THE USE AND EFFECT OF FISHING WITH LIGHTS

Although some work has been done by Japanese authors on the physiological effect of light of different colors and luminosities, no reports have been received by the Committee on the practical application to the fisheries and the effect on populations, although two Japanese contributions by Mr. S. Takamaya and Dr. Z. Nakai are available at this Session as *Technical Papers Nos. 27 and 28*, and merely descriptive information on the use of lights in Indonesia is contained in *Technical Paper No. 23* by the National IPFC Committee of Indonesia.

Bright light fishing in *Hong Kong* is standard practice with purse seiners but it is considered that surface illumination is wasteful and better results can be obtained by under-water illumination. The kerosene pressure lamp is commonly used for surface illumination and, apart from the cost of kerosene, maintenance costs of globes and mantles are heavy for the results achieved, particularly in windy weather. The Fisheries Division of the Department of Agriculture, Fisheries and Forestry, has been conducting experimental work over the past two years on bright light fishing and within recent months has concentrated more on under-water light fishing using electric lights. A simple and efficient under-water light has been tested and is being gradually introduced to purse seiner fishermen.

Should the Council desire to follow up this investigation it is suggested that Member Governments be requested to assign workers to carry out the necessary research work during the next period and that critical paper be prepared by a competent worker to be selected, on the basis of the forthcoming information and of a bibliography the compilation of which should form an integral part of the task, some time prior to the 7th Council Session.

INDIGENOUS VERSUS IMPORTED MATERIALS FOR CONSTRUCTION OF NETS AND OTHER GEAR

The introduction of non-indigenous fishing methods usually brings with it new materials used in more advanced countries for the construction of nets and other gear. In most Indo-Pacific countries foreign exchange is limited and it is often difficult, if not impossible, to continue large-scale importation of gear construction materials. This brings up the question of substituting imported materials with those of local manufacture. This often can be done, for many Indo-Pacific countries are producers of various types of natural fibres—some have fairly well advanced plants for processing native fibres into twine and cordage. Tanning and preserving materials are very often available. Floats of light wood are usually available. Metal parts, such as purse rings and swivels can usually be made locally.

There are several points to be considered. Very often the most important feature of non-indigenous gear is its design and method of operation. In such cases it is probable that many local materials can be used to reproduce the gear in question. Possibly the indigenous materials will not last as long as the imported—they may be heavier and not as strong and the finished gear may not be quite as efficient as the imported. But, as experience accumulates and local knowledge is applied, it is quite possible that local adaptations may finally be as good as, if not better, than imported gear.

In some cases, such as the use of synthetic fibres, the advantages lie more directly in the nature of the materials used. Here, substitutions are more difficult and perhaps impossible. Sometimes it is possible to cut foreign exchange costs by importing only the raw fibre, which is considerably cheaper than the finished twine, and spinning it locally. In any case, government finance authorities would be well advised to consider the nett gain to national economy before refusing import permits.

The report from *Pakistan* states that cotton nets were used until nylon parachute cord became available as surplus World War II material. Fishermen found that nylon lasted much longer than cotton and caught more fish—much less care and maintenance was required and costs were lowered. Records kept by the Department of Fisheries show that cotton gill nets last six months as a maximum but those of nylon are usable for at least three years and that catches average 10 to 15 percent greater. Since nylon cord is not manufactured in Pakistan, it must be imported. This is being done to some extent with the assistance of the American Aid Programme.

In Madras, *India*, a similar situation exists with respect to the use of nylon. Here, although nylon nets are more costly, fishermen are anxious to procure them. In Bombay, fishermen have been using imported hemp which was found to last better and have more catching power than cotton. The Department of Fisheries helped fishermen societies to import hemp twine in substantial quantities and the American Aid Programme also provided a supply. Nylon has also been introduced and has been found advantageous. Supplies have been obtained under the American Aid Programme. In India, the price of both hemp twine and nylon is not ordinarily within economic reach of fishermen. But in view of the utility and durability of these materials, fishermen do not mind paying a little more than for cotton twine and local hemp twine. Demand for nylon is increasing day by day and this has undoubtedly increased the output of fish in the areas where it is used.

A detailed compilation of indigenous materials used for fishing gear in *Indonesia* is recorded in *Technical Paper No. 23* presented at the 6th Session by the Indonesian IPFC Committee.

It is reported from *Burma* that imported materials for the construction of nets and gear have been found to be more durable and economical in the long run. The question of foreign exchange, however, has yet to be solved. Ways and means to improve the quality and increase the output of locally-produced cotton netting twines are being studied. Because hemp also is in strong demand for twines for fishing purposes, the Government of Burma is planning local production on a large scale.

All materials used in *Hong Kong* for the construction of nets and other gear are imported. China grass twine is the most popular material used in net making. This is obtained from the *Boehmeria nivea* Gaud., a shrub 6 ft. in height which grows wild and is also cultivated in many provinces in China. The dry fibre, which is said to be non-absorbent, is imported from Kwangsi and Kwangtung in large bundles varying from 50 catties to 1 picul in weight. The fishermen make their own nets from the dry material from which they make thread, or buy the finished thread from those who are engaged in this occupation.

Cotton netting is used mainly by purse seiner fishermen as the ready-made netting can be cut to the required size and joined together to make a purse seine in very little time. Immediately after the war this netting was imported from Swatow but recently large quantities have been imported from Japan. The price is low when compared with the handmade nets of the local fishermen.

Nylon net from Japan has also been tried and found superior to cotton net but its use is not widespread as the price of nylon is high.

Nylon line imported from Germany and England is gradually replacing the old silk line as it is durable, flexible, strong, and transparent, and treatment is unnecessary. Fishermen claim that nylon line in the sea is not easily seen by fish, therefore catches are high.

Fishing hooks were formerly made in local shops. This trade has, however, ceased as the hand-made hooks were found unsatisfactory, irregular in size, blunt, and weak. The rate of production was slow and the price of the finished article high. Machine-made hooks are now imported in large quantities from Norway and Japan.

Stainless steel wire has replaced the copper wire once popularly used for the snoods in hairtail and conger-pike longlines. This wire is durable, does not rust and is never broken by the sharp teeth of the hairtail and conger-pike. Stainless steel wire is imported from America and Japan.

The use of indigenous and imported materials in fishing gear construction in the *Philippines* is discussed at length in *Technical Paper No. 22* presented at this Session by Mr. A. F. Umali.

The use of synthetic fibre for fishing nets and rope in *Japan* is reported on by Mr. H. Miyamoto in *Technical Paper No. 26*.

EXPLORATION FOR NEW SHRIMP RESOURCES

No specific reports have come to hand from Member Governments regarding exploration for new shrimp resources, notwithstanding the interest in this subject expressed at the 5th Session, although it may be gathered from several of the contributions to the Symposium to be held in conjunction with the 6th Session, that Member Governments are conscious of the necessity to locate the adult prawns in deeper waters rather than continue to exploit only the juveniles.

II. FOOD TECHNOLOGY

Chairman—Mr. J. R. Vickery

The following report of the work of the Panel in the period 1954-55 has been compiled from information submitted by members in Australia, Ceylon, Indonesia, Malaya, India, Pakistan (West and East Pakistan), the Philippines and the United States of America.

It will be recalled that the panel's main task, agreed upon at the last Council Session, was a study

of improved methods for the production and storage of dried fish, with particular reference to methods suitable for wet, humid seasons of the year. Some progress has been made in surveying the methods of processing and storage used in a number of member countries, and also in defining the programme of investigations which should be undertaken in order to discover ways and means of producing dried fish of better initial quality and better keeping quality. Some research work is already in progress in three countries.

Representatives have been asked to consult their Government's about the part (if any) of the agreed programme which their countries are prepared to undertake. It is hoped that it will be possible, thereby, formally to launch this programme at the forthcoming Session of the Council at Tokyo. Several months elapsed after the last Council Session before the panel was properly organized and in the succeeding 9 months it has not been possible to advance the research programme much beyond the point of securing general agreement on the details.

In this report, the subject of dried fish is dealt with under the headings of current processing and storage methods, research work in progress, and proposed research work. A statement on the research programme follows. Brief statements on other fish preservation and processing research work are also appended.

A STUDY OF IMPROVED METHODS FOR THE PRODUCTION AND STORAGE OF DRIED FISH, WITH PARTICULAR REFERENCE TO METHODS SUITABLE FOR WET, HUMID SEASONS OF THE YEAR

1. Australia

(a) *Current processing & storage methods.*—The production of dried fish is negligible. There is a moderate production of smoked fish fillets from barracouta (*Thyrsites atun*) and mullet (*Mugil dobula*) using the traditional kiln smoking process. The process is, however, very mild and the weight losses of the fillets during processing seldom exceed 2 to 5 per cent.

(b) *Research work in progress.*—Nil.

(c) *Proposed research work.*—None.

2. Ceylon

(a) *Current processing and storage methods.*

Dried fish—limited to very small species such as prawns and sprats. The fish are dried on the hot sands of beaches in the dry zone.

Salt fish—dry cured—applied to all species. The fish are gutted, split and incised. Powdered salt is rubbed into the incisions using approximately 30% salt. The exuding moisture is allowed to drain off for about 12 hours, the product washed in sea water and then dried in the sun for 3-5 days. It is then stored in a dry place. In certain areas, untreated fish (from large batches) are buried under one foot of sand on the sea beach for up to 3 days while awaiting processing. In all other cases, fresh fish in good condition is used. The process depends on bright weather for sun-drying. Although the product keeps for only about a month after curing, there is a better market for this than for wet cured fish.

Salt fish—wet cured—applied to all species. Small species are used ungutted, others are gutted and scaled, if necessary. The fish are sliced and placed in barrels of saturated brine. The following variations in processing are practised:

- (i) To the brine is added the dried pericarp of goraka, *Garcinia cambogia*, in varying quantities usually about 2% of the fish or 1 part to every 12-15 parts of salt. This ingredient tones down the sharp taste of the salt in the cured product.
- (ii) Instead of adding brine, salt (or salt and goraka) is added to the fish and allowed to form a brine with the moisture in the fish.
- (iii) The first brine is removed after a few hours, concentrated and returned to mixture and or more salt is added to keep the brine saturated during curing.
- (iv) In dry weather, small fish may be removed from the brine and sun dried during the day and returned to the brine for the night. The cure is usually completed by sun drying.
- (v) In most cases, sun drying is not employed, the fish being left in brine till completely cured.

Wet curing takes about two to three weeks and the product can be stored in brine for two to three months.

Maldivé fish—made on a very small scale as the price of the local product is higher than that imported from Maldivé Islands, due to the higher initial cost of raw material. Applied only to blood fishes (tunnies) chiefly *Euthynnus pelamis* (Balaya). The fish are gutted and sliced to give thick chunks. A broth is prepared either by boiling offal blood and bones in half diluted sea water (equal parts sea water and fresh water) or by boiling goraka in half diluted sea water. The fish chunks are placed in the boiling broth and boiled for ten minutes. The chunks are then removed and rolled in wood ash or coconut leaf ash, smoked for a few days and dried in the sun.

This process gives a hard cured product which is in great demand as a seasoning in food and as an ingredient in local sauces and savouries.

General remarks

- (i) In all processes contact with metal is avoided as this spoils the product.
- (ii) No scientific test of any nature is applied. Completion of cure is judged by appearance, smell and firmness to the touch. Decomposition and fitness for human consumption are judged similarly.
- (iii) There are no standards as regards salt, moisture and sand content.

(b) *Current research programme.*—As the present curing methods depend on sun drying or the use of a complicated 'pickle' cure, an investigation has been started to work out a simple salt curing process independent of the weather and use it to attempt the conversion of fresh rough (unmarketable) fish of inferior varieties into marketable cured fish in an effort to increase the amount of fish available for human consumption.

The following is a report of the work done so far. The material chosen for experiments in curing was the flesh only of a catfish, *Tachysurus (Netuna) thalassinus* (Ruppel), and brine curing was the method tested. The strength required of the salt solution was determined by immersing pieces of flesh in brines of different salinity. The stable solution was one containing solid salt. Flesh in 10° and 50° brine decomposed in two days, 70° brine in 13 days, 100° (saturated) brine in 20 days while flesh in saturated brine with solid salt remained stable for two months. In all solutions fat separated out on the surface slowly, and after a few days, supported a fungoid growth which was skimmed off. The entire solution was changed occasionally when the fungus could not be removed completely from the surface.

When the flesh is immersed in brine, moisture in the flesh disperses into the brine and salt from the brine penetrates the flesh. To follow this process, analyses for moisture and salt were done on flesh immersed in saturated brine containing solid salt. Before immersion, moisture was 77%, salt negligible. After two days, moisture was 55%, salt 21%. After a week the moisture was still about 55% and salt 21%. The ratio 55% moisture to 21% salt represents a 27% w/w salt solution in flesh which is a saturated solution. Hence within two days the salt penetration is complete and the salt is in equilibrium as a saturated solution in the flesh and in the outside liquor. A saturated solution in the flesh is possible only with a brine containing solid salt.

When the salt saturated flesh was removed from the brine and exposed it lost moisture. A piece hung up inside the laboratory dried to 30% moisture while a piece dried artificially in an oven to 0% moisture regained 20% moisture on exposure. These are approximate figures as it was observed that the moisture content rose and fell when checked from time to time. These variations are now being related to humidity readings. The air dried sample had a thick outer crust of salt showing that most of the water had dried from the surface while the rapidly dried sample had only a fine surface deposit of salt possibly indicating that most of the water was removed as vapour from the entire piece.

The oil content of the flesh showed a decrease during processing. Fresh flesh contained 22% oil calculated on dry weight. After salt saturation the oil was 11% on dry weight and after prolonged air drying this came down to 4% on dry weight.

A piece of cured flesh was boiled in two changes of water (ten minutes each time) and tasted. There was no excess salt present and the product was palatable, though the texture of the flesh was fibrous.

Conclusions.—The experiments indicate that as regards the flesh of the catfish, a satisfactory cure is obtained by immersing the flesh in saturated brine containing solid salt for two days and hanging the flesh indoors to dry. The immersion is sufficient to preserve the flesh and the drying is merely to adjust to external conditions. This brine process is now to be applied to the complete catfish and then to other species.

(c) *Future research.*—A Government sponsored Fisheries By-products Factory is to be established in the near future. The new factory will produce salt fish using equipment and data supplied by Canada under the Colombo Plan. A technological laboratory will be attached to the factory to deal with research into by-products and dried fish.

Suggested lines of research.—For consideration by the proposed Technological laboratory:

- (i) Test the use of air drying sheds.
- (ii) Test the use of mechanical presses to remove moisture as a preliminary treatment (meal manufacture only).
- (iii) Check ingredients used for cures namely, effect of salt impurities and active agent in goraka.
- (iv) Investigate smoke curing methods.
- (v) Investigate possibility of tests for completion of cure and fitness for human consumption.
- (vi) Advise on standards for moisture, salt and foreign matter (sand) in cured products.

3. Federation of Malaya and Singapore

(a) *Current processing and storage methods:* Salt fish is prepared by both Malays and Chinese in Malaya and is eaten extensively by the Asian population. It is estimated that up to fifty per cent of the total fish landings in Malaya may go to salting establishments.

Native method of salting fish.—

Methods of dressing fish—In the case of small fish like tamban, selayang, kembong (temenong), selar kuning and other small selar, kikek and selangat, the gills and entrails were removed through one of the gill openings by a dexterous dig with a knife. If time permitted the tissue around the anus was removed by the incisions with the knife. This was done because very frequently in the process of evisceration the intestine snapped and the portion attached to the anus would be left inside the body cavity. The scales were not removed.

For small gelama, merah, kerapu, kachi, asoh asoh, and siakap (less than 6" in length) the method of evisceration was the same, but in this case the scales were removed by scratching the surface of the fish by means of a scale remover in a direction from the caudal fin to the snout. The scale remover consisted of a flat piece of wood (6" long, 1" wide and $\frac{1}{4}$ " thick) with three to four nails ($\frac{1}{2}$ " long) knocked through one end.

For big merah, gelama, kerapu, jengahak, kachi, asoh asoh, siakap, parang, chencharu, tenggiri, sagai, senangin, kurau and terubok, the fish was split into halves along the back from the snout along the dorsal fin to the caudal fin with the vertebrae sticking to one half. The gills and entrails were then removed. The scales might or might not be removed. In the case of the very big fish, the vertebrae and scales were also removed and the flesh split along the length of the fish at one inch intervals.

For bawal, daun bahru, debam and dengkis, the body cavity was opened by means of a slit cut from the anus to the mouth. The gills, entrails and scales were then removed.

In the case of duri the head was removed and the fish was split along the back. The vertebrae were then removed together with the entrails and the flesh scored at one inch intervals along the length of the fish.

In the case of yu the head was removed and the fish split along the stomach cavity. The entrails and vertebrae were then removed and the flesh split at one inch intervals along the length of the fish.

The above methods were generally used in dressing the fish. Individual fishermen, however, may use any method to suit their whim and convenience.

For big fish, especially merah, kurau and kerapu, the fish might be opened up by slitting from the anus forward to the symphysis below the head. The gills and entrails were then removed from the opened body cavity and the fish salted by a slow dry salting process. All the fish were rinsed with sea water before being treated with salt.

Salting process.—The dressed fish were then placed in wooden tubs or concrete tanks which might contain some brine left over from the previous salting process in the case of the cheaper varieties. Extra salt was put in according to requirements, usually about ten per cent of the weight of the wet fish would be sufficient. For big valuable fish like tenggiri they were stacked in layers and salt was sprinkled in between. For small fish like tamban and kembong, the fish, salt and brine were stirred up with a pole so as to ensure that the salt as more or less evenly distributed. Pieces of bamboo netting were then placed on top of the fish and stones about six inches in diameter, were then placed over the bamboo netting. This helped to keep the fish in the brine. The salting process was allowed to go on for two days or more. After that, the salted fish were taken out in baskets, made of thin rattan in such a way that there were numerous holes of 1" diameter on the sides and bottom to facilitate draining, and rinsed with sea water. After rinsing the superfluous water was allowed to drip off and the sun-drying process was started.

The brine found in the salting tubs at the end of the salting process was found to vary from 85° to 100° when the strength was determined with a salinometer. After about ten days the residual brine would get stale and would be discarded. The salt used in Malaya was imported mainly from Thailand, Arabia and Egypt. The Thai coarse grain salt was preferred because it was cheaper and deliquesced more slowly and would thus be more economical to use. Although the content of calcium and magnesium salts was definitely higher than that of the fine grade British fishery salt and the deterioration in the fish protein resulting from the use of lower grade salt was correspondingly greater, it would appear that the Asian population rather favoured the flavours developed as a result of this slight deterioration.

Sun-drying process.—Sun-drying of the salted fish was carried out on structures called plantars. A planter consisted of a platform of planks with supports consisting of poles, usually nibong, planted in the sea or on the foreshore according to circumstances. Very often the planks were replaced by the bark of nibong or areca nut tree trunks. The combination of poles were bound together by soft seizing wire or nails.

Pieces of matting (10' × 5') made of pandan or mengkuang leaves (*Pandanus* sp.) were spread over the floor of the plantar and the fish to be sun dried were arranged on them in a single layer. They were turned over frequently in the course of the day. Sun drying usually started at 7 a.m. in the morning and, weather permitting, was continued till 5 p.m. in the evening. If there should be a shower, half of each piece of matting was turned over to cover the other half so that the fish was sandwiched in between. If the shower was expected to be prolonged then the matting together with the fish was folded up and kept in the shade. The duration of the sun-

drying process varied between ten hours to thirty hours depending on the weather.

Nature of product.—Different types of salt fish as produced by the fish curers in Malaya were analysed. It will be seen from the table below that the moisture content was still very high. Bilis is in a class by itself. Its length varies from $\frac{3}{4}$ " to $2\frac{1}{4}$ " and dries rapidly as compared with the other types of salt fish—hence its low moisture content.

The following table gives the results of analysis of locally salted and sun-dried fish as found in the Singapore markets :

Type of fish	Moisture percentage	Sodium chloride percentage	Protein percentage
Bilis ..	25.04	6.10	59.45
Senangin ..	48.82	17.33	29.18
Kembong ..	53.72	14.03	27.32
Selar ..	43.86	17.00	31.36
Sepat Siam ..	48.54	17.34	27.95
Gelama ..	36.85	13.95	38.16
Tenggiri ..	50.52	17.47	21.73
Terubok ..	54.88	14.87	25.08
Kerisi ..	48.38	17.67	27.10
Merah ..	60.25	19.28	19.61
Selayang ..	48.82	13.23	32.29
Parang ..	65.80	12.67	18.37
Yu ..	43.94	12.11	39.78
Kurau ..	53.14	16.04	22.11
Selar Kuning ..	39.92	9.73	34.67

Salt fish trade in Malaya.—An average of about 22,000 tons of salt fish was produced in Malaya and an average of about 12,000 tons of lightly salted low grade fish was produced and used as fertilizer. The following table gives an idea of the estimated total production, the imports and exports of salt fish in the Malay Peninsula (excluding Perlis) for the year 1939.

There was always an excess of exports over imports amounting to about 11,000 tons. Singapore's production of salt fish (excepting a small quantity of dried bilis) was practically nil. With regard to salt fish, Singapore formed the centre at which salt fish, not only from the Malay Peninsula, but also from the other parts of the world, was collected. After sorting and repacking the salt fish was distributed,

State	Fresh fish landed	Salt fish produced	Imports	Exports
Kedah ..	6,000	2,800	..	2,608
Penang ..	7,000	700	..	..
Province Wellesley ..	3,600	600	..	..
Perak ..	21,500	6,500	1,309	3,806
Pahang ..	9,000	3,600	189	3,413
Selangor ..	16,300	2,500	1,431	40
Negri Sembilan ..	400	50	542	37
Malacca ..	3,000	300	..	..
Johore ..	6,000	1,200	2,306	997
Trengganu ..	12,400	6,200	..	6,125
Kelantan ..	700	300	..	274
Total ..	85,900	24,750	5,777	17,300

* Quantities in tons.

some to the Malay Peninsula and the rest to Java, Sumatra, Borneo and other parts of the world. The entrepot trade at Singapore with respect to salt fish and other marine products has been described in details in a separate paper.

Fish maws.—These consist of the swim bladders of fishes and marine eels. In Malaya the swim bladders of the following types of fishes are used :—

- (i) Sciaenidae—known locally as Selampia. Their swim bladders are elongated.
- (ii) Polynemidae—known locally as Senohong. Their swim bladders are rounded.
- (iii) Muraenesocidae—known locally as Melong. The swim bladders of eels are also elongated.

They are removed from the fishes or eels and all extraneous tissue cut off. They are then cut open, scraped to remove blood vessels which may be adhering, washed and then stretched on bamboo frames to dry.

They are used by the Chinese for the preparation of one of the more costly items on their menu. They are also regarded as having medicinal value. The present market price for large maws of good quality is about M \$800 per picul.

Shark fins.—Shark fins form one of the major courses in a Chinese dinner and this demand has created a business in this particular commodity. The pectoral, ventral, anal and caudal fins of sharks are utilised. The dorsal fins are also utilised, but often sold independently. They are cut from the shark and then dried in the sun and marketed in the dried condition.

Before use the fins are soaked in hot water to soften the skin which is then removed together with the bony portions. What remains is the gelatinous edible material.

Commercially they are graded into 'white' fins and 'black' fins. The 'black' fins vary in colour from grey to brownish. The 'white' fins are much lighter in colour and are more costly because the gelatinous portion is greater than in the 'black' variety. The large 'white' variety costs as much as M \$800 per picul whilst the large 'black' variety costs about M \$300 per picul. The larger the fins the more costly they are.

The local production is small compared to the amount imported for local consumption or re-export.

Ikan Kayu.—This consists of chunks of tuna flesh which have been dried and smoked over red hot charcoal. It is almost as hard as soft wood and hence its name Ikan being fish and Kayu being wood in Malay. Before it can be used it has to be scraped with a blunt knife and the shredded meat is then

used extensively in preparation of curries. There is now no local production, as fishing for tuna is not considered profitable at present.

(b) *Current and proposed research work:*

- (i) No investigations are at present being made on the preparation of dried fish; pilot trials have, however, been initiated to study the storage of dried fish in carbon dioxide.
- (ii) Initial experiments have been conducted to determine the advantages of storing dried fish in polythene wraps. These experiments were suggested by a series conducted in Singapore testing the efficiency of polythene wraps in retaining normal texture and flavour of deep-frozen fish. Preliminary results obtained in storing polythene-wrapped dried fish in low temperatures are promising.
- (iii) It is considered that the experimental application of artificial drying techniques would be profitable if studied in relation to the highly developed taste preference of the Malayan consumers. Traditional techniques impart a marked flavour to processed products, the result of partial spoilage. The sterile product of modern techniques is not acceptable. Accordingly, it would be useful, were experiments made to determine the possibility of permitting controlled spoilage, without reducing the keeping qualities of the product, in the mechanical processing of the fish.

The primary object of the polythene and CO₂ experiments is the improvement of bulk storage of dried fish on the east coast of the Peninsula. At the onset of the north-east monsoon there is an almost complete cessation of fishing operations for some three or four months, and so, prior to the monsoon a large proportion of the fish landings is dried and stored. The quantity so dried is necessarily limited and it may happen, if the monsoon is severe, supplies are inadequate. In any event, considerable deterioration of the dried fish stock occurs and distributions towards the end of the monsoon period are often of poor quality. Our experimental programme aims at developing simple, inexpensive storage methods to permit of better and longer available supplies.

Secondly, in the CO₂ experiments mentioned above, it was found that the anchovy could be stored for long periods in a CO₂ atmosphere without suffering any deterioration excepting after a three months' storage, a browning or reddening of the

flesh. This result reduced the value of the stored fish. This phenomenon is not, it is reported, the result of bacterial or fungal action. It would be worthwhile having this investigated.

A further series of experiments planned to study the manufacture of fish meal by a small scale pilot plant operated in the fishing villages and utilising for the most part the trash fish of bignet and fishing stake catches began only this year.

Analysis of experimental batches prepared have shown that a very satisfactory feeding stuff can be processed from these fish. The operation of this plant besides affording an opportunity to study the technical difficulties involved in manufacture of satisfactory meals for animal foodstuffs and fertilisers would measure the economic advantage, if any, of mechanical drying against the existent traditional method of sun-drying. Sun-dried products from trash fish are sold locally for pig and duck feed. Manufacture of a fish meal with superior keeping qualities would allow wider distribution and would be more economical in respect of transport and, as bulk purchase would be possible, of purchase costs to the stock-keepers. Again the present form of the processed trash fish renders it unsuitable for use as a fertiliser. It is considered a local fish meal could readily compete with expensive imported fish meals.

4. Indonesia

(a) *Current processing and storage methods.*—These closely resemble those employed in the Federation of Malaya and Singapore (above).

(b) *Current research work.*—Nil.

(c) *Proposed investigations.*—Indonesia will probably be willing to carry out some of the investigations proposed in the general research programme (below). Consideration will be given to compiling analytical data; studying the effects of impurities in the salt on the quality of salted dried fish; studying the use of mild antiseptics in prolonging storage life; studying the use of special containers designed to restrict water uptake and insect infestation during storage.

5. India

(a) *Current processing and storage methods.*—Large quantities of dried fish are produced during the coastal fishing season (November to March). The method usually adopted is to sun-dry on the beaches after a preliminary salting. However, in some areas no pre-treatment with salt is carried out, while, frequently, unpopular species which have no ready market as fresh fish are dried as whole fish without gutting. In such fish extensive putre-

faction often takes place, making it scarcely fit for human consumption.

In some States, the pre-treatment of fish with salt prior to drying is enforced by legislation, and fishing salt is made available to curers at subsidised rates.

Since curing is carried out during the dry winter months, the curers usually have little difficulty in effecting adequate drying of the products. On the whole, insufficient care is exercised in the preparation and handling of dried fish in India, and as a result there is often considerable losses of nutrients during storage and the onset of bad odours due to rancidity and decomposition of viscera.

(b) *Current research work.*—Nutritional studies and analytical data on sun-dried fish (West Bengal). Investigations of the effects of improved methods of preparation including salting, on the nutrients and chemical composition.

Publications.—(i) 'Nutritional Investigation of Sun-dried Fishes Available in Bengal', Saha, K. C., Deb, A. and Sen, D. P. *Ann. Biochem. Exp. Med.*, 1949; 9, 9.

(ii) 'Nutritional Investigations on the Sun-dried Fish of West Bengal'. Saha, K. C. and Chowdhury, N. K. *Ann. Biochem. Exp. Med.*, 1951; 11, 193.

(c) *Proposed investigations.*—Not available.

6A. East Pakistan

(a) *Current processing and storage methods:* Fish are sun-dried during the season of glut in districts where fish are surplus and transport facilities are poor. Fish which are of big size, no matter to which species they belong, are gutted and made into fillets and exposed to the sun for drying. On the other hand small fishes are dried whole. The fish are spread on mats or hung up by strings for drying. It takes about a week when the weather is fair.

The dry fish are kept on mats in huts for some time. On the approach of summer they are transferred to big earthen-ware vessels with a neck in which fish oil was previously allowed to soak for a considerable time as a measure to protect against moisture. The container when packed with dry fish is buried underground up to its neck. In some cases trenches are dug in the earth. In these trenches when lined internally with mats dried fish are stored and covered by sand or soil. This treatment apparently protects the dried fish from the attack of insects and helps in restoring a uniform consistency through the bulk.

Further details are given in an article by Nazir Ahmad 'Preservation & Curing of Fish in East Pakistan', *Pakistan J. Sc.*, 5 (1953), pp. 117-122.

(b) *Current research work.*—Nil.

(c) *Proposed investigations.*—Owing to lack of funds, investigations cannot be undertaken at present, but two lines of study are proposed :

- (i) The use of cold storage of dried fillets as a means of prolonging the storage life, particularly during the wet season.
- (ii) To test the smoke curing of partially dried fillets as an alternative method of prolonging the storage life. It is suggested that when drying is almost complete, the fillets could be transferred to a smoke-house and hot smoke applied until the dried fillets have reached the final stage.

6B. West Pakistan

(a) *Current Processing and Storage Methods.*—

Dried Fish—Small fishes are sun-dried and later used in the preparation of fishmeal and manure. Only *Harpodon nehereus* (Bombil) is sun-dried and used for human consumption.

Salt Fish—dry cured—applied to all big teleostean fishes. The fish after being split and incised are smeared with salt and put in pits for 18-24 hours, washed in seawater and then dried in the sun on ground, on mats and on top of the curing yards on the Mekran Coast.

The Sharks and Skates are skinned and long steaks cut. Only the wings of the rays are cured.

Shrimps are boiled in strong brine for about two hours, dried in the sun, thrashed with sticks and cleaned of shell. These are stored in dry places and exported in gunny bags or mat packing. Shark fins are separately cured. Fish maws, obtained from thread-fins, croakers and cat fishes, are split open, cleaned and dried in the sun.

Salt Fish—wet cured—not generally practised ; only on special demand this type of curing is done.

General remarks.—

- (i) Only wooden drums are used and as far as possible metal containers are avoided.
- (ii) There are no standards as regards salt, moisture and sand content.
- (iii) Completion of cure is judged by appearance, smell and firmness of the flesh. It has been proposed to standardize and classify the products.

(b) *Current and Proposed Research Work and Improvements.*—

- (i) Analyses of different kinds of salt used in curing and improving quality of salt.
- (ii) Drying the fish in shade after curing on barbecues instead of on sand.

(iii) Dry curing vs. Wet curing.

(iv) Construction of Government curing yards at different places on the coast where improved methods will be introduced for improving the products.

(v) Improvement in storing methods.

7. Philippines

(a) *Current processing and storage methods.*— *Dried fish.* Drying fish without the use of salt is confined to dilis (*Stolephorus* sp.) only because of its small size and low fat content.

After washing with clean sea water, the fish is spread on buri or split bamboo mats and sun-dried for 2-3 days, the length of time depending on the weather. Fresh fish dried during good weather are better in quality than those dried during bad weather. During rainy days the dilis is converted into salted fish paste (bagoong). Drying of fish in the shade with artificial heat would improve the quality of dried dilis.

Because of the negligible amounts of salt and fat, and high mineral and ash content, dried dilis is an excellent fish meal for human as well as poultry feed.

The ordinary container for dried dilis is jute sacks. A much cheaper and appropriate container for dried dilis is the buri sacks which protect the product from dust and foreign materials.

Salt fish—dry cured.—Large species that are preserved with this method are as follows :

1. Talakitok (*Caranx* sp.)
2. Dalangang bukid (*Caesio* sp.)
3. Maya-maya (*Lutjanus* sp.)
4. Tulingan (*Auxis thazard*)
5. Alumahan (*Rastrelliger chrysozonus*)
6. Banak (*Mugil* sp.)

After splitting the fish the gills, viscera and blood are removed with the aid of a hard brush ; washed with sea water ; dry-salted and then arranged with meat side up in wooden vats. The fish are weighted down and after six hours or when firm, a little amount of brine is added (one part salt to 3 parts water). The next day the fish is removed from the brine and then washed thoroughly with sea water to remove excess salt, and dried in the sun on split-bamboo mats for 2-3 days, the drying time depending upon the size of the fish and the weather.

The use of a hard brush to remove completely the viscera and blood improves the colour of the product.

Bacterial fermentation often occurs during the process of sun-drying the fish, especially during bad

weather. Drying in the shade with the use of artificial heat would improve the quality and taste of the finished product.

Philippine solar salt contains high percentages of impurities, namely, magnesium and calcium salts. With the common belief in this country that more salt would preserve fish longer, a tremendous amount of dried fish is lost annually due to moulds and bacterial contamination.

Salt fish—wet cured.—Species of fish salted by the wet-cured method are as follows:

1. Hasa-hasa (*Rastrelliger brachysomus*)
2. Salay-salay (*Caranx kalla*)
3. Sap-sap (*Leiognathus* sp.)
4. Tamban (*Sardinella longiceps*)
5. Tunsoy (*Sardinella fimbriata*)

The fish is cured in concentrated brine solution for 2-3 hours, and after washing with sea water it is dried in the sun on split bamboo mats for 2-3 hours. Containers for dried fish, either split or whole are wooden boxes of 25-55 kilograms net. Problems similar to those encountered in other salted dried fish are also found in the case of this product.

Binoro. This salted tamban (*Sardinella longiceps*) and its preparation in a big business in Mindanao and the Visayan Islands.

The fish is immersed in concentrated brine for at least 12 hours. From the brine it is allowed to drain thoroughly and then packed in bamboo baskets lined with paper or banana leaves. Each layer of fish is covered with salt and more salt is added on the last top layer for protection from flies. The product is too salty and commands very low prices in the market. The product is often shipped in wooden boxes or bamboo baskets of 55 kilograms nett.

(b) *Research work in progress.*—None.

(c) *Proposed research work.*—

- (i) Drying of salted fish with the use of pure salt and artificial heat for drying.
- (ii) Improved methods for the manufacture of smoked fish.
- (iii) Chemical analysis of dried fish for the purpose of standardization.

8. United States of America

(a) *Current processing and storage methods.*—The production of dried fish in U.S.A. is probably negligible.

(b) *Current research programme.*—A programme on the freeze-drying of foods, including fish, is now in progress at the Food Technology Department,

University of California (at Davis). No results have yet been published.

9. Hong Kong

The paper by McCarthy and Tausz ('Salt Fish Industry in Hong Kong', Government Printer, Hong Kong, 1954), published by the Marketing Department of Hong Kong gives a full description of the construction and operation of a mechanical fish-dryer (pages 23-30), of the advantages of its use (pages 12-14) and of the keeping qualities of the fish dried (pages 34-35).

The drying machine is hygienic, independent of the weather, and reliable; it dries the fish at a temperature of 80°F. and a relative humidity of about 50%. Since salt fish absorbs moisture at a relative humidity higher than 72%, and Hong Kong humidities are very rarely below this figure, it is possible to air-dry fish only in direct sunlight, which lowers the humidity by raising the surface temperature of the fish. With heavily salted fish, it is possible to wait for favourable weather, though a prolonged drying time must mean excessive handling and deterioration in quality. If the fish is but lightly salted, then the fish is likely to go bad unless favourable drying weather at once presents itself. It is found then that the machine-dried fish tends to be better in quality, more uniform and more evenly dried than sun-dried fish; it is immune from the losses due to bad weather.

Where the retail market, as in Hong Kong, is close at hand, dealers tend to dry fish inadequately. However, with a quick sale this is not important. For export or prolonged storage it must be well dried—to about 40% moisture content. Well dried fish keeps fairly well even in hot humid weather for three weeks to a month, though there is a tendency to absorb moisture and to lose salt by drip. For export to a distant market, or for prolonged storage—beyond a month—the temperature should be below 45°F. and the relative humidity below 72%. In these conditions the fish can be stored almost indefinitely.

GENERAL COMMENTS ON THE PROBLEMS OF PROCESSING AND STORAGE

In the majority of Indo-Pacific countries, simple drying or salting combined with drying is the most important form of fish preservation, enabling people living at considerable distances from fishing centres to enjoy useful additions of much-needed protein to their diet. It is surprising therefore that there are so few technical data in respect of many indigenous processes. Except in a few instances, reliable information is not available on such basic characteristics as moisture, fat and salt contents; rates of

drying in relation to meteorological conditions; storage life as a function of temperature and relative humidity of the air, to cite a few examples.

Simple improvements in processing methods are probably needed in many traditional dried products, with the aims of making the fish curer independent of the vagaries of the weather and of producing a more uniform product. The extent to which such improvements can be effected will vary considerably from country to country and will depend on the economic status of the fishermen and in particular on their ability to meet the cost of improved equipment and methods.

Improvements in keeping quality of many types of dried fish, particularly during the wet, humid season of the year, are urgently needed. For economic reasons, cold storage is unlikely to be feasible except in a few favoured localities. Other methods of control of deterioration must therefore be tested, such as lower initial moisture contents; storage in containers which restrict the uptake of moisture and prevent insect attack; and possibly the use of mild flavourless disinfectants known to have negligible acute and chronic toxicities to man.

PROGRAMME OF INVESTIGATIONS

Of the eight countries which submitted information, three (Ceylon, India and the Federation of Malaya and Singapore) currently have active investigations proceeding, details of which are given in the preceding sections. Several other countries have signified their willingness to carry out investigations on some aspects of the preparation, processing and storage of dried fish.

It is clear that there is an urgent need for systematic investigations. Consequently, a draft programme was circulated to representatives of all member countries for their comments. As the result of replies received from eight countries, the following programme has been drawn up. At the forthcoming session of the Council at Tokyo, the representatives of the respective governments have been asked to come prepared to state what part, if any, of the research programme their country will undertake. Additions and alterations will no doubt be found desirable when the investigations are in progress and the initial data are examined and collated.

(a) *Analytical data.*—The customary range of moisture, salt and oil contents of dried fish and salted dried fish immediately after preparation.

(Note.—These will vary widely from region to region and should be obtained by each country producing substantial quantities of these products.)

(b) *Methods of preparation.*—

- (i) In areas where rain and dull weather often interfere with the preparation of dried fish, studies of the use of simple forms of shed-drying with artificial heating. (Note.—These studies will probably also involve investigations on the extent to which air temperatures during drying can be raised without impairing the quality of the products.)

During the dry months, it may be possible in certain areas to test the effects of partial drying by exposure of fish fillets to the sun, and subsequently to complete the preservation by hot smoking in bins or sheds. It is understood that this process would be economically feasible in at least one area (East Pakistan).

- (ii) The effects of impurities in the salt on the quality of salted dried fish.
- (iii) Any other important aspects of preparation which may be peculiar to certain regions and forms of processing.

(c) *Keeping quality.*—

- (i) Careful surveys to determine the storage life of each dried fish product and to determine approximately the amount of spoilage leading to rejection; and to specify precisely the major causes of such deterioration.
- (ii) For dried fish products found to have an inadequate keeping quality, experiments to vary procedures of preparation with the aim of getting better keeping quality. Such experiments might include the effects of moisture contents lower than customary. These experiments could be carried in conjunction with experiments suggested in (b) (i) above.

In products where the storage life is terminated early by the attack of micro-organisms, the incorporation of mild, relatively harmless antiseptics, such as boric acid, should be tested.

- (iii) Investigations on the use of storage containers, preferably as large as possible, with the object of restricting the uptake of moisture by the dried fish and excluding insect attack. These tests might need also to include studies on the inclusion of small quantities of fumigants, such as ethylene dibromide, in the sealed containers to kill inherent insects and their eggs.

- (iv) Where economic circumstances warrant it, and where large quantities of dried fish are normally stored for considerable periods of time, experiments on cold storage of the products.

Since, normally, the higher the temperature of storage, the cheaper will be the storage charges, it would be advisable to conduct experiments at each of three temperatures—say 0°C, 7°C and 15°C, in order to gain information on the highest temperature which holds the products in a satisfactory condition for the desired periods of time.

(d) *Standards of quality*.—Detailed information gained from the above investigations, particularly the analytical data, together with consumer preference tests, may be used to assist in drawing up standards of quality for each product. The setting up of such standards, perhaps enforced by legislation, may help considerably in raising the initial quality and keeping quality of dried fish products.

PARTICIPATION IN RESEARCH PROGRAMME

The following countries have signified their willingness to undertake investigations on some parts of the programme.

Ceylon.—Work is in progress on parts of (b); could undertake work on (a), (b) (ii) and (c) (i).

Federation of Malaya & Singapore.—Work is in progress on some aspects of (c) (i) and (c) (iii).

India (West Bengal).—Work in progress on (a); desires further work on (d).

Indonesia.—Subject to sufficient financial aid forthcoming, could carry out investigations on (a), (b) (ii), (c) (ii) (2nd paragraph) and (c) (iii).

East Pakistan.—If sufficient funds were made available, prepared to carry out investigations on (a) and (b) (i).

APPENDIX

OTHER RESEARCH WORK IN PROGRESS ON FISH AND MARINE PRODUCTS PROCESSING AND PRESERVATION

Australia

Fundamental investigations.—

(1) Studies on the denaturation of fish muscle proteins in frozen fish.

(2) Breakdown of urea and trimethylamine oxide in the flesh of elasmobranch fishes during bacterial spoilage and as the result of heat processing.

(3) Heat-inactivation of the tyrosinase enzyme which is responsible for the development of melanin-like substances in certain tissues of cooked prawns.

(4) Development of techniques for the rapid estimation of volatile bases in fish muscle.

Applied investigations.

(1) *Prawns*.—A survey has been made of the conditions of handling raw and cooked prawns between catching and marketing in the iced state. A special study has been made on the condition known as 'black-head' in cooked prawns.

(2) *Crayfish*.—Studies have included measurements of weight losses during various cooking procedures and of changes occurring in raw and in cooked flesh during frozen storage.

(3) *Shark*.—The canning quality of the flesh of one species of edible shark has been investigated. Studies have also been made on the post mortem development of ammonia in shark stored in ice.

(4) *Miscellaneous canned fish*.—Work has been carried out on improvements in out-turn of various Australian species of canned fish, shell-fish and crustaceae. A programme is to be commenced in order to determine the canning quality of certain species of tuna which are not at present being canned in Australia.

Ceylon

(1) *Shark liver oil*.—Oil is extracted from the livers of sharks and related species on a commercial scale. The oil is purified, tested for its Vitamin A potency and blended with groundnut oil to a uniform Vitamin A content of 3,000 i.u./g. This oil has a ready market as a substitute for cod liver oil and the demand is greater than the supply.

(2) *Agar from local seaweed*.—A survey of seaweed beds was made and various samples from the beds were analysed. The survey showed that large amounts of raw material for an agar industry are available.

(3) *Whole fish analysis*.—This is a long-term project to determine the protein, fat, moisture and ash content of various fish. The information acquired will be useful in fish meal production and liver oil extraction. The figures will also give an indication of the food value of the fish.

(4) *Liquid fish*.—This useful adjunct to fish meal production is being investigated. Fish are ground up and placed in jars containing formic acid. After a few weeks the fish is reduced to a liquid state which is stable. The liquid can be used as an animal feed or as a fertilizer.

(5) *Curing of porpoise flesh*.—This is being attempted on the experimental scale using a standard sweet pickle formula. Preliminary results are encouraging and further work is in progress prior to exploring the market possibilities of this type of food.

(6) *Storage of fish in cold brine*.—An experiment in a small refrigerated tank showed that fish can be successfully stored for a few days in cold brine. This gives a better product than iced fish due to uniformity of cooling and exclusion of air. The fish appear fresh and do not have the flavour peculiar to deep-frozen fish. Fading of gill colour can be prevented by adding sodium nitrate to brine.

India

(1) Studies on the keeping quality of fish meal used as a poultry food c.f. Saha, Sen & Sen, *Ann. Biochem. Exp. Med.*, 1951, **11**, 197-202.

(2) Preservation of fresh fish with ice containing preservation chemicals c.f. Saha, Sen & Sen, *Ann. Biochem. Exp. Med.*, 1951; **11**, 181-192.

Philippines

(1) *Production of galongong (Decapterus macrostoma) fish meals and studies on their comparative food values*.—Galongong fish meals prepared under three varied conditions were bio-assayed for comparative study as to food values. The proximate chemical composition as well as the mineral content of the fish meals were also determined.

(2) *Utilization of galaman-dagat (Gracilaria confervoides)*.—Galaman-dagat, a seaweed which appears annually in commercial quantities along the shallow shores of Manila Bay is being investigated to find its possible use as a substitute for imported commercial agar. At present it is used directly as food in the form of salad and also as supplementary feed for the bangos (*Chanos chanos*, Forskal).

(3) *Availability of calcium in various fishery products*.—The availability of calcium in shrimp paste (*bagoong alamang*), dried small shrimps (dried *alamang*), canned bangos, and other fishery products is being investigated. These sources are common and easily available to average families at very low cost. They may be considered as good substitutes for milk, which is an excellent but expensive source of calcium in the diet.

(4) *Purification of oysters*.—To safeguard the health of the consuming public, experiments on purification of oysters by the use of crude aureomycin are being undertaken.

(5) *Food value of deodourized fish flour*.—A comparative bio-assay of deodourized and non-deodou-

rized fish flour is being undertaken to determine the effect of deodourization with organic solvents on the food value of the product.

U.S.A.

Extensive investigations on the preservation of fish by icing, freezing and by canning, at Fishery Technological Laboratory, Fish and Wildlife Service, Seattle and elsewhere; but detailed research programme not yet available.

Thailand

1. During March 1955, the Government of Thailand adopted the resolution that only salted fish of good quality be exported from Thailand, and has authorized the Fisheries Department to conduct the inspection and the certification.

2. Exporters of (pedah salted and dried *Rastrelliger*) must declare whether the product is *On Standard* or *Under Standard* and whether *Red* (oily) *Pedah* or *White* (slightly oily) *Pedah*.

3. *Pedah On Standard* requires the following qualifications:

<i>Grade Special</i>	1,000 fish weigh	40 kg.
		and upward
<i>Grade I</i>	1,000 „ „	36-39 kg.
<i>Grade II</i>	1,000 „ „	31-35 kg.
<i>Grade III</i>	1,000 „ „	25-30 kg.
<i>Grade IV</i>	1,000 „ „	21-24 kg.
<i>Grade V</i>	1,000 „ „	15-20 kg.

All fish in each lot and each grade are alike in kind, and have fine external condition. It must not be broken, badly bent, torn and badly ragged. Such fish are allowed not more than 5%. A very minimum or no entrails and gills may remain.

4. Dryness is accepted on the condition that no liquid appears when pressing stomach and eyes.

5. Characteristic odour of pedah.

Any *Pedah*, failing to conform with the above requirement, is certified as *Under Standard*.

6. *Pedah*, except that of Grade V, must be packed, in layers, in wooden cases (An empty case with lid, nails and wire must weigh 30-34 kg.)

III. SOCIO-ECONOMICS AND STATISTICS

Chairman—Mr. D. W. Le Mare

Contributions have been received from the following countries: Burma; Ceylon; India; Indonesia; Japan; Pakistan; the Philippines; Thailand and the United Kingdom. No contributions have been received from Australia; Korea; the Netherlands

and Viet Nam. It is assumed that the United States, having no specific problems under the Headings for this Panel's work, has not in consequence submitted any contribution.

There were five subjects allocated for attention during the period since the Fifth Session of the I.P.F.C.,

1. Advances in the collection of adequate fisheries statistics, including sampling survey methods in the production phase.
2. Socio-economic problems affecting the production and distribution of fisheries products; their solution.
3. Advances in the development of fish marketing and distribution; development of consumption of fisheries products to improve nutrition; the effect of consumer tastes for non-customary products and means of influencing them.
4. Development of fisheries extension service (i.e. the extension of scientific knowledge to the level of the fisherman and fish-farmer.)
5. Significance of fish-culture as an integral part of rural economy.

In the area covered by the Indo-Pacific Fisheries Council, a proper appreciation of human values is undoubtedly the underlying factor which conditions the progress of all workers in the field covered by Panel C; fishing has been pursued at a peasant level for centuries, and it is the peasant fishermen among whom the Government official has his major work to do. This is even true of Japan where the fishing industry is the most highly developed in the area, and the winning of the confidence of people whose main life is spent at sea, using their experience to overcome the rigours of the weather and to reduce the high degree of uncertainty which exists in the fishing industry, bound by superstition and traditional beliefs, is most important.

Not only is it the sea fisherman who must receive the attention of the Government worker, but also the agricultural peasant who adopts a procedure of fish-culture as a means not only of augmenting his income but also of adding to his own diet. Perhaps the more quickly obtainable results of fish culture methods in ponds and rice fields have been a stimulus to workers as a means of increasing protein food supplies and in this field it is clear that good progress has been made. It is encouraging to note that taking the area as a whole, considerable progress is being made under each of the five headings listed above, which will lead to a better control of the fishing industry for the purpose of extension and development work, which already is producing more fish as

food for the rapidly growing populations of the Indo-Pacific area, while at the same time widespread attention is being given to the social and economic status of the producer.

During the 1953-55 period all territories which have reported, have made some advances in statistical procedure. The advantages of sampling procedure have been firmly grasped by Governments and the discipline of the trained statistician has been brought to bear in many instances in order to refine methods and expand the fields covered by the results of analysis. It is clear that the fundamental importance of sound statistics has been universally appreciated but in one or two cases, for domestic administrative reasons, the progress wished for by Fisheries workers has not yet been achieved. It is equally clear that a sound foundation is being laid, which after an adequate time interval will provide comparative data of extreme importance.

1. *Advances in the Collection of Adequate Fisheries Statistics, including Sampling Survey Methods in the Production Phase.*

In *Burma* a programme for the systematic collection of fisheries statistics is under active consideration by the Government. Already some progress has been made in collecting fundamental data. In this country, Fisheries may be classified under two sub-heads, 'Open Fisheries' i.e. riverine, brackish-water and marine fisheries. For these a register of licensed fishing unit is kept. The number, type and size of fishing implements, by locality, are recorded but so far neither the operators nor the craft are registered. The other category is that of 'Leased Fisheries' i.e. naturally impounded freshwater lakes and creeks adjoining them, for which the number of units and the revenue collected is registered but no register is kept of the operators, their gear or craft. District Revenue Officers furnish rough estimates of annual fish production and disposition of catches.

In *Ceylon* the present method of collecting statistics is by issuing schedules to the field staff of the Fisheries Department stationed at various fishing centres along the coast, and this has been found to afford little truly accurate data as many of the returns are based on approximations and not on personally recorded observations. Adoption of a statistical system of collecting fishery information, modified from the Indian pattern, has been suggested for trial and is now in hand. The plan of statistical collection has been drawn up as follows:—

- 1.1 Factors of production.
 - 1.11 Man-power
 - 1.12 Equipment, craft and gear, etc.
 - 1.13 Finance

- 1.2 Operation of the factors of production.
- 1.3 Production volume and value, landings specified by species and in respect of gear used, money values realised at the first wholesale.
- 1.4 Cost of production.
- 1.5 Factors of distribution.
 - 1.51 Man-power
 - 1.52 Equipment
 - 1.53 Finance
- 1.6 Operations of the factors of distribution.
- 1.7 Cost of distribution.
- 1.8 Volume of supply.
- 1.9 Prices.

Continued statistical collection is on 1.11, 1.12, 1.2, 1.3, 1.51, 1.52, 1.8 and 1.9. Information on other items of the programme has to be sought after a sample survey which could be undertaken only after the completion of the registration of fishing craft and gear.

Besides the routine statistical collection, statistical studies are made on different analytical problems which are biological, technological and economic, a few of which being :

- (a) The study of the seasonal variation of fish landings and fish prices.
- (b) The seasonal fluctuations of fresh water fish landings and its correlation with ice dispatch, rainfall, temperature, etc.
- (c) Study of the foreign trade in fish products and its position in relation to the trade in other commodities.
- (d) Analytical treatment of trawler data.
- (e) The mechanization of local craft and its advantages over non-mechanization.

The primary method of statistical collection is by enquiry and report by the Inspectors, fish receipts as found in some countries being absent. Steps are at present taken to register fish dealers in the island, who will be requested to submit their monthly transactions. These statements will contain basic information for further biological, technological or marketing studies. Information on the dispatch of fish by the railway is collected by the Inspectors at the different rail heads.

Two items of major statistical importance are a sampling survey of fish catches to test the accuracy of the present incoming data and then to work out a method of obtaining information on catch and operation with minimum labour and inspection with a required degree of reliability and also a survey of a representative sample of the fishery population.

In *India* the Central Fisheries have taken the lead in this matter. The Central Marine Fisheries Research Station at Mandapam initiated a sample

survey in 1949 to estimate marine production. The whole coast line was divided into 12 zones with similar patterns of fisheries. In each zone, 3 or 4 fishing villages were chosen and a survey assistant took readings once every fortnight when 10% of each type of fishing unit, their landings, etc. were recorded. From these sample data, the total production was worked out. Based on this method, the total catch of marine fish in India for the past five years is :

Year	Landing in tons (1 ton = 2,240 pounds)
1950	570,860
1951	525,482
1952	520,002
1953	572,278
1954	581,259

Collection of statistics for inland waters presents many difficulties in India, and sampling methods are being developed and tested, both for total production and for the production of fry. Procedure is being decentralised to State level.

In *Indonesia* the main effort is to develop a geographically comprehensive statistical service to cover the extensive Indonesian Archipelago. Data are collected by various means according to the administration and organisation of the locality, and the collected data are at present only approximate. The estimates are based upon the enumeration of fishing vessels and gear engaged in the fisheries and daily or periodical questioning. Sampling survey methods in the production phase are not yet practised. At present the principal data sought are, the total amount of fish caught, the locality where fish is landed, the species and the value of the fish landed. The number of basic species upon which the overall comprehensive data are based has been increased from 12 to 20. Coverage of the vast area concerned involves a very great amount of work.

In *Pakistan* a programme has been carefully planned to evolve a good and rational statistical service. Prior to 1953 a survey was made of man-power, craft, and gear. In 1954 a comprehensive survey of fisheries resources was instituted. Firstly a pilot survey was undertaken in Karachi Administration Area, to collect data with accuracy, to test international comparability and to coordinate various phases of the industry, e.g. catching, handling and distribution. This survey is now being extended to the Sind and Baluchistan Coasts.

During this survey, the Fishing Units were defined and classified into categories and an inventory was prepared. Statistical data on the number and types of fishing craft and fishing gear, collected in the preliminary study were compared and the

rate of change of units was recorded. The amount of effort engaged was also measured in some cases.

Random sampling methods were adopted to record the landings and operations of the boats at the major centres in the Karachi Administration Area and valuable information was thus obtained regarding quantity and seasonal variation of fish caught.

Production, landing and utilization of fish is at present assessed on a country-wide basis, by sporadic statistical collection, in the absence of a regular system.

The data on imports and exports of fresh fish and fish products to and from Pakistan are collected as a yearly routine. Comparative studies are made and trends of use to the industry are predicated.

The data collected in the preliminary survey of West Pakistan marine fisheries has already been published in the series 'Investigation Reports'. Periodical papers regarding statistical information relating to marketing, production, valuation, external and internal trade have been issued and information supplied to interested parties.

In *Japan* the present system of compiling monthly reports on marine fisheries has been in operation since 1951. Sampling surveys have been conducted for most of the major fisheries and considerable improvements were made in 1953. The items now include the number of fishing units, and the number of trips made per unit by types of fisheries, catch by types of fisheries and by species. The number of fishing units and trips, as well as the catch, are also broken down according to the tonnage of the craft. As a result of these developments, it is now possible to fully appreciate all production aspects of Japanese fisheries.

In applying the principle of sample surveys to fisheries statistics, efforts have been made to record accurately the actual conditions of the fisheries, in view of the remarkable differences existing between types of fisheries as well as between fishing areas.

The Second National Fisheries Census was conducted in 1953, by which the number of fisheries enterprises, operators and employees were clarified as were the amount and value of their catches. A summary of the Census was published in August, 1954, and detailed reports will be completed in the near future.

In the *Philippines* activities in statistical work have remained restricted to the relatively limited sphere reported in 1950. An inventory of the fishing gear used in the country in 1953 has been made and is available. While the adoption of sampling survey methods in improving the collection of statistical

data is under serious consideration, lack of funds, coupled with lack of personnel adequately trained in sampling survey work, prevents progress for the present.

In *Thailand*, statistical work has been limited by poor communications in certain areas. It has been estimated that there are more than 50,000 fishing operators engaged in full-time fishing at sea. As far as inland fisheries are concerned, most of the farmers in the extensive rice-growing areas are part-time fishermen. They operate both for home consumption and sell the surplus production to middle-men or agents who bring the fish to market. Altogether it is estimated that about 300,000 tons of wet fish from all sources, including Molluscs and Crustacea, worth approximately 900 million Bahts are produced. From this, approximately 20,000 tons of salted and dried fish, worth approximately 45,000,000 Bahts are exported.

As regards *United Kingdom* territories, in the Federation of Malaya and Singapore, considerable progress has been made in the refinement of statistical procedure by the universal adoption of tested sampling procedure for the recording of data. This has meant a considerable saving in time and has enabled staff concerned to widen their field investigations and to make more accurate recordings. Procedure is currently in hand to codify all data collected, with the assistance of Organization and Methods specialists from the British Treasury, so that when all data are collected, they may be processed on new statistical machinery installed by the Federal Government. It is estimated that only 2 hours per week by a trained operative will be required to provide coordinated and correlated data over a wide field. Associated with this, is a reclassification of fishing gear and craft adapted to changes in the industry. During the past two years, two detailed marketing surveys have been conducted in Singapore and Penang, involving a great deal of intensive statistical recording, in order to provide data for future market and town planning.

A description of the *Hong Kong* Fish Marketing Scheme was given in a paper presented at the Indo-Pacific Fisheries Council in 1954. In the summer of 1954, the Food and Agriculture Organization of the United Nations held, in conjunction with the Hong Kong Government, an FAO/ETAP Fish Marketing Training Centre at which the Hong Kong Fish Marketing Organization was held as an example. It may therefore be reasonable to assume that most territories of the region are aware of the main functions of the Hong Kong Fish Marketing Scheme.

By far the greater part of fresh fish consumed in the Colony is inexpensive. Over 95% of fresh fish sold through the Organization last year had an

average wholesale price of HK\$1.00 per catty or less. The more expensive fish (Wholesale price of HK \$.100 per catty and more) includes Garoupa, White Pomfret, and other types of luxury fish which form only 2.64% of the total catch, and is mainly in demand by the more wealthy classes.

It is significant that the wholesale prices of both fresh and salt-dried fish have not increased in conformity with the general increase in the cost of living. On the contrary, wholesale prices for 1954 were the lowest ever recorded.

2. Socio-economic Problems affecting the Production and Distribution of Fisheries Products

In *Burma* the Government have approached this problem by giving some loans to sea-fishermen, who, of course, are the minority producers since freshwater fish is the traditional source of protein. In the inland fisheries more than 600 producer co-operatives have been organised and fairly substantial loans have been given to some of these. In addition, they are being assisted to obtain producer-goods.

In *Ceylon* it was considered urgent, as far back as 1943, to take immediate action to alleviate the burden of the fishermen, by granting them financial aid as :

- (i) loans to individual fishermen.
- (ii) loans to unregistered groups of fishermen.
- (iii) loans to registered co-operative societies.
- (iv) marketing advances.

This was done because it was known that the average fisherman lived under conditions of continual hardship, with debts running into generations, poor returns for catch due to rings of middlemen and poor production due to primitive craft and gear. The loans to unregistered groups of fishermen has been the only unsuccessful scheme and was stopped in 1948. The scheme for marketing advances was also stopped in 1948 as a Government Marketing Scheme was established. Altogether Rs. 5,414,000 were advanced for marketing and at the end of 1953 the balance outstanding was only Rs. 448,000. In order to enable fishermen to obtain their essential requirements at concession rates, thus ensuring that part of the loans would effectively be utilized, stores were opened to supply foodstuffs and fishing supplies direct to the fishermen. In 1952, six such stores were opened and by the end of 1954 there were twenty-two. Salt is issued to fishermen at a concession rate of less than one-third of the open market price and in 1953 the quantity issued amounted to 95,930 cwt. Timber is issued for boat building from Crown Forest Reserves at one-fourth royalty rates. There is also adequate provision for the relief of distress due to loss of life,

damage to craft and gear or prolonged periods of bad weather causing destitution.

Most of the above measures were introduced in the early 1940's and present conditions call for amended procedure. There is, therefore, a survey under consideration on an island-wide basis. A pilot survey is first to be instituted to indicate the social and economic conditions of the fishing population, the industrial organization, technological factors and an estimate of the manner in which the present socio-economic programme has affected the fishing population so far. The analysis is intended to yield quantitative measures of the different relationships which obtain, whereby it will be possible to determine which way the different Government measures need modification and whereby they need intensification. Simultaneously, an intensive effort is being made, with Colombo Plan Technical Assistance, to develop the existing co-operative organisations and to incorporate adult education with special emphasis on fisheries training.

In *India* the fishermen in many areas still continue to occupy a place in the lowest strata of society and there are many social and economic problems of a traditional nature to be overcome. Recently vigorous attempts have been made by the Government of India to raise the moral and material standards of all backward classes, including fishermen, specific privileges having been given for education and public services. While marine fishermen enjoy free fishing, the inland fisheries used to be auctioned to middlemen and the inland fishermen were completely at their mercy. The policy has been changed at State level and it is now almost universal practice for the State Governments to lease out their fisheries to co-operative bodies of inland fishermen at reasonable rates, instead of by public auction. However, the Government realises that outsiders with vested interests may manage to get into the committees of management and exploit the illiterate members. Indebtedness of inland fishermen to village money lenders is not very high, as they have usually alternative occupations to turn to as subsidiary occupations in times of fish shortage.

For the marine fishermen, a number of societies have been organised to give them facilities for the direct purchase of fishing gear and consumer goods and for the marketing of catches. Unfortunately, many of the marine fishermen are perpetually indebted to money lenders and, it is frankly admitted as in many places the world over, the fishermen are prone to spend their earnings on drink. Attempts to stabilise their economy by giving them advances through Co-operative Banks have not been very fruitful, as the marine fisherman

readily incurs further debts, immediately after he is freed from one. In fact, the plight of the marine fishermen presents an almost insuperable socio-economic problem. An indirect method has been applied in some States by the introduction of prohibition; but the results have yet to be properly assessed. The following solution to the problem is suggested in the report of the Government of India :

- (i) Removal of the younger generation from contact with their parents and giving education and training in a different atmosphere, in additional aspects of fisheries while maintaining the natural conditions for fishing to which they are at present accustomed.
- (ii) A chain of co-operatives which would insist on the enrolment of all marine fishermen as members, managed for at least five years by Business Managers trained and provided by the State. It may be necessary to introduce legislation to compel the marine fishermen to bring their catches to the co-operative depots instead of selling it themselves and paying a high proportion of their income to the money lenders.
- (iii) Efficient methods of distribution of catches will go a long way in raising the socio-economic position of the fishermen. Inland fishermen do not face this problem to the same degree and they actually enjoy a higher status than their marine brothers. In the case of estuarine fishermen, e.g. at Chilka lake, it has been comparatively simple to raise the status of the fishermen by grouping them into co-operatives for joint marketing, in view of the fact that the lake is State property and has good facilities for communication. Development of communications must proceed simultaneously with improvements in distribution and marketing procedure in the case of the marine fishermen.

Bombay State has given liberal financial assistance in the shape of loans and subsidies to fishermen and their co-operative societies for installation of engines on boats, running of ice and cold storage plants and for procuring new boats and nets etc. The total amount of such loans exceeds Rs. 3,000,000 and subsidies granted for mechanization of fishing craft and installation of ice and cold storage plants amount to Rs. 380,000.

In Bombay, 50 out of 78 Fishermen's Co-operative Societies are affiliated to the Central Co-operative Organization, which markets, on an average, Rs. 800,000 worth of fish per annum. The Co-operative Societies have been of great benefit to fishermen for

providing loans and subsidies for purchase of costly items of equipment and procurement of many essential items such as cotton twine, hemp twine, sail cloth, fish hooks and other fishing requisites for supply at reasonable rates.

In Madras, over 250 Fishermen's Cooperative Societies have been organised, most of which are credit societies, but they also supply food grains, yarn and fish hooks. There are a few societies for fish marketing, fish curing and net making also.

In Orissa, two major schemes on co-operative lines were taken up for development of marine fisheries and marketing of fish. There are 21 societies dealing with fish worth about Rs. 3,200,000. The societies meet the requirements and daily needs of fishermen in the coastal area and grant loans to tank owners for reclamation work in connection with fish culture.

In Saurashtra, 17 Co-operative Societies distributed fishery requisites worth Rs. 280,000 during 1954. It is planned to organise a Co-operative Central Fish Marketing Organization for the State.

Travancore-Cochin has 145 societies which are mainly credit societies. Efforts are being made to organize Fishermen Co-operatives in the States of Andhra, Bhopal, Himachal Pradesh, Kutch, PEPSU and Punjab.

The Norwegian Aid Community Project, initiated in 1953, in Travancore-Cochin has taken measures for the improvement of health and sanitary conditions of the fishing community in the project area by providing preventive and curative medicines, latrine and protected water supply etc. About 100 fisherwomen were also given training in tailoring.

In *Indonesia* a very great deal of socio-economic work is in hand, which is a logical extension and development of that work which has occurred previously. A summary of the experience in this territory will doubtless be of value to others, since the foundations were first laid with the establishment of an organized fish auction in 1912 at Tegal in Central Java. The success of the socio-economic programme in Java has been based on the development of fish auctions run by Co-operative Societies. The programme has been extended to the other islands of the Indonesian Archipelago. Fish auctions previously controlled by local governments or by the Institute of Sea-Fisheries, were after World War II gradually transferred to Fishermen's Co-operatives, although where circumstances demand, the auction still remains in the hand of the local government. Privately organised fish auctions are prohibited.

The socio-economic aspects of fish marketing in *Indonesia* are dealt with at length in Technical

In *Japan* the Government reports that the most vital socio-economic problem is the repeated capture by foreign ships of Japanese fishing boats, which is seriously affecting the production of fish. To meet this, a fisheries agreement was signed in April, 1955, between Japanese and Communist Chinese fishermen. Though this was not done on a Government-to-Government basis, it is believed that it will help towards a solution in the China Sea area, because the agreement, good for one year, provides that both Japan and Communist China take steps for :

- (1) conservation of marine resources.
- (2) the establishment of six fishing areas for safe operation by Japanese fishermen in the offshore waters off the China coast.

The second problem is the depression in the export trade in marine products. The Japan-Communist China private trade agreement signed in May this year, is expected to improve the export trade of marine products.

The accidental damage to Japanese fisheries, by the Hydrogen-bomb experiments at Bikini atoll, has also had a depressive effect on the fishing industry.

In *Pakistan*, a Socio-economic Section has been established in the Central Fisheries Department at Karachi. In order to increase production, it is essential that :

1. The fishermen may get their requirements supplied at cheap rates and on easy terms.
2. Loans become available to fishermen, to purchase their requirements, to maintain them during the off-season and to free them from their perennial obligations to the money lenders.
3. Fishermen's Co-operatives organize fishing units and sales depots.
4. Markets be created abroad as well as at home.
5. Societies should start on a small scale and expand gradually.

Adopting the above principles, the Section is supervising the operations of a Fishermen's Co-operative Society. Materials available locally are provided for the fishermen at cheap rates, and items which are not available locally are procured.

Active co-operation and guidance of the Government is important, since the main cause of failure of Co-operative Societies has been that most of the members were illiterate and were exploited by a few unscrupulous educated persons.

In the *Philippines* foremost among the socio-

economic problems affecting fish production is that rooted in the employment of clandestine methods of fishing, such as the use of explosives and poisonous substances. Use of these methods grew to alarming proportions immediately after the termination of World War II. The pernicious impact of the use of these methods has telling effects upon the industry and is looked upon as one of the probable reasons behind the depleted status of the resource which is apparent in the fact that while the factors of production at work in the industry has increased since the postwar period, there have been no commensurate returns to fish production.

To solve the problem, the Bureau of Fisheries, with the co-operation of all police forces in the country, has embarked upon more vigilant police work, together with the proclamation of the last week of October of each year as a Fish Conservation Week, when radio talks, lectures, contests etc., stress in the minds of the people the importance of measures and practices for the wise utilization of the fishery resources. Posters and publications depicting the evils attendant on the use of clandestine fishing methods are put into circulation. An X-ray laboratory has been set up in Manila for examining fishes suspected of having been caught with explosives. Findings in this laboratory are now taken as *prima-facie* evidence in court and on several cases have served as the basis for the conviction of a number of fishermen apprehended for fishing with explosives.

Another problem rests with the low income level of fishermen. In a survey of some fishing villages it was found out that on the average, a fisherman receives P500 (US \$250) a year as his income from fishing. It is only through subsidiary income in other occupations that a fisherman can maintain his family which, on the average, numbers about eight members. To improve the low income level, a 'Minimum Wage Law' has been passed.

High cost of fishery requisites presents another problem. Import control regulations in the country visibly affected the prices of commodities imported from foreign countries, and most fishery equipment and appliances are of foreign origin. To reduce the high cost of fishery requisites the Government has abolished the 'Sales Tax' formerly paid by fish producers.

The preponderance of antiquated gear being employed in the industry, shown in the inventory list of fishing gear used in the country in 1953, accounts for another problem affecting fish production. Productive returns from fishing could be improved by the introduction of modern and effective gear.

The Government has, therefore, set up several fisheries schools where young people are trained in the use of modern and effective fishing appliances. The Government also encourages the importation of foreign fishing experts to train local fishermen in modern fishing methods, and a number of longline fishing experts from Formosa were allowed entry into the country for this purpose. Technical aid to new and old investors in the industry is also being given.

The imposition of a ban which prohibits trawlers to operate in certain good trawling grounds in the southern islands has resulted in overcrowding in other trawling areas and this has led to a noticeable decline in the production per vessel.

Some operators of the trawlers affected have taken upon themselves to shift to another type of gear called *basnig* (bag net) when they realised the futility of continuing on with trawling operations, while others transferred to more distant fishing grounds, so mitigating the problem of overcrowding and over-fishing to some extent.

Catching of juveniles is another problem affecting fish production. Since time immemorial, local fishermen have been using fine-meshed nets for catching fish. Concern about the disastrous effects of nets with very fine meshes has been shown since the Spanish regime, but their use persists to the present day.

The depletion of the resources due to non-observance of 'closed seasons' by fishermen adds to the manifold problems that beset the industry. Lack of funds, along with lack of personnel to enforce 'closed season' has rendered orders for the observance of such seasons ineffective.

The need for improvement of the present inadequate fish landing places cannot escape notice. Transactions for the exchange of fish products occur in the open with the baskets or trays.

Presently, a move is being taken by the Bureau of Fisheries towards the approval of a plan to establish a self-operating fish exchange in Manila. This is expected to serve as the initial move towards the establishment of similar institutions in various strategic points in the country. The plan includes, among other things, the establishment of modern fish landing facilities, complete with fish handling equipment as used in other countries, refrigeration units, and an up-to-date exchange room. Success of the scheme, should it be approved, will lead to the establishment of other fish exchanges in other parts of the country and afford a solution to the problems arising from the lack of good fish landings.

The control exercised by fish dealers in the dis-

tribution of fishery products has long been a problem. Much of the fish produced by the fishermen is sold to these shrewd dealers at the price dictated by them. Enormous quantities of fish and other fishery products are being channelled to these operators enabling them to bring considerable influence to bear on the distribution system.

Until the idea of establishing co-operatives became popular there appeared to be no means of controlling the influence of these dealers. The co-operative movement has done much in improving the distribution of some agricultural commodities in the country and its eventual entry into the fisheries industry is looked upon to relieve the fishermen from this onerous system of financing.

In the *United Kingdom* territories, the work of the Hong Kong Fish Marketing Scheme continues with no major changes. An appraisal of the mechanization of local fishing craft has shown that the earning power of the owner-operator fisherman has been greatly improved by the change from sail to diesel power for both propulsion and fishing. More time must elapse before it is possible to evaluate the significant factors that have contributed to increased landings over the past five years.

A sampling analysis made by the Marketing Department of 21 fishing vessels of various types, before and after mechanization, indicates that the minimum increase in catch is twice and the maximum four times. Apart from these direct benefits, the provision of large sums of money by both Government and private enterprise for loans at low rates of interest for mechanisation has weaned the fishermen from the traditional sources of loan money, with crippling interest rates. Loan money is fed back through the Fish Marketing Organization which compels the fisherman to market through that organization if he accepts cheap loan money.

An encouraging and important development towards financial independence among local fishermen was the registration of the first Fishermen's Thrift and Loan Co-operative Society in September, 1952. The establishment of this Society was carefully watched by fishermen all over the Colony, who by nature are extremely conservative and cautious in adopting new ideas. The progress made by the first Thrift and Loan Society was most impressive and a total of 20 such societies are now registered.

In the *Federation of Malaya and Singapore* gradual progress is being made over a wide field of socio-economic activities and in the majority of these, the Department of Fisheries operates as the Co-ordinator between a number of Governmental Services. There has also begun a healthy development of community consciousness among fishermen in a number

of areas, associated with the development of elected local, State and Federal Government, where they have formed committees and associations with elected leaders to represent them. The Government Departments which work together at all levels in this socio-economic development, both fresh water and marine, are :

- (i) *The Co-operative Department* for guidance and advice in the formation of Co-operative Thrift and Loan Societies and for Co-operative Marketing Societies.
- (ii) *The Rural & Industrial Development Authority* which provides funds for Community Development projects and cheap money as loans for craft, gear and equipment. The Authority also provides funds for training.
- (iii) *Marine Department* which designs the law controlling all craft and their crews. Provides staff for training and examination in navigation and seamanship for fishermen.
- (iv) *Education Department and Surveyor of Ships Department* for training and examination in engine care, maintenance and installation for fishermen.
- (v) *The Town Planning Department* which assists in the designing of layouts for fishing villages.
- (vi) *The Agricultural Department* with whom all work on fish-culture is closely associated.
- (vii) *The Administration* which not only is directly concerned with the overall social and economic welfare of the people, but which is also directly concerned with land administration and utilization and is, therefore, fundamentally concerned with any shore-based installations or work for the fishermen.

With the appropriate co-ordination of Departments, a considerable number of developments have been made in the past two years, covering training of fishermen in navigation and engine care and maintenance ; formation of co-operative societies ; issue of cheap loans for engines, craft and gear and of motor lorries for carrying fish to markets ; building of jetties and roads, and supplying such public services as water and electricity to fishing villages (in such schemes 'self-help' is stimulated and encouraged). Assistance is given in the design and construction of mechanized craft and here it is worthwhile noting that it is often essential to achieve a compromise between what the fisherman wants and what the principles of good design and sound installation dictate.

In marketing, there have been two major difficulties to overcome ; vested interests and the dis-

honesty of elected officers of co-operative societies which leads to mistrust. It is clear that if the spirit of co-operation is not inherent among the members of a community, a long time is often necessary to educate them to the value of the principles, by experience. It is rendered more difficult by the fact that there is often traditional competition within a village among crews operating different types of gear to catch the same types of fish. Undoubtedly the most successful co-operative society in Malaya which combines both marketing and 'thrift and loan,' is composed solely of handliners and trollers—they all think in the same way and the stock of goods in their co-operative store is of common value to them all.

In one area of Malaya, a government organised Fish Marketing Scheme has been started on a basis which will permit of it ultimately passing to co-operative ownership. The Scheme has been started on a pilot-scale, to handle approximately 3 long tons of fish per day. The major difficulty has been the competition of vested interests of middlemen, who are doing a great deal to attract the fishermen away from a project designed to safeguard the interests of the fishermen and the consuming public. It is of great interest to see how the fisherman lives for today and does not worry about tomorrow until it arrives.

In *Singapore* a Fisheries Loans Board has operated for a number of years and has recovered the capital issued amounting to a quarter of a million straits dollars, plus interest at rates varying between 4% and 6%. A mobile engine repair and instruction unit visits all the fishing villages, either by road or by sea and attends to engines, giving instruction at the same time. A charge is made for materials and spare parts.

In the fish culture field, both brackish and marine, courses at all levels from Government staff to villagers have been held throughout Malaya, including the inmates of prisons.

In *Sarawak* there is a successful co-operative marketing society for handling Government's fish and another society among the drift net fishermen.

In *Brunei* there is a scheme for providing loans for fishermen which is growing. In North Borneo there are no activities in hand at present, but plans are under consideration.

3. *Advances in the Development of Fish Marketing and Distribution ; Development of Consumption of Fisheries Products to Improve Nutrition ; the Effect of Consumer Tastes for Non-customary Products and Means of Influencing them.*

In *Burma* two fishmarketing co-operatives have been operating, one in Rangoon and one in Manda-

lay. As stated above, one of the major problems to be overcome in Burma is to accustom the population to sea fish, since traditionally they have eaten fresh water fish. A programme of cookery demonstration and propaganda by advertising, is in hand, to achieve this.

In *Ceylon* the marketing and distribution of fish was handed over to an autonomous body, the Ceylon Co-operative Fish Sales Union. This Union has opened up several 'fair price' stalls in various parts of the City of Colombo with the intention of providing fish at reasonable prices to the consumer. The use of refrigerated display cabinets has been started.

In *India* the main approach has been the introduction of equipment to improve the physical aspect of marketing. With TCA and FOA aid from the United States, ice plant, quick freezing plant, refrigerating plant and refrigerated transport have all been imported and are now operating. With the expansion of hydro-electric power and the manufacture of refrigerating machinery within the country considerable progress is expected.

In *Indonesia* the accent has been on the extension of the well-established marketing organisation, which is part of a phased though comprehensive approach to the whole of the economic problems in the fishing industry, to those parts of the Republic where the organisations are not yet functioning. A great deal of work is being done in this respect. [(See Technical Paper IPFC/C55/TECH 45 (SS)].

In *Japan* there is only one matter worth special mention for the period. In 1955, broadcasting facilities are being provided for 17 fishermen's co-operatives with national funds and these facilities will be spread widely in future years. It is expected that this will do much towards establishing fair transactions in fish marketing, in the stabilization of fish prices and the improvement of fish production. One other problem is receiving attention, the prevention of waste in the preparation of human food. At an experimental level satisfactory pastes have been made from whole fish, but so far, consumer taste has not been met.

In *Pakistan* there are no advances to report other than the comprehensive planning made in the section dealing with socio-economics of the industry.

In the *Philippines* the most notable development has been in the marketing of 'patis' (fish sauce). Because of keen competition among producers, they have adopted various means of presenting their product. To-day, patis is sold in attractively labelled bottles with brand-names and trade-marks.

The role played by air transport in fish distribution has become increasingly important. Iced

fish and shrimp from fishing centres in the Southern Islands are transported regularly by air to Manila. During the season, the fry of *Chanos chanos* are transported in earthenware pots in millions by air to Manila. Although air-freight rates are high, the price differential between points of production and consumption is high enough to enable bulk dealers to ship by air at these rates and still make an adequate profit.

There has been a significant increase in the use of ice and its manufacture, which has made it possible for fish landed in the Southern Islands to be distributed over wide areas. An improvement in the roads has further contributed to this progress.

A widespread and comprehensive campaign to increase the consumption of fish and fish-products is in hand. Pamphlets; posters; training in home economics; cooking classes; recipes in local newspapers and magazines have all been used to improve nutrition. While it is not yet possible to evaluate the results, it is clear that the campaign is having a marked effect, at least among educated groups.

In the *United Kingdom* territories, and with special reference to *Hong Kong* the main accent has been on consolidation of the well-known Co-operative Marketing Scheme. One technical advance has been made which assists in marketing, which is the production and storage of dried fish in humid or raining weather. This is done by machine drying, which is hygienic, independent of the weather and reliable; it dries the fish at a temperature of 80°F. and a relative humidity of about 50%. Since salt fish absorbs moisture at a relative humidity greater than 72% and Hong Kong humidities are rarely below this figure, the mechanical methods prove of great advantage. Where as in Hong Kong, the retail market is close at hand, dealers tend to dry fish inadequately. For export or long storage it must be well dried. It would be interesting to know from Hong Kong, of the economic advantages gained and the costing of this method.

In the *Malayan* territories some progress has been made with the icing and packing of low grade fish (Clupeoids; Scombrids; Lethrinids) for distribution over long distances and marketing. Where it has been customary to salt and dry the low grade fish, it is now becoming important to feed inland population centres, where labouring classes predominate, with cheap food. The use of insulated metal containers which hold either 25 or 50 kilograms of fish and ice, are strong, not too heavy for two men to handle and can be transported by road or rail, are beginning to prove successful. The insulant used and found most successful is a material known as 'ONAZOTE', which is vulcanized blown rubber. Fibre glass has been tried, but settles with

the vibration incurred during transport. It is essential that the equipment be relatively cheap and stable. In addition, considerable progress has been made with the mechanical production of 'belachan' or shrimp paste under clean and hygienic conditions. The use of the new plastic sheet has been encouraged for packing and the adoption of trade marks, to indicate the well-prepared product which is now being placed on the market in a clean, hygienic and attractive packing.

In *Kelantan*, in the North-east of Malaya a comprehensive marketing scheme has commenced which is to handle and distribute the fish over the whole area of the State, to provide the fishermen with producer goods and essential foodstuffs at economic rates, and to encourage thrift. The Scheme is meeting with opposition from vested interests and the suspicion which confronts such schemes in any part of the world is particularly difficult to overcome in backward areas, where the fishermen are largely illiterate and inarticulate, and from bitter experience have found that only the fittest survives.

4. *Development of Fisheries Extension Services*

In *Burma*, training courses in fresh-water fish culture are conducted, the trainees being supported while undergoing training. Plans are in hand for the recruitment of foreign and local personnel and the procurement of vessels, equipment and materials for the training of master fishermen in modern fishing methods.

In *Ceylon*, extension work has been done to promote the utilization of inland bodies of water and to encourage freshwater fish breeding in tanks, ponds and rice fields. Lectures are given in simple language explaining the cultural methods and the preparation of ponds and tanks. Leaflets in the vernacular languages and film shows are conducted to illustrate the *modus operandi* and benefits that accrue from farming fish. This has had encouraging results.

In *India* a realistic approach has been made. Fisheries research in this country has been only of recent origin and the results achieved, which are of practical value, are very few in number. A scheme of research was initiated jointly by the Central Fisheries Department and the State of Orissa. The former confined themselves to the basic problems and whatever results were achieved, were taken to the fishermen by the State Department. The results have been surprisingly encouraging. Based on this experience, the Central Fisheries have now established extension units and this aspect is given prominence in the Second Five Year Plan. At present, the scientist has little to offer the fisherman in the field and considerable progress has to be

made, not only in solving the day-to-day problems, but in carrying the solutions to the fishermen.

In *Indonesia* as in other countries, an attempt is being made to increase fish production in the whole country. This is very urgent, because of the great shortage of animal protein for the people. The collective fish production from sea and inland fisheries at this moment gives an average per capita fish consumption per year of about 8 kilograms only.

It may be said that the Indonesian people are still consumers of too small a quantity of animal protein. To change this, fish production has to be increased as quickly as possible, together with an increase of the production of meat. This aim is not an impossibility. There are still so many unexploited fishing grounds and land suitable for fish culture, so much cultivable waters still waiting for diligent hands, so many fishery activities which can be improved to get higher yields, so many unknown factors still to be investigated by sea and inland fishery laboratories. But the most important factor is contact with the people themselves, i.e. the fishermen, fish farmers, and others, who must be properly equipped to take the best advantage of the resources.

In order to attain this end, it is necessary to pay attention not only to fishery projects already in hand, but also to those which still have to be constructed or to be discovered. Therefore two main ways have to be followed: firstly, finding or constructing new fishery areas, including new methods, new cultivable fish species, new kinds of equipment etc., and secondly, improving fishing and cultivation methods applied by fishermen and farmers.

A description of the Inland Fisheries Extension Service in Indonesia is given in Technical Paper IPFC/C55/TECH 43 (SS) presented at the 6th Session.

In *Japan* the establishment of a service to extend scientific knowledge to the level of the fishermen and fish farmers was inaugurated in 1953. The extension services of the Government are conducted under two headings: sea-fisheries and agriculture.

Certain boats are selected from among all fishing boats in a designated area and these are designated as 'centre boats' by both local and central governments. The activities with which 'centre boats' are concerned, include the following fishing methods: gill nets, lift nets, drag nets, longline and hook and line fisheries. Machinery and gear necessary for the improvement of these fisheries are provided free to the centre boats by the Prefectural Fisheries Experimental Station, and experts of the Station go on board these boats as extension advisors to give technical guidance to the crew. Fishing boats, other

than the centre boats, are formed into groups by types of fishery, to be given help and guidance through the centre boats.

The type of machinery and gear provided by the Station for this purpose are; fish finders, binocular microscopes, colorimeters, water samplers, reversing thermometers, plankton nets, electric harpoons and synthetic-fibre fishing nets.

This is all in addition to the results achieved by formal training at the various schools and colleges in Japan, which has 1½ million fishermen. There are 27 schools in which ordinary education as well as fisheries courses are conducted, and 29 Fisheries High Schools. There are five Universities with courses in Fisheries for a major degree and seven Universities which incorporate Fisheries with Stock Farming and Agriculture. Finally, there is Tokyo University of Fisheries which consists solely of the faculty of Fisheries.

In the *Philippines*, separate and independent fisheries extension services are conducted by the Bureau of Fisheries and the Bureau of Agricultural Extension Service. The Bureau of Fisheries has the more comprehensive programme, covering all phases of the industry, while in the other Bureau, there are only matters pertaining to fish farms.

Through lectures and demonstrations in the field, scientific knowledge in the construction and use of modern fishing appliances and mechanized equipment is brought within the understanding of fishermen. Where lectures and demonstration work prove inadequate, they are advised to take up courses in any of the fisheries schools in the country.

By special request to the Bureau of Fisheries, experts or specialists are assigned to interested parties to help them organize their project, train their men, construct or rig their vessel with new gear, etc. Publications dealing with developments in the industry are printed not in English but in the vernacular languages.

Extension service for fish farmers includes among other things, the assignment of experts to help farmers construct ponds, to teach them proper fish culture procedures, and to inform them about the various requirements that have to be met if their projects are to be successful. Since the number of people that could be attended to by experts is limited, pamphlets are distributed in English and the Philippine languages.

The Bureau of Agricultural Extension Service is conducting a successful extension service to farmers. With extension workers who have previously been trained in the Bureau of Fisheries, they have contributed immensely to the growth of backyard fish

farms in the country. Like the Bureau of Fisheries, the Bureau of Agricultural Extension Service also disseminates information through printed articles.

In *West Pakistan* dissemination of fisheries knowledge to the level of fishermen and fish farmers is done through film shows depicting the utilization of waste waters by stocking with useful varieties of fish; its capture and marketing, revealing the statistics and comparing it with other crops.

Other means adopted are radio talks, leaflets, articles, notice boards at important places illustrating what to encourage and what to discourage in regard to Conservation, Development and marketing of fish. Exhibitions are held where live fish of various species are exhibited along with charts and maps imparting easily understandable information.

More useful is the demonstration method. Parties are taken to the fish farms and netting of fish is done in their presence to show the disparity in the yield of fish crops under scientific fish culture as against haphazard cultivation.

Under the village-aid programme, ponds in the Punjab are being selected. The Government of the Punjab is to receive American aid on extension work, which will include fisheries.

In *East Pakistan* under the Agriculture Extension Service, fisheries staff has been delegated to train the Officers of Agriculture, Co-operation, etc., so that they in turn may help the fish culturists. Tilapia was introduced in East Pakistan in 1952, but it was washed out owing to floods, except at Ghaibanda where it is thriving and the fingerlings are being distributed to the farmers. Carp fingerlings are also being supplied.

In the *United Kingdom* territories, *Hong Kong* has nothing to report. In the *Federation of Malaya and Singapore* extension work is carried out by Fisheries Officers and Fisheries Assistants. The fields covered in the past two years have been:

- (a) *Sea Fisheries*. The design of motor boats, the modification of traditional craft to take inboard engines, and the installation of engines. The procedure adopted is for the boat owner or prospective boat owner to approach an officer of the Department and for them to discuss the fisherman-boat-owner's needs. Then together they visit the boat-builder and the needs of the fisherman are interpreted to the boat-builder in terms of good design and engineering practice. Designs are drawn, models are used and good craft demonstrated. In addition, craft have been built by the Department and lent to

fishermen in order that they may assess the principles, in practice.

In the icing and packing of fish for distribution, demonstration has been given of the value of mechanical ice-crushers and the production of crushed ice of varying grades to suit different sizes and types of fish. The value of good, cold, hard ice has been expounded and satisfactory types of insulated containers demonstrated for long-distance haulage.

Echo-sounding surveys of the sea-bed have been made to indicate to the fishermen areas where banks occur, so that they may operate handlines, longlines and portable traps to advantage. Marked improvement in local production of certain types has resulted.

(b) *Fresh-water Fisheries and Fish Culture.*

Demonstration in the field on pond construction and land survey; construction of dams, sluices, and canals; stocking, feeding and rearing methods are carried out by Fisheries Officers, for those embarking on or developing fish culture techniques. Then a series of practical courses have been held for Assistant Administrative Officers and for Agricultural Assistants based on existing farm ponds and paddy fields. Instruction in the vernacular has been given to village headmen, advantage being taken of school holidays to hold classes in schools, these are followed up by the distribution of illustrated instructional leaflets and buses are chartered to show the trainees successful fish culture systems. Demonstration is always accompanied by detailed explanation. Fish culture courses have been given in prisons, in three of which there are now fish ponds maintained by the prisoners, serving both as food supply and instructional units.

5. *The Significance of Fish Culture as an Integral Part of Rural Economy.*

In *Burma*, fish from freshwater has traditionally been more acceptable to the consumer than sea fish. However, it is only recently that all the problems associated with fish culture and its practice by the inland farmer as a means of adding both to his diet and his income have been appreciated by the Government. With financial and technical aid, construction of fresh-water fish ponds, to be operated later by co-operatives or village committees, has started.

In *Ceylon*, fish culture in rice fields is now

carried out at two Agricultural farms, to serve as demonstration units for farmers to try in their own fields, and this has already been taken up by a small number of rice farmers. A course of training for officers in inland fishery techniques is in progress, under Dr. S. W. Ling, F.A.O. fish culturist. As in *Burma*, fish culture is new to the rural scene and it is too early as yet to assess its significance in the rural economy.

In *Japan*, widespread fish culture is declining, since productivity in that country is low. Its contribution to the rural economy as a whole has been comparatively small, except in the case of eel and trout culture. However, the role which fish culture has played for over a thousand years in the rural economy, as an important source of protein food and cash in areas remote from the sea, must not be discounted.

Some 97% of the total management units are small private enterprise, and the number of management units and the total area used for fish culture shows a declining trend. This indicates that the production of fish by culture operations has already reached an economic ceiling and in the present situation, the low productivity must be assessed against the vast funds needed to develop fish culture facilities.

Despite the unpromising future for fish culture as a general practice in *Japan*, the culture of land-locked trout to meet an export demand has progressed.

Year	Total Production	Volume of Export
1952	429 tons	135 tons
1953	466 „	164 „
1954	827 „	274 „

Nagano and Yamagata prefectures hold the lead in trout culture, and reap a maximum income of Y4,000,000 and Y1,850,000, respectively.

The culture of fish in rice fields is declining.

	1951	1952	1953
No. of households engaged in fish culture in rice-fields	143,000	136,000	126,000
Area of rice-fields used	21,320 acres	18,860 acres	17,220 acres
Production for food	1,538 tons	1,163 tons	1,013 tons

This declining trend is in spite of the benefit of increased rice harvest and the high price fetched by the fish which is produced without extra cost or labour. The value of fish is estimated to be Y4,000 per acre per year. The reasons for the decline are the increasing discouragement to the peasant farmer through loss of fish from theft, flood

and the recent introduction of chemical manures and insecticides as part of rice cultivation. However, the importance of fish culture in rice fields is distinctly shown by the fact that about half of the total production of carp in Japan comes from these fields.

In the *Philippines*, the virtual absence of irrigation systems, precludes the culture of fish in rice fields, but where irrigation projects are being undertaken by the Government, fish culture as a part of the rural economy will be incorporated.

Fish culture in ponds is most important and is based on the milk fish, *Chanos chanos*. A measure of the significance of this industry may be appreciated from the following figures. As of December 31, 1954, a total of 100,097 hectares of fishponds were operated principally for the cultivation of *bangos*, representing a capital investment of US. \$100 million. Production from these ponds is estimated at 35 million kilograms in 1954 and constitute about 11% of the total fish production for that year.

It was on account of its importance to the economy that the Philippine Government, through the Rehabilitation and Finance Corporation, instituted a liberalized system of financing to accelerate fishpond development. It was due to this agency that within the five years 1950 to 1954, some 27,000 hectares of idle swamp land were converted into productive fishponds. This continues with increased tempo.

In *India* the only source of water in the villages which do not have any access to rivers is still in most cases the village tanks. In addition, during the past 50 years on account of indiscriminate construction of embankments in the form of railways, roads, irrigation canals etc., a large number of swamps have developed which have been not only totally unproductive, but have contributed to general unsanitary conditions and diseases, particularly malaria. In fact, the engineers are now realising that before any embankment is laid precautionary measures against malaria has to be taken in advance, but unfortunately this idea has not been of much practical application. Experiments conducted in Orissa have conclusively shown that large swamps extending from 50 to 1,000 acres may be converted into scientific fish farms and yield good results if stocked with good quality carps. Almost each village has a swamp of its own and a number of small ponds varying between 5 to 7 acres. According to the present rate of production, which is very low, the villagers may expect about 50 maunds of carps valued at Rs. 3,000 per year provided the tanks are stocked with fish every year.

Until now, there has been no suitable indigenous variety of fish which breeds in tanks and shows quick growth. Exotic species like Tilapia, Gourami, etc., have given encouraging results. With improved cultural practices it is not impossible to get 10 maunds or 820 lb. of fish per acre, which means that a village may expect 120 maunds of fish per year and a monetary income of Rs. 7,200, in addition to which there will be less malaria. Considering these facts the maximum stress has been laid in the first Five Year Plan on development of inland waters and now practically every State is laying great emphasis on this aspect. It has now been generally agreed that the village tanks should be the responsibility of a village committee which will take up fish culture and will have its officer trained in fish cultural practices.

Indonesia is an agrarian country and the means of subsistence of about 80% of the people is agriculture, which includes fish culture. This fish culture is most important, and has been practised for a very long time. Even in the 13th century, regulations were enacted to protect against theft fish culture ponds, which were mostly owned by the nobility as a pastime. Brackish-water ponds were first constructed in the 15th century, starting with brackish-water ponds of Gresik (East Java). About a century ago (1860) the Government propagated fish culture to the people, beginning in West Java. The religious leaders played a big part in extending fish culture, because at that time they were the persons who controlled the water supply.

It will therefore be seen that fish culture has been an integral part of the rural economy of Indonesia since very early times.

The outstanding economic aspects of this special type of rural activity are described at length in Technical Paper IPFC/C55/TECH 46 (SS) presented at this Session.

Pakistan has nothing to report.

Thailand has nothing to report.

In the *United Kingdom* territories, the problem in *Hong Kong* is essentially how best to use land under intensive production for the best economic return, and appropriate land use is one of the guiding principles in government policy. In these special circumstances it has been decided to concentrate on pond development in suitable areas for the culture of carp species, (an expansion of long established practices) and to give special attention to comparatively large areas of brackish-water land for the raising of grey mullet in association with duck raising and the growing of varieties of rice which tolerate salt.

Experimental work in Hong Kong has been confined to three localities and to one species—the common carp—in relation to fish culture in rice fields. It is believed that carp raising in rice fields is not suitable for the average Chinese peasant rice farmer in the Colony, because

- (1) Individual holdings are small, often less than one acre and the whole area is required for rice and/or vegetable production.
- (2) Under normal conditions, water supply is barely adequate for rice culture; the provision of higher bunds to allow of fish culture is too costly for peasant farmers, and sufficient water to raise fish is not available in many areas over the growing period.
- (3) Two rice crops involving about 120 days each for maturation necessitates the provision of holding ponds: in many areas land cannot be sacrificed for this purpose.
- (4) Without adequate bunds and traps many fish are lost during periods of flooding.
- (5) Even under ideal conditions, losses of fry are considerable.

It will be appreciated therefore, that in Hong Kong, by comparison with other South-East Asia territories, there is nothing casual about the economy of fish culture, but it is carefully planned on an intensive scale, with research following up established practice to improve the yield. The following are the four main lines of investigation undertaken by the Fisheries Research Unit of the University of Hong Kong.

1. Stocking densities of compatible species.
2. Growth rates and productivity, in relation to artificial and natural feeding.
3. The environment provided by the ponds.
4. Parasitism and disease.

In the *Federation of Malaya and Singapore* fish culture is practised in two ways:

- (a) in rice fields.
- (b) in ponds, fresh or brackish.

(a) Fish culture in rice fields provides an addition to the diet of the cultivator and in those areas which are fully irrigated to a depth of between 15 and 25 centimetres an important additional cash crop. There are 360,000 hectares of rice land under wet cultivation, all of which produces fish. Of this total 45,500 hectares may be classified as the 'deep' irrigated areas and from them, an estimated 7,500 tons of fish per annum are produced as a cash crop for salting and drying on an industrial scale. In all the other areas, comprising the balance of the total area under wet rice, there is a spasmodic production of fish marketed both fresh and dried, but the limiting factors of water availability and water depth affect the magnitude of this industry.

(b) Fish culture in ponds is promoted throughout the country as a factor in the mixed economy of the agricultural peasant. Nowhere is there a fish farm which provides the sole means of livelihood of its owner. The principle upon which such ponds are operated, is to provide the owner with a cash income primarily and secondly to enable him to obtain an additional protein supplement to his diet. It is now firmly established that with proper management, under favourable environmental circumstances, the fish pond is an economic unit which can more than earn its keep, provided it is associated with stock and/or poultry (to fertilize the water) with fruit trees (on the banks and mulched with the sludge from the ponds) and the stocking and harvesting programme is carefully planned.

It is estimated that from all sources, approximately 22,500 metric tons of fish are produced by fish culture methods, as part of a mixed agricultural economy. Approximately 385,000 people are involved.

REPORT ON THE STATUS OF THE FISHING INDUSTRY

1. There has, during the period since the Fifth Session, been a notable quickening of the interest shown by most Governments of the Region in the fisheries as a source of food although there are still one or two instances where no steps have yet been taken to establish a competent government authority to encourage the development of the industry.

2. This is particularly true in the attempt made, with or without support from various sources of foreign aid, to explore the feasibility of introducing the larger, more costly types of non-indigenous gear such as trawlers, longliners, purse-seines, gill-nets etc. While it is still too early to attempt an over-all evaluation of these new methods, it may be said that the results have varied from the firm establishment of successful commercial operations to complete failure in a few cases.

3. Negative results must not, however, be considered as a total loss, since they point the way to other, more profitable activities. Moreover, the lack of success is not always attributable to the non-availability of adequate natural resources or to intrinsic deficiencies in the fishing method itself, but to difficulties encountered in training personnel, in overcoming procedural and financial obstacles in government itself, or in creating a consumer demand for wholesome but unfamiliar products.

4. Considerable advances have also been made in the field of inland fisheries, more especially in the encouragement of fish culture activities.

5. It is probable that the field in which most remains to be accomplished is in the improvement in the conditions prevailing in the small, subsistence fisheries at isolated points along coastlines and rivers, where there is still much hardship due to over-expenditure of effort for too little return, due to primitive capture methods, lack of management of grounds which have been intensively overfished for centuries and lack of proper transportation, handling, processing and marketing practices.

6. Moreover, too little is still known about the nature of the resources on which the fisheries are based and the degree to which fishing has reached or passed the point of economic return and, conversely, to what extent fishing efforts might be intensified without danger of depletion.

7. This is especially true in the case of certain fisheries such as *Rastrelliger*, Hilsa and the Sardines, which apparently suffer from cycles of good and bad years, whether of abundance or availability, it is not

yet clear. Certainly the ability to predict these favourable and unfavourable seasons would relieve the industry of the perennial fear of disaster and would permit the diversion of man-power to other fishing grounds or methods, or alternatively into non-fishing activities during the bad years.

8. One of the problems which has beset the fishery industries of the region and which is receiving more attention from Governments is that of distribution and marketing. It is becoming increasingly apparent that a greater return from the sea has in the past often been hampered by low returns to the fisherman and high prices to the consumer due to improper practices in the fields of marketing and financing, coupled with dangerously low economic conditions and nutritional standard; fluctuations in catch which might be cushioned not only through the diversion of fishing effort as suggested above, but also by means of improved storage and handling; by proper distribution to inland areas; and through the education of consumer taste to accept unfamiliar products. These problems are being attacked at all levels, e.g. government loans and subsidies; government fishing operations (which should, however, probably in most cases be entrusted to private operatives so soon as new fishing methods can be properly demonstrated and financed); encouragement of co-operative effort, including capture, marketing and supply of materials; building of cold storage plants, properly organized and hygienic marketing premises; adequate transportation to inland areas; establishment of quality standards both for home consumption and export, etc.

9. In *Burma*, fish landings are estimated to have been of the order of 46,000 metric tons as against the last report of 43,200 for 1950. It is certain, however, that this figure would be very greatly increased if subsistence fishing were taken into account. That there is room for a considerable expansion of the industry is proved by the continuing large importation of fishery products. Two Japanese trawlers continue to operate by arrangement with the Government and produced, 1,127 m.t. in 300 operating days and 670 m.t. in 274 operating days, respectively. Fishing is mostly in the neighbourhood of the Mergul Archipelago and the crew is Japanese, with Burmese apprentices. A Japanese report states that the higher prices available in the monsoon period when river and coastal fishing comes to a standstill will probably decide the economic feasibility of continuing these

operations. All principal fishing equipment comes from Japan but fuel and ice are purchased in Rangoon. For heavy repairs the boats must be taken to Singapore. Technical Assistance is being sought from Canada through the Colombo Plan, for the mechanization of small, indigenous craft. Government is giving assistance to fishermen through fishery co-operatives of which there are at present 844, both in the way of loans (about one million kyat to date) but also in producer supplies at subsidised rates. Fish culture is being encouraged both in government experimental stations and at village level and training courses are being conducted. An F.A.O. expert has been provided to assist the Government in 1955. A paper by U Ba Kyaw, 'A Glimpse of the Fisheries in Burma' is presented at this Session. It is, however, apparent that although Burma is a fish consuming country, insufficient attention is still given to fisheries development and there is at present no department within the Government itself concerned with these activities, which are dealt with by the Agricultural and Rural Development Corporation.

10. No information has been received on the status of the fisheries of *Cambodia* although it is known that increasing interest is being evinced in the possibilities of development of the sea fisheries in the Gulf of Thailand. Some concern has been expressed regarding the pressure being brought to bear on the inland fisheries centred on the Great Lake, the Tonle Sap, and there is probably an urgent need for properly planned population studies to determine whether undesirable changes are taking place in the composition of the stocks.

11. According to a *Ceylon* report of the Planning Secretariat on the Six-year Programme of Investment for 1954/1960, local production of fish still only suffices for about 45 per cent of total consumption, the balance having to be imported. It is the long-term objective of the Government not only to make the country self-sufficient in fish at the present level but also to increase the present rate of consumption by providing larger quantities at lower and more stable prices. Allied to this is the aim of improving the social and living conditions of the fishermen themselves, who form about 2 per cent of the gainfully employed population and caught some 24,000 tons in 1953. Broken down in terms of catch per man per year, this represents only half a ton of fish annually, which while fairly representative of subsistence finishing in the region as a whole, can undoubtedly be improved. A determined attempt is to be made to assess the extent of the fishery resources and to ensure that future supplies will not be jeopardized by over-fishing. There is an indication that large quantities of migrant stocks

exist in the Indian Ocean beyond the compass of the indigenous craft and research is proceeding on this project. In this task, considerable assistance has been given by the fishery biologist provided by the Colombo Plan and the work will be continued by the local trainees. The Colombo Plan has, in addition to the two trawlers previously reported, supplied 40 marine diesel engines which will be supplied to the industry on easy terms from a revolving fund. Assistance has been received from F.A.O. in determining to what extent existing local craft may be advantageously mechanized and favourable results have been obtained with the larger boats in the Jaffna area; experiments will now be extended to include the mechanization of the *orus* on the southern and western coastlines. A considerable increase in fish from fresh and brackish-water lakes is also expected and a survey is presently being conducted with assistance from an F.A.O. expert. Considerable attention is being paid to the marketing, transportation and handling aspects. Eight insulated refrigerated trucks have been received as a gift from Canada and will bring in fish from remote centres, for which purpose access roads are being constructed. A cold storage plant to hold the excess fish caught in the favourable seasons is being built, also with Canadian assistance, together with a by-products factory, which will probably be handed over to a board as a commercial undertaking. A modern fish harbour is being constructed at Mutwal at an estimated cost of Rs. 5.7 million. Besides the comparatively short-term effects of the above programmes on the welfare of the fishermen, the Government has launched a scheme for the construction of 3,250 houses for fishermen at a cost of 6 million rupees. An illustrated F.A.O. report has recently been released on the mechanization of fishing operations in Ceylon, as the outcome of the termination of the work of the first fishery engineer supplied under the Expanded Technical Assistance Programme. The most outstanding result of this work is the eagerness of many fishermen to have engines of their own.

12. The total landings of marine fish in *India* in 1953 were 570,768 tons as against 501,884 tons in 1952. The general conditions of Marine Fisheries along the East Coast of India seemed to have been more or less steady during the past few years while those on the West Coast were extremely variable owing to wide fluctuations in the landings of the major shoaling fishes like the sardines and mackerel which form the main fisheries of the West Coast. The Fishery Survey, conducted by the Central Marine Fisheries Research Station, has indicated that 1953-54 fishing season for sardines was one of the most successful in recent years. About 27,118 tons of fisheries products consisting mostly of dried.

dried-salted and wet-salted fish valued at Rs. 41,890,000 were exported to Ceylon, Burma and other countries as against 24,390 tons valued at Rs. 38,680,500 in 1952-53, and 19,340 tons valued at Rs. 24,555,700 during 1951-52. The imports during 1953-54 period mostly from East Pakistan consisted of 3,142 tons of fishery products valued at Rs. 1,605,000 as against 3,664 tons valued at Rs. 1,883,000 during 1952-53 and 4,394 tons valued at Rs. 2,169,000 in 1951-52. During the year under review, steps were taken to develop both the inland and marine fisheries of India. Under the 'Grow More Food' Fisheries Development Schemes, the Central Government during 1954-55 sanctioned Rs. 466,000 in the form of grants and Rs. 1.38 million as loans to different State Governments. About 120 million fry and spawn were collected and stocked during the season 1953-54. The Central Inland Fisheries Research Station continued investigations on pond culture, riverine, lacustrine and estuarine fisheries. Considerable improvements have been effected in carp nursery practices and the increased survival of fry. Experiments on the culture of Tilapia, separately and in association with commercial carps, are in progress to determine the suitability or otherwise of its introduction in Indian waters. A substantial programme has been initiated under a new Indo-U.S. agreement which provides for the development of inland fisheries, reclamation of swamps, distribution of fish to the interior areas by transport vehicles etc. with an estimated expenditure of U.S.\$555,000 and Rs. 2,834,500.

In the marine fisheries, mechanization of indigenous craft and the introduction of new powered boats have materially yielded more catches by increasing the time and area of fishing. In Bombay State, there has been an increasing demand for marine diesel engines for fitting in the local fishing craft operating in inshore waters and 337 such powered boats were in operation, mainly through loans and subsidies granted to fishermen by the State Government. Under the U.S. aid programme 363 engines have also been procured for various maritime States and some engines have also been received under the Norwegian Assistance Programme in Travancore-Cochin, which has also continued its experiments on fishing with purse seine, drift nets and longlines, construction of new types of boats and the installation of an ice factory.

Exploratory and experimental fishing and marine fisheries research were continued at the Deep Sea Fishing Station of the Government of India at Bombay. The bull trawling operations conducted by the two Dutch cutters *Ashok* and *Pratap* have yielded very encouraging results indicating that bull trawling has very good potentialities in the

Indian seas. A private Japanese fishing vessel, *Taiyo Maru* No. 17, worked successfully during the year in some of the more productive areas and landed 488 tons of fish from 31st December, 1953 to 20th July, 1954. Taking the results of fishing from December, 1953 to May 1954, it has been found that the average catch per hour of fishing by *Tairu Maru* was 570.1 lb. against 1,347.4 lb. by *M. T. Ashok* and *Pratap* working as a pair of bull trawlers. During the 1954-55 fishing season *M. T. Ashok* and *Pratap* together landed 177 tons of fish in 5 voyages from 2nd January, 1955 to 5th March, 1955. The two Danish cutters *Sagarika* and *Baruna* also continued to conduct exploratory fishing in the Bay of Bengal.

Efforts to organize fishermen's co-operative societies were intensified and timely loans and assistance in the fishery requisites at reasonable rates were arranged. The State Governments, notably Madras and Bombay, have established some 800 fishermen's co-operative societies.

Marketing arrangements in some of the States were improved. Bombay has recently constructed a fish market at a cost of Rs. 1,600,000. Facilities for ice and cold storage and transport are being provided by the States of Bombay, Madras, Orissa and Saurashtra. Madras has set up two ice and cold storage plants at Calicut and Mangalore. Under the American assistance programme, eleven insulated road vans have been procured for maritime states. The Central Government is taking steps to introduce refrigerated railway wagons for long distance transportation.

A comprehensive study of the different methods of fish curing practices throughout the country has been commenced at the Central Marine Fisheries Research Station, with a view to effect improvements in handling and processing of fishery products.

An F.A.O. naval architect was engaged on designing suitable types of fishing craft for different regions of the coast. In Madras State the results of the fishing experiments with small power boats by an F.A.O. Fisheries Engineer have already attracted the attention of the fishermen who are now requesting these types of boats and gear on reasonable terms.

Investigations on the Mullet (*Mugil parsia*) and fresh-water eel (*Anguilla bengalensis*) indicated that a definite slowing down of growth during the monsoon caused a break in the formation of the circuli on the scales of these fish. Based on the studies of their scales it has been found possible to determine the annual and half-yearly growth increments in the length of these fishes.

13. During the postwar period from 1945 to 1947, Japan suffered from dire shortage of food,

including fish. Affected by war damage and fluctuations in the availability of migrating fish resulted in a serious reduction in the annual fish catch to the lower level of 1,875,000 to 2,250,000 tons. Measures were therefore taken to secure the rehabilitation of fisheries production, by building fishing boats and by preferential supply of fishing materials. Since 1950, the fisheries rehabilitation programme has been pushed forward at a rising tempo year after year. Stimulated by the elimination of the restricted fishing ground during the occupation, the high seas fisheries (arctic salmon, trout, and crab fisheries, high seas tuna fisheries, etc.) attained full development and the fish catch in 1953 and 1954 rose to 4,772,500 tons and 4,800,000 tons respectively. In consequence, per capita per day animal protein intake merely from aquatic products in 1952 and 1953 was 10.2 grams and 9.4 grams respectively. This was a substantial gain over that in 1945-47, although in view of the growing population, it has become necessary to raise the fisheries production still further. However, when the number of boats operating fisheries is increased, individual incomes from fisheries will decline, thus resulting in decreases in fishing. The Government has therefore taken steps to reduce the number of trawl fishing boats and their conversion into other fisheries. In 1950 the consolidation was carried out as regards medium trawlers operating on the East China Sea (west of 130°E longitude). Under the five-year programme beginning 1951, small type trawlers (less than 15 gross tons) have been consolidated and since 1953 medium type trawlers (15 gross tons or more) have been urged to convert into power tow boats for towing catcher boats for bonito and tuna.

Of the 2,600 fishing ports deemed important from the national or local economic viewpoint, 450 have been repaired or improved since 1951.

In 1951, the Reconstruction Finance Corporation was replaced by the Japan Development Bank, which has provided capital for whaling in the Antarctic Ocean, high seas tuna fisheries of 300 gross tons or more, and ice-making and cold-storage equipment. Long-term, low-interest loans have also been made available to other smaller fishermen from the Agriculture, Forestry, and Fisheries Finance Corporation. A smaller fishermen's loans guarantee system was also devised by the Government whereby smaller fishermen or fisheries co-operatives and local public entities make their own contributions and their obligations to private banking institutions are guaranteed by the Government.

During the period from 1952 to 1954, fisheries-rights bonds amounting to 17,800 million in face value (U.S. \$49.5 million) were delivered to the old fisheries rights owners as compensation for the

cancellation of the fisheries rights and these bonds converted into cash were used for the formation of fisheries co-operatives and other fishing operations.

In order to render active co-operation to the international agreements for conservation of aquatic resources, Japan participated formally in the International Whaling Agreements and has abided faithfully by the restrictive and prohibitive clauses. In July 1954, Japan became the host country of the International Whaling Convention held at Tokyo.

Although Japan does not participate in the international agreement for fur sealing, she participated in the triple conference (the U.S.A., Canada, and Japan) held in 1952 for ecological study of fur seals. Until the formal participation in the Fur Seal Conservation Agreements, fur sealing operations on the high seas are prohibited. The study of food habits of fur seals in Japanese waters were undertaken by the Government of Japan in 1953-54. The Government has dispatched boats every year since 1953 to make the study of the resources of arctic salmon, trout and crab.

Various research and investigations have been carried on since 1950 under the leadership of the national fisheries research institutes for the conservation of aquatic resources and expansion of new fishing areas. Great expectations are held for the overall research projects on the Tsushima Warm Current (from the East China Sea to Hokkaido through the Sea of Japan) carried on under a three-year plan beginning 1952. The study of the resources of sardine, mackerel, demersal fish, bonito, mackerel, pike, and of migrating squids are also in progress under the leadership of these institutes.

Since 1951, government fisheries statistics experts have been stationed at the main fishing centers throughout the country. Based on the analysis of these statistics, it is decided whether or not the conservation of aquatic resources is well maintained and what further measures may be required. Tuna totalling nearly 483 tons caught by about 856 fishing boats had to be discarded, having been irradiated as a result of hydrogen bomb experiments conducted in the Marshall Islands in 1954. As tuna fishing is one of the most promising operations in postwar Japan, the impact on Japanese fisheries is quite serious, especially due to the loss of fishing grounds by setting up off-limit areas to tuna catcher boats and because of the increased time employed in reaching the fishing ground, owing to the necessity of avoiding the prohibited areas. In addition, the purchase of tuna and other fish showed a substantial decrease, resulting in lower prices and fish exports came to a complete standstill. The Government of Japan in May, 1954, dispatched boats to study the impact of bomb explosions on the aquatic resources

in the Bikini area. The data collected by the experts are now under compilation.

14. In *Netherlands New Guinea* there is a striking difference between the Northern and Southern coasts. The water masses along the north coast are mainly of an oceanic character and, situated just south of the equator, are regulated by the equatorial currents. The mouths of some great river systems along with some extensive reef areas of the Geelvink bay and the Radja Ampat Group, are the richest fishing grounds in this area. The continental shelf is mostly very narrow, extending only a few miles out to sea near the mouths of the afore-mentioned rivers. The pattern of the south coast is largely influenced by the numerous river systems emptying into the comparatively shallow Arafura shelf. Although the waters along the coastline are rich in fish and crustaceans, little is known of the productivity of the off-shore waters.

The fishing industry, which is chiefly at a subsistence level, employs very primitive methods. It is believed that the total yearly fish catch is between 2,500 and 3,000 tons. The growing quantities of dried salted fish indicates that the production is gradually increasing. In 1954 an estimated amount of 600 tons of canned and frozen fish and 150 tons of dried salted fish was imported into the territories. In 1954 a three-year programme for development of the fisheries was started. Exploratory and experimental fishing was carried out during 1954 with two Dutch-built steel cutters, one of which is chiefly equipped for the exploration of potential trawling grounds, while the other will be used for the exploitation of the pelagic fish stocks in this area to satisfy the immediate demand for fresh fish on the north coast and the exploration of the off-shore fishing grounds on the north and west coast. During 1954 a considerable area was covered by the trawl cutter and several suitable trawling grounds were found along the north and west coast of the territory. Indigenous crews were successfully trained in trawling operations, engine maintenance and net mending and construction. The tuna boat also conducted reef fishing in the Geelvink Bay and Radja Ampat Island area. Experimental fishing was carried out with three small motor launches in the shore waters of the Humboldt and Geelvink Bays. The results of these experiments will form the basis for future development schemes for the fishing industry of the territory. Meanwhile, an extension service of the Fisheries Division is being built up, so as to introduce the preliminary results and findings of the investigations into the local fisheries. As a first step of mechanization,

small air-cooled inboard diesel engines will be installed in native fishing craft. The first of these units will be ready for testing in the middle of 1955. During the latter part of 1954 an ichthyological survey was started of the fishes and crustaceans of the inland waters of *Netherlands New Guinea*. This survey was made possible with the financial aid of the South Pacific Commission.

15. No information is available on the fisheries of *Australian New Guinea* and *Papua*. However, the check-list of New Guinea species has been revised, as a result of the investigation of the *M. V. Fairwind* during 1948 and 1949. The number of species of fish known from Australia is thus increased from 821 to 1003.

16. As regards the fisheries of the *Commonwealth of Australia*, the Barramundi (*Lates calcarifer*) is the only fishery of economic importance in central and northern Queensland waters and in the Gulf of Carpentaria, but catch statistics revealed a noticeable decline from a peak figure in 1947, related to illegal fresh water fishing and the taking of under-sized specimens. A further 900 fish were tagged during the year. The return of ten tags confirmed the previously held hypothesis regarding very rapid early growth rate and catadromous behaviour. Morphometric studies revealed differences between stocks inhabiting the east coast of Queensland and the Gulf of Carpentaria and between fresh (i.e. land-locked) and salt water inhabitants.

The most important species in the Australian fish catch in 1953-54 was the Australian Salmon (*Arripis trutta*) with a record yield of 11.4 million pounds.*

The commercial catch of Barracouta (*Thyrssites atun*) was 4.3 million pounds (beheaded and cleaned) in 1953-54 was the lowest since 1941-42. The adverse conditions of the previous three years recurred in Bass Strait and on the east coast of Tasmania.

The overfished New South Wales Tiger Flathead (*Neoplatycephalus macrodon*) trawl fishery remains at a low level. One of the two steam trawler companies has ceased to operate and the shipwreck of two trawlers has reduced the fishing effort, which is however still estimated to be considerably in excess of the optimum.

The 1954-55 season for Southern Bluefin tuna (*Thunnus thynnus maccoyi*) in New South Wales opened very promisingly. However, because of falling prices overseas and lack of freezer space, catch quotas were enforced and only about 550 tons were taken.

* Annual Report, C.S.I.R.O.

Commercial net fish were abundant in Lake Macquarie in New South Wales, while ground fish such as Flathead and Whiting are relatively scarce. There is some indication that black bream are over-fished.

A study of the movements of the Sea Mullet (*Mugil cephalus*) within an estuarine system shows that the mullet school persists as an entity, although some emigration from (and presumably immigration to) the school takes place. Considerable range in behaviour is displayed by individual schools. Evidence suggests that most adult fish participate in the spawning migration only every second or third year.

The data on the biology and catch statistics of Yellow-eye Mullet (*Aldrichetta forsteri*) are at an advanced stage of analysis in Western Australia. There is evidence that the yellow-eye mullet of Victoria and Tasmania are racially distinct from those of Western Australia.

The total catch of the Western Crayfish (*Panulirus longipes*) rose to 10.3 million pounds in 1954. Plans were made for an investigation of the fishery of the Southern Crayfish (*Jasus lalandii*) in Tasmania where the rate of catch, although not the catch itself, is falling in most areas.

The Tiger Prawn (*Penaeus esculentus*) was taken in fair quantities in Western Australia.

It has now been found that the almost universal absence of 0+ age-group in samples of the Pearl Oyster, *Pinctada maxima*, is due to the inability of divers to see them. Beds on which no 0+ group oysters have been seen in the past three years carry plenty of the 1 and 2+ groups. It is now possible to determine accurately the state of maturity of pearl oyster gonads by histological examination.

17. Fish landings in Pakistan have shown a downward trend of about 10% due to shortage of raw materials for fishing and also failure of the thrimp fisheries on the coast of West Pakistan, due to bad weather. Export of fish products for 1954 were: West Pakistan (principally cured fish) 7,600 tons, East Pakistan: 10,000 tons (principally fresh fish to West Bengal, India) while the export of fertilizers and meal to Europe and Ceylon was 2,000 tons. A joint company with American and Pakistani capital have installed a freezer at Karachi and have till now sent some samples of frozen shrimps to the United States. Another Pakistani company has started a canning plant at Karachi. The Central Fisheries Department has been conducting fishing with *Ala*, a trawler received as part of the assets of the Government of Pakistan. Exploratory fishing, specially for shrimps is also being conducted from a 67-foot vessel acquired under the American aid pro-

gramme. The work on fish harbour at Karachi has started under the guidance of an American Harbour Engineer.

A preliminary report on the mechanization of fishing craft has been received from F.A.O. and the recommendations contained therein are being implemented. On the recommendations of the F.A.O. experts who surveyed East Pakistan, a scheme for the 'collection of fish from Sunderbans area and its marketing' has been finalized. Two engines are being provided for two carrier vessels based on Khulna. Two further carrier boats are being reconditioned to carry fish to Chittagong by the Fishermen's Co-operative Society.

18. In Thailand, the number of 'pohs' or stake traps, which are the principal coastal fishing gear for chub-mackerel (*Rastrelliger* spp.) varies from year to year. There were 1,177 units in 1948, 1,160 units in 1949, 1,047 units in 1950, 1,122 units in 1951, 1,254 units in 1952, and 1,334 units in 1953. The Chinese purse seine with mechanized craft as fish carriers showed a remarkable increase since 1948. The numbers were 37 units in 1948, 52 units in 1949, 59 units in 1950, 71 units in 1951, 126 units in 1952, and 121 units in 1953.

The catch in 1953 was about the same as in 1949, as reflected by the fresh fish landing in Bangkok Wholesale Fish Market, but the price was lower than that in 1949. This was interpreted by the low demand of the salted *Rastrelliger* in the Indonesian market. In 1954 the catch of *Rastrelliger* was estimated to be about 3 times of that in 1953, and the extremely low prices for salted *Rastrelliger* caused great hardship among fishermen. There is expected to be a much smaller number of pohs and Chinese purse seine fishing units in operation in 1955.

In 1954, shrimp trawling was started at the mouth of Chao Phya River. The result was encouraging. One unit consists of a one to ten ton boat and two to three trawls respectively. In 1955 it is expected to have 200 trawling units. The catch per boat was about 50 kg. per day. The season lasted 4 months.

19. The inshore fishing grounds of Hong Kong are confined to waters up to 20 fathoms south of the Colony; these waters are fished by purse seiners, gill netters, shrimp beam trawlers and small liners. The deep sea fishing grounds are in waters from 30 to 65 fathoms along the coast of Kwang Tung province, China, extending from 111°30' to 116° East longitudes and between 20°15' to 20°30' North latitudes. These waters are fished by trawlers and longliners.

In the following notes information is provided on the 16 important species of food fish landed in the

Colony by Hong Kong fishermen. On the whole the season was a good one but attention is drawn to the falling catches of Red Sea Bream and Snapper, attributed to the increased activities of mechanised trawlers. Lower yields of Yellow Croaker and White Herring are attributed to adverse climatic conditions but there is no reasonable explanation for the fall in catches of Anchovies. Of interest also was the reduction in size of the average catch of Lizard Fish and the greatly increased yields of Mackerel Scad, Golden Sardine, Conger Pike, Cuttle Fish and Silver Shrimp. There is no reason to suppose, despite the greatly increased number of mechanised craft working both inshore and in deep sea fishing grounds, that there has been any serious decline in fish populations.

- (1) Golden Thread—*Synagris virgatus* (Houttuyn). Golden Thread are caught mainly by deep sea longliners along the coast of Kwang Tung where the depth ranges from 45-65 fathoms with muddy bottom. The fishing season lasts throughout the year but from February to April, owing to the spawning period, large quantities are usually caught as compared with the rest of the season. Landings of this species during the year were the highest since the war. It is said that the good catches were due to reduced shark activity in the fishing ground on the west coast of Kwang Tung. Catches were steady and there was little damage to gear from sharks. Fishermen changed their fishing waters frequently to avoid shark damage to gear.
- (2) Red Sea Bream—*Taius tumifrons* (Schlegel). Red Sea Bream is the main catch of deep sea trawlers and long liners. The fishing ground for this species coincides roughly with that of Golden Thread. The fishing season lasts throughout the year but fish are especially abundant in winter and spring. Catches for the year were considerably reduced in number and size as compared with previous seasons. Fishermen claim that this might have been a result of overfishing by mechanized trawlers.
- (3) Lizard Fish—*Saurida argyrophanes* (Rich). This species is a sea bottom fish and is caught mainly by deep sea trawlers on the fishing grounds from 50-65 fathoms deep with sandy and muddy bottom along the coast of Kwang Tung. The migration of Lizard Fish is from the west coast to the east coast of Kwang Tung during September to April. The fish

spawn in the east coast from February to April and move away when the spawning season is over. Production during the year was high but catches consisted mainly of medium sized fish.

- (4) Melon-seed—*Psenopsis anomala* (Schlegel). Melon-seed is a sea bottom fish and is caught by deep sea trawlers in the fishing grounds with muddy bottom on the west coast of Kwang Tung in 30-50 fathoms. Production was high in October and November, 1954. The fish spawn in March and April and move away after the spawning season.
- (5) Yellow Croaker—*Pseudosciaena crocea* (Richardson). Yellow Croaker is a seasonal fish and is caught by gill netters. The migration of this species to the Pearl River estuary for the purpose of spawning begins from September and lasts until December. This species usually appears first in the area off Ladrone Island and then moves gradually to the shallow water near Hong Kong when the weather is warm and fine. The season was spoiled by the typhoon of November 1954 which drove the Yellow Croaker to the east coast of Kwang Tung near Swabue and Kit Shak.
- (6) Mackerel Scad or Horse Mackerel—*Decapterus lajang* (Bleeker). This species is a seasonal fish and is caught by large purse seiners at a depth of from 20-30 fathoms on the south and south-east of Hong Kong near Ping Hoi and Lema Island. Fishing lasts from November to April but fish are most abundant when the weather is warm and fine. During the season Mackerel Scad appeared in large shoals in February and March on the west of Hong Kong near Ladrone Island and St. John Island. Production in the normal fishing ground on the southeast of Hong Kong was low. Many fishermen reported that they had seldom had such good catches of Mackerel Scad.
- (7) Anchovies—*Stolephorus* spp. Anchovies are caught by small purse seiners in the inshore waters throughout the year. February, March, July and August are the best months for this species. Unfortunately, catches have been poor over the past two years. The reason for this is unknown.
- (8) Carangids. Carangids are caught by small purse seiners in the inshore waters from

May to July but the fishing season during the year was extended to September. Production was good especially in June and July in the areas near Lintin and Lema Island after which the fish moved gradually eastward to the Nine Pin Island and Port Shelter.

- (9) Golden Sardine—*Sardinella aurita* (Cuv. & Val.). Golden Sardine is the main catch of purse seiners. The fishing ground is confined to the inshore water near Lema Island. The fishing season starts from August and lasts to October but the season during the year under review began one month earlier and extended to November. Fish appeared in great abundance in Hong Kong waters near Po Toi, Lema Island and Mirs Bay.
- (10) Conger Pike—*Muraenesox arabicus* (Bloch and Schneider) Conger Pike is the main catch of inshore long liners. The fishing ground is mainly confined to the inshore waters within a depth of 20 fathoms. Fishing continues throughout the year, but January-March is the period when the catch is usually higher than the rest of the year. The production of Conger Pike increased about 50% during the year. Some of this increase has followed mechanization of longliners which now operate in a good Conger Pike ground west of Ladrone Island.
- (11) Hair Tail—*Trichiurus haumela* (Forsk.) Hair Tail are caught by small longliners in the inshore waters throughout the year but are most abundant in March and April. The catch in February and March was low owing to the big shoals of cuttle fish in the fishing ground near Po Toi Island and Lema Island which took the baits from the longlines.
- (12) White Herring—*Ilisha elongata* (Bennett). White Herring is a seasonal fish and comes to the Hong Kong water from April to June. The fishing season started late in 1954. White Herring appeared in the Tai O area in May and disappeared at the beginning of June. It is said that the Pearl River flood had reduced the water salinity in the normal fishing ground.
- (13) Cuttlefish—*Sepia* spp. This is seasonal, usually migrating to the Hong Kong waters in the spring season. It is caught by hand liners and purse seiners. The Cuttlefish season started earlier this year. Large quantities appeared in the area near Po Toi Island in October, December,

February and March when the weather was warm and fine and the sea was calm. The total yield for the season is estimated at over 80,000 piculs. Fishermen of many years experience claimed that they had seldom seen such large numbers of Cuttlefish.

- (14) Snapper—*Pagrosomus major* (Schlegel). This species migrates to the harbour area on the eastern coast of Hong Kong for spawning in winter. Large quantities always appear in Tolo Harbour, N.T., and are caught by beach seines. Production during the year, however, was low, as only a small quantity appeared in Mirs Bay. Fishermen said that the large number of mechanised shrimp trawlers operating along the coast had interfered with Snapper fishing.
- (15) Shrimp—*Penaeopsis* spp. Catches of shrimp in summer and autumn were abundant in the area from Ladrone Island to Lema Island where a good fishing ground was discovered by mechanized shrimp trawlers. This area is situated outside the Pearl River estuary.
- (16) Silver Shrimp—*Acetes* spp. This species appears mostly in the shallow water near the Pearl River estuary where the sea bottom is sandy and is caught by the fishermen in Tai O and Cheung Chau with push nets and Chinese seines. The best fishing seasons are during the summer and winter. In January dense shoals of Silver Shrimp were discovered in the deep water area near Lema Island and were fished successfully by purse seiners. The total catch was estimated at over 2,000 piculs. The catch of push net fishermen in the shallow water area was poor as the Silver Shrimps were caught by mechanized purse seiners before they could come close inshore.

20. In *Mayala*, the outstanding feature of 1954 was the continuous bad weather which markedly affected total landings. The South-west monsoon in the earlier part of the year and the North-east monsoon in the latter part were both exceptionally severe, keeping craft in port, fishermen ashore and destroying fishing stakes, involving the industry not only in loss of income but also of capital equipment. That the total drop in landings was only of the order of 8.4% below the figure for 1953 is entirely due to the other significant feature, the development of mechanization. It can no longer be said that the fishing industry in Malaya is extremely backward. Mechanization started in about 1949 and during

1954 craft were built and engines installed in increasing numbers. The total number of craft licensed during the year was 21,839 and of

these 4,052 were powered boats. The change which has come about in the industry, in the past five years, can best be illustrated in tabular form.

Year	Landings (Tons)	Number of Fishermen	Number of Gear	Number of Powered Boats	Number of Non-powered Boats
1949	104,880	71,403	21,139	327	21,793
1954	109,934	49,532	18,654	4,052	17,787

While the change has been gradual, the comparison between the two end-years of the five-year period shows most markedly the effect of mechanization in bringing about a big reduction in the number of fishermen; a reduction in the amount of gear operated and a significant increase in the number of powered boats, although the total number of boats licensed is about the same.

The retail price of fish in the higher grades remained static on the average but the price of the lower grades dropped a little. Increasing quantities became available on the fresh fish market due to the offtake for making dried fish falling, but the latter market recovered during the later part of the year. Ice was in adequate supply, although it is hoped that the manufacturers will take steps to increase their production potential in the Southern part of Trengganu, as two factors are expected to influence the demand for ice in the future. Firstly, the new main road through Pahang, known as the Maran Road, will be opened shortly which will put the East Coast in close touch with Central Malaya and secondly the efforts of the Department to diversify the production economy of the fishermen, so that they will not be as dependent as hitherto on the bulk supplies of lower grade fish, for their livelihood.

While experimental trial loads of fish in insulated aluminium containers have been successfully placed on the markets of Central Pahang, the fish being purchased for M \$4 per picul and sold for M \$35 per picul after transportation in ice, it is clear that the retail price would be depressed if greater and regular quantities were available to the consumer, and the ensuing price differential might well not be adequate to make such distribution profitable. The higher grades are not in such prolific supply and are always in demand from the consumers of the higher income groups and it is felt that in supplying fresh fish to the New Villages and towns of Central Malaya, it will be possible to provide an economical pay-load of mixed high and low grade fish, so that the bulk

of low grade fish may reach these potential markets at a low price.

Considerable success has already been achieved in the operation of *bubus* (portable traps) from an improved type of craft with a small inboard diesel engine. These traps, set in holes and depressions in the sea-bed, among rocks and coral, catch the higher grade perch and snappers. When the season for this form of fishing is over, the same craft are used in trolling for Spanish Mackerel which is always in good demand.

The general relationships of the Department with the Rural and Industrial Development Authority have been most satisfactory. In general terms it may be said that in any project or scheme the Department provides the technical knowledge for the Rural and Industrial Development Authority which functions as a financing corporation. Above all, the officers of the Department of Fisheries endeavour to see these schemes and projects in their proper context in the rural communities concerned and do not regard them as isolated entities.

The Fisheries Division of the Department of Commerce and Industry is administered by a Fisheries Officer with a staff of twenty-six Fisheries Inspectors. Local production is actively encouraged by the introduction of improved techniques, new methods and materials and the application of scientific research to fisheries. The Government is also actively engaged in raising the standard of living of the local fishermen and in assisting them to meet the changing conditions within the industry.

The South China Sea and the fringes of the Indian Ocean at the northern entrance to the Malacca Straits were surveyed by the departmental vessel, *M.V. Dunvegan* and commercial fishing vessels operating on Government subsidy against losses. Rich and extensive longline grounds for Red Snapper and China Sea Bream were found and units of the Singapore longline fishing fleet were diverted to these rich grounds.

The utilization of swamps for the cultivation of fish and prawns is encouraged. Experiments designed to increase the yield of these brackish water ponds were initiated by the establishment of a small experimental brackish water fisheries station in the Colony. The Regional Fisheries Research Station is now in the process of construction at Changi. It is envisaged that the research work of this station will contribute towards the fuller development of the fishing industries of the British territories of South-East Asia.

The Fisheries Loans Fund and the Fishing Materials Purchase Account were utilised to assist fishermen to purchase fishing gear and vessels to modernise the industry. The mobile fisheries unit continued its operations in instructing the fishermen on the maintenance and repair of their boat engines. Many fishermen are now able to maintain their engines in good condition, thus increasing their fishing time at sea.

In Table I are shown the revised figures for total marine fish landings for the past five years, with their values. It will be noticed that landings are not increasing. While there are many reasons which may be adduced to account for this, such as emergency operations including coastal curfews, bad weather and the change-over to mechanization bringing with it inevitable minor snags in the early stages, a note of warning must be sounded. The Malayan fishing industry has operated for many decades in a narrow coastal sea-belt and with the increased demand for fish, intensity of operation has increased. While it is not possible to assert dogmatically that overfishing is occurring, there is a probability that the reduced fishing during World War II caused a resurgence of fish stocks, which enabled the industry to rehabilitate rapidly. This feature which is now coming to light indicates a real need for the refinement of statistical procedure which is in hand. It is an indication that fish must be sought further afield than at present and that provision must be made to ensure that an offshore fleet is trained and developed.

The exploratory work of the Headquarters vessel, *M.F.V. Dunvegan* which was commenced in 1953, was continued until September 1954. Her operations were extensive but nowhere were grounds found which justified more intensive operations. On the occasions when indications of good quality fish in any quantity occurred, the nature of the sea-bed and the restricted area which contained the fish precluded the possibility of development of that particular area.

From 1928 to 1931 the Government engaged the coal burning Castle-type Grimsby trawler, *S.T. Tongkol*. Nowhere, either on extensive or

intensive operations, could this vessel find economically exploitable trawling grounds for operation with an otter or Vigneron-Dahl trawl. In 1953-54 a small modern economical trawler, which could be operated more easily, had similarly disappointing results. It may now therefore be categorically stated that within reasonable steaming distance of Malaya, there are no bottom grounds capable of economical exploitation by the otter trawl or its modification, the Vigneron-Dahl trawl.

It is also improbable that the paired bull trawl or pareja trawl would pay. Four units of this gear came to Singapore from Hong Kong in 1951, by the end of 1954, with the fall in prices due to the cessation of the rubber boom, they all had either ceased to operate or left Singapore.

There are restricted areas in which bottom-living fish do occur and the latter part of the year's work of the *Dunvegan* was to plot these areas, off the Trengganu coast, by means of the echo-sounder. When such an area had been discovered from the trace on the echo-sounder, it was followed up by handlining or by setting portable traps known in Malaya as *bubus*.

It soon became apparent that the accurate determination of these areas, which are the natural habitat for certain types of sea perch, snapper and grouper, will be most profitable for the fishermen and that by using small motor boats to carry themselves and their fishing gear to these areas, a profitable catch to the fishermen and valuable food to the consumer may be assured.

The present work of the *Dunvegan* is the search for two types of Tuna off the North-west coast of Malaya, to establish the limits of their distribution, the best time for fishing for them and the most economical way of catching them.

General improvement in emergency conditions has brought about increased interest in fish culture throughout the Federation and this is particularly emphasised in Chinese New Villages. Among Malays interest has developed in Kedah, Perak and Pahang, while the well established interest in Negri Sembilan and Johore has continued.

A number of enquiries have been received from estates and mines on the possibility of fish culture as an additional source of protein food for the labour force. Where water supply and terrain are suitable, there is no reason why schemes of this nature should not go forward, especially with *Tilapia mossambica*.

21. In so far as the Island Colony of Singapore is concerned, the fishing grounds exploited by local fishermen extend from the inshore areas round Singapore to the offshore areas in the South China

Sea and the Indian Ocean. The main inshore fishing methods are fixed traps, lines, beach seines, push nets and drift nets. In the offshore areas pair trawls, longlines, troll lines and drift nets are used. In addition, many fishermen are engaged in the trapping of prawns and estuarine fish from swamps which have been converted into brackish-water ponds. Others are engaged in the culture of carp and other fish in fresh-water ponds.

The number of licensed fishermen employed in the industry dropped from 6,672 in 1953 to 6,023 in 1954 of whom about 70 per cent were Chinese and 30 per cent Malays and others. The number

of gears licensed was 2,139 and the number of boats was 3,231. Of the latter 21 per cent were powered vessels representing an aggregate of 2,722 tons whilst the remaining 79 per cent were non-powered. The mechanization of the industry is growing apace. Capital for this industry is provided either by the producer himself or through wholesale agents and dealers.

Fresh fish is landed at various points on the Island and auctioned at the two City Council Wholesale Markets or the three privately owned wholesale markets. Auctions are conducted by wholesale agents who receive a commission from the fisherman and pay a fee to the market owner.

AUCTION MARKET HANDLINGS OF FISH (tons)

	1952	1953	1954
Local production	4,271.9	4,537.4	4,260.3
Imports from Indonesia	2,031.4	1,935.9	1,741.0
Imports from Burma, Borneo, Thailand, Hong Kong and India	107.8	191.1	134.0
Imports from the Federation of Malaya	3,242.4	3,379.9	3,907.7
	<u>9,653.5</u>	<u>10,044.3</u>	<u>10,043.0</u>

It will be observed that local production has now reached a peak and is not expected to increase further because of the shortage of nearby fishing grounds. Imports from the Federation of Malaya are increasing in volume.

It is estimated that about 86 per cent of the fish is retailed in the city area and the remaining about 14 per cent in the rural area. The fish is sold fresh and little use is made of cold storage facilities. Small

amounts of certain types are boiled and sold during seasons of glut.

Singapore serves as the entrepot for salt fish as well as other marine produce. Imports of salt fish come mainly from Thailand, Cambodia, and Riouw. The dried fish are sorted, redried and then repacked in Singapore for despatch mainly to Indonesia. The large entrepot trade in salt fish is declining rapidly on account of the restrictive measures of certain importing countries.

IMPORTS AND EXPORTS OF SALT DRIED FISH

	1952		1953		1954	
	Tons	Value	Tons	Value	Tons	Value
Imports ..	49,566	S \$ 34,325,384	30,441	S \$ 19,669,755	12,163	S \$ 11,718,440
Exports ..	46,148	44,994,151	28,690	25,523,289	11,390	10,455,947

The trade in other marine products such as beche-de-mer, blachan, seaweed, fish maws, shark fins, green snail and trochus shell and canned fish, including canned salmon and canned sardine, amounted to 5,680 tons valued at S \$10,118,278 in imports and 3,303 tons valued at S \$6,187,127 in exports during the year.

No reports have been received on the status of the fisheries industries in Cambodia, the Australian territories of Papua and New Guinea, French territory of New Caledonia, Indonesia, Korea, the Philippines, Portuguese Goa, Macau and Timor, Viet Nam or China.

LIST OF DELEGATES AND OBSERVERS

<i>Member Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
Australia	Mr. D. J. Rochford (Delegate)	Principal Research Officer	Division of Fisheries, CSIRO Marine Biological Laboratory, Cronulla, N.S.W., Australia.
	Mr. H. Dunn (Adviser)	3rd Secretary	Australian Embassy, Tokyo, Japan.
Burma	U Ba Kyaw (Delegate)	Executive Officer	Division of Fisheries, Agricultural & Rural Development Corporation, Rangoon-Insein Road, Kamayut, Burma.
Cambodia	Mons. Chuop-Hell (Delegate)	Directeur	Service des Eaux, Chasse et Peches a Phnom Penh, Cambodia.
	Mons. Dom-Saveun (Alternate)	Chef	Cantonnement des Peches de Phnom Penh, Phnom Penh, Cambodia.
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France	Mons. J. Lemasson (Delegate)	Conservateur des Eaux et Forets	Ministere de la France d'Outre Mer, 27 rue Oudinot, Paris 7e, France.
France	Mons. R. Serene (Alternate)	Conseiller	Institut Oceanographique de Nha Trang, Station Maritime de Cauda, Nha Trang, Viet Nam.
India	Dr. N. K. Panikkar (Delegate)	Chief Research Officer	Central Marine Fisheries Research Station, Mandapam Camp, P.O. S.Rly, S. India.
Indonesia	Mr. G. M. C. Kasuma (Delegate)	Chief	General Division, Sea Fisheries Dept., (Pusat Djawatan Perikanan Laut), Djalan Kerapu 12, Djakarta, Indonesia.
	Mr. H. Saanin (Alternate)	Chief	Laboratory for Inland Fisheries, (Laboratorium Perikanan Darat), Tjikeumeuh 99, Bogor, Indonesia.
	Mr. M. Ahjar (Adviser)	Chief	Inland Fisheries Service, West-Java Province, (Djawatan Perikanan Darat, Propinsi Djawa Barat Djalan Wastu) Kentjana 17, Bandung, Java, Indonesia.
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<i>Member Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
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	Mr. K. Kawakami (Adviser)	Secretary	1st Section, Treaties Bureau, Ministry of Foreign Affairs, Tokyo, Japan.
Korea	Mr. Choi Kyu Hah (Delegate)	Consul General	Korean Mission, No. 1-5 Take-yacho, Azabu, Minato-ku, Tokyo, Japan.

<i>Member Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
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	Mr. J. D. Bromhall (Adviser)	Chief Scientific Officer	Fisheries Research Unit, University of Hong Kong, Hong Kong.
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	Mons. Cao Thien Buu (Alternate)	Chef	Service National des Peches Continentales, Direction des Eaux et Forets, Saigon, Viet Nam.

<i>Non-Member Governments and Observer Organizations</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
Portugal	Mr. A. S. Matias (Observer)	Charge d'Affaires	Portuguese Legation, Tokyo, Japan
New Zealand	Mr. C. A. H. Paul (Observer)	Commercial Attache	New Zealand Legation, Tokyo, Japan.
Iran	Mr. A. Namdar (Observer)	Commercial Attache	Iranian Embassy, Tokyo, Japan.
CIESMM	Mr. E. A. Dandilly (Observer)	Cultural Attache	French Embassy, Tokyo, Japan.
PSC	Dr. A. L. Tester (Observer)	Director	Pacific Oceanic Fishery Investi- gations, P.O. Box 3830, Hono- lulu, Hawaii.
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- 42 A Brief Review of Recent Studies of Faunal and Climatic Changes in North America, with Special Reference to Marine Animals, by J. C. Marr.
- 43 The Inland Fisheries Extension Services in Indonesia, by M. Ahjar.
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- IPFC/C55/INC 1 List of Delegates and Observers.
 2 List of Documents.
 3 List of Fisheries Films of Interest to the Indo-Pacific Countries in Addition to Those Furnished in the List Issued by FAO in 1953.
 4 General Information.
 5 Provisional Schedule of the Session.
 6 Order of the Day (Sept. 30th).
 7 Side Tour to Misaki Fishing Port.
 8 Opening Statements of Delegates and Observers.

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- P 2 Request by Mr. Boon Indrambarya, Chairman of the IPFC to H. E. The Minister of Agriculture & Forestry to open the Session.
- P 3 Opening Address by Honourable Mr. I. Kono, Minister of Agriculture and Forestry at the Sixth Session of the Indo-Pacific Fisheries Council, Tokyo, Japan, 30 September 1955.
- P 4 Message by the Honourable the Foreign Minister, Mr. M. Shigemitsu to the Sixth Session of the IPFC.