

11 April 1984

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

MEETING OF COASTAL STATES AND DISTANT-WATER FISHING NATIONS
(Noumea, New Caledonia, 18 - 22 June 1984)

REVIEW OF PROGRESS WITH PRIORITY ITEMS WITHIN THE
TUNA AND BILLFISH ASSESSMENT PROGRAMME

(Paper Prepared by the Secretariat)

The Tuna and Billfish Assessment Programme was designed to provide a better understanding of the stocks of tunas and billfish throughout the central and western tropical Pacific and to determine the status of the stocks of the commercially important species. It provides information on the distribution and availability of exploitable concentrations of these species and documents recent changes in yields and harvesting techniques. It also provides assessments of resource levels, thereby providing governments with information on which sound fisheries development and resource management can be based.

This review updates that presented to the Fifteenth Regional Technical Meeting on Fisheries (August 1983) and concentrates on changes since that time.

1. Development of a regional statistical programme.

See Working Paper No.3.

2. Estimation of the degree of interaction between pole-and-line and purse-seine fisheries and assessment of the impact of each on tuna resources, principally of skipjack and yellowfin tuna.

As work on this item has progressed it has become obvious that there are several major problems of interaction between the various tuna fisheries operating in, and adjacent to, the Commission area which are not adequately covered in the original description of this issue (priorities 2 and 10). Most important is the evaluation of interaction between the larger commercial fisheries and the subsistence and/or artisanal activities adjacent to small island communities and interaction between any two or more fisheries of similar type operating in discrete or overlapping areas.

Analyses of the degree of interaction amongst all locally based, joint-venture surface fisheries have been completed. In all cases this interaction has been found to be minimal, largely because these fisheries operate over relatively small areas and are separated from each other by more than one thousand miles (more than ten times the radius of the coverage of the individual fisheries). Programme staff have, however, stressed that the degree of interaction between fisheries is largely a function of the distance between them and where two fisheries are exploiting the same species and size classes in the same general area (such as purse-seiners, pole-and-liners and artisanal craft operating on a common fishing ground) interaction can become extreme. Precise definition of the degree of such interaction is made difficult by the considerable problems of taking due account of variability in vulnerability of tunas to different gear types and in non-uniformity in the distribution of tuna in any region. However, much progress has been made in this area and it may soon be possible to provide estimates of interaction as a function of the distance between fishing units, which could be used as a basis for the optimum deployment of fishing effort. Several manuscripts on this issue have been prepared by Tuna Programme staff.

3. Assessment and monitoring of the levels of exploitation of the stocks of the commercially important billfish species, especially black marlin, blue marlin, striped marlin, sailfish and swordfish.

From the 1950s through the 1970s the great majority of the billfish taken in the Commission area were captured by longline. There has been a decline in total longline fishing effort in the area in the 1980s, suggesting that some improvement could occur in the status of the stocks of billfish within the region. It is not yet possible to determine if the degree of the decrease in longline effort will be sufficient to allow a recovery in the catch rates of all billfish species; the stocks of several species have for some time been considered to be reduced to well below the levels that would sustain maximum catches. Longline catch and effort data will continue to be carefully scrutinised for indications of changes in the resources of all billfish species.

Purse-seiners do take billfish, particularly large blue marlin, and catches of this species by purse-seine have increased with the increase in effort. Unfortunately billfish catches are not often accurately reported from purse-seiners with the result that the billfish catch by this method can only be estimated. Preliminary estimates from Tuna Programme data suggest that the number of blue marlin caught by purse-seine in the Commission area is now approximately half of the number caught by longline. Therefore the total effective effort on this species has, unlike that for other species, almost certainly increased in 1983/84. In view of previous opinion (1977) that the resource levels of blue marlin might be approaching the point where recruitment failure could occur, there is cause for serious concern.

4. Continued analyses of the data generated by the Skipjack Programme and evaluation of the impact of this data on resource assessment.

Estimates of skipjack resources for individual countries based on the regional tagging data set generated by the Skipjack Programme have been completed to the extent possible with the statistics available on distant-water fishing fleets. All of the Programme's final country reports have been completed and sent to governments. They should all be printed and given routine distribution well ahead of the scheduled completion of the first two years of the Tuna Programme. This has allowed some decrease in the priority given to the continued analyses of Skipjack Programme results. There remains however, a need to re-evaluate resource assessments made from this data as new analytical procedures are developed or previously unobtainable effort and catch data become available. Future analyses using Skipjack Programme data will be concentrated on improving the estimates of interaction between fisheries.

The concluding technical reports based on various specific aspects of Skipjack Programme results have now either been published or are in press. These reports include descriptions of the Programme's methods and the results on the estimation of the regional skipjack population size and turnover, evaluation of skipjack population structure and growth and implications of the occurrence of tuna juveniles in the stomachs of skipjack and other predators. They also include estimates of interactions between fisheries for all cases for which there were reasonable numbers of tag recoveries and reasonable effort and catch data.

5. Assessment and monitoring of the levels of exploitation of the stocks of the commercially important tuna species, especially yellowfin tuna, bigeye tuna and albacore.

Work on the assessment of the status of the stocks of large tuna species was initially concentrated on improving the statistical data base and in preliminary analyses of trends in time series of catches. Now that the recovery of tags from yellowfin released during the Skipjack Programme has ceased, it has become feasible to estimate the region's yellowfin tuna resource from this tagging experiment. Data generated from the release of 9,596 tagged yellowfin tuna during the Skipjack Programme and the subsequent recapture data on 257 of these (those for which there were adequate recapture information) were used to estimate the size of the yellowfin tuna resource in the study area.

Yellowfin tuna was the secondary target species during the Skipjack Programme's fieldwork and hence the number of yellowfin tuna released was much less than that of skipjack, the primary species (9,596 yellowfin compared to 140,443 skipjack). Furthermore, survey effort was concentrated on locating skipjack concentrations throughout the study area and yellowfin tuna abundance was only investigated opportunistically. Furthermore, large yellowfin tuna are not vulnerable to the type of pole-and-line gear used by the Skipjack Programme; they could therefore not be tagged. As a result the distribution of those yellowfin tuna that were tagged and released was by no means representative of the distribution of fish even of the size range tagged, and could not in any way be correlated with the occurrence of large size individuals such as are taken in the longline and purse-seine fisheries. Yellowfin tuna tag recovery data generated by the Skipjack Programme should therefore be treated with due caution. However, in the absence of alternative estimates of the total resource the mean estimate of the standing stock of 600,000 tonnes derived from these data is noteworthy. Perhaps more important even than the magnitude of the standing stock is the estimate of turnover rate of 16 per cent per month of the tagged population. In combination these figures give rise to an estimated throughput of 96,000 tonnes per month which exceeds the present catch rate by a considerable margin. These results therefore suggest that the total yellowfin tuna resource in the Commission area is greater than previous estimates of the population vulnerable to longlining. They must however, as already stressed, be regarded with caution. Furthermore, the yellowfin tag release and recovery data do not unfortunately shed much light on the problems of interaction, particularly between fisheries which exploit the larger individuals (i.e. the longline and purse-seine fisheries). Further tagging directed at the specific problem is required.

The previously reported decline in longline catch rates of yellowfin tuna and the possible association of this decline with the increase in purse-seine effort continue to be regarded as priority research items (see item 10).

The need to accurately differentiate between yellowfin and bigeye tuna as declared in the catch reports from all types of vessels is now considered a priority issue and will be given greater emphasis in the work carried out under the extended Tuna Programme.

6. Assessment of the biological information necessary for the study of population dynamics of the dominant species.

The need for accumulation of additional biological data is recognised, but in the absence of a demonstrable relationship between total effort and catch per unit of effort for skipjack and in the absence of a demonstrable stock recruitment relationship for any tuna species in the Commission area, other aspects of the Programme's work have, in the short term, been afforded higher priority. A pilot study on the possibility of determining by histological techniques, the periodicity and frequency of skipjack spawning has been initiated. If warranted and feasible, a large scale sampling programme will be undertaken and the prospect of extending this type of work to yellowfin tuna or other species given careful consideration.

A sampling programme for collection of additional data on species composition and length frequencies of catches from ports of unloading and from observers on fishing vessels operating within the region will be initiated.

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

Baitfish resource assessments for all countries and territories surveyed during the Skipjack Programme have been completed and included as a major component of the final country report series. The evaluation of the comparative effectiveness of each of the major baitfish species has been completed and a final manuscript is in preparation. A handbook on the identification of the baitfish species occurring throughout the Commission area has been published with Programme assistance. Additional baitfish surveys continue to be conducted in response to direct requests from individual governments.

8. Comparison of the biological data on major species with relevant oceanographic and environmental information with a view to obtaining a description of the habitat available to each species, and hopefully predicting abundance in certain areas.

Largely because of the rapid expansion of the purse-seine fishery, the distribution of fishing effort in the western and central Pacific has varied much more than normal in the last few years. There is increasing interest in correlating fishing success with oceanographic characteristics with a view to correlating recent changes with oceanic conditions and hopefully predicting future fishing success. The strong "El Nino" of 1982/83 may well have been a major influence on several of the recent changes in tuna fisheries and its occurrence has highlighted the relevance of oceanography to tuna resource assessment and evaluation.

Accordingly the Tuna Programme is attempting to increase its use of oceanographic data and is investigating the possibility of establishing a detailed co-operative project with ORSTOM scientists in Noumea, and possibly other oceanographic centres in Pacific countries, to more fully integrate oceanographic information into regional tuna and billfish resource assessments.

9. Evaluation of the use of anchored rafts as tuna aggregating devices.

The Commission has had a very successful involvement in the evaluation of alternative techniques and materials for the construction and deployment of fish aggregation devices (FAD) through the efforts of the Inshore Fisheries Programme. There is no doubt that these devices can be very effective for attracting tuna and making them more vulnerable to fishing. Their introduction has had a major impact on total fisheries production in many Commission countries. While this effectiveness is unquestioned, it is difficult to quantify the underlying changes in tuna vulnerability or the effect on tuna abundance. Detailed statistics on artisanal catches in individual countries will be required, together with the declarations by the larger commercial fleets using the agreed regional catch statistics forms on which association of catches with FADs is required information. The fisheries statistical training course in Noumea in September 1984 will be used as a medium for increasing the awareness by the numerous national fisheries statistics services of the need for and means of collecting such information. A few specific case studies will also probably need to be initiated by Programme staff and these will become possible under the proposed tagging component of the two year extension of the Programme.

10. Estimation of the degree of interaction between surface and longline gears exploiting yellowfin tuna, bigeye tuna and albacore, and assessment of optimal exploitation of each species by gear type.

The interaction between surface and longline fisheries, particularly for yellowfin tuna, has been upgraded in priority and is being considered together with item 5 discussed above. The proposed tagging component of the two-year extension of the Tuna Programme is essential to the evaluation of this interaction.

11. Co-ordination of observer programmes on distant-water fishing vessels.

Observer programmes are normally initiated for one of two major reasons; firstly to assist the licensing state with surveillance and/or enforcement activities on board foreign flag vessels fishing in its zone; secondly to obtain scientific data or to improve the accuracy of existing information for resource assessment purposes. Great care must be taken to keep the use of observers in the perspective of these two alternatives. Observers placed on vessels for surveillance purposes can be used to obtain limited types of scientific data, but observers whose primary function is science should not be used for surveillance purposes.

Tuna Programme staff have undertaken several field trips as observers on foreign flag fishing vessels for the following scientific purposes:

- (a) Evaluation of the accuracy with which logbook forms are completed by individual vessels and identification of inadequacies with the present forms or problems encountered by fishermen in using them.

- (b) Investigation of the precise species composition of catches. In particular to evaluate the problems of differentiating between yellowfin and bigeye tuna in purse-seine catches (see priority item 5 above) and to estimate the species composition and quantities of discards from purse-seine vessels.
- (c) To improve the Programme's general understanding of the mode of operation of the various types of fishing vessels operating in the region.
- (d) To assess the requirements for sampling programmes on board vessels and at shore-based facilities in order to improve the size composition data available for resource assessment purposes.

Reports of observer trips by Tuna Programme staff have been produced and distributed to fisheries officers throughout the region.

12. Assessment of the impact on the stocks of changes in the type of longline gear used, especially the trend towards gear which fishes at greater depth.

Data accumulated by the Programme's statistical system have enabled analyses of relative performances of deep and shallow longline gear for catching yellowfin and bigeye tuna; shallow gear tends to be more efficient for catching yellowfin while deeper gear results in slightly higher catches of bigeye. There are differences in relative efficiencies with area fished and in most cases the strategy selected by fishermen in tropical areas appears to be for the purpose of having a balance in the catch of these two principal species. The comparatively high degree of seasonal variability in longline catch rates and the small differences in relative catch rates with the estimated average depth at which a longline fishes, imply that a transition in effective fishing depth of the order observed would not have a detectable impact on the levels of the stocks of yellowfin or bigeye tuna being exploited.

13. Evaluation of alternative fish attraction devices.

In accordance with its low priority, little work has been carried out on this item. Developments in other research laboratories where attractants such as natural odours and chemicals are tested, are being monitored.
