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SOUTH PACIFIC COMMISSION

SEVENTEENTH REGIONAL TECHNICAL MEETING ON FISHERIES  
(Noumea, New Caledonia, 5-9 August 1985)

REPORT

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I. OPENING ADDRESS

1. Mr Tamarii Pierre, the Acting Secretary-General, in the absence of the Secretary-General, formally opened the meeting with an address welcoming delegates and emphasising the importance of the technical advice provided by this meeting to the Committee of Representatives of Governments and Administrations, and the South Pacific Conference.

II. APPOINTMENT OF CHAIRMAN AND OTHER OFFICE BEARERS

2. Following the procedure adopted at the 1982 Regional Technical Meeting on Fisheries of rotating the chairmanship among countries in alphabetical sequence, Mr Richard Kaltongga from Vanuatu was appointed Chairman. Mr Clovis Logologofolau from Wallis and Futuna was appointed Vice-Chairman and Chairman of the Drafting Committee. Other members of the Drafting Committee comprised representatives from New Caledonia, New Zealand, Solomon Islands, and Papua New Guinea.

III. APPROVAL OF AGENDA AND TIMETABLE

3. The agenda was adopted as follows.

AGENDA

1. Opening address
2. Appointment of Chairman and other office bearers
3. Approval of agenda and timetable
4. Review of coastal fisheries work programme
5. Consideration of report on SPC/UNDP Regional Refrigeration Assessment and Training Project
6. Regional Fisheries Training Project
  - (i) Project outline and report of progress to date
  - (ii) Consideration of regional training needs and priorities and development of a core programme of training activities for 1986-87 period
7. Oceanic fisheries
  - (i) Progress on priority items of the Tuna and Billfish Assessment Programme
  - (ii) Status of Western Pacific yellowfin fishery
  - (iii) Continuation of the Tuna and Billfish Assessment Programme
8. Fish aggregation devices
  - (i) Further design improvements to FAD mooring systems with particular emphasis on shallow and moderate water depths
  - (ii) Biological and behavioural studies of fish aggregations associated with FADs
  - (iii) Proposal for research on optimal FAD deployment and management for commercial exploitation
9. Workshop: Management of deep bottom fish resources in the South Pacific
10. Discussion of recent developments in mariculture within the region
  - (i) Seaweed culture
  - (ii) Pearl and pearl shell culture
  - (iii) Giant clam, trochus and other molluscs
11. Other business
12. Adoption of the report

#### IV. REVIEW OF COASTAL FISHERIES WORK PROGRAMME

4. The Fisheries Adviser, Mr Bernard Smith, requested the three master fishermen to comment briefly on their country visits during the last twelve months. Master Fisherman Paul Mead reported on his work in Fiji that concentrated on teaching deep-bottom fishing and simple reef trolling techniques in Vanua Levu and developing vertical longlining techniques around FADs in Viti Levu.

5. Mr Mead reported good success in spearing squid around attraction lights at night and indicated its potential as bait for vertical longlining. Despite four cyclones, the last of which destroyed the FAD around which he was working, he was able to assist with trial shipments of tuna, wahoo and snapper to Hawaii and bigeye to Japan. In May, Mr Mead proceeded to Tonga to work on a training programme with local fishermen. In co-operation with an FAO marketing consultant, he was able to make another trial shipment of snapper to Hawaii. This visit was interrupted for Mr Mead to participate in the training of students in practical fishing in Fiji.

6. The representative of Fiji expressed his appreciation of Mr Mead's work, especially in Vanua Levu where seven fishermen are now engaged in deep-sea fishing when previously there was none. Other delegates commented on the usefulness of the training at the fisheries officer and the fisherman's level. Answering an inquiry from the Cook Islands delegate about the possibility of adding extra trainees to the practical fishing module of the SPC/Nelson Polytechnic Pacific Island Fisheries Officer Training Course, the Secretariat indicated that twelve was considered to be the optimum number.

7. Master Fisherman Pale Taumaia then reported on his visits to Christmas Island (Kiribati) and Marshall Islands. Both visits included the training of a demonstration team and of individual fishermen. In Christmas Island, where new fishing grounds were explored and where bait (milkfish) was readily available, he reported excellent fishing success. Mr Taumaia, who also spent three weeks in Fiji working with Mr Mead on vertical longline development, then commented that the vertical longline, fishing deeper, catches bigger tuna than traditional methods such as drop-stone fishing.

8. The representative of Kiribati expressed his appreciation of the Deep Sea Fisheries Development Project but suggested that more timely reports would optimise the follow-up action of his Division. Subsequently the meeting made the following recommendation:

Recommendation No. 1

Noting the importance of early follow-up action by the governments concerned, the meeting recommended that the backlog of reports on the Deep Sea Fisheries Development Project be cleared as a matter of priority. Draft reports from future country visits should be submitted to the host country as soon as is practicable after the master fisherman has left.

9. Several delegates inquired about ciguatoxicity in deep-bottom fishes such as Lutjanus bohar and of ways to detect it. The discussion was postponed until the Assistant Fisheries Officer, Mr Garry Preston, could make a presentation on the more recent developments in that area.

10. Master Fisherman Lindsay Chapman reported on his 10-month visit to Yap in Federated States of Micronesia where he was occupied in a survey of the deep-water resource and in the construction and deployment of FADs. He commented on the changes in species composition and fish sizes over the months following FAD deployment, and described his visit to Hawaii to study the palu-ahi technique. Mr Chapman also described the work he has been doing in conjunction with the Fisheries Department, since his arrival at New Caledonia in July 1985, primarily in experimental techniques around a FAD situated north of Noumea and in deep-bottom fishing in the southern part of the territory.

11. The representative of New Caledonia thanked the South Pacific Commission and Mr Chapman for their work in New Caledonia and commented on the excellent relations experienced between Mr Chapman and the staff of the Fisheries Department and emphasised the value of the experience to both sides.

12. The representative of Federated States of Micronesia indicated his appreciation of Mr Chapman's efforts and also those of the two other master fishermen who had previously worked in FSM.

13. In the discussion that followed his report Mr Chapman indicated that the type of fishing gear used will change with fish species and size. In reply to a question from the representative of Tonga asking what makes a fisherman more readily accept a new method, a general discussion followed with input from Mr Chapman and the representative of Western Samoa. The conclusion was that although it takes a long time, consistent good catches increase enthusiasm and this is more important than anything else.

14. In answer to previous points raised on ciguatera poisoning, Mr Garry Preston, Assistant Fisheries Officer, highlighted the information about this contained in a paper written by Doctor Hokama of the University of Hawaii as presented during a PEACESAT seminar. The basic point of this paper was that ciguatera poisoning of any fish may be diagnosed by means of an immunoassay or "poke stick" method which would appear to be reliable and could be used in the field. Mr Preston indicated that the information contained in the document was available to any representative who was interested. The representative of Tonga pointed out that in his view ciguatoxin is stored in individual bodies so that anyone who has a history of eating affected fish will be more prone to be affected. The representative of Western Samoa noted that in his country a traditional method of detecting ciguatoxicity was to place a silver coin in the gills of a suspect fish, green discolouration of the coin indicating that the fish would be poisonous.

15. After the Chairman asked for comments on the Deep Sea Fisheries Development Project, extensive discussion developed concerning the appropriate balance between training fishermen and fisheries personnel and on the division between gear development and training. The means of assessing the effectiveness of the programme was also discussed and it was pointed out this could be done, as in 1981, by the recruitment of a consultant or by individual evaluation by member countries. The Secretariat invited member countries to submit their own evaluations of the programme before any formal evaluation was contemplated. Several contrary points of view were expressed, and in conclusion the Chairman suggested the interested parties get together with the drafting committee to produce definite recommendations to the meeting as to apportioning the master fishermen's time and length of each country visit.

16. The following recommendation was made.

Recommendation No. 2

The meeting noted the importance and potential value to the region of the gear development work carried out by the Deep Sea Fisheries Development Project, and recommended that the project be restructured in the following manner to place increased emphasis on this activity and to enhance its effectiveness.

- (i) One of the master fishermen to be assigned full-time to the development of new and innovative fishing gears and fishing methods suitable for use in the Pacific Islands.
- (ii) This assignment should be for an initial period of two years and located at a suitable site within the region. Every effort should be made by the host government and the South Pacific Commission to ensure that the programme has every support.
- (iii) Where gear development activities are undertaken during individual country projects, longer term arrangements would be desirable.



17. A 16-minute video was presented to illustrate vertical longline techniques and this will be available to the SPC member countries, at cost, on request.

18. Following this presentation, Mr Mead answered questions on the method covering the following points: the number of boats able to fish a FAD simultaneously, the optimum snood length, methods for deciding sinker weight, the advisability of tying to FADs, the preferred bait, the possibility of injury to the fisherman, and the approximate cost of gear. Dr Kim Holland cited the Hawaiian situation where up to forty boats, each fishing a one-hook vertical line, are able to fish the FAD simultaneously without conflict by means of a "gentleman's agreement".

19. Following a question by the representative of Fiji regarding the strengths and weaknesses of the different trolling techniques, Mr Lindsay Chapman indicated it has much to do with personal approach, one method permitting the catching of small fish quickly and the other the catching of fewer but larger fish.

20. In concluding agenda item 4, the Fisheries Adviser reviewed the recommendations of the 1984 meeting and the corresponding action taken. With regard to Recommendation No. 6 the French Delegation gave a brief status report on the SPOT satellite imagery project. A more detailed report with slides will be presented during agenda item 10 (iii). Recommendations 7, 8 and 9 are addressed in working paper 3.

21. With regard to Recommendation No. 10, the representative of Vanuatu indicated that the coconut crab project was now underway.

V. CONSIDERATION OF REPORT ON SPC/UNDP REGIONAL REFRIGERATION  
ASSESSMENT AND TRAINING PROJECT

22. The Fisheries Adviser briefly reviewed the background of this project, and the Assistant Fisheries Officer and the United Nations Refrigeration Specialist, Mr Michael Vincent, explained the salient points of the survey that had been conducted in the various member countries and which were set forth in working paper 2. Accompanying slides were shown to highlight the presentation.

23. The Fisheries Adviser then asked UN Refrigeration Engineer Mr Michael Vincent to comment on the SPC/UNDP Regional Refrigeration Course held earlier in the year in Rarotonga, Cook Islands. In doing so Mr Vincent stressed the very practical nature of the course, which involved field service calls as well as laboratory and classroom work. Mr Vincent commented on the high calibre and performance of most students, which he attributed to their engineering backgrounds and the fact that most were mature-age family men, who in general have proved to be more diligent students than younger individuals. He also noted the beneficial training effect of working with a "captive audience" where the trainees are isolated from the distractions of their normal home environment. In closing, Mr Vincent expressed his thanks to the Government of Cook Islands for its excellent support throughout the course.

24. The representative of Western Samoa inquired as to the qualifications needed to ensure that participants succeeded in a course of this nature and became competent refrigeration mechanics. In replying, Mr Vincent noted the advanced level of the course and emphasised that students needed a firm grounding in engineering or electrical subjects before undertaking this type of training. Students without such a background could not be expected to become fully competent refrigeration technicians in such a short course, but more basic training could be developed depending on the qualifications of the students. A flexible course length approach was considered desirable in any follow-up training activity as this could accommodate the needs of trainees with less experienced backgrounds.

25. The representative of Tonga asked whether there were disadvantages to using seawater ice machines as these were being contemplated for installation in his country. Mr Preston and Mr Vincent jointly responded that reliable seawater ice machines are commercially available and there are no serious technical difficulties in the production or use of seawater ice, although corrosion problems may occur.

26. The representative of Tonga also queried whether waste heat from air-cooled condensers could be usefully used, for example in drying fish. Mr Vincent advised the meeting that this could be technically feasible without the need to modify condensers.

27. The representative of Kiribati expressed interest in the possibility of utilising solar-powered refrigeration in his country, and suggested that more effort might usefully be channelled into developing equipment of this type by countries of the region. In replying, Mr Preston noted that a major sub-regional programme on renewable energy is currently being finalised with the Commission of the European Communities for implementation under the auspices of the South Pacific Commission in French Polynesia, New Caledonia, and Wallis and Futuna. He noted that the experience of this project may be useful in assessing the development and suitability of solar-powered refrigeration equipment in the region. The representative of French Polynesia briefly described his territory's policy in encouraging the use of solar and other forms of renewable energy. He also noted the technical difficulties associated with the development of solar refrigeration equipment, particularly for larger-scale equipment which requires high energy inputs.

28. The representative of Kiribati also referred to the possibility of repeating the SPC/UNDP Regional Refrigeration Course or a similar training programme, and in doing so suggested that a new venue might be selected to allow another country to host the course in the future. The Fisheries Adviser responded by thanking the United Nations Development Programme, the Australian Development Assistance Bureau, and the Australian Maritime College for their contributions to this year's course, and advised the meeting that future courses of a similar nature could be considered if demand so justified. The representative of Western Samoa then commented on the difficulties of relocating the heavy plant and equipment installed for the first course and suggested that Rarotonga, Cook Islands be retained as the venue for the next course.

29. The Director of the FAO/UNDP South Pacific Fisheries Development Programme, Mr Keith Meecham, requested information from delegations as to the current employment situation of participants in the SPC/UNDP Regional Refrigeration Course. In describing the current status of his country's trainee, the representative of Papua New Guinea noted his country's need for further training opportunities of this type. The representative of Solomon Islands then described the positions of his country's two trainees, and in doing so indicated that he would like to see the course continued. He also noted that for his country, more emphasis on diesel-driven units would be useful if this could be incorporated into the training. The representative of Tonga described the progress of his country's participant since returning from the course, and also noted that follow-up visits to individual countries by refrigeration instructors would be useful in some cases. This last point was endorsed by the representative of Niue.

30. The representative of New Caledonia observed that the trainees following the course would be required to become technical advisers in their countries and that it was important therefore to stress the economic factors that must be borne in mind in selecting freezing equipment. Mr Preston agreed with this comment but pointed out that the course was designed for technicians rather than for economists. At the request of the Chairman, Mr Preston briefly summarised the main points of section 7 of working paper 2, where other refrigeration planning considerations are referred to.

31. Representing Vanuatu, the Chairman briefly described the results of storage trials on iced and frozen deep-water snappers carried out in Vanuatu and the United Kingdom, and offered to make the report of this work available to delegates when it is completed. The representative of United Kingdom and Dr Rene Grandperrin outlined further details of the study, which was carried out as a collaborative project between the United Kingdom's Tropical Development and Research Institute (TDRI) and the Vanuatu Fisheries Department. Dr Grandperrin gave details of storage trials on deep-water snapper species carried out in Vanuatu.

32. The Chairman then requested further expressions of support for a repetition of the SPC/UNDP Regional Refrigeration Course. The representative of Fiji expressed his country's satisfaction with the earlier course, and its support for a second training programme of this type. The representatives of Western Samoa, Vanuatu, and Cook Islands also endorsed the idea of a repeat course. The representative of Vanuatu further supported Tonga's earlier suggestion of follow-up visits to individual countries by the instructors. Discussion of the proposal for a second course(s) was deferred for further consideration under agenda item 6.

## VI. REGIONAL FISHERIES TRAINING PROJECT

### (i) Project outline and report of progress to date

33. The Fisheries Adviser described the discussions during the 1984 Technical Meeting which led to the appointment of the Fisheries Training Officer. He requested the meeting to give guidance to the Secretariat in deciding on possible future directions and emphasised that the project was not in conflict with existing courses, but was mainly intended to meet the need for short vocational courses. The Fisheries Adviser reviewed working paper 9 and also ongoing programmes.

34. During the review of working paper 9, the Fisheries Adviser suggested that section III "Analysis of questionnaire on fisheries training" may give the meeting an insight into each country's priorities regarding training needs. He commented that the syllabus for the Nelson course was well established apart from the recent inclusion of a practical fishing module and possibly required no change.

35. Mr Alastair Robertson was asked to provide some comment on the Nelson course, which he did briefly reviewing the past and present courses with regard to student selection and course content.

36. The representative of Tonga indicated his country's willingness to host the practical fishing module in 1986 should it be the intention to move the course. The Fisheries Adviser, after thanking Fiji for its excellent support in the last two courses, indicated he would be pleased to accept the offer if it was the wish of the meeting. A general discussion with input from many representatives ensued, all supporting the idea of moving the course to Tonga in 1986 and thereafter rotating the course to other venues which will be decided at future technical meetings. It was pointed out by the Fisheries Adviser that logistical problems could rule out the possibility of some countries hosting the course.

37. The representative of Western Samoa questioned the difference, if any, between the training of the practical fishing course and that of the master fishermen. Mr Robertson indicated that the Nelson course followed a more formal and basic introduction to fishing methods, while that of the master fishermen was intended to give specialised training to already experienced fishermen and as such there was little overlap.

(ii) Consideration of regional training needs and priorities and development of a core programme of training activities for 1986-87 period

38. The Fisheries Adviser again referred to working paper 9 as a means of the meeting addressing the regional training needs. He indicated that a face-to-face survey might be needed for the Secretariat to discover each country's individual training needs, but some indication had been given by the results of the questionnaire survey and the priority list developed from this. He indicated that the needs for refrigeration training had been partially met and that on the appointment of a specialist, the subject of fish handling will also be addressed. He, however, indicated that previous meetings had put forward the need for a regional course to train selected people at instructor level, and this had been followed up with FAO.

39. Mr Keith Meecham of FAO, asked to comment on the recommendation of the 1984 Technical Meeting with regard to holding a workshop on boat design and construction, stated that the UNDP regards it as valuable and that funds could be made available.

40. A general discussion on individual country's training needs followed, with comment from representatives as follows: the representative of New Zealand asked if there was a need for training administrators and managers, with the representative of Tonga indicating such courses did exist in the region, and the representative of United Kingdom saying such courses were also operating in his country. Several countries indicated the need for training in aquaculture. Dr John Munro of ICLARM informed the meeting of the proposed development of an aquaculture centre in Solomon Islands with eventual training input. The representatives of Tonga, Solomon Islands, Fiji, and Papua New Guinea indicated their training priorities to the meeting. In answer to a question by the representative of Niue, the representative of Vanuatu said there would not be a training element in the coconut crab programme which was a bilateral programme between Vanuatu and ACIAR. The representative of Western Samoa asked if training outside the region really met the region's needs and suggested if training can be done in the Pacific that that should be the first priority.

41. During the lunch break, two video films were shown illustrating the training given to students attending the SPC/Nelson Polytechnic Pacific Island Fisheries Officers Training Course and the Practical Fishing Module.

42. In reply to a request from the representative of Tonga, the Fisheries Adviser listed the terms of reference of the Fisheries Training Officer and indicated that the duty statement for the Training Officer post could be made available if required.

43. Captain Alf Carver of the Australian Maritime College described the courses offered by the college and emphasised the college's willingness to help with training courses in the Pacific. In answer to a question from the representative of Marshall Islands, Captain Carver indicated there was a possibility that students attending courses at the college could work on fishing boats during vacations.

44. The Fisheries Adviser replied to Captain Carver's address by stating his appreciation of the facilities offered and the intention of the Secretariat to take advantage of his kind offer.

45. On being asked by the Chairman, Mr Meecham reviewed the alternatives in funding and running future refrigeration courses. During the discussions that followed many representatives expressed their support of the idea for two consecutive courses. The representative of Marshall Islands then recommended the continuation of the refrigeration course at Rarotonga, Cook Islands. This was seconded by the representative of Papua New Guinea. The following recommendation was then adopted.

Recommendation No. 3

The meeting noted the value of the SPC/UNDP Regional Refrigeration Training Course and recommended that this should be followed up with:

- (i) A survey to assess and assist the work of former trainees and help select future candidates;
- (ii) two further training courses with flexibility to cater for the needs and capabilities of the trainees;
- (iii) provision of basic tools to successful trainees of all three courses to allow continuation of their work on their return.

46. In response to the Chairman's request for comments on a boat-building workshop, a complex discussion took place following which the Secretariat was requested to submit a specific proposal to canvas individual countries and FAO on the possibility of organising such a workshop at a convenient time, bearing in mind that the Asian Development Bank was developing a meeting on sail power for artisanal fishing craft.

47. In conclusion to agenda item 6, the Fisheries Adviser summarised the meeting's deliberations on the training programme.

48. The following recommendation was made.

Recommendation No. 4

Reiterating the importance of the work to be undertaken under the Regional Fisheries Training Project, the meeting recommended that the Secretariat undertake the following activities under this project.

- (i) Review existing training arrangements and disseminate this information to member countries.
- (ii) Assess the training needs of individual member countries through consultative visits and develop action programmes to address these needs.
- (iii) Continue existing or planned activities.
- (iv) Develop regional training programmes in priority areas identified by the Seventeenth Regional Technical Meeting on Fisheries as listed below.
  - (a) Marine engineering
  - (b) Outboard engineering
  - (c) Refrigeration engineering
  - (d) Business management
  - (e) Fish handling and processing
  - (f) Communication skills
  - (g) Fish marketing
  - (h) Aquaculture training
  - (i) Navigation and chartwork
  - (j) Fishing operations
  - (k) Fishing gear design and development
  - (l) Fish quality control.



## VII. OCEANIC FISHERIES

### (i) Progress on priority items of the Tuna and Billfish Assessment Programme

49. The Programme Co-ordinator, Dr John Sibert, reviewed the progress on the priorities of the Programme as documented in working paper 3. He then proceeded to summarise new developments in the work conducted under each priority item. This included the first use of the data base for stock assessment purposes in spite of continuing problems with gaps in coverage both in high seas and time. He also reported on theoretical work conducted to address the fisheries interaction question and mentioned that the practical research was the object of a separate proposal. The evidence at hand prompted the Programme Co-ordinator to indicate that the amount of blue marlins caught by purse seine was small in comparison to those caught by longline and that there was no indication that purse seining activity had caused the observed decrease in longline catch per unit effort. Other activities included answering specific requests from member countries on projects such as onboard fisheries observers or statistical training. Finally, the Programme Co-ordinator noted the reassessment of the computer needs of the Programme which has been completed by an independent consultant.

50. The proposed new priority items for the Programme were then presented from working paper 4.

51. Commenting on the projection of a film on a computer simulation of the movement of tagged skipjack, the Programme Co-ordinator reported that there appeared to be no directed movement and that tagged fish tend to disperse from the areas of release. The representative of France felt that this statement needed to be qualified and suggested that if environmental data had been superimposed, localised directed movement could have been evident. The Programme Co-ordinator agreed but cautioned that analysis of fish movements from tag recapture data may be biased by distribution of fishing effort.

52. A lengthy discussion about the inclusion of revised priority items numbers 7 and 8, which do not specifically address concerns of the Tuna and Billfish Assessment Programme, followed. The representative of Western Samoa questioned whether the TBAP and SPC was the appropriate body to address the work outlined in these additional items. The representative of New Zealand expressed concern that the flexibility required to meet particular needs of individual countries would adversely affect other priority items.

53. The representative of Tonga, after acknowledging the valuable assistance provided by the Programme to his country in the last twelve months, stressed the relevance of the proposed priority items 7 and 8 to the needs of Tonga. He also expressed his satisfaction at seeing a change in the Programme's priorities to accommodate the needs of small countries.

54. The representatives of Fiji, Tokelau, and Tuvalu also expressed their appreciation of the Programme's recent involvement in their respective countries and supported the adoption of the revised list of priorities.

55. The representative of the United States of America indicated his government's approval of the revision, provided that other priorities did not suffer. The representative of France concurred, explaining that a ten per cent flexibility margin is usually acceptable for a research organisation to conduct ancillary activities.

56. The Programme Co-ordinator clarified the involvement of the Programme with artisanal statistics by stressing that it would be limited to assisting the countries with the development of their own collection systems and that it could be done with existing staff. The representative of Tonga informed the meeting of the proposed survey of fisheries research needs in the region to be conducted under the auspices of the FFA. The representative of New Zealand, recognising the importance of the issue and taking into account the proposed survey and the ongoing SPC consultancy for the collection of artisanal fisheries data in Tuvalu, suggested that the Secretariat determine for the next technical meeting under which framework this assistance could be best provided.

57. The representative of Kiribati was concerned that the immediate need for information on the resource was not addressed properly in the list of priorities. The representative of Federated States of Micronesia suggested that with priority item 8, his officers would be better able to use the results of the Programme. Overall, the meeting concensus was to adopt the revised list of priority items as listed in working paper 4, although the representative of Western Samoa expressed some reservations.

(ii) Status of Western Pacific yellowfin fishery

58. The Programme Co-ordinator then presented results of analysis on yellowfin stocks and interaction between longline and purse seine fisheries included in working paper 5. Although the analysis was limited to Japanese data in economic zones, it constituted the first formal use of the data base to address fisheries problems. The results show that under present conditions, catch per unit of effort of purse seiners has not been affected by the tenfold increase in effort and that the observed variations from month to month do not reflect changes in overall abundance. Longline catch rates in 1984-85 are lower than those in 1979-81. Decreases in longline catch rates are not related to the spatial distribution of the purse seining catches. However, the data are insufficient to determine whether the increased purse seine catches have contributed to the overall decline in longline catch rates. In addition, the meeting was reminded that this analysis was limited to Japanese data in a well-defined area and that it was not known if it was representative of the overall situation.

59. Answering queries from several delegates, the Programme Co-ordinator concluded that within the limitations of the present analysis, owing to the nature of the data and providing that catch per unit of effort is representative of overall abundance, it appears that surface fishing effort could be increased without reducing catch rates.

60. A discussion on data holdings and confidentiality ensued. The Programme Co-ordinator outlined the confidentiality policy and pointed out that no data could be released to a third party without agreement from the country or organisation which supplied the data. The meeting expressed concern about the implications of incomplete data on the relevance of the work of the Programme and the following recommendation was made.

Recommendation No. 5

In consideration of the difficulties caused by incomplete data holdings, the meeting recommended that the Secretariat renew appeals to all nations whose vessels operate in the region to co-operate with the countries of the region by providing complete data sets for catch and effort for tuna and billfish taken within the South Pacific Commission region, and if possible in relevant international waters adjacent to the region, assuring them that full confidentiality will be maintained. This should be treated as a matter of urgency.

(iii) Continuation of the Tuna and Billfish Assessment Programme

61. The Chairman reminded the meeting that under a directive from the Committee of Representatives of Governments and Administrations (CRGA), two consultants had investigated possible avenues to increase the participation of distant-water fishing nations (DWFNS) in providing data and contributing funds to the Programme. One of the consultants, Mr Terry Curtin, then proceeded to highlight the report to be made to CRGA. The terms of reference of the review assumed that there was a problem obtaining adequate data from DWFNS and sufficient funding for the programme, and that an increased involvement of DWFNS would solve these problems. The consultants sought direction from countries and organisations that had not previously expressed their views. Their conclusion was that, recognising the strong endorsement of the Programme throughout the region, the short time available to implement institutional changes and trying to minimise the disruption of the Programme's activities, the most desirable solution was to have the Tuna and Billfish Assessment Programme remain within the South Pacific Commission as an extra-budgetary programme. In addition, they recommended a determination of a specific duration of the programme to ensure the technical integrity of the work, the recognition of an overseeing role for FFA, and the use of the Expert Committee to expand the involvement of the distant-water fishing nations if that was considered necessary.

62. Following the presentation, the representative of France expressed his disappointment that no French-speaking countries or research organisations had been contacted by the consultants and asked for the opportunity to meet the consultants before the finalisation of the report. The Secretariat saw merit in the idea of other delegates also meeting the consultants and noted that all countries and territories had been consulted on the issue of alternative institutional arrangements for the Tuna and Billfish Assessment Programme.

63. The representative of New Zealand expressed his support for a regionally based tuna and billfish resource assessment programme, and as such supported the objectives as presented in working paper 4. He noted that this support was without prejudice to current discussions on institutional arrangements. This view was supported by the representatives of France and the United States of America.

64. The representative of Tonga expressed concern over the employment policy which might be disruptive to the staffing of the Programme. The Secretariat indicated that a comprehensive review of the policies was anticipated for 1986 and that such concern could be addressed then. The representative of Kiribati supported the continuation of the Programme but expressed reservations about the relative benefits to his country.

65. There was a general discussion on the continuation of the Programme and its importance was generally recognised. The meeting expressed strong support for the continuation of the Tuna and Billfish Assessment Programme and recognised the necessity of a longer time frame.

#### VIII. FISH AGGREGATION DEVICES

(i) Further design improvements to FAD mooring systems with particular emphasis on shallow and moderate water depths

66. The Chairman then gave the floor to consultant Lt Richard Boy, who opened the session by briefly recapitulating the main points of the SPC design study of FADs carried out two years ago. Lt Boy then invited SPC Master Fisherman Lindsay Chapman to describe his involvement in a recent FAD programme in Yap, Federated States of Micronesia.

67. In so doing, Mr Chapman outlined the recent construction and deployment of a series of FADs, which mainly followed SPC recommendations, in Yap state. Mr Chapman showed slides to highlight the presentation, and noted that although the first two FADs had been lost, probably owing to abrasion of the mooring rope on rough bottoms, the remainder were still in place.

68. The representative of Marshall Islands noted his intention to deploy a series of subsurface FADs in a trolling alley, and suggested that subsurface deployment may be a means of avoiding the effects of wave action, which causes working, and consequent wear, of mooring components. Lt Boy agreed, and commented that the FAD buoys should be submerged below the low-tide water level by at least half the wavelength of the largest waves expected, to avoid excess wave action.

69. Lt Boy then detailed the main points of working paper 8, which describes modifications used when deploying FADs in relatively shallow water. Lt Boy referred particularly to the use of subsurface floats to provide underwater buoyancy for semi-taut moorings in situations where depths are not adequate to allow for use of the inverse-catenary design.

70. The representative of American Samoa then described his country's success in its FAD programme and commented on the usefulness of this programme to its local game and commercial fishermen. The representative of Marshall Islands remarked that equal success was enjoyed by game fishermen in his country, where there were no FADs, and suggested that perhaps the beneficial effects of FADs were being overemphasised in some situations. The Fisheries Adviser responded by noting that in French Polynesia, detailed statistics showed that FADs had enabled fishermen to approximately double their catches while halving their fuel consumption. The representative of French Polynesia added that a further benefit accrued to his country's fishermen because catches from around FADs contained a higher proportion of yellowfin, which is more valuable.

71. Some discussion followed on the cost of FADs and FAD components. The representative of Australia outlined a FAD programme in Western Australia and offered to make information on material costs available to interested delegates. The representative of Marshall Islands, and subsequently the representative of Cook Islands, both queried the costs of FAD materials used in the Yap FAD programme outlined by Mr Chapman, as these appeared fairly high. In commenting on this, Lt Boy noted that Yap probably obtained its supplies directly from the United States, where higher purchase and shipping costs were likely to be encountered. The Chairman noted that in many situations cheaply available local materials could be incorporated into FADs and these were no less effective than costly imported components.

72. Several representatives, including those from Cook Islands, Fiji, and Western Samoa, then provided details on their own FAD programmes. Responding to a request from the representative of Papua New Guinea for information from other countries which could assist its FAD programme, the representative of American Samoa offered to provide data on design and component materials developed for the American Samoa FAD project.

73. The discussion turned to FAD losses, and the Fisheries Adviser noted the confirmed occurrence of several cases of fish bite in the region. Given the depth distribution of fish-bite incidents, the main culprits are probably sharks. The meeting then discussed ways to avoid the problem, including the use of special rope coating to discourage shark attack, with a dark colour, polyurethane coating preferred.

74. In concluding the discussions on this sub-item, the Chairman suggested that delegates with further technical points to discuss get together outside the meeting, and asked the Fisheries Adviser to sum up. Mr Smith referred to several key considerations for FAD programmes, including the need to supervise FAD assembly carefully, the importance of accurate echo soundings to good deployment, and the benefits of keeping detailed records on all aspects of FAD construction and use.

(ii) Biological and behavioural studies of fish aggregations associated with FADs

75. The Chairman then introduced consultant Dr Kim Holland, who made a slide presentation illustrating his research work on tuna tracking. Dr Holland first described the equipment and methodology used in attaching sonic tags to live tuna, then went on to describe the activities of tagged fish and outline the preliminary conclusions of his study. The yellowfin and bigeye tuna studied had shown consistent and predictable travelling behaviour and appeared to be able to navigate towards known locations. Deep swimming fish, particularly bigeye, show repeated vertical migrations which Dr Holland felt were a mechanism of achieving a desired body temperature. Marked differences in behaviour occurred between day and night, with fish generally swimming closer to the surface at night. Finally, while in association with FADs, tuna seem to spend most of their time on the up-current side, and often stay very close to the FAD mooring line.

76. Dr Holland continued with his address which covered the feeding behaviour of yellowfin tuna, concentrating on that behaviour associated with their sense of smell and on the possibilities of developing "enhancers" to the baits currently being used in various Hawaiian tuna fisheries. After this presentation Dr Holland answered questions from the meeting. The representative of Western Samoa then outlined his country's experience in fishing around FADs in relation to the scientific findings presented by Dr Holland.

(iii) Proposal for research on optimal FAD deployment and management for commercial exploitation

77. The Tuna Programme Co-ordinator reviewed agenda item 8 (iii) as contained in working paper 7. Representatives were asked for comment and direction. All countries were in favour of this project with many offering their country as a venue. Some reservations were raised as to the criteria in choosing a venue and in the inter-area applicability of the results. The representative of Western Samoa noted that this programme would be of more immediate benefit to countries with commercial fisheries in place than to countries as yet without commercial fisheries. The meeting then made the following recommendation:

Recommendation No. 6

Accepting the vital need for further scientific study of the dynamics of fish populations associated with fish aggregation devices (FADs), the meeting recommended that the Secretariat proceed with the development of a proposal to study the dynamics of tuna aggregations at FADs.

IX. WORKSHOP: MANAGEMENT OF DEEP BOTTOM FISH RESOURCES  
IN THE SOUTH PACIFIC

78. The Fisheries Adviser, in his opening statement to the workshop, referred to the marked increase in deep bottom fishing that had occurred in the area over the past ten years, and which was explained partially by the high commercial value of the species found there. He added that several studies of the biology and behaviour of those species had been completed, the findings of which were available.

79. After being introduced by the Fisheries Adviser, Dr Stephen Ralston read out the agenda for the workshop (Annex I), and spoke of the Workshop on the Biology and Management of Tropical Snapper and Grouper that had been held in March 1985 in Hawaii.

80. Dr Ralston gave a brief description of various papers that had been read at the symposium, dealing with the taxonomy of the Lutjanidae and Serranidae groups, and recent studies of juveniles of the species that were being exploited and also the studies of their reproduction.

81. The representative of Tonga proposed that all statements in the ensuing discussion should be related to resource management rather than to the purely scientific aspects of the subject.

82. Replying to the Fiji representative, Dr Ralston stated that groupers were known for their propensity to assemble in large numbers at certain periods of time, usually for reproduction purposes. He stressed the danger of over-exploiting such groups during the spawning period.

83. In response to a question from the representative of Kiribati about artificial reefs, Dr Ralston observed that there were other factors limiting the stock as well as those relating to lack of space.

84. Several questions were addressed to Dr Ralston concerning growth of deep bottom species and their vulnerability. He said that studies for purposes of resource assessment that had been carried out in the Northern Mariana Islands and in Hawaii indicated that such stocks were very vulnerable to over-exploitation.

85. Dr Ralston then spoke about determining rates of growth and mortality in respect of certain tropical demersal species. He stressed the importance of taking into account such coefficients in making any assessment of exploitable stocks, and described the findings of a study carried out in Hawaii on the growth of certain fish species.

86. Mr Geoff McPherson outlined the findings of a study on whole otoliths that had been carried out on the Australian Great Barrier Reef, and which were set forth in working paper 23. He recommended that in any such study, due attention should be paid to the sex of the individuals sampled.



87. Dr Ralston referred to the various techniques that could be used to estimate the natural mortality rate of certain tropical species, and dealt briefly with the question of the feeding habits of such fish. He added that further research was needed to assess the impact of intensive exploitation of a given deep bottom species on the whole food chain to which it belongs.

88. Dr Grandperrin introduced the findings of the study he had carried out in conjunction with the Vanuatu Fisheries Department as described in working paper 12. He thanked the many people who had contributed to the survey and who were attending the present meeting. As a conclusion to his presentation, Dr Grandperrin emphasised three points, thus:

- species diversity decreases with depth;
- the average size of fish caught increases with depth, as does the size of sexual maturity;
- the rate of growth of very deep species (depths greater than 200 m) is slower than that of shallower species (100 to 200 m).

The three points outlined demonstrated the vulnerability of demersal species to sustained exploitation and proved the need for resource management studies.

89. Discussion then took place on a number of subjects, including the concept of "maximum sustainable yield" (MSY), and stressed the importance and limitations of this fundamental concept in stock management.

90. Dr Ralston briefly reviewed the development of the deep bottom fishery in Hawaii and proceeded to describe the development of a stock production analysis based on monthly reports from fishermen around the main islands of Hawaii. The analysis was based on data from four areas obtained between 1959 and 1978. He noted that the fishery was dominated by Lutjanids and that habitat was estimated on the basis of the length of the 100-fathom isobath. The analysis was based on a total biomass approach which included about thirteen species. Applying a Schafer type of model to the data, Dr Ralston produced estimates of several population parameters including maximum sustainable yield, optimum effort and catchability coefficients. The analysis suggested a maximum sustainable catch of 272 kg per nautical mile of the 100-fathom isobath in the Maui, Lanai, Kahoolawe, and Molokai (MLKM) area. Dr Ralston pointed out that the recreational catch was not taken into account in this analysis and that the figures presented were conservative, being lower bound estimates.

91. Dr Ralston then outlined a yield per recruit analysis for Pristipomoides filamentosus, an important deep handline species in Hawaii. This fish is fairly slow growing, and estimates of mortality rates based on length frequency sampling decreased with distance from Honolulu. Natural mortality rate was estimated at 0.25.

92. Dr Ralston noted that the introduced species Lutjanus kasmira flourished in Hawaii and was now considered a nuisance. The representative of American Samoa indicated that the reverse was true in American Samoa where this species, known locally as savane, was highly prized and stocks were now depleted. He sought advice from Dr Ralston as to the desirability of re-introducing this species to augment the resource. Dr Ralston replied that introductions were probably not warranted at this stage.

93. Dr Ralston then described the survey carried out on deep bottom fish in the Northern Mariana Islands which began in 1982. Catch rates were estimated through a systematic fishing programme, and biomass was estimated by applying a catchability coefficient measured during an intensive fishing experiment in one area. After noting differences in yield estimates for different island types, Dr Ralston pointed out the similarity between the estimate of 222 kg/nautical mile of 100-fathom isobath for the Mariana Islands and the figure of 272 kg/nautical mile of 100-fathom isobath quoted for Hawaii.

94. An ecosystem model of the French Frigate Shoal system produced an estimate of 250 kg/nautical mile of 100-fathom isobath for deep bottom fishes.

95. Dr Ralston pointed out that these figures might be a useful guide for planning development in other areas provided that they were used with care.

96. A brief discussion on the possible effects of the number of lines fished from the survey vessel on catch rates concluded that little competition was likely to have taken place between the lines.

97. Dr Ralston then described the results of a study at Johnston Atoll, which attempted to compare abundance as estimated from a submersible to that estimated by fishing. Fifty-two species were observed from the submersible compared to ten which were caught during the fishing survey. The study concluded that there was no evidence that catch rate was not proportional to abundance.

98. During similar studies at Penguin Bank similar numbers of fish were observed as at Johnston Atoll, but catch rates were much less. This study concluded that catch rates may not be a good measure of abundance where fishing activity is intense.

99. Based on experiments fishing simultaneously with different sizes of hook, Dr Ralston had concluded that for the range of fish encountered and hook sizes used that small hooks tended to sample a wide size range while large hooks tended not to catch smaller fish. A similar experiment conducted in the Northern Mariana Islands with larger samples produced similar results.

100. Owing to limits on available time, the representative of New Caledonia was unable to talk about trap fishing, but the delegates were referred to discussion of that subject in working paper 17.

101. Dr Ralston again suggested that the data collected could be generalised for use in other areas but that caution was required. He suggested that future assessments be based on otolith work to estimate growth coefficients and the collection of size frequency data to measure changes in mortality rates. He recommended against setting up elaborate systems of sampling to measure fish effort.

102. Dr J. Munro outlined the possible mechanisms for managing a deep water fishery and stressed the importance of determining the management objectives for the fishery in question. He noted that the primary decision to be taken was whether or not to control fishing mortality directly (by implementing controls on gear, vessels, or number of fishermen). The traditional regulation of fishing effort in some areas offered opportunities for effective control of effort which might otherwise be very difficult. Dr Munro discussed the advantages and disadvantages of imposing minimum sizes restrictions and pointed out the problems that arise where species change sex at a size which may result in a population composed entirely of females. The effects of seasonal closures, area closures and catch quotas were briefly reviewed.

103. Dr Munro pointed out that the problem facing most fishery officers is knowing how far a fishery can develop. He suggested that a useful rule of thumb would be to allow catch rates to reduce to no less than one-third of the catch rate at the beginning of the fishery. He suggested also that routine assessments should involve fishing with standard equipment and the monitoring of size frequency distributions as a measure of changes in mortality rate.

104. Dr Munro reviewed options for direct intervention in the natural history of appropriate species including enhancement (if recruitment is limiting), introductions, and artificial reefs. He noted that introductions should not be attempted unless there is very good reason and there was not evidence that artificial reefs had increased production in any area.

105. A brief discussion followed on ways of adequately sampling size frequency and Doctors Ralston and Munro stressed the need to be aware of the selective characteristics of the sampling gear used.

106. The Fisheries Adviser then concluded the workshop and thanked the contributors for their presentations.

X. DISCUSSION OF RECENT DEVELOPMENTS IN MARICULTURE  
WITHIN THE REGION

(i) Seaweed culture

107. The Fisheries Adviser introduced agenda item 10 indicating that there had been a growing demand, in recent meetings, for this subject to be addressed. He listed the various papers to be presented and Mr Steve Why, Technical Co-operation Officer with the Kiribati Fisheries Division, was asked to present his working paper.

108. Mr Why delivered his address on Eucheuma seaweed farming in Kiribati as presented in working paper 19. This also included a slide presentation. Mr Why indicated that the seaweed project addresses the development of alternative sources of income for outer islands. He described the stages of progression of the programme, and by the use of the slides, the actual establishment and drying procedures. Establishment costs, farm productivity and costs were thoroughly described. During his presentation he mentioned his trouble in obtaining a suitable press for compacting the seaweed for freighting, and asked the meeting for assistance in this problem.

109. The meeting was opened for questions, and the subject of ship worms attacking wooden structures, the problems of herbivore attack, sea water temperatures, and traditional tenure systems were addressed. The representative of New Zealand indicated he would be pleased to assist in finding a suitable press.

110. In continuation of agenda item 10 (i), Dr Antony Lewis was asked to relate Fiji's experiences in developing seaweed farming. Dr Lewis briefly described the progress of this venture in Fiji. He explained that Fiji had only been involved in the development for a short time and the results so far, despite the devastating effects of four cyclones, looked exceedingly promising and that the stage had now been reached where a one acre farm was in a position to supply commercial growers. Dr Lewis, however, stressed the need for caution in the commercial development of seaweed farming. He indicated there was a possibility that a New Zealand company could establish processing facilities in Fiji and this could be of benefit to other countries in the area.

111. In the questions which followed both presentations Dr Lewis or Mr Why indicated: that the expansion of production would not be likely to affect the market prices initially as this was an expanding market; that the seaweed did not significantly deteriorate in storage, especially if it was not re-washed in fresh water; that the best way of harvesting was to take the whole plant and re-tie the tips rather than just take the outer leaves. It was also explained that the price received for the seaweed was dependant on its carrageenan content, but at this stage no experimental work was able to be undertaken to see if this could be improved or would vary with area.

112. Mr Why said he would like the meeting to take note that recognition for the initial introduction of seaweed culture in the Pacific region should be given to the University of Hawaii, and he briefly recounted its regional development.

113. As a conclusion to this agenda item the representative of New Zealand said he would like to introduce a cautionary note in that seaweed farming involved the movement of large amounts of biological material around the region, and there were some dangers attached to biological introduction as his country had cause to regret. The Chairman said he expected this point to be covered during later items in this section of the agenda.

(ii) Pearl and pearl shell culture

114. Mr Martin Coeroli, representative of French Polynesia, then presented a video of pearl culture techniques made in his country. During the presentation Mr Coeroli outlined the methods used to collect and grow pearl oyster spat, graft the mantle and the pearl nuclei around which grow the pearl layer into the mantle, and extract and grade the final product. In the ensuing discussion, the representative of French Polynesia indicated that the video could be made available to Pacific Island countries once certain copyright formalities had been completed, and undertook to advise the Secretariat when it was ready for release.

115. Several countries requested further technical information on pearl culture. The representative of Western Samoa asked whether a pearl shell could be re-used to culture more than one pearl. Mr Coeroli replied in the affirmative, but advised that subsequent pearls were usually of inferior quality. The representative of American Samoa asked for indicative figures on the investment required for pearl shell farming. Mr Coeroli replied that in French Polynesia, for example, about 15 million CFP were invested in activities which induced pearl grafting of about 15 000 shells per year. He noted, however, that local costs would be extremely variable due to differences in site conditions and logistical constraints.

116. The Chairman, representing Vanuatu, asked whether French Polynesia had experienced difficulties in introducing pearl culture. Mr Coeroli replied that his territory had suffered many problems in its attempts to develop this industry since 1963. The representative of Cook Islands then described his country's attempts to develop pearl farming, and recorded his thanks to French Polynesia for its substantial assistance to Cook Islands.

(iii) Giant clam, trochus and other molluscs

117. The Fisheries Adviser then introduced this sub-item and asked Dr John Munro to open with a presentation on giant clam culture. Dr Munro outlined the work of ICLARM and of James Cook University in co-ordinating various clam rearing, farming and product development work in collaboration with other institutions. Dr Munro then showed slides illustrating recent developments in giant clam culture at James Cook University. During his presentation, Dr Munro noted that the distributions of most species had been greatly reduced by exploitation.

118. Dr Munro then described plans to develop a pilot clam hatchery in Solomon Islands, and noted that it is thought to be premature to encourage countries to consider commercial development at this stage, since markets and hatchery techniques are not well understood at this time.

119. Dr Lewis, of Fiji, then briefly summarised related work at regional institutions. The University of Papua New Guinea is studying, in particular, aspects of giant clam spawning, and extensive mariculture. Two universities in the Philippines are carrying out studies on growth rates under varying conditions, as well as extensive mariculture and resource surveys. The Fiji Fisheries Division is conducting a survey of natural stocks, as exploitation of this resource is growing, and in the longer term is interested in investigating the possibility of re-seeding reefs.

120. The representative of Kiribati requested information on how governments should consider regulating fishing effort to protect stocks. Dr Munro noted the lack of information on this subject. He advised that, because clams continue to grow rapidly even when quite large, it is more productive to harvest them at a large size. The representative of New Caledonia then noted the difficulty of enforcing a size regulation when the meat is extracted and the shell left behind. Several other delegates also commented on aspects of regulation.

121. Discussion turned to the subject of introduction and transfer of exotic species. The representative of French Polynesia noted the dangers of introducing unwanted parasites and bacteria along with desirable animals, such as clams. Dr Munro added that genetic degradation of local stocks may occur as a result of introducing new biological material. He recommended that good quarantine procedures be followed when considering transplants; for instance, introduced material should be bred through one or more generations and parent stock destroyed to ensure freedom from disease, before their release into the wild. The meeting noted that these precautions were relevant to most biological transfers and that the South Pacific Regional Environment Programme had developed a protocol regarding introduced species, and requested the Secretariat to circulate more information on this subject. The meeting then made the following recommendation.

Recommendation No. 7

Noting the potential problems associated with the introduction and transfer of exotic marine species, the meeting recommended that Pacific Island countries adopt the following interim guidelines:

- (i) No species of clams should be introduced to areas outside its known recent distributional range.
- (ii) Where transfers are to be effected within the natural range of a species, the spat should be reared in sea water filtered to 1 micron and be maintained in ultra-filtered, recirculating, ultra-violet irradiated sea water in the four weeks preceding the transfer.
- (iii) Giant clam seed or spat should be transferred at the earliest possible stage in their life history.
- (iv) The receiving institution should maintain the spat or seed in quarantine tanks or raceways, preferably filled with filtered sea water, for at least six months. The overflow water from the tanks or raceways must flow to waste into a septic tank or other in-ground sump and must not be drained back into the sea.
- (v) In the event that during the quarantine period any diseases, parasites or predators appear in the introduced stock, the stock should be destroyed by boiling, all equipment sterilised and a fresh start made.
- (vi) The country exporting the clam seed or spat should accept the responsibility of ensuring that the above-mentioned guidelines are adhered to and undertake to issue a certificate to that effect.

122. Dr Willy Bour of ORSTOM then made a presentation based on working paper 11, regarding the assessment and management of trochus in New Caledonia. After outlining the history of the country's trochus fishery, he described the results of stock assessment carried out all around the New Caledonia coast. He also mentioned the legislation that the Territorial Government was planning to introduce in order to allow trochus stocks to regenerate and ensure a sustained production of around 400 tonnes/year, rather than the present 100 tonnes/year. The development of small processing units in coastal villages should also contribute to a more even distribution of the fishing effort around the country. The representative of Papua New Guinea sought more details of the techniques used to map the trochus habitat areas of shallow reefs in New Caledonia.

123. Dr Bour also noted that a small trochus hatchery to allow re-seeding of over-exploited reef areas had been established. He then went on to describe the French Government's SPOT satellite imagery project. Tests of the imagery equipment have been used to compile thematic maps of the Tetambia reef, near Noumea, and this in turn has allowed mapping of the trochus biotope in this area. Dr Bour pointed out the usefulness of this technique for marine resource mapping on reefs and in shallow lagoons throughout the region.

124. The representative of Papua New Guinea expressed his country's interest in remote sensing using the Landsat System, and noting that this would require substantial funding commitments, asked if other island countries and territories were interested in a co-operative regional approach to utilise this technology.

125. During the subsequent discussion of Dr Bour's presentation, the Chairman, representing Vanuatu, asked how Pacific Island countries could gain access to the facilities offered by SPOT. Dr Bour replied that the satellite would be managed by a commercial company, SPOT Image, and that users would simply enter into a commercial arrangement with it. The representative of France added that, since his government had formally committed itself to assisting the region in the field of satellite imagery, an approach via the SPC could possibly result in access to the satellite's facilities on more favourable terms. The Chairman then thanked Dr Bour and turned to the next agenda item.



XI. OTHER BUSINESS

126. The Fisheries Adviser briefly referred to earlier discussions regarding a workshop on boat building, for which the meeting had requested the Secretariat to further develop a proposal for consideration under this item. He advised the meeting that time limitations had prevented this proposal being given the attention it deserved, and requested the meeting's concurrence that the proposal be distributed in writing at a later date.

127. The Fisheries Adviser also requested comment from delegates on a suitable subject for the one-day workshop to be held in conjunction with next year's meeting. No suggestions were forthcoming.

128. The representative of Australia asked the Secretariat to comment on the possibility of advance distribution of documents for future meetings. The Fisheries Adviser noted the late production of many documents, but advised that a decision had already been made to try to circulate at least the more important working papers in advance of next year's meeting. He also noted the usefulness of the many papers submitted by participating countries, and asked that these be submitted in good time to allow for translation, printing and distribution. The representative of New Zealand asked for longer notice for future meetings and suggested that papers could probably be more carefully divided into true working papers, and information papers which would not be referred to during the working sessions.

129. The representative of Western Samoa noted that time limitations had cut short the discussion of many items of particular interest to some delegates and felt that evening or extra-plenary sessions should be considered to allow for extended discussions on specialist topics.

130. The representative of Western Samoa also noted that many of the topics addressed during the meeting were of direct interest to the Institute of Marine Resources (IMR), and asked whether they had been invited to the meeting. The Fisheries Adviser responded that formal and personal invitations had been issued, but that these had not been taken up. Several countries commented on the desirability of future IMR participation.

131. The representative of New Zealand drew the attention of the meeting to information paper 3, regarding research needs on South Pacific albacore. He invited delegates to contact him directly, or via Dr Le Guen of ORSTOM, if they wished to contribute their views on this subject.

132. The Tuna Programme Co-ordinator drew the meeting's attention to the Secretariat's proposal for a tagging project on yellowfin (described in working paper 6) which had been overlooked during earlier discussions on the Tuna and Billfish Assessment Project. After expressions of support, the meeting made the following recommendation.

Recommendation No. 8

The meeting recommended that the Secretariat seek funding in order to allow implementation of the proposed tuna tagging project which will enable the analysis of interactions between surface and longline fisheries in the Western Pacific.

XII. ADOPTION OF THE REPORT

133. The report of the meeting was adopted.

XIII. SUMMARY OF RECOMMENDATIONS

REVIEW OF COASTAL FISHERIES WORK PROGRAMME

Recommendation No. 1

Noting the importance of early follow-up action by the governments concerned, the meeting recommended that the backlog of reports on the Deep Sea Fisheries Development Project be cleared as a matter of priority. Draft reports from future country visits should be submitted to the host country as soon as is practicable after the master fisherman has left.

Recommendation No. 2

The meeting noted the importance and potential value to the region of the gear development work carried out by the Deep Sea Fisheries Development Project, and recommended that the project be restructured in the following manner to place increased emphasis on this activity and to enhance its effectiveness.

- (i) One of the master fishermen to be assigned full-time to the development of new and innovative fishing gears and fishing methods suitable for use in the Pacific Islands.
- (ii) This assignment should be for an initial period of two years and located at a suitable site within the region. Every effort should be made by the host government and the South Pacific Commission to ensure that the programme has every support.
- (iii) Where gear development activities are undertaken during individual country projects, longer term arrangements would be desirable.

REGIONAL FISHERIES TRAINING PROJECT

Consideration of regional training needs and priorities and development of a core programme of training activities for 1986-87 period

Recommendation No. 3

The meeting noted the value of the SPC/UNDP Regional Refrigeration Training Course and recommended that this should be followed up with:

- (i) a survey to assess and assist the work of former trainees and help select future candidates;
- (ii) two further training courses with flexibility to cater for the needs and capabilities of the trainees;
- (iii) provision of basic tools to successful trainees of all three courses to allow continuation of their work on their return.

Recommendation No. 4

Reiterating the importance of the work to be undertaken under the Regional Fisheries Training Project, the meeting recommended that the Secretariat undertake the following activities under this project.

- (i) Review existing training arrangements and disseminate this information to member countries.
- (ii) Assess the training needs of individual member countries through consultative visits and develop action programmes to address these needs.
- (iii) Continue existing or planned activities.
- (iv) Develop regional training programmes in priority areas identified by the Seventeenth Regional Technical Meeting on Fisheries as listed below.
  - (a) Marine engineering
  - (b) Outboard engineering
  - (c) Refrigeration engineering
  - (d) Business management
  - (e) Fish handling and processing
  - (f) Communication skills
  - (g) Fish marketing
  - (h) Aquaculture training
  - (i) Navigation and chartwork
  - (j) Fishing operations
  - (k) Fishing gear design and development
  - (l) Fish quality control.

OCEANIC FISHERIES

Status of Western Pacific yellowfin fishery

Recommendation No. 5

In consideration of the difficulties caused by incomplete data holdings, the meeting recommended that the Secretariat renew appeals to all nations whose vessels operate in the region to co-operate with the countries of the region by providing complete data sets for catch and effort for tuna and billfish taken within the South Pacific Commission region, and if possible in relevant international waters adjacent to the region, assuring them that full confidentiality will be maintained. This should be treated as a matter of urgency.

Continuation of the Tuna and Billfish Assessment Programme

The meeting expressed strong support for the continuation of the Tuna and Billfish Assessment Programme and recognised the necessity of a longer time frame.

FISH AGGREGATION DEVICES

Proposal for research on optimal FAD deployment and management for commercial exploitation

Recommendation No. 6

Accepting the vital need for further scientific study of the dynamics of fish populations associated with fish aggregation devices (FADs), the meeting recommended that the Secretariat proceed with the development of a proposal to study the dynamics of tuna aggregations at FADs.

DISCUSSION OF RECENT DEVELOPMENTS IN MARICULTURE WITHIN THE REGION

Giant clam, trochus and other molluscs

Recommendation No. 7

Noting the potential problems associated with the introduction and transfer of exotic marine species, the meeting recommended that Pacific Island countries adopt the following interim guidelines:

- (i) No species of clams should be introduced to areas outside its known recent distributional range.
- (ii) Where transfers are to be effected within the natural range of a species the spat should be reared in sea water filtered to 1 micron and be maintained in ultra-filtered, recirculating, ultra-violet irradiated sea water in the four weeks preceding the transfer.
- (iii) Giant clam seed or spat should be transferred at the earliest possible stage in their life history.
- (iv) The receiving institution should maintain the spat or seed in quarantine tanks or raceways, preferably filled with filtered sea water, for at least six months. The overflow water from the tanks or raceways must flow to waste into a septic tank or other in-ground sump and must not be drained back into the sea.
- (v) In the event that during the quarantine period any diseases, parasites or predators appear in the introduced stock, the stock should be destroyed by boiling, all equipment sterilised and a fresh start made.
- (vi) The country exporting the clam seed or spat should accept the responsibility of ensuring that the above-mentioned guidelines are adhered to and undertake to issue a certificate to that effect.

OTHER BUSINESS

Recommendation No. 8

The meeting recommended that the Secretariat seek funding in order to allow implementation of the proposed tuna tagging project which will enable the analysis of interactions between surface and longline fisheries in the Western Pacific.

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ANNEX I

AGENDA - WORKSHOP: MANAGEMENT OF DEEP BOTTOM FISH RESOURCES  
IN THE SOUTH PACIFIC

1. Introduction
2. Biological characteristics of the resource
  - Taxonomy
  - Early life history
  - Reproductive biology
  - Age and growth
  - Mortality
  - Trophic biology
  - A case study: Vanuatu
3. Assessment research
  - Hawaii
  - Northern Mariana Islands and Guam
4. Sampling considerations
  - Submersible research at Johnston Atoll
  - The effects of hook size on catch
  - Trap fishing
  - Future assessment work
5. Resource management

ANNEX II

LIST OF WORKING PAPERS PRESENTED AT THE MEETING

SPC/Fisheries 17/Informal 1 - List of participants

- WP.1 Summary report of the South Pacific Commission activities under the Fisheries Work Programme - coastal resources
- WP.2 Fisheries sector refrigeration systems in Pacific Island countries, by G. L. Preston, SPC Assistant Fisheries Officer and M. A. Vincent, Refrigeration Engineer, United Nations
- WP.3 Review of progress, problems, and opportunities within the Tuna and Billfish Assessment Programme, presented by the Secretariat
- WP.3/Corr.1 Table update for WP.3.
- WP.4 Revised priority items for the Tuna and Billfish Assessment Programme, presented by the Secretariat
- WP.5 Yellowfin tuna catch rates in the Western Pacific, presented by the Secretariat
- WP.6 Analysis of interaction between tuna fisheries in the Central and Western Pacific Ocean, presented by the Secretariat
- WP.7 Optimisation of FAD deployment and management for commercial exploitation, presented by the Secretariat
- WP.8 FAD mooring systems for moderate to shallow depths, by R. L. Boy, Buoy Systems Engineer, US Coast Guard, and B. R. Smith, Fisheries Adviser, South Pacific Commission
- WP.9 Fisheries training requirements in Pacific Island countries, presented by the Secretariat
- WP.10 Final report - SPC/UNDP Regional Refrigeration Assessment Training Project
- WP.11 Assessment and management of the Trochus resources in New Caledonia, by W. Bour and C. Hoffshir, ORSTOM, Noumea, New Caledonia



- SPC/Fisheries 17/WP.12 Deep-bottom fishes of the outer reef slope of Vanuatu, by F. Brouard, and R. Grandperrin, ORSTOM, Noumea, New Caledonia
- WP.13 Logs as fish aggregation devices in the equatorial Western Pacific, by Kevin Bailey, Fisheries Research Division, Ministry of Agriculture and Fisheries, Wellington, New Zealand
- WP.14 Parasites of the albacore (Thunnus alalunga) as possible stock markers, by Brian Jones, Fisheries Research Division, Ministry of Agriculture and Fisheries, Wellington, New Zealand
- WP.15 Fish aggregation devices in New Zealand waters, by Kevin Bailey, Fisheries Research Division, Wellington, New Zealand
- WP.16 Country statement - Australia
- WP.16/Corr.1 Amendment to country statement - Australia
- WP.17 Deep trap fishing. Initial results of a trial undertaken by a fisherman in New Caledonia.
- WP.18 Continuation of the Tuna and Billfish Assessment Programme, presented by the Secretariat
- WP.19 Eucheuma seaweed farming in Kiribati, by Stephen Why, Technical Co-operation Officer, Fisheries Division, Ministry of Natural Resource Development, Kiribati
- WP.20 Country statement - Solomon Islands
- WP.21 Small-scale FAD research in PNG: Situation report, by S. D. Frusher, Fisheries Research and Survey Branch, Department of Primary Industry, Wewak, Papua New Guinea
- WP.22 (Withdrawn - not applicable to all delegates at the meeting)
- WP.23 Great Barrier Reef demersal fish research, by G. R. McPherson, L. Squire, J. O'Brien and G. B. Goeden, Northern Fisheries Research Centre, Fisheries Research Branch, Queensland Department of Primary Industries, Australia

SPC/Fisheries 17/WP.24 Considerations regarding the introduction or transfer of tridacnid clams, by J. L. Munro, ICLARM South Pacific Office, Townsville, Australia; J. Lucas, Zoology Department, James Cook University of North Queensland, Townsville, Australia; A. Alcala, Marine Laboratory, Silliman University, Philippines; E. D. Gomez, Marine Sciences Center, University of the Philippines, Quezon City, Philippines; A. D. Lewis, Fisheries Division, Suva, Fiji; J. C. Pernetta, Faculty of Sciences, University of Papua New Guinea, Port Moresby, Papua New Guinea

WP.25 Country statement - New Zealand

WP.26 Deep bottom fishing survey in Solomon Islands, January-June 1985, by Albert Wata, Fisheries Officer (Surveys), Fisheries Division, Ministry of Natural Resources, Honiara, Solomon Islands

WP.27 Country statement - Fiji

SPC/Fisheries 17/Information Paper 1 - Regional Fisheries Training Project position paper - Australian Maritime College

Information Paper 2 - List of working papers

Information Paper 3 - Determining the research needs for the South Pacific albacore

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