

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

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

REVIEW OF PROGRESS, PROBLEMS, AND OPPORTUNITIES WITHIN THE
TUNA AND BILLFISH ASSESSMENT PROGRAMME

(Paper prepared by the Secretariat)

A number of changes have occurred in the Tuna Programme during the previous year. Nearly half of the staff have been replaced, and new staff are contributing new ideas and approaches to the work of the Programme. Since the completion of most of the backlog of reporting from the Skipjack Programme, attention has been concentrated on other fields. This has mainly been directed to the approved priorities of the Programme, and there has also been activity in areas derived from these priorities. This past year has been a fruitful time for reflection on the the Programme and its priorities. As a result several areas have become prominent as warranting close attention, and some problems have been noted.

A. PROGRESS ON PRIORITIES

1. Collection and evaluation of catch and effort data.

Work on this item has been the major activity of the Tuna Programme and it currently occupies roughly half of staff resources. The collection of catch and effort data is proceeding well and, at present, this data base contains approximately 300,000 daily catch records plus a large amount of data supplied in summarized form. The daily catch reports consist of information forwarded by 11 countries from the South Pacific Commission region. Data holdings are tabulated by country forwarding data in the table below. These data include catches by national fleets of the region, as well as the distant-water fishing fleets of Japan, Korea, Taiwan and United States of America. In terms of computer usage, current holdings total over 35 megabytes (Mb) and are growing at a rate of about 7 Mb per year.

TABLE 1

| | |
|--------------------------------|----------------|
| American Samoa | 0(1) |
| Australia | 5 942(2) |
| Cook Islands | 0 |
| Federated States of Micronesia | 101 096 |
| Fiji | 4 792 |
| French Polynesia | (3) |
| Guam | 0 |
| Kiribati | 30 729 |
| Marshall Islands | 0 |
| Nauru | 0 |
| New Caledonia | 2 305(4) |
| New Zealand | (5) |
| Niue | 0 |
| Northern Marianas | 0 |
| Palau | 8 752 |
| Papua New Guinea | 76 227 |
| Solomon Islands | 19 189 |
| Tokelau | 0 |
| Tonga | 407 |
| Tuvalu | 1 370 |
| United States of America | 10 916(6) |
| Vanuatu | 6 299 |
| Wallis and Futuna | 0 |
| Western Samoa | 0 |
| TOTAL | 268 024 |

-
- (1) Data from longline vessels unloading in Pago Pago, summarised by FAO statistical area, are supplied by the United States Government.
- (2) Data for the Australian Fishing Zone are supplied as monthly summaries of one degree squares by the Government of Australia.
- (3) The Government of French Polynesia supplies summaries of Avis Pêche reports and catches of the "bonitier" fleet operating out of Papeete.
- (4) Summaries of Avis Pêche reports are supplied for the New Caledonia Exclusive Economic Zone (EEZ).
- (5) Data for the New Zealand EEZ are supplied as 10 day summaries of one degree squares by the Government of New Zealand.
- (6) Data for United States flag vessels are supplied by the American Tunaboat Association as daily catch records since 1984.

The Tuna Programme is also beginning to look into the acquisition of other kinds of fisheries data, such as information on the size distribution of catches. Work in this area is deliberately slow because of uncertainty about the applicability of this information to fisheries for tropical tuna, and uncertainty about the most useful method and form in which to collect and store the data. An extensive set of length-frequency data from the purse seine and pole-and-line fleets of Solomon Islands will be used for initial evaluation of size distribution data.

Evaluation of the data is a continuous process which depends primarily on feedback from users. The principal avenue for evaluation of the data is through fisheries officers in the region who routinely receive quarterly data summaries. There have also been requests from member countries for more detailed analyses of the condition of fisheries within their EEZs. Equally important, the data base has grown to such a size that SPC staff have begun to use it productively to analyse fisheries problems on a sub-regional basis. The first extensive use of data in this way is the current comprehensive evaluation of the western Pacific yellowfin tuna fishery. The problems to be addressed in this study are the status of the stocks and the possible interaction between surface and longline fisheries. A report on this work appears as a working paper (SPC/Fisheries 17/WP.5) to this meeting.

Several problems have occurred in the statistical system. Problems of long standing continue, the most troublesome of which is that of data gaps. No current data have been received for the high seas areas except small amounts supplied by Taiwan, and by the American Tunaboat Association since 1984. No data have been received on the full scale commercial operations of United States flag vessels for the critical years 1982 and 1983. The consequences of these data gaps are that the usual methods for tuna stock assessment (production models) are invalid, and that inferences on interaction can only be tentative in the absence of complete data.

There is also the problem of inconsistency in catch report forms; more than 25 different types of forms have been forwarded to the SPC for processing. Each time a new form is introduced into the system, opportunities for errors are also introduced, errors which may propagate throughout the entire statistical system. Not only is this procedure costly in terms of potential errors, but it is costly of staff time in dealing with the new forms and checking to ensure that errors have not been made. The catch forms currently in use are largely satisfactory, although some room for improvement has been noted, and their use is strongly encouraged. Suggestions for minor modifications to the standard SPC forms will be presented at a future technical meeting.

Some problems of technical origin have also been noted. There have been inconsistencies in the manner in which missing data, in particular unreported weights, have been accommodated. These inconsistencies have produced a few large errors in some calculations. To date, these errors do not seem to have caused any serious problems and have been corrected as they have been noticed. In most cases the source of the problem can be traced to either non-standard catch report forms or to errors in filling out the standard form. Uniform application of the standard SPC catch form will minimize the future occurrence of some errors of this type.

There have also been problems that could be best described as "growing pains". The extent of the SPC data holdings has grown at such a rate that the volume and complexity of the data create special problems. A great deal of work has gone into developing the processes of data acquisition and verification, but much less work has gone into developing the processes of data storage, retrieval, and utilization. The major activities of two new staff members, who joined the SPC early this year, will be to redesign methods for storing and utilizing fisheries statistics. The result will be that routine data summaries will be more accurate and more timely and that special requests will be handled more easily.

The Tuna Programme has received some requests for assistance with artisanal and subsistence fisheries statistics which encompass fisheries for all species. In addition to this not being mentioned in the current priorities of the Tuna Programme, staff have little expertise in this sort of work. It does, however, represent an opportunity to obtain some information about artisanal fisheries for tuna. The Fisheries Statistician made a preliminary trip to Tuvalu where a system for monitoring fishing effort and catches was implemented. A follow-up visit will commence soon.

2. Assessment of interaction between fisheries.

Three categories of fisheries interaction have been identified as warranting attention: effects of commercial tuna fishing on artisanal fishing; effects of fishing in one area or country on fishing in another; and effects of one gear type on another gear type operating in the same general area. The Tuna Programme has encountered obstacles to the definitive analysis of these problems: (i) the general theory for the analyses of fisheries interactions is not well developed in fisheries science; (ii) until recently staff have been preoccupied with other matters, namely the collection and evaluation of catch and effort data; (iii) the data required to address these questions have not been collected.

Work on interaction has therefore been confined to activities that can be conducted in the offices of SPC headquarters and some successes have been achieved. Data from the Skipjack Programme tagging data base is being re-analysed from the standpoint of fisheries interaction and school integrity, and as a result some new notions about skipjack schooling, movement, and migration have been developed. The regional catch and effort data has been applied to the analysis of interaction between surface and longline fisheries. The Tuna Programme staff have made progress in theoretical analysis of fisheries interactions which have been useful in identifying the components necessary for practical understanding of the problem.

The question of the effects of commercial fishing on artisanal fishing is the aspect of fisheries interaction which has received the least attention. The reason is that artisanal fishermen do not keep the kinds of records which might provide the data required for analysis of the problem. Data has recently been received from Tuvalu which may provide some indication of variability to be expected in artisanal fisheries. Theoretical results indicate that commercial fishing could have severe impacts on artisanal fisherman and also that these effects could be very difficult to measure scientifically. It also appears that some knowledge of how tuna populations segregate themselves into schools may be a very important component to analysis of fisheries interaction in general and is critical to understanding interaction with artisanal fisheries.

Theoretical progress has also been made on the problem of interaction between fisheries in adjacent countries. Application of this theory to the tagging data from the Skipjack Programme confirms previous conclusions that, at the time tagging was done, catches in one country had very little effect on catches in neighbouring countries (Tuna and Billfish Assessment Programme Technical Report Nos.12 and 13).

The Programme has had most success in analysing the effects of two gear types operating on the same fishing ground. Theoretical calculations, based on conditions in other areas, indicate that the purse seine fleet which harvests younger yellowfin could have a very great impact on the longline fleet which harvests the same fish one or two years older. Considering the difference in landed value between purse seine caught (canning) and longline caught (sashimi) tuna, this interaction could have tangible economic implications. Analysis of the catch and effort data on hand indicates that the interaction between purse seine and longline fisheries is much less severe than expected. Details of these analyses can be found in SPC/Fisheries 17/WP.5.

Most of this work, however, remains mainly an exercise in theory, and data gathered specifically for the purpose of fishery interaction are required. The required data include, for both yellowfin and skipjack tuna, detailed information on movement, estimates of growth and production, complete information on catches and fishing effort, and perhaps information on the size composition of catches. In this respect, the Tuna Programme seeks the assistance of fisheries officers of the region to identify areas where intense commercial fishing occurs in the same area as an active artisanal tuna fishery from which detailed fishing records could be obtained. To permit a more rigorous analysis of fisheries interaction, a proposal for tagging both yellowfin and skipjack tuna in the western Pacific has been prepared and the SPC is optimistic that funding can be found for this proposal. A copy of the tagging proposal appears as a working paper (SPC/Fisheries 17/WP.6) to this meeting.

3. Assessment and monitoring of the levels of exploitation of the stocks of commercially important billfish species.

Catch rates of blue marlin by longliners have been steadily declining for several years and the question is often asked whether purse seine activities contribute to this decline. This problem is one on which SPC observers on purse seine vessels have produced some interesting results. The figures below indicate the number of blue marlin counted by SPC observers in "log" sets in both Papua New Guinea and Federated States of Micronesia over the past three years.

| Vessel Type | Year | Log Sets | Blue Marlin |
|-----------------------|------|----------|-------------|
| Japanese Single Seine | 1982 | 23 | 17 |
| Japanese Group Seine | 1983 | 5 | 4 |
| Japanese Group Seine | 1984 | 6 | 6* |
| American Purse Seine | 1984 | 7 | 10 |
| Total | | 41 | 37 |

Although the data are not extensive, the conclusion is clear. Every tuna school found in association with a log in the western Pacific purse seine area contains on the average one (0.90) blue marlin. The extent to which purse seine induced mortality effects longline catches depends on whether the log-associated fish exchange with the stocks normally vulnerable to longline fishing.

* May include other billfish

4. Descriptions of the habitats of major species.

This work involves the synthesis of oceanographic data gathered by other institutions with the fisheries data held by the SPC. The impact of the environment on the exploitation of a migrating pelagic resource, such as tuna, expresses itself by modifying both distribution of the resource on one hand, and by changing the catchability of the fishing gears on the other. Furthermore, its influence may be either seasonal or interannual; in the western intertropical Pacific, the latter seems to be the most significant. One of the aims of work under this priority is to define the habitat of commercially important tuna and billfish species in such a way that potential fishing success may be predicted. These predictions may be either of new fishing grounds or of annual variation in well known fishing grounds.

Some previous analyses done by ORSTOM, relating oceanographic data gathered by ships of opportunity to the long range Japanese pole-and-line catch statistics, showed the major role played by the equatorial upwelling on the skipjack catch distribution. Japanese scientists have also pointed out the influence of general circulation (currents and counter-currents) on the skipjack catches in size and numbers. On a global scale, these oceanographic phenomena create convergence-divergence systems which, by increasing nutrients in the surface layer of the ocean and subsequent stimulation of the food chain, determine tuna distribution and catchability. The spatial pattern and intensity of this system depends basically on the large scale climatic event called El Niño-Southern Oscillation (ENSO). The best indicator of the system's status has been shown to be the 35 ‰ salinity line; at the present time, surface salinity maps in the western Pacific are available on a biannual (1956-1973), quarterly (1974) or monthly (since 1975) basis.

Initial work on this priority item will focus on the area delimited by 15°S-15°N and 130-180°E. This area was chosen because of good oceanographic coverage and fair fisheries coverage (Japanese pole-and-line, purse-seine and longline data within EEZs). Later, if the statistical information allows, this study may be expanded to the area 20°S-5°N and 170°E-170°W. A first step will be to confirm and update previous results (particularly to check the validity of using CPUE instead of catches); a second step will consist of a finer analysis of the 1979-1984 period of the fishery/environment relationship, as well as the 1982-1983 ENSO impact on the distribution and abundance of the resource. Obstacles to the success of this work are the lack of complete data and the absence of data from US flag vessels for the very important period spanning the strong ENSO event of 1982-1983.

5. Studies on the biology and ecology of the most important baitfish species used for catching tunas.

Work on this subject has consisted of responding to requests from countries for assistance with surveys of baitfish and in training staff in methods of baitfish collection. This year the SPC has conducted, or assisted with baitfish surveys in Tuvalu, Tokelau, and Kiribati, and planning is in progress for further work. A report describing some of this work is in press (Tuna and Billfish Assessment Programme Technical Report No.14).

6. Monitoring of the use of anchored rafts and/or other fish attractants as fish aggregation devices.

The SPC assisted in a pilot project to test the feasibility of tagging tuna from small vessels in conjunction with a study of tuna associated with fish aggregation devices (FADs) in French Polynesia. Also, the SPC is beginning to receive data from countries on the rate of exploitation of fish stocks around FADs by national fleets. Analysis of these data should prove useful in developing procedures for optimizing production from FAD-based fisheries. The Tuna Programme has recognised that there are several important questions that need to be addressed in the operation of successful commercial fisheries in association with FADs, and has prepared a draft research proposal to address these questions which appears as a working paper (SPC/Fisheries 17/WP.7) to be discussed under a separate agenda item.

B. ACTIVITIES IN OTHER AREAS

The Tuna Programme has become involved, through requests from countries, in a number of activities in areas related to the priority items, such as on-board fisheries observers, training, and assistance with local fisheries statistics. Requests have been received for assistance in training observers who make trips on foreign vessels, and for SPC observers to make trips on local vessels. Tuna Programme staff have made trips on Japanese (both single and group), American, and New Zealand purse seiners operating in the waters of Papua New Guinea, Federated States of Micronesia and Fiji and on the Tongan longliner MV Lofa. Tuna Programme staff expect that with increased experience, as a result of observer programmes, they will be able to offer suggestions which may contribute to increased catches by vessels of national fleets of countries within the SPC area. The information gathered by the observers has also been useful in the evaluation of catch and effort data under priority No.1. Reports on most of these trips are in preparation and will be published as SPC Tuna Programme Technical Reports.

Several activities have developed as a result of purse seine observer trips. The proposal to study mechanisms of FAD management was developed in part as a result of questions noted by an SPC observer. A set of slides, with commentary on each one, on the operations of large scale purse seining has been prepared. This unit is intended for use by people seeking employment on these vessels, but would also be of value to observer trainees. Also in the realm of training, the SPC could conduct, if sufficient interest is expressed by authorities, a workshop for training observers.

The SPC conducted a training course in fisheries statistics funded by the Asian Development Bank (ADB) and the United Nations Development Programme (UNDP) in September 1984. The course was very well received by the participants and follow up activity, in the form of on-the-job training for small groups, is planned for 1985. In addition, the course manual will be reprinted as a joint SPC/ADB regional publication. One of the more positive results of the course was the increased awareness on the part of the participants of the importance of maintaining accurate fisheries data, not only for industrial fisheries, but for artisanal activities as well. In fact, one participant indicated that, partly as a result of the course, a system of fisheries statistics will be implemented in his home country.

A study of skipjack fecundity was initiated jointly with the United States National Marine Fisheries Service. Dr John Hunter, of the Southwest Fisheries Center in La Jolla, California, kindly agreed to conduct histological examinations of skipjack ovaries, collected by SPC observers in Fiji and Papua New Guinea, in order to determine the frequency of spawning activity. The results indicate that during the active spawning season, mature female skipjack spawn once each day. Since the spawning season may last up to six months in some areas, these results indicate a reproductive capacity for skipjack much higher than previously suspected. The results are discouraging, however, for the prospects of successful cohort analysis of skipjack since "birthdates" would be spread over a long period, and length-frequency distributions would show little coherence (as is observed in data from the Skipjack Programme). Some caution needs to be retained, however, since Dr Hunter's interpretations are based on extrapolation from the processes known to occur in Northern Anchovy off California, and calibration for skipjack needs to be done.

C. PROBLEMS

As mentioned above some problems have been encountered in the statistical programme. These problems, while not yet causing adverse impacts for users, are serious and have been aggravated by lack of sufficient staff. New staff and redirection of existing staff should, in the course of time, eliminate most difficulties and ultimately provide the region with a better organised and more useful tuna fisheries data base.

The Tuna Programme computer was installed in 1979 to service the rather modest data processing requirements of the Skipjack Programme. Since that time, with the addition of the fisheries statistics activities to the work of the Tuna Programme, the computing facilities have become inadequate. Hardware breakdowns have now become frequent, and staff are finding the computer system awkward and difficult to use. Tuna Programme staff are of the view that the equipment and its operating software are obsolete. An independent assessment of the state of the computer system is in progress at the present time.

There are non-technical problems as well. The most important of these is of course the future of the Programme. This problem will be discussed under a separate agenda item.

The success of the the Fisheries Statistics Course indicates that there is a requirement for staff in fisheries offices who are well trained in statistics and fisheries mathematics. The Tuna Programme has received several requests from countries for assistance with implementing data collection systems for local artisanal and subsistence fisheries. Since these requests are not directly related to tuna fisheries the Programme has had some difficulty in providing the necessary help.

A revised set of priorities which more accurately reflects the work of the Programme is presented for discussion in SPC/Fisheries 17/WP.4.

SPC/Fisheries 17/WP.3/Corr.1
3 August 1985

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

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

CORRIGENDUM

REVIEW OF PROGRESS, PROBLEMS, AND OPPORTUNITIES WITHIN THE
TUNA AND BILLFISH ASSESSMENT PROGRAMME

This table is an update of Table 1 on page 2 of SPC/Fisheries 17/WP.3.

TABLE 1

| | |
|--------------------------------|-----------|
| American Samoa | 0(1) |
| Australia | 5 942(2) |
| Cook Islands | 0 |
| Federated States of Micronesia | 103 118 |
| Fiji | 7 325 |
| French Polynesia | (3) |
| Guam | 0 |
| Kiribati | 31 612 |
| Marshall Islands | 36 206 |
| Nauru | 0 |
| New Caledonia | 2 305(4) |
| New Zealand | (5) |
| Niue | 0 |
| Northern Marianas | 0 |
| Palau | 9 177 |
| Papua New Guinea | 76 560 |
| Solomon Islands | 20 730 |
| Tokelau | 0 |
| Tonga | 407 |
| Tuvalu | 1 370 |
| United States of America | 10 916(6) |
| Vanuatu | 6 299 |
| Wallis and Futuna | 0 |
| Western Samoa | 0 |
| TOTAL | 311 967 |