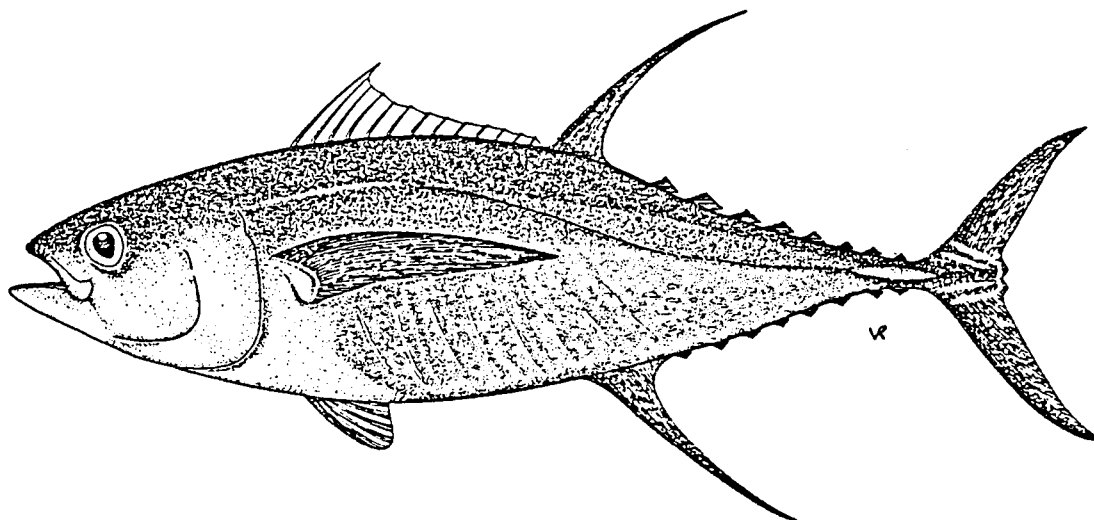



REPORT
OF MEETING

FIRST WESTERN PACIFIC
YELLOWFIN RESEARCH GROUP

(Port Vila, Vanuatu, 20-21 June 1991)



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I. INTRODUCTION

The Western Pacific Yellowfin Research Group (WPYRG) was formed on the recommendation of the Third Standing Committee on Tuna and Billfish (SCTB 3) Meeting, held in Noumea in June 1990. The Group was established in recognition of the increasing need for a comprehensive assessment of the yellowfin stocks in the western Pacific Ocean. The aim of the group is to foster collaborative research action among members, to facilitate the collation of various data sets for use in stock assessment and, to develop a work plan for the assessment of western Pacific yellowfin. It is intended that the work of the Group would culminate in a major workshop to be held in 1992 or 1993.

This first meeting of the WPYRG was held at the International Studies Centre, Port Vila, Vanuatu on 20–21 June 1991.

II. AGENDA

1. PRELIMINARIES
 - 1.1 Opening address
 - 1.2 Election of Chairman and Rapporteurs
 - 1.3 Adoption of Agenda

2. REVIEW OF WESTERN PACIFIC FISHERIES FOR YELLOWFIN
 - 2.1 By country and gear type
 - 2.2 Best estimates of historical catch and effort

3. REVIEW OF RESEARCH ACTIVITY ON YELLOWFIN, PAST AND PRESENT, INCLUDING STOCK STATUS

4. DEVELOPMENT OF A COOPERATIVE RESEARCH PLAN LEADING TO STOCK ASSESSMENT
 - 4.1 Possible stock assessment approaches and data requirements
 - 4.2 Compilation of a database for stock assessment purposes
 - . catch and effort data
 - . biological studies

5. PLANNING FOR 1992 YELLOWFIN WORKSHOP

6. OTHER BUSINESS

III. SUMMARY OF DISCUSSIONS

1. PRELIMINARIES

1.1 Opening address

1. In welcoming participants to the Meeting, Dr Tim Adams, Chairman of the Fourth Standing Committee on Tuna and Billfish (SCTB4), provided background information to the formation of the Western Pacific Yellowfin Research Group (WPYRG). The WPYRG was convened as a result of Recommendation 2 of SCTB3 which, *'in recognising the increasing need for a comprehensive assessment of yellowfin stocks in the western Pacific region, proposed a scientific workshop on yellowfin, and recommended that a special working group, operating on a similar basis to the South Pacific Albacore Research workshop and fostering collaborative research action among group members, be established to develop a work plan and arrangements for the workshop.'*

2. The collaborative working arrangements among participating scientists were stressed, as was the informal nature of the Group.

1.2 Election of Chairman and Rapporteurs

3. The Representative of New Zealand, Dr Talbot Murray, was elected Chairman of this first WPYRG meeting.

4. While it was not expected that the Group would consider and approve a formal record of proceedings, it was intended to circulate a Meeting Report.

5. The following rapporteurs were appointed:-

- Agenda Item 2 – Mr Peter Sitan, Federated States of Micronesia
- Agenda Item 3 – Mr Sylvester Diake, Solomon Islands
- Agenda Item 4 – Mr Andrew Richards, Papua New Guinea
Dr Peter Craig, American Samoa

6. The agenda circulated in draft form was adopted by the Group.

2. REVIEW OF WESTERN PACIFIC FISHERIES FOR YELLOWFIN

2.1 By country and gear type

7. The Chairman sought summaries from participants on yellowfin fisheries and catches within their respective EEZs. It was noted that these were primarily mixed species fisheries. Participants were reminded of SCTB4 WP.3, which provides a historical summary of regional tuna fisheries and best estimates of 1990 total catches by species, gear etc.

Australia

8. Mr Peter Ward representing the Bureau of Rural Resources (BRR) provided an overview of yellowfin tuna fisheries in the Australian Fishing Zone (AFZ), tabled WP.2 - *A summary of the*

history, fishing activities and data collection programmes. The Australian fishery is characterised by a variety of methods and seasonal variability in catches. Catches of yellowfin tuna have ranged between 1,000 and 5,000 mt each year.

9. Longline is the main fishing method, with Japanese longliners accounting for over 70 per cent and Australian longliners about 20 per cent of the total catch in recent years. Longlining by Australian vessels tends to occur in coastal waters, following the seasonal southward movement of 18–22° C sea surface isotherms. Japanese longline activities, restricted since the declaration of the AFZ in 1979, are concentrated in the north eastern AFZ, between May and December. Incidental yellowfin catches are also reported by pole-and-line and purse seine vessels targeting skipjack tuna. Small quantities of yellowfin are also taken by other methods, such as troll and handline.

10. Yellowfin tuna are an important species to recreational anglers, even though such catches probably account for less than five per cent of the total yellowfin catch. In Australia over 10,000 anglers fish for yellowfin tuna off eastern Australia each year. Organised angling (fishing clubs, tournaments, etc.) accounts for a large portion of the recreational catch. Many yellowfin tuna are also tagged and released by anglers. Collecting adequate data from this fishery is a problem, and a data collection programme is yet to be established. Monitoring programmes are well-established and supported for the major commercial gears used to take yellowfin tuna in Australia.

11. Mr Ward stated that a five per cent yellowfin by-catch allowance for pole-and-line fishing vessels might be imposed because of sport fishing industry concerns, rather than biological reasons. This limit, however, has rarely been exceeded by pole-and-line and purse seine vessels in the past.

12. Mr Ward also pointed out that restrictions on the longline fishery introduced in 1985 constituted a management tool to avoid further escalation of the fishery. The Government's attitude was to give preference to small domestic operators. The current number of sixty Japanese longline vessels will gradually decrease as some of the vessels will change to Australian flag as part of an arrangement with Japan. Thirty Japanese longline vessels currently accounted for 70% of the total catch in Australia.

Fiji

13. Dr Tim Adams gave an overview of the yellowfin tuna fishery in Fijian waters. Exploitation of yellowfin tuna is primarily by the pole-and-line fleet (10 domestic vessels, and 4 licensed from Kiribati), with an estimated yellowfin catch in 1990 of 500–800 mt. Taiwanese longline vessels targeting albacore tuna for sale to the Fiji cannery also harvested yellowfin as by-catch. The estimated catch of the twenty vessel fleet was approximately 500 mt in 1990. At certain times, this fleet might have dumped some of the yellowfin catch or landed some in Suva for the domestic market. The longline fishery has been operating for over twenty-five years while the pole-and-line fishery has operated since 1975.

14. Since 1985 a domestic fleet of small sashimi longliners targeting bigeye and yellowfin (with a very occasional bluefin tuna) has developed, with a large proportion of albacore in the catch. These are mostly locally-based joint-venture vessels (Australia, New Zealand, U.S.A and Korea) and deploying 1,000 to 1,200 hooks per set. All operate within or around the limits of the Territorial waters, but the range is extending. Although fifteen vessels at most were licensed in 1990, only seven were operational at the start of 1991 due to financial or other problems, particularly in the marketing of fresh tuna in Japan. Most fresh tuna now goes to USA markets. Many vessels are multipurpose, with the option of deploying demersal longlines or droplines for

deep water snappers. Catch of yellowfin from this domestic longline fleet was approximately 300 mt in 1990.

15. Data from the domestic longline fleet are scarce, but have improved with the introduction of a new licencing and logbook system for domestic tuna boats at the beginning of 1991.

16. Fiji has a small, but growing, charter game-boat fleet operating at resorts scattered throughout the country. These vessels target billfish, particularly marlin, and large tuna, including yellowfin. The boats are not licensed and data on catches are not recorded, but clubs and vessel owners may keep some records. There is considerable interest in tag and release methods in this community.

17. A small, but apparently growing artisanal troll fishery is becoming established around the Fish Aggregation Devices (FADs) that Fiji Fisheries Division maintains off Suva, Savusavu and other areas. A minor amount of yellowfin is currently landed for domestic consumer markets. The Division maintains around ten FADs in key locations, for the benefit of both the troll (artisanal and gamefishing), and pole-and-line vessels. It is hoped that this network will be expanded in the future.

18. All sectors of the pelagic fishery are becoming increasingly vocal over the possibilities of interaction effects. Gamefishermen complain about billfish catches by domestic longliners, domestic longliners complain about the discards by Taiwanese longliners operating in the EEZ, and pole-and-line fishermen worry about the potential interaction from proposed increases in purse seining. The legislation which introduced the domestic catch reporting system in 1991 also included provision for setting up areas restricted to certain fishing methods, and a potential mechanism for limiting catches of certain species by certain gear types. None of these restrictions have yet been implemented.

American Samoa

19. Noting that much of the yellowfin tuna caught in the region by purse seine vessels was landed in American Samoa for canning, Dr Peter Craig gave a general overview of these landings. He pointed out that the records are confined to cannery landing products and such data are lodged with the United States National Marine Services (NMFS). Data have been collected since 1976. Generally speaking, about 25 per cent of total off-loaded catch in Pago Pago is yellowfin tuna. The total yellowfin landings in recent years have been about 40,000 to 60,000 mt per year.

Vanuatu

20. An overview of the historical Vanuatu yellowfin fishery was provided by Mr Wycliffe Bakeo. Yellowfin catches were primarily high during the operational years (1975–1985) of the South Pacific Fisheries Company located at Santo. There is currently small-scale fishing for tuna, but catches are not large because of the low domestic market value of tuna in Vanuatu. The local market predominantly targets demersal fish species.

United States

21. Dr Gary Sakagawa, representing NMFS, gave an overview of the U.S. yellowfin tuna fisheries in the central and western Pacific (WP.5). These fisheries are not solely for yellowfin, but take other species as well. They consist of the large distant-water purse seine fishing fleet (40–50 vessels), and the coastal fisheries in U.S. states and territories. The main coastal fishery is the artisanal fishery in the Hawaiian Islands. Recent yellowfin catches by all fleets combined were

about 42,600 and 58,900 mt in 1989 and 1990, respectively, although only about three per cent of the catch came from the artisanal fishery.

Tonga

22. Yellowfin catches in Tonga are primarily by-catch from the one Tongan longline vessel targeting albacore. Catch data supplied to SPC indicated that the 1990 yellowfin longline catch was 36 mt. The artisanal fishery is very limited and information from that fishery is not available. Tonga expects to acquire additional longline vessels in the coming years, and incidental effort on yellowfin will increase as a result.

Tuvalu

23. No statistics are available from the small-scale domestic artisanal tuna fishery in Tuvalu, although plans are underway to collect the data in the near future. In respect of the DWFNs fleets fishing the Tuvalu EEZ, (Taiwan, Korea, Japan, and the U.S.) all available records have been provided to the SPC Regional Tuna Fisheries Database.

Solomon Islands

24. Yellowfin catches in the Solomon Islands EEZ, reviewed by Mr Sylvester Diake, are taken by the domestic pole-and-line fleet, operating mainly inside the Main Group Archipelagic (MGA) baseline and FADs deployed within the 12 mile limit, and by purse seiners (single and group seiners). Distant-water fishing fleets comprised of Japanese pole-and-line vessels, longliners and U.S. purse seiners also catch yellowfin from the Solomons EEZ under access agreements.

25. The proportion of yellowfin in the purse seine catch is 20–50 per cent while the percentage in the pole-and-line catch is less than ten per cent. Total yellowfin catches in 1990 from pole-and-line and purse seine vessels were 2,300 and 3,660 mt, respectively.

26. Regarding the current expansion of purse seine effort in the Solomon zone, Mr Diake confirmed that an increase of purse seine effort has already been authorised for the Frabelle Fishing Company from the Philippines, in the form of a 35,000 mt annual allocation. This will bring the total tuna allocation in the Solomon Islands to 120,000 mt. A review of the potential yields available will however be provided early in 1992, after results of the joint SPC/Solomon Islands Government (SIG) tagging project are completed and analysed. In the meantime, it is expected that an increase of yellowfin (and skipjack) catch in the zone will occur.

Federated States of Micronesia

27. Yellowfin tuna catches in the Federated States of Micronesia (FSM) EEZ have been made primarily by foreign DWFNs fleets through licensing arrangements. These include purse seiners from Japan, the United States, Philippines, Australia, Taiwan and Korea. Access by Taiwanese and Korean purse seine fleets has been suspended for almost one year. The yellowfin component of the purse seine catch from these fleets is 17–30 per cent. In recent years, FSM has acquired six purse seiners either wholly owned by FSM interests or through joint-venture arrangements. With this increase, domestic effort on yellowfin tuna by purse seiners in the EEZ will increase.

28. Longliners, primarily from Japan (250 in 1991), Taiwan, and most recently, some small domestic vessels, also operate in the FSM EEZ. At present, access to Taiwanese longliners is

restricted to seventeen vessels based in FSM ports, which transship their catch from these ports. In respect of the domestic fleet, there are about six to seven vessels operating occasionally, deploying an average of 500 hooks per set. Additional smaller vessels are expected to arrive in FSM from the U.S. and Japan by 1992. Again, it is expected that effort on yellowfin stocks by longliners will increase in the coming years. The proportion of yellowfin in the longline catch is about 60 per cent. The total annual longline catch in the zone is estimated to be 8,000–12,000 mt.

29. Pole-and-line fishing in FSM is limited to distant-water fishing vessels from Japan. The fishery is seasonal, occurring during the early months and the latter part of the year. The number of vessels continues to decrease each year. Approximately sixty vessels have operated during the first half of this year. Catches fluctuate from year to year, but the total yellowfin catch from this fishery has been quite small.

30. Finally, small quantities of yellowfin are taken by the local artisanal fishery, either by handlining or trolling. Few data are available on yellowfin catches from this source.

31. Details of all catches by DWFNs in FSM are available on the SPC Regional Tuna Fisheries Database.

32. When asked about data collection procedures being instituted for the domestic fleets, Mr Peter Sitan advised that domestic regulations had already been put in place and the Micronesian Maritime Authority is working with local authorities in each state to provide the needed data. It was also reported that two tuna longline base facilities will be constructed in the states of Yap and Chuuk (Truk) to service both domestic and foreign longline vessels, and should operate by mid-1992.

Papua New Guinea

33. Exploitation of yellowfin in PNG waters occurs mostly by DWFNs operating in the Declared Fishing Zone (DFZ) through access arrangements. The predominant fleets are purse seiners from Taiwan, Korea, the U.S. and Philippines. There has been no access agreement with Japan (purse seine, longline, pole-and-line) since March 1987. The Government of PNG has recently decided to reinforce the closure of its archipelagic waters to foreign fishing fleets to promote shoreside development by those fleets. At present no pole-and-line vessels or longliners are operating in PNG waters. Data from foreign purse seiners are submitted to the SPC Regional Tuna Fisheries Database (WP.3).

34. Artisanal fishing is limited to village level operations. There are also several sport fishing clubs in PNG, but recreational yellowfin tuna catches are believed to be very small.

35. The Secretariat noted that the tuna fishery in the PNG DFZ is probably the most important in the SPC region, with total annual tuna catches during the past two years in excess of 200,000 mt.

Japan

36. Dr Sachiko Tsuji, provided a historical background of the Japanese distant-water longline, pole-and-line and purse seine fleets active in the western tropical Pacific. The longline fleet has historically targeted on both yellowfin and bigeye tuna, but after 1978, the fleet had shifted its primary target to bigeye tuna. Data from the longline fleets are compiled by 5° square on a quarterly basis, but have not been published since 1980.

37. The pole-and-line fleet has been gradually reduced through regulated replacement by purse seiners since the late 1970s. Yellowfin tuna accounted for 20 to 25 per cent of the total purse seine catch. The present operational trend of Japanese purse seiners involves increased focussing on free-swimming schools, which have a higher percentage of typically longline-sized yellowfin tuna.

38. The majority of vessels operating in the central and western Pacific are off-shore fishing vessels and are regulated by the Japanese Government. The group seiners and small-scale longliners based in Guam originated from domestic fleets and are controlled under a slightly different management scheme from that regulating large-scale offshore fleet activity.

39. In response to a question regarding the Japan Fisheries Agency (JFA) possibly resuming its publication of longline data, Dr Tsuji replied that JFA has a policy of releasing data for management if mutual benefits can be provided. Dr Tsuji explained that the tuna data collection system in Japan involves entry and initial processing of original log-book data by a contracted computer company, with verification by the National Research Institute of Far Seas Fisheries (NRIFSF) in Shimizu. NRIFSF then stores the processed data for subsequent analysis.

Palau

40. Mr Ramon Rechebei, provided a detailed explanation of yellowfin catches and data collection in Palau. Purse seine data are collected from Japanese and U.S. vessels, then forwarded to SPC. Japanese longline data are also provided to SPC.

41. There are two joint-venture companies in Palau with Taiwanese interests. One of the companies has two-hundred-and-fifty licensed vessels and the other about two hundred. Some Japanese longline vessels have also tried to operate out of Palau's ports, but the Japanese Fishing Associations have informed Palau that they should not transship since it is currently against Japanese regulations. Data collection from these joint-venture companies has been problematic. While Palau has issued four-hundred-and-fifty permits, only a proportion of vessels actually off-load in Palau. During off-loading the captains have claimed that the SPC catch form is very difficult to complete despite being translated. Every effort is being undertaken to improve data collection. The two joint-venture companies are planning long-term development in Palau and have built new processing plants to process by-catch as well as the target species.

42. There is a small domestic pole-and-line vessel operating for the local market. Historical data on past activities of the Van Camp pole-and-line fleet during the 1970s have been submitted to SPC. Sport fishing is rising as tourism expands in Palau. Few data are available from this source.

43. The Secretariat informed the meeting that a consultant had been hired to review the longline unloading in Palau and to establish a data collection port sampling system for those operations.

44. Mr Lujan, representing the Western Pacific Regional Fishery Management Council (WPRFMC), pointed out that through the U.S. Federal Authority in Guam, the United States could assist in enforcing non-compliance if longliners licensed to operate in Palauan waters fished in Guam's EEZ.

Marshall Islands

45. Mr John Bungitak, gave an overview of yellowfin catches in the Marshall Islands. The Marshall Islands have two joint-venture purse seiners, which have been operating mostly in PNG.

and FSM waters. Longliners are mostly Japanese and the catch data from the fleet are lodged with SPC. There is a new development to establish a local longline operation in the Marshall Islands. There are currently three U.S. longliners from Hawaii operating from Majuro. The operation may expand to up to fifty vessels in the coming years.

46. Pole-and-line fishing is also carried out seasonally by Japanese distant-water vessels. Data from that fleet are also provided to SPC. There is a growing domestic recreational fishery. Data from this fishery, however, are not readily available.

Philippines

47. Attorney Reuben Ganaden of the Bureau of Fisheries and Aquatic Resources (BFAR), provided an overview of the yellowfin fisheries in the Philippines. There are two categories of tuna fisheries in the Philippines, municipal and commercial. Both fisheries utilise FADs to catch yellowfin and other tunas.

48. The municipal fishery involves handline, longline and gillnet. Eighty percent of the yellowfin catch from this fishery is caught with handlines. In respect of the commercial fishery, the two main gears used are purse seine and ring net. Average yellowfin catch from the two fisheries combined during the past twelve years has been around 55,000 mt annually. The catch in 1989, however, reached 62,000 mt. Most of the catches are from southern Philippine waters. In respect of the catch from Philippine purse seiners operating in the South Pacific, the data should be with SPC through access agreements, but are not generally available to BFAR. The recreational fishery is a small component of the yellowfin fishery in the Philippines and data from this fishery are very limited.

49. Regarding the size of handline caught yellowfin, it was pointed out that the catch was dominated by fish measuring 100 cm LCF and more. Catch from the handline fishery was 26,000 mt for all species in 1989. Fishing occurs mostly around payaos, which are typically moored in depths of 3,000 m.

Indonesia

50. Dr Nurzali Naamin, summarised the yellowfin tuna fishery in eastern Indonesia as having artisanal and industrial components. The industrial fishery involves purse seine, pole-and-line, and longline methods. The artisanal fishery is composed of gillnet and handline operations.

51. There are three purse seiners based in Biak that are part of a joint-venture arrangement with French interests. This recently was acquired by PT Mantrust (Indonesia). About eight longliners have recently moved from Bali to Biak. The longliners use live bait (milkfish), but problems remain with keeping the bait alive for an extended period of time. With respect to pole-and-line operations, there are three state enterprise bases in Sorong, Ambon and Bitung, with small pole-and-line vessels in the 10–30 GRT size categories, and other bases in Maluku, Sulawesi, Nusa Tenggara and Irian Jaya. These vessels normally fish around payaos. Yellowfin make up about 10–20 per cent of the pole-and-line catch.

52. Gillnetting occurs on a small scale. Handlining is either by vertical line or surface line around payaos, both using live bait. The catch from this fishery is destined for the fresh sashimi export market. Details of the catch are provided later, and in SCTB4 WP3. Yellowfin catch data in Indonesia have been collected and collated by the Indo-Pacific Tuna Development and Management Programme (IPTP).

New Caledonia

53. The yellowfin tuna fishery in New Caledonia consists primarily of incidental catches from a Japanese longline joint-venture with a local fleet of small longliners. CPUE ranges from 0.5–1 yellowfin per 100 hooks. Mean weights of yellowfin are higher during the austral winter months. These figures are based on 1987–89 catch data. Detailed data are also provided to SPC for compilation.

New Zealand

54. Dr Talbot Murray, noted that yellowfin tuna catches in New Zealand are primarily from the recreational fishery during the summer months and as by-catch of both domestic and Asian longliners targeting for albacore, bigeye and southern bluefin tuna. Catches from the two sources are very small.

French Polynesia

55. Working Paper 3 provides an overview of some characteristics of the yellowfin tuna fisheries in French Polynesia.

56. Yellowfin is the second most important species caught in French Polynesia's EEZ in terms of catch volume, following bigeye tuna in the longline fisheries, and skipjack in the surface fisheries.

57. The data which form the basis of WP.3 are essentially from Japanese and Korean longline catches in the EEZ of French Polynesia from 1980–1990 and the catches of pole-and-line bonito boats (bonitiers) from 1979–1990.

58. The pattern of historical longline effort is influenced by the existence of access agreements. Two main operational areas can be distinguished by latitude: 4°–13°S (most effort) and 18–21°S. CPUE trends show alternate periods of low (1980–82; 1987–88), and high (1983–86; since 1989) catch rates. These may be related to the El Niño phenomena. Seasonality in CPUE is not well marked. Maximum yellowfin CPUE is seen at 8°S.

59. A small domestic fleet fishes with vertical lines around FADs. Slight decreases in CPUE and average fish size have been noted over the last four years. It is unclear whether this is a general trend, or is restricted to the Society Islands.

60. At the conclusion of these presentations, it was noted that compilation of total catch estimates, overall CPUE and data collection generally are considerably more complex for yellowfin than has been the case for albacore for the SPAR group. Yellowfin catches cover the entire central and western Pacific and are taken by a variety of fleets and gears, and at various sizes.

61. The geographical distribution of catches by DWFN fleets is also influenced by access agreements. A historical compendium of these would be useful for background information and interpreting distribution of catch. It was recognised that while every effort should be made to estimate total catch for stock assessment purposes, more detailed information would be required.

2.2 Best Estimates of Historical Catch and Effort

62. Drawing on the country presentations and WP.3 of SCTB4, the Fisheries Statistician had compiled the following tables, which are included in this report.

- Historical catches (mt) of yellowfin in the western Pacific, by gear and in total (Table 1).
- Catches (mt) of yellowfin by longline (Table 2), pole-and-line (Table 3), purse seine (Table 4), and fishing nation.
- Sources of catch/effort data by country and gear (Table 5).
- Sources of size frequency data by country and gear (Table 6).

63. The best estimates of the total western Pacific yellowfin catch (SPC statistical area plus eastern Indonesia/Philippines) recently show a marked increase from 1988 to 1989 (229,000 to 317,000 mt), and continuing through 1990 (339,000 mt). In contrast, total catches throughout most of the 1980s, except for 1987, were in the 190,000 to 230,000 mt range.

64. It was recognised that these estimates of total catch could be improved, and some possible avenues were suggested. For scientific purposes, less than complete coverage (80% of catches was suggested) on the logbook database would be adequate, given good data quality. Attainment of 100 per cent coverage is probably neither realistic nor of high priority. Independent estimates of total catches, stratified by area/time strata, gear type and nation, would however be essential.

3. REVIEW OF RESEARCH ACTIVITIES ON YELLOWFIN, PAST AND PRESENT, INCLUDING STOCK STATUS

65. It was agreed that Working Paper No. 1, *Possible approaches and data requirements for yellowfin tuna stock assessment in the western Pacific*, presented by the Tuna and Billfish Assessment Programme (TBAP) and Background Paper No. 2, *Status of world yellowfin tuna fisheries and stocks*, presented by Dr Ziro Suzuki, NRIFSF, Japan, should be used as starting points for the discussion.

66. The Principal Fisheries Scientist presented a brief overview of yellowfin stock status, summarised as follows. The estimated total yellowfin catch during most of the 1980s was 200,000 to 220,000 mt per year, except in 1987 when it increased to 280,000 mt. Since 1989, catches have increased significantly, largely as a result of increased purse seine catches, to over 300,000 mt.

67. Trends in CPUE in the purse seine fishery can be highly variable for reasons other than variation in stock size. The same is probably true of Japanese longline CPUE, although this variable is probably a better indicator of adult yellowfin abundance than purse seine CPUE.

68. CPUE in the Japanese longline fishery declined through the 1960s and 1970s, most likely as a result of normal fishing-down of accumulated biomass. There was an increase in CPUE in the mid-1970s, possibly due to several strong year classes. By the mid-1980s, the CPUE was back to the levels of the early 1970s. It is not clear whether this decrease was due to the longline fishery, interaction with the expanding purse seine fishery, or both.

69. It is believed, on the basis of fishery indicators, that yellowfin total annual catches of 200,000–220,000 mt are sustainable, but the present total catch has reached approximately 330,000 mt. It remains uncertain whether catches at this increased level are sustainable. Although trends in CPUE can be a useful indication of stock conditions, they do not allow predictions of future sustainable catch levels.

70. Discussion on various aspects of Background Paper No. 2 followed, including observed increases in yield-per-recruit in the eastern tropical Pacific following increased targeting on larger fish, persistence of young yellowfin around FADs in Vanuatu in El Niño years, and postulated effects of El Niño on recruitment success.

71. The Chairman then invited individual members to comment on past and present research activities. Many Pacific Island countries indicated that they did not have specific research programmes on yellowfin, apart from monitoring, and looked to the SPC TBAP for research results relevant to the region.

72. In presenting Working Paper 4, the Representative of BRR, summarised work in Australia on research surveys, observer data, analysis of Japanese longline catch and effort data, stock structure and movement (including tagging and population genetics), reproduction, age and growth, recruitment, and a review of available scientific literature on yellowfin and other tunas. Major issues were seen to be those relating to stock structure, specifically the relationship between east coast Australian fish and the wider South Pacific, and between coastal longline fisheries and the offshore Japanese longline fishery.

73. The Representatives of Vanuatu and ORSTOM then described their collaborative research programme. From 1981 to 1987 aggregations of yellowfin tuna and skipjack around FADs were studied in Vanuatu by ORSTOM in collaboration with the Fisheries Department. Size composition and otolith data were collected for growth studies of both species. A summary publication is in preparation.

74. It was pointed out that NMFS tuna research was done on a multi-species basis and hence focused on complex scientific questions relating to fisheries rather than exclusively on a single species component of the fishery. Projects addressing various aspects of tuna biology and ecology, including studies of ecological relationships within tropical tuna schools, reproductive biology and distribution of larvae, population modelling and acoustic tracking of several tuna and billfish species, were briefly described.

75. Work carried out by the Inter-American Tropical Tuna Commission (I-ATTC) on various aspects of yellowfin tuna biology and population dynamics was related in broad detail. This is comprehensive and includes, inter alia, studies of age and growth of eastern Pacific yellowfin tuna which suggests different growth estimates depending upon whether tagging or otolith data were used. With I-ATTC support, a proposed tetracycline experiment by the TBAP in the Solomon Islands in September/October 1991 for growth validation purposes is planned. Related to this, length-frequency data have been collected from Solomon Islands surface fisheries continually in this connection since 1985.

76. The main data base for Japanese tuna research work comes from daily log-sheets, interviews with fishing masters, and size information based on port sampling, as well as onboard voluntary size measurement. Training vessels from fisheries high schools and prefectural survey vessels provide basic oceanographic and biological information as well as special assistance with biological

sampling on request. Much work has been done on fisheries characteristics, CPUE changes and fisheries oceanography, including the effect of large events such as El Niño and La Niña on tuna fisheries. Recent research work on yellowfin includes fish behaviour around FADs using sonic tags, reproductive biology, and larval distribution.

77. It was pointed out that research on skipjack is carried out at the Tohoku National Fisheries Research Institute and that tuna research is carried out at the NRIFSF, Shimizu. As a result, some data on yellowfin arising incidentally from skipjack research were not necessarily readily available.

78. Perhaps as many as fifty Japanese training vessels are active in the tropical western Pacific. Results of these cruises are not, however, routinely published.

79. Studies involving yellowfin as well as billfish fisheries and oceanography were described by Dr McB. Williams, representing the Australian Institute of Marine Science (AIMS), Australia.

80. Dr Naamin described tuna research in Indonesia. The Research Institute for Marine Fisheries (RIMF) has the national mandate to conduct research and development on marine fisheries resources and fisheries technologies (fishing techniques and post harvest technology) as well as studying the socio-economics of Indonesian fishermen. Tuna (yellowfin, bigeye, albacore and skipjack) research programmes include these three aspects. Research on biological aspects consist of two major activities, (i) the collection of data (and information) through sampling activities, and (ii) fish tagging activities. There are three main activities on fishing technology, (a) fishing gear and fishing methods; (b) research on live baitfish for pole-and-line, longline and handline operations (as well as frozen fish for longline); and (c) the use of payaos as fish aggregating devices.

81. Tuna (including yellowfin) sampling activities commenced in 1979 mainly in the eastern portion of Indonesian waters (Sorong, Ambon, Bitung, Kendari and Maumere). Data on catch by boat and by species, by fishing ground, trip duration, number of boats landing and biological data (mainly length and weight data) have been collected from the abovementioned landing sites.

82. A total of 10,293 fish, consisting of 9,264 skipjack and 1,029 yellowfin tuna, were tagged and released through four cruises of the RIMF tagging programme from December 1983 to December 1990 in the north eastern part of Indonesia. The recovery rate has been 1.18 per cent for skipjack and 0.64 per cent for yellowfin. Since then 7,562 tuna were tagged by the SPC Regional Tuna Tagging Project (RTTP) during a visit in March 1991, with an interim recovery rate of 13.5 per cent.

83. No research in French Polynesia is directed specifically at yellowfin tuna, but research studies on FADs have included this species.

84. It was pointed out that for biological studies, particularly involving longline fisheries, weight frequency data were often a lot easier and cheaper to collect than length-frequency data and that these data could be used in place of length-frequencies. The resulting population estimates would not be as accurate and care would need to be taken with respect to spatially and temporally variable length-weight relationships.

85. Observer data on length-weight relationships by sex for a range of tunas and billfishes is being collected in New Zealand.

86. Forthcoming studies at the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia, on yellowfin will address questions of stock structure using tagging (in association with the TBAP), otolith microstructure and mitochondrial DNA analysis.

87. With respect to TBAP involvement in yellowfin tuna research, the meeting was referred to WP.2 of SCTB4, and TBAP Technical Report No. 26 describing current SPC activities, including the RTTP, and incidental work on yellowfin during the Skipjack Survey and Assessment Programme (SSAP). This work had been described in considerable detail during SCTB4. It was emphasized that in-country tagging in the RTTP was always done on a cooperative basis with the host country, from actual tagging to report preparation.

4. DEVELOPMENT OF A COOPERATIVE RESEARCH PLAN LEADING TO STOCK ASSESSMENT

4.1 Possible stock assessment approaches and data requirements

88. In reviewing WP.1, the Principal Fisheries Scientist initiated a discussion regarding possible management approaches and data requirements for yellowfin tuna stock assessment in the western Pacific. Three basic fisheries assessment questions and associated methodological approaches were outlined;

- (a) What is the current stock size of the stock, and how has it changed over time in response to fishing?
- (b) What is the exploitation potential of the stock?
- (c) What will be the effects on the stock and its component fisheries of a particular fishing development or harvesting strategy?

89. Largely because of the constraints with respect to existing data, a combination of assessment approaches will probably be required. In the short term, the development of statistical models of CPUE, such as the General Linear Modelling (GLM) approach, could provide useful information on the current status of the stock additional to that provided by raw CPUE data. In the medium term (within two years), data from the SPC's RTTP will be available to undertake assessments of current status and exploitation potential based on tagging data. In the longer term (within five years), more detailed assessments will be required, and those based on age-or size-structured models appear most suitable.

90. Discussion of the topic then centred on the more immediate aspects of the problem, i.e. what are the management questions that need to be addressed now? The basic information that needs to be identified is as follows:-

- (1) How much yellowfin tuna can be harvested in individual EEZs?
- (2) Can the yellowfin stock(s) be locally managed (or depleted)?
- (3) What will be the impacts of one fishery on another?

91. Various other topics were briefly brought up during discussion. It was deemed inappropriate to unequivocally describe the status of the yellowfin tuna stock as 'healthy', particularly given that recent harvests have vastly exceeded the former and apparently sustainable range of 200,000 to 220,000 mt.

92. The Group felt that both regional and local views of yellowfin stocks were important. On the one hand, an island nation would like to know how much yellowfin it can harvest in its EEZ. On the other hand, yellowfin tuna are highly mobile and thus a regional approach is biologically appropriate to overall management of the resource.

93. Because yellowfin are generally taken in multi-species fisheries, it is somewhat inappropriate to view yellowfin in isolation. However, for the present this is desirable. That skipjack stocks are believed to be in better condition poses some complications for purse seine fisheries. A growing trend to target on yellowfin, rather than catch it as a secondary species, was also noted in some purse seine fleets.

94. While it was recognised that data needs must be prioritised, it was felt that key data elements would be gathered simultaneously rather than in a sequential fashion.

4.2 Compilation of a database for stock assessment purposes

95. Having agreed on the three major stock assessment issues, as follows:-

- Total potential yields
- Fishery interaction
- Local depletion

the Meeting was requested to consider what data and research was required for each issue.

Total potential yields

96. Referring to WP.1, Dr Hampton advised that two methods were appropriate to study potential yield, namely production models and age/size-structured models, with several categories of data required. These were:-

- (a) Catch and effort data, stratified by 5° square and by month or quarter.
- (b) Size composition data, spatially stratified.
- (b) Biological data on growth and mortality to support the models.

97. The participants discussed the optimal stratification and the need for finer data. The Chairman indicated the need to determine practical limits to stratification. Techniques were available for condensing data in a statistically sound fashion. Further condensing could be done for a particular modelling exercise.

98. With reference to data requirements for the three areas of interest, it was suggested that historical data could be collected in an agreed stratification by species which could then be made available to all participants for analysis. There should also be a commitment to collect further data and distribute it in an aggregated form. A division of the area 40°N–40°S, 120°E–150°W, the western and central Pacific, into seven areas (Figure 1), was accepted in principle by participants.

99. The Chief Fisheries Scientist, drew the participants' attention to the difficulty of separating juvenile bigeye tuna and yellowfin tuna in purse seine catches, which would impinge on estimates of total catch. The Principal Fisheries Scientist added that at some landing points, notably Pago Pago, sampling data exist to allow estimates of the proportions of these tunas.

100. Tagging and genetic studies were suggested as two means to determine stock structure. Dr Lewis felt that, following the SPAR Working Group definition, there were pragmatic considerations as well as genetic considerations, and there should be a thorough investigation of management needs carried out before lines defining stock boundaries were arbitrarily drawn on a map.

101. The Chairman asked the Representative of CSIRO, what Australian research work would assist the Research Group. In reply, he stated that although approaches had not yet been fully developed, yellowfin tuna had been identified as a species worthy of further research. Interactions would be investigated and on a much smaller scale a movement model is to be developed. Assessment methods would depend on the stock structure work. If all recruits to Australian east coast fisheries were coming from elsewhere, yield per recruit models would be used. If stocks were shown to be separate, then age- or size-structured models would be used. The data required would include catch and effort, size composition and tagging results.

102. The Chairman asked the Representatives of NMFS, ORSTOM and Japan whether they could assist in this regard. Staff movements constrained the assistance of NMFS and ORSTOM while the Representative of Japan replied that yellowfin tuna was not a priority issue at present. Some ad hoc research might be possible. It was suggested that the FAO Expert Consultation may overlap with this work. The Chairman noted that yellowfin tuna work at the Consultation will not take the place of the work of the Research Group, but rather will supplement it.

103. The Representative of WPRFMC said that his organisation had prepared a list of proposed tuna research projects in the central and western Pacific for funding during 1992–96. Log-book information from domestic longliners was available, particularly in Hawaii.

104. The Representative of BRR described the operation of Japanese longliners in Australian waters in the 1980s, where yellowfin tuna was a target species in relation to gear and vessels. There was also a commitment to the development of management measures for the fishery; length and weight conversion factors were available. The Chairman summarised research activities on yellowfin tuna previously described.

105. Re TBAP contributions, morphometric work on the RTTP tagging vessel was mentioned as was a stored collection of otoliths. The latter would be used for ageing, possibly at I-ATTC or CSIRO. The possibility of the otoliths being analysed at a Central Aging Facility in Australia was proposed. It was reported that Australian observers had collected otoliths, length/weight information and morphometric data from yellowfin tuna. At present, the observer coverage was less than five per cent of trips, but this was expected to improve. Fiji requested advice from SPC in regards to morphometric work.

Fishery interaction

106. The Chairman noted that the FAO Expert Consultation will concentrate on fisheries interaction issues. The Principal Fisheries Scientist stated the need for research into fisheries interactions at a small-scale level. The results of the RTTP would assist in describing in-country interactions, initially in the Solomon Islands and later for Kiribati and Fiji.

107. The Chairman asked the meeting to specify if possible where interactions are occurring. It was suggested that a table could be compiled to indicate the location of these interactions. Discussion ensued on this topic.

108. In the Australian fishery, local and regional interaction concerns were described. In the former category, questions were being asked about whether removal of the Japanese longline fleet would lead to increased catches in the commercial fleet. The question of the need to stratify the total number of Japanese vessels was also asked. There is also a concern that commercial fleets affect catches in the recreational fleet. In the latter category there were three questions:

- (i) Does purse seining in the western Pacific affect Australian catches?
- (ii) Given the high frequency of spawning fish in the handline fishery, should it be closed to commercial fishermen?
- (iii) Does intense fishing affect the food chain?

109. Fiji's fisheries sector concern about interaction is as follows:-

- (a) Will purse seining in the western Pacific affect the profitability of local fishing operations?
- (b) Will the taking of by-catch by domestic longliners affect the game fishing industry?
- (c) Should there be longline exclusion areas to protect recreational fisheries?
- (d) Should there be increased lobbying to reduce purse seining regionally?

110. WPRFMC reported perceived catch competition in Guam between domestic longliners with protected species and longliners with small troll vessels. There are currently moves to ban purse seiners and longliners. Foreign longliners are not licensed to fish the Guam and Northern Marianas EEZs, and four were arrested last year.

111. The Chairman asked for further data requirements for studying interactions.

Local depletion

112. Local depletion and availability is an issue mainly in intensive domestic fisheries, such as the Solomon Islands. Usually, data are available locally where depletion is an issue.

113. Dr Sainsbury (CSIRO) suggested that local depletion was part of the fishery interaction problem, and that it was an important aspect of trying to understand movement problems. The connection between them was worth pursuing.

114. The Chairman called for the data requirements for studying local depletion and availability. It was stated that CPUE and size composition would be critical for spatial distribution. Dr Sakagawa reminded the meeting that environmental concerns often overlapped these situations.

115. Difficulties in studying local depletion and interactions close to shore were mentioned by the SPC consultant, Mr Albert Caton. In an artisanal/recreational fishery there were typically difficulties with obtaining statistics, due to the wide range of landing points.

5. PLANNING FOR 1992 YELLOWFIN WORKSHOP

116. The Chairman drew attention to the limited progress made and the vast amount of work still to be done, while recognising the useful nature of the small amount that had been done. He stated that the Group should meet again to assist in reducing the uncertainty about the status of the stock.

117. It was suggested by Dr Lewis that a full-scale workshop on yellowfin tuna recommended for mid-1992 by SCTB 3 would be a little premature. A number of reasons were put forward by participants pointing to the need for a workshop next year but not on a large scale. The Chairman noted that the dynamic nature of the situation required regular updates to be made.

118. Data collection should continue towards the elucidation of stock structure, while at the same time attempts should be made to see how research might fit into evolving management structures. Information relevant to stock assessment is now known to exist and more information would be available from the RTTP next year. Also, Australia will have more data next year. There was scope for improving the present position even if a full-scale workshop was not held in 1992.

119. A smaller liaison group was suggested as a means of maintaining communication between the main groups of researchers, including TBAP, in conjunction with PINs, Australia, Japan, NMFS, Indonesia and the Philippines. Suggestions were made by a number of participants as to how membership of the working group could be widened by reducing the close linkage to SPC. The notion of relating the chairmanship of the Group was suggested as a way of doing this.

120. Dr Lewis suggested the possibility of attaching the research group meeting to a WPFCC meeting planned for next year. Advantages, such as a common membership, cost saving and separation from SCTB, were mentioned. The current WPFCC Chairman supported this suggestion in principle but could not speak for the WPFCC Secretariat.

121. The Chairman summarised discussion by noting that there would be a research group meeting (or workshop in some form) in one year's time; it would be of at least one day's duration in conjunction with a meeting of either SCTB or WPFCC. There would be a break between the meetings, preferably over a weekend. The suggestion to rotate the Secretariat amongst major research agencies led Dr Lewis to ask whether NMFS could follow up its previous offer to host a research group meeting in Honolulu. Dr Sakagawa replied that this was possible.

122. Dr Sakagawa suggested that a Chairperson for the group be elected immediately. That person would then prepare an agenda, plan the meeting format, and distribute it with invitations. It was further suggested that team leaders be appointed to prepare reviews for each subject area as follows:

Potential yield	-	NMFS (CPUE);	TBAP (Size composition);	JAPAN (Biology).
Fishery interactions	-	TBAP, with FAO.		
Local depletion	-	AUSTRALIA.		

123. This suggestion received the unanimous support of the meeting. Dr Sakagawa was nominated as Chairman for the next WPYRG meeting and duly elected.

6. OTHER BUSINESS

124. The Fisheries Statistician suggested that an Action Item be adopted in relation to a call to compile catch estimates for the WPYRG meeting. It was agreed that it should be kept separate from the SCTB call for data.

Action Item 1: *That countries or organisations compile yellowfin catch estimates prior to the second WPYRG Group meeting, and that countries/organisations as listed collaborate to produce summaries of the topics listed.*

125. The Chairman listed the topics of Action Item 1 and countries/organisations responsible for summaries, as follows:-

- | | |
|--|---|
| (a) Review of stock structure | - TBAP, CSIRO (Australia) |
| (b) Length/weight, sexual maturity, size composition by gear type and area | - AUSTRALIA, NEW ZEALAND, TBAP, FSM, INDONESIA, JAPAN, PHILIPPINES, NMFS. |
| (c) Tables of catch/effort | - TBAP |
| (d) Updates of tagging programme analyses | - TBAP, CSIRO |
| (e) Updates on fisheries developments | - ALL PARTICIPANTS. |

126. Countries and organisations would be requested to compile yellowfin catch estimates for the seven areas in Figure 1.

7. ADMINISTRATIVE MATTERS

127. Meeting notes were to be compiled by the Secretariat for distribution to participants for later comment.

128. The Chairman thanked the participants, rapporteurs and the Vanuatu Department of Fisheries for hosting the meeting.

129. Dr Tim Adams, thanked the Chairman on behalf of the participants.

130. The meeting closed at 6.00 pm.

IV. LIST OF PAPERS PRESENTED AT THE MEETING

WORKING PAPERS

1. Possible approaches and data requirements for yellowfin tuna stock assessment in the western Pacific. *Tuna and Billfish Assessment Programme*, South Pacific Commission.
2. Yellowfin tuna fisheries of the northeastern Australian Fishing Zone. *Peter Ward*, Bureau of Rural Resources, Australia.
3. Quelques données sur la pêche de l'albacore (Yellowfin tuna, *Thunnus albacares*) en Polynésie Française. *Stephen Yen*, EVAAM, Papeete, Tahiti.
4. A guide to biological and fisheries research on yellowfin tuna in eastern Australia. *Peter Ward*, Bureau of Rural Resources, Australia.
5. Summary of US yellowfin tuna fisheries and research in the central western Pacific for 1989 and 1990. *Gary Sakagawa*, National Marine Fisheries Service, NOAA, USA.
6. Preliminary analysis of yellowfin tagging data and related information collected by the Skipjack Survey and Assessment Programme. *David Itano and Peter Williams*, Tuna and Billfish Assessment Programme, South Pacific Commission.
7. Caractéristiques des captures d'albacore (*Thunnus albacares*) réalisées par les palangriers Calédoniens (période 1987–1989). *Régis Etaix-Bonnin*, Service de la Marine marchande et des pêches maritimes, Noumea, New Caledonia.

BACKGROUND PAPERS

1. Status of tuna fisheries in the SPC area during 1990, with annual catches since 1952 (SCTB4/WP3). *Tuna and Billfish Assessment Programme*, South Pacific Commission.
2. Status of world yellowfin tuna fisheries and stocks. *Ziro Suzuki*, National Research Institute of Far Seas Fisheries, Japan.
3. Directors' report to the 42nd Tuna Conference on tuna and tuna-related activities of the Southwest Fisheries Science Center for the period May 1, 1990 to April 1991. *National Marine Fisheries Service*, NOAA, U.S.A.

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Action Item for 1991–1992

Action Item 1: *That countries or organisations compile yellowfin catch estimates prior to the second WPYRG meeting, and that countries/organisations as listed collaborate to produce summaries of the topics listed.*

Table 1. Historical catches (mt) of yellowfin in the western Pacific by gear and in total

YEAR	LL	PL	PS	TOTAL	SE ASIA	TOTAL
1960	0	0	0	0	0	0
1961	0	0	0	0	0	0
1962	53,327	0	0	53,327	0	53,327
1963	49,715	0	0	49,715	0	49,715
1964	41,270	141	0	41,411	0	41,411
1965	43,563	173	0	43,736	0	43,736
1966	49,966	71	0	50,037	0	50,037
1967	28,168	52	0	28,220	0	28,220
1968	38,401	17	0	38,418	0	38,418
1969	37,598	133	0	37,731	0	37,731
1970	33,253	75	0	33,328	0	33,328
1971	40,677	263	0	40,940	0	40,940
1972	48,649	2,796	0	51,445	0	51,445
1973	49,494	2,688	412	52,594	0	52,594
1974	49,087	3,180	728	52,995	0	52,995
1975	28,937	4,177	1,664	34,778	0	34,778
1976	36,310	11,944	3,504	51,758	0	51,758
1977	52,657	9,759	5,189	67,605	0	67,605
1978	72,573	5,885	7,854	86,312	0	86,312
1979	57,673	5,440	11,271	74,384	67,123	141,507
1980	81,384	11,048	12,015	104,447	68,921	173,368
1981	50,735	10,204	45,320	106,259	81,415	187,674
1982	39,313	3,286	66,840	109,439	80,002	189,441
1983	46,162	2,499	86,990	135,651	88,124	223,775
1984	34,706	3,074	87,920	125,700	89,621	215,321
1985	38,761	5,808	80,625	125,194	98,423	223,617
1986	32,939	3,428	99,752	136,119	97,018	233,137
1987	40,414	3,531	148,101	192,046	87,516	279,562
1988	36,066	4,662	93,968	134,696	94,551	229,247
1989	36,480	4,050	156,494	197,024	120,141	317,165
1990	38,057	3,967	176,703	218,727	120,141	338,868

key: LL Longline
 PL Pole and Line
 PS Purse Seine

Table 2. Catches (mt) of yellowfin in the western Pacific by longline and fishing nation

YEAR	AU	JP	KR	NC	SB	TW	OTHER	TOTAL
1960	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0
1962	0	53,327	0	0	0	0	0	53,327
1963	0	49,715	0	0	0	0	0	49,715
1964	0	41,270	0	0	0	0	0	41,270
1965	0	41,563	2,000	0	0	0	0	43,563
1966	0	46,966	3,000	0	0	0	0	49,966
1967	0	24,209	1,900	0	0	2,059	0	28,168
1968	0	28,051	5,300	0	0	5,050	0	38,401
1969	0	29,340	3,500	0	0	4,758	0	37,598
1970	0	28,256	2,000	0	0	2,997	0	33,253
1971	0	26,439	5,300	0	0	8,938	0	40,677
1972	0	27,091	11,800	0	0	9,758	0	48,649
1973	0	28,809	12,000	0	91	8,594	0	49,494
1974	0	28,868	15,104	0	0	5,115	0	49,087
1975	0	25,127	725	0	0	3,085	0	28,937
1976	0	29,165	3,600	0	146	3,399	0	36,310
1977	0	40,425	9,230	0	198	2,804	0	52,657
1978	0	58,240	10,497	0	207	3,629	0	72,573
1979	0	46,932	7,223	0	493	3,025	0	57,673
1980	0	60,583	15,109	0	564	5,128	0	81,384
1981	0	49,003	0	0	146	1,586	0	50,735
1982	0	38,162	0	0	306	764	81	39,313
1983	0	40,193	4,953	7	443	518	48	46,162
1984	0	28,433	5,405	25	213	575	55	34,706
1985	0	30,766	7,074	119	151	607	44	38,761
1986	7	24,872	7,363	151	0	513	33	32,939
1987	229	35,388	0	448	0	4,317	32	40,414
1988	224	30,444	0	436	0	4,936	26	36,066
1989	484	31,295	0	248	0	4,426	27	36,480
1990	236	32,612	0	248	0	4,925	36	38,057

Key: AU Australia
 JP Japan
 KR Korea
 NC New Caledonia
 SB Solomon Islands

Table 3. Catches (mt) of yellowfin in the western Pacific by pole-and-line and fishing nation

YEAR	FJ	JP	SB	OTHER	TOTAL
1960	0	0	0	0	0
1961	0	0	0	0	0
1962	0	0	0	0	0
1963	0	0	0	0	0
1964	0	0	0	141	141
1965	0	0	0	173	173
1966	0	0	0	71	71
1967	0	0	0	52	52
1968	0	0	0	17	17
1969	0	0	0	133	133
1970	0	0	0	75	75
1971	0	0	141	122	236
1972	0	1,158	237	1,401	2,796
1973	0	1,536	195	957	2,688
1974	0	1,293	310	1,577	3,180
1975	0	1,920	215	2,042	4,177
1976	84	2,410	474	8,976	110944
1977	151	4,816	363	4,429	9,759
1978	409	1,534	524	3,418	5,885
1979	403	1,441	714	2,882	5,440
1980	233	6,143	658	4,014	11,048
1981	599	2,706	211	6,688	10,204
1982	814	1,531	227	714	3,286
1983	562	1,030	578	329	2,499
1984	580	1,275	338	881	3,074
1985	724	3,229	338	1,517	5,808
1986	823	1,827	565	213	3,428
1987	411	1,500	1,456	164	3,531
1988	527	1,500	2,251	384	4,662
1989	507	1,500	1,475	568	4,050
1990	516	1,000	2,309	142	3,967

Key: FJ Fiji
 JP Japan
 SB Solomon Islands

Table 4. Catches (mt) of yellowfin in the western Pacific by purse seine and fishing nation

YEAR	JP	KR	PH	SB	TW	US	OTHER	TOTAL
1970	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0
1973	412	0	0	0	0	0	0	412
1974	728	0	0	0	0	0	0	728
1975	1,664	0	0	0	0	0	0	1,664
1976	3,304	0	0	0	0	200	0	3,504
1977	4,989	0	0	0	0	200	0	5,189
1978	7,654	0	0	0	0	200	0	7,854
1979	10,671	0	0	0	0	600	0	11,271
1980	10,446	0	0	449	0	1,100	0	12,015
1981	25,193	0	0	1,342	0	18,785	0	45,320
1982	31,107	2,711	0	1,444	0	31,578	0	66,840
1983	28,360	4,101	0	2,530	2,160	49,600	239	86,990
1984	31,308	3,870	0	2,397	3,840	45,100	1,405	87,920
1985	37,885	1,684	3,331	2,882	4,480	29,000	1,363	80,625
1986	40,597	11,489	1,630	2,258	5,600	36,600	1,578	99,752
1987	42,663	21,933	3,867	3,837	7,280	66,400	2,121	148,101
1988	27,749	18,846	6,829	4,244	9,120	25,200	1,980	93,968
1989	35,690	39,680	11,636	4,152	16,000	46,793	2,543	156,494
1990	43,575	39,520	8,026	3,662	23,040	56,670	2,210	176,703

KEY: JP Japan
 KR Korea
 PH Philippines
 SB Solomon Islands
 TW Taiwan
 US United States

Table 5. Sources of catch/effort data by country and gear

VESSEL NATIONALITY	GEAR TYPE	TIME PERIOD	STATUS
AUSTRALIA	LONGLINE	1985-1990	✓
FIJI	POLE-AND-LINE	1976-1990	✓
FIJI	LONGLINE	1988-1990	▪
INDONESIA	GILLNET	1981-1990	▪
INDONESIA	HANDLINE	1987-1990	▪
INDONESIA	LONGLINE	1972-1990	▪
INDONESIA	POLE-AND-LINE	1967-1990	▪
INDONESIA	PURSE SEINE	1986-1990	▪
JAPAN	LONGLINE	1952-1961	▪
JAPAN	LONGLINE	1962-1980	✓
JAPAN	LONGLINE	1981-1990	▪
JAPAN	POLE-AND-LINE	1952-1968	▪
JAPAN	POLE-AND-LINE	1969-1980	✓
JAPAN	POLE-AND-LINE	1981-1990	▪
JAPAN	PURSE SEINE	1967-1990	▪
KIRIBATI	POLE-AND-LINE	1986-1990	✓
KOREA	LONGLINE	1954-1974	▪
KOREA	LONGLINE	1975-1980	✓
KOREA	LONGLINE	1981-1982	▪
KOREA	LONGLINE	1983-1985	✓
KOREA	LONGLINE	1986-1990	▪
KOREA	PURSE SEINE	1980-1990	▪
NEW CALEDONIA	LONGLINE	1983-1990	✓
NEW CALEDONIA	POLE-AND-LINE	1981-1983	✓
PAPUA NEW GUINEA	POLE-AND-LINE	1970-1981	✓
PHILIPPINES	VARIOUS	1965-1990	▪
PHILIPPINES	PURSE SEINE	1982-1990	▪
SOLOMON ISLANDS	LONGLINE	1981-1985	✓
SOLOMON ISLANDS	POLE-AND-LINE	1981-1990	✓
SOLOMON ISLANDS	PURSE SEINE	1985-1990	✓
TAIWAN	LONGLINE	1954-1966	▪
TAIWAN	LONGLINE	1967-1985	✓
TAIWAN	LONGLINE	1986-1989	✓
TAIWAN	LONGLINE	1990	▪
TAIWAN	PURSE SEINE	1983-1990	▪
TONGA	LONGLINE	1982-1990	✓
TUVALU	POLE-AND-LINE	1982-1990	▪
UNITED STATES	PURSE SEINE	1974-1977	✓
UNITED STATES	PURSE SEINE	1978-1980	▪
UNITED STATES	PURSE SEINE	1981-1984	✓
UNITED STATES	PURSE SEINE	1985-1987	▪
UNITED STATES	PURSE SEINE	1988-1990	✓
USSR	PURSE SEINE	1985-1990	▪

Table 6. Sources of size frequency data by country and gear

COUNTRY	VESSEL NATIONALITY	GEAR TYPE	TIME PERIOD	STATUS
AUSTRALIA	JAPAN	L	1987-1989	✓
FIJI	TAIWAN	L	1990	✓
FIJI	TONGA	L	1990	✓
JAPAN	JAPAN	L	1952-1985	▪
JAPAN	JAPAN	L	1986-1988	✓
JAPAN	JAPAN	L	1989-1990	▪
NEW CALEDONIA	NEW CALEDONIA	L	1983-1989	▪
SPC	NEW CALEDONIA	L	1990	✓
UNITED STATES	JAPAN	L	1962-1972, 1987	✓
UNITED STATES	KOREA	L	1962-1989	✓
UNITED STATES	KOREA	L	1990	▪
UNITED STATES	TAIWAN	L	1964-1989	✓
UNITED STATES	TAIWAN	L	1990	▪

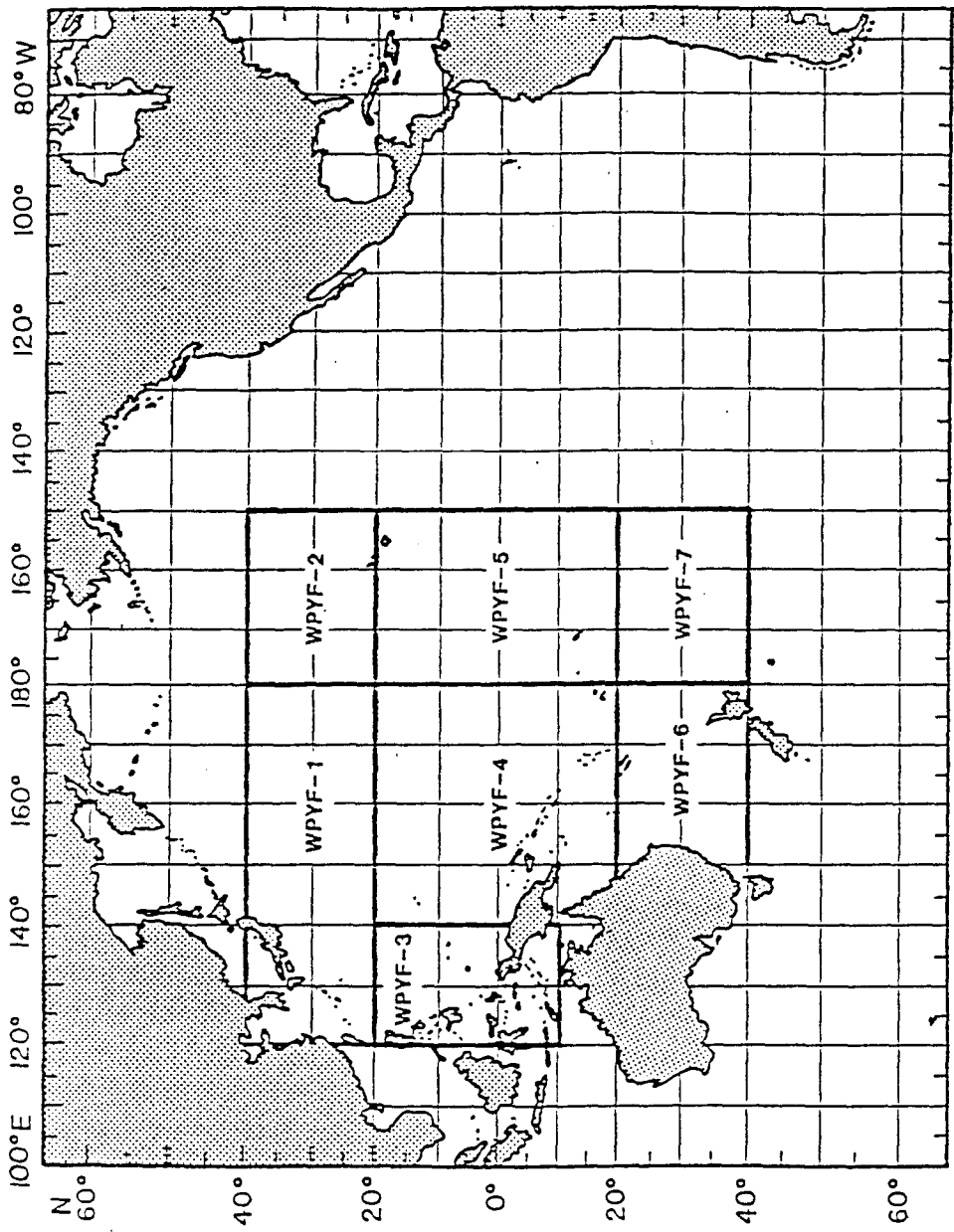


Figure 1. Statistical areas used by the Western Pacific Yellowfin Tuna Research Group for assembling yellowfin tuna fishery statistics