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CFRAMP OVERVIEW OF THE ANNUAL ICCAT MEETINGS FOR 1992

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ABSTRACT

CARICOM attended the International Commission for the Conservation of Atlantic Tunas (ICCAT) 1992 Standing Committee on Research and Statistics (SCRS) and Commission Meetings as an observer and presented a report on recent developments in pelagic fisheries statistics and research in the region. This document summarises the salient points of the discussions held, with emphasis on issues affecting the western Atlantic, including the CARICOM region.

The SCRS reviewed the status of major Atlantic tuna and tuna-like species and made several recommendations on statistics and research which would improve assessments, and recommendations on management where essential. Although there have been some transatlantic recoveries of tagged yellowfin, only an assessment of the east Atlantic stock was presented this year, which showed this stock to be almost fully exploited. An assessment of the west Atlantic stock, as well as an assessment which incorporates mixing of the two stocks is planned for 1993. The Commission will wait for the results of the 1993 assessments before introducing new regulations for yellowfin tuna. Two assessments of bigeye tuna implied different levels of exploitation of this stock. The Commission urged the SCRS to resolve the inconsistencies, owing to the importance of this fishery. No new regulations were proposed for this species.

The current status of skipjack tuna is unknown due to a lack of sufficient data for analysis, and hence no regulations were introduced. Recent catches have been high due to the widespread use of floating objects, and there is now some concern about current levels of exploitation. Due to a lack of data, small tunas were not assessed and only catch trends were examined. There is evidence that Gulf of Mexico and Florida stocks of *Scomberomorus brasiliensis* and *S. maculatus* may be over-exploited. These stocks are currently regulated by catch quotas under the U.S. Fishing Management Plan. No additional regulations were recommended during the 1992 meetings.
(Abstract continued on next page)

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Assessments of the marlins indicate that these are currently over-exploited. Sailfish is thought to be moderately exploited. The need to improve statistics used in analyses, as well as to reduce fishing mortality of billfish species was recognised. These fisheries will now be more closely monitored to address these needs, although no international regulations were introduced at this time. The Billfish Program plans to expand its activities in the Caribbean. Swordfish assessments indicate moderate to full exploitation. In view of contradictions in the assessments and inadequacies in the database, the Commission could not reach a consensus on further management recommendations. Various management options will be considered at the SCRS 1994 meeting. The report includes details showing U.S. swordfish fishing activities in the Caribbean region during 1987-1992. Regarding the issue of shark catches, the data show that most shark fisheries target demersal and coastal species. However, some tuna fisheries such as Brazil's longline fishery, reported a high incidental catch of shark.

The Subcommittee on the Environment addressed the issue of the recent significant increase in eastern Atlantic purse seining operations using artificial floating objects for aggregating tunas. These fish aggregating devices (FADs) have caused significant increases in catches, and the Subcommittee noted the need to investigate the statistical and ecological implications of this development. The report includes an update on the use of these FADs and other fishing aids being developed, and also on new assessment methodology being applied in ICCAT analyses.

Both the SCRS and the Commission noted concern regarding a significant increase in the number of vessels being reflagged, usually to avoid higher taxation. The new flag often belongs to non-ICCAT member countries, which do not normally enforce ICCAT data reporting regulations. If the data from these vessels are unreported, the progress of ICCAT assessments is hindered and this affects ICCAT's ability to provide good management advice. Appendix 2 of the report provides guidelines to CFRAMP participating countries for the collection and reporting of all tuna and tuna-like catch and effort data to ICCAT.

TABLE OF CONTENT

INTRODUCTION

The rationale for CFRAMP's collaboration with ICCAT has been described by Mahon and Murray (1992), which also provided an agenda of ICCAT's 1992 activities relevant to CFRAMP. As recommended, CFRAMP participated in several inter-sessional meetings during 1991/1992 at which sections of the ICCAT database were revised and updated, and progress in assessment research and implications of this on current management were reviewed. These meetings included the Second ICCAT Billfish Workshop, held in Miami, Florida, during July 22-29, 1992 (Singh-Renton, 1992; ICCAT, in press, SCRS/92/16 and COM/SCRS/92/16) and meetings of the Working Groups on Tropical Tunas and Small Tunas, which were held in Madrid, Spain during October 28-30, 1992. The meeting of the Working Group on Western Atlantic Tropical Tunas (WATT), held in Brazil during July 1-7, 1992, focussed mainly on data from the southwestern hemisphere and CFRAMP did not participate as originally planned.

CFRAMP also attended the 1992 ICCAT Standing Committee on Research and Statistics (SCRS) and Commission meetings held November 2-13, 1992 in Madrid, Spain. The CARICOM delegation comprised Chief Scientist, R. Mahon and Biologist, S. Singh-Renton, both of the Pelagic and Reef Fishes Resource Assessment Unit in St. Vincent and the Grenadines. Only the Commission meeting sessions pertaining to the management recommendations of the SCRS were attended. In addition to obtaining updated information on the status of the Atlantic tuna stocks, the Madrid meetings also facilitated acquisition of a complete ICCAT database for the North Atlantic and ICCAT forms used for recording Task 1 and Task II data (further details given in Appendix 2). The CARICOM delegation presented a report on recent developments in the statistics and research of pelagic fisheries (Mahon and Singh-Renton, in press, SCRS/92/154).

The present document reports on the assessment analyses undertaken by ICCAT Working Groups and provides interpretations of these where possible. It also documents relevant 1992 SCRS recommendations on statistics and research which were adopted by the Commission, and reports on developments in fisheries management, fishing technology and assessment methodology as applied to Atlantic tuna stocks. Sections dealing with technical details are provided in fine print, for interested readers. In addition, Appendix 2 of the report provides guidelines to CFRAMP participating countries for the collection and reporting of all tuna and tuna-like catch and effort data to ICCAT. These guidelines are consistent with ICCAT recommendations regarding data collection and reporting, and are presented here because of their relevance to the present document. The reader should note that these guidelines were not presented or discussed at the 1992 ICCAT meetings.

OVERVIEW OF SCRS AND COMMISSION MEETINGS

CARICOM attended the Meetings as an observer, and provided an update on CFRAMP activities in 1992, as well as recent developments in the region's pelagic fisheries, accuracy of national statistics contained in the ICCAT database, the contribution of shark to catches, and data collection at Trinidad and Tobago's trans-shipment port. The SCRS meeting reviewed all species working group analyses, conclusions and overall recommendations for future work and |

stock management. The species working group reports which were adopted by the SCRS and presented at the Commission meeting are summarised below. Current regulatory measures recommended by ICCAT are summarised in Appendix 1 (ICCAT, in press, COM/92/20).

In its plenary sessions, the Commission reviewed and adopted the report of the SCRS (ICCAT, in press, Report of the Eighth Special Meeting of the Commission). Additional issues • were also addressed by the Commission. The issue of membership fees was considered. It also examined the related issues of reflagging of vessels and reporting of catches by non-contracting parties. It was noted that in 1991, there had been exports of bluefin tuna from certain CARICOM Member States to Japan, but that there had not been any reports of catches of bluefin tuna by these states.

SUMMARY OF SPECIES WORKING GROUP REPORTS

Tropical tunas and West Atlantic Tropical Tunas (WATT)

Yellowfin tuna

In 1973, ICCAT nations agreed to adopt a minimum size regulation of 3.2 kg for yellowfm tuna *(Thunnus albacares).* The meeting noted that this regulation appears to have been ineffective in reducing juvenile fishing mortality, as many juvenile fish weigh more than 3.2 kg.

In the early sixties, the western Atlantic catch quickly decreased from 29,500 mt to 13,600 mt, after which it remained fairly stable until 1980 when it increased again with the development of surface fisheries (Fig. 1). Since 1982, the catch has exceeded 24,000 mt, with 33,100 mt being taken in 1991. The apparent stability of catches during the 1980s and up to 1991 is probably due to the movement of surface fleets between Atlantic and Pacific Oceans (ICCAT, in press, Report of the SCRS). However, in 1991 new purse seiners began operating in the Venezuela EEZ, thus increasing effort there. Although there is now some evidence which questions the hypothesis of two independent Atlantic stocks, separated by an east-west boundary, only assessment of the east Atlantic stock was attempted this year.

Technical considerations

Two production models, PRODFIT and ASPIC, were applied lo the data. The results of the two fits indicate that in recent years the stock has been close to or slightly above full exploitation. The models estimated maximum sustainable yield (MSY) to be 117,000 mt and 115,000 ml respectively; recorded catches for 1989, 1990 and 1991 are above both of these figures. Effort was estimated to be close to PRODFIT and above ASPIC estimates of effort at MSY respectively. Hence, the SCRS recommended that fishing effort on eastern Atlantic yellowfin not be increased, and this was adopted by the Commission. Furthermore, in addition to changes in fishing techniques, oceanographic conditions also appear to affect yellowfin catchability (ICCAT, in press, Report of the SCRS). Consequently, current assessment estimates need to be refined further using models which incorporate oceanographic variability.

SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *The recent extensive use of artificial floating objects as fish aggregating devices in the purse seine fishery in the eastern Atlantic has introduced statistical problems. There is the need to improve the system for collecting and processing size samples.*
- *Persons responsible for data collection should ensure that statistics are obtained from vessels with flags of convenience, which are being recorded as part of the 'NEI' ('Not Elsewhere Included') fleet. This concern was again raised during the meeting of the Subcommittee on the Environment and details of the discussions are given in that section.*
- *Due to recent improvements in the western Atlantic database (1CCAT, in press, COM-SCRS/92/15), SCRS recommended that a meeting of the Working Group be held to obtain more information on the stock in the western Atlantic. The Working Group should attempt to conduct an assessment of the eastern and western stocks, as well as an assessment of the total Atlantic which would account for varying degrees of mixing.*
- *Current estimates of size-weight relations for western Atlantic yellowfin need to be improved.*

No new regulatory measures were proposed, pending the 1993 assessments of the western and total Atlantic.

Bigeye tuna

A minimum size regulation of 3.2 kg was adopted in 1980 for bigeye tuna *(T. obesus),* mainly to reinforce a similar regulation in effect for yellowfin.

During 1962-74, the total Atlantic catch increased steadily from 23,000 mt to 63,800 mt (Fig. 2). After 1974, the catch declined until 1979 then increased to a peak of 74,600 mt in 1985. The catch then declined to 48,800 mt in 1987, after which it again increased to 69,500 mt in 1991. These trends have been driven mainly by longlining operations which have taken 60-70% of the total catch up to 1990, when surface fisheries began to expand their activities (Fig. 2). It should be noted, however, that Brazilian longline operations in the southwest Atlantic have increased since 1988.

Technical considerations

Assessments were carried out assuming a single Atlantic stock. Analyses used only those CPUE indices from the longline fisheries which target bigeye throughout its distribution; bigeye is caught only seasonally or incidentally by the surface fisheries and hence these CPUE indices were Dot considered representative of overall slock abundance. In previous years, the data have been analysed using cohort analysis, simple yield-per-recruit analysis and multi-gear yield-per-recruit analysis. Cohort analysis for the period 1980-89 indicated an increase in fishing mortalities (>0. i) on fish of ages 1, and 2 and ages 4 and over, as compared to previous years. Results of the simple yield-per-recruit analysis suggested an increase in fishing mortality would result in significant increases in yield. However, the multi-gear analysis, indicated that increased fishing mortality on adult bigeye would be accompanied by a simultaneous decrease in juvenile fishing mortality, and the overall gain in yield would be less than expected (Pereira, in press, SCRS/92/160).

This year, two production models were also applied to the data. PRODFIT estimated MSY to be 67,500 mt-76,100 mt. This result implies that the stock is being fully exploited at present. The ASPIC fit incorporated a change in catchability to reflect an improvement in Japanese longlines which came in effect in 1985. ASPIC estimated MSY to be 61,200 ml. Catches taken in the last three years have therefore been greater than MSY, as predicted by

this model. Model estimates also indicate that the 1991 stock biomass was slightly less than biomass at MSY, and that fishing mortality in 1990 exceeded optimum levels.

After considering the assessments, the SCRS recommended that current regulations be maintained and this recommendation was adopted by the Commission. Several SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *The recent extensive use of artificial floating objects as fish aggregating devices in the purse seine fishery in the eastern Atlantic has introduced statistical problems. There is the need to improve the system for collecting and processing size samples.*
- *Detailed information on the proportion of deep longlines operating by 5° square and by*

month as requested.

- *There is a need to develop an abundance index which incorporates data from surface fishing fleets.*
- *Further research is required to determine the differences in catchabihty between traditional and deep longline gears used and hence, effective effort on bigeye.*

No new regulatory measures were proposed.

Skipjack tuna .

There are no current regulations in effect for skipjack tuna *(Katsuwonus pelamis)*. The total Atlantic skipjack catch has generally increased from 11,200 mt in 1962 to 195,500 mt in 1991 The 1991 catch represents an increase of 57,800 mt over the 1990 value, and is mainly due to the increased fishing power of the purse seine fleets, achieved through the introduction of floating objects for aggregating tunas. In the west Atlantic, catches increased to a maximum of 39 900 mt in 1985 (Fig 3). The western catch decreased during 1986 to 1988 and then increased again to reach 31,300 mt in 1991. The 1986-88 decline occurred when a large pan of the Venezuelan fleet shifted its operations to the Pacific Ocean. The observed trend is similar to that of yellowfin which, as already noted, may have been affected by shifts in effort.

Only data on nominal effort, such as vessel carrying capacity (load capacity) and number of days fishing, are currently available for the east Atlantic stock. In the west Atlantic, only number of days fishing is recorded at present. Nonetheless, due to an expansion of the purse seine fleet, nominal effort in the west Atlantic may have increased. Also, the Spanish and France-Ivoire-Senegal (FIS) purse seine fleets which are now using artificial floating objects to attract fish are following the objects which tend to drift west. Hence, the fishing areas of these fleets has expanded slightly westward. Due to the lack of good effort data, no detailed analyses were attempted this year. In 1984 an assessment suggested that skipjack was underexploited at that time. However, the SCRS was unable to establish whether the relatively high catch of 1991, associated with a change in the pattern of exploitation, could be maintained.

SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *The recent extensive use of artificial floating objects as fish aggregating devices in the purse seine fishery in the eastern Atlantic has introduced statistical problems. There is the need to improve the system for collecting and processing size samples.*
- *Catch and effort statistics for the west Atlantic needs to be improved, as well as sampling quality for the southwest Atlantic.*
- *Countries in the west Atlantic should provide historical data on composition of fleets to the Secretariat.*
- *There is a need to study the association of tunas with floating objects, to determine the implications on assessment.*
- *More information is needed on skipjack reproduction in the west Atlantic.*
- *There is a need to analyse changes in effective effort, due to the introduction of fishing aids such as bird radars and artificial flotsam.*
- *Environmental factors appear to influence skipjack abundance, and these factors therefore need to be investigated.*

No new regulatory measures were proposed.

Small tunas

Small tunas comprise 10 species which are mainly exploited by coastal artisanal fisheries. These species are of considerable importance to CFRAMP participating countries. However, as previously stated, this is the least active working group in ICCAT, and the ICCAT database is least complete for these species (Mahon and Murray, 1992). In most cases, there are no effort data for these species. Therefore, the working group focussed mainly on examining trends in landings, which are reported by gear and country, for the entire Atlantic. Although the areas from which the catches are taken are not reported, it is possible to discern some trends in the data which are most likely to pertain to the western Atlantic stocks (Figs. 4-11).

Blackfin tuna *(T. atlanticus)* occurs only in the western Atlantic. During the 1960s, the total catch averaged approximately 760 mt. This figure increased to 1,900-2,000 ml during 1970 to 1972, after which it decreased to previous levels. Small increases (200-300 mt) were observed in 1977-80, and in 1981-84, the catch again reached the 1970-72 level (Fig. 4). In 1985, the catch decreased by 500 mt, but subsequently rose again and continued to increase, reaching 3,500 mt both in 1990 and 1991.

During the 1960s, Martinique took over 70% of the Atlantic blackfin tuna catch. During 1970-72, Guadeloupe catches contributed to over 50% of the total Atlantic catch according to ICCAT records. From 1973 until the late eighties, catches from these islands comprised only about 30-69% of the catch with the rest of the catch being taken by the Dominican Republic, Cuba, Venezuela and other countries. The data suggest that Venezuela only began catching blackfin tuna in 1987. Venezuelan catches have increased since then, reaching 1,300 mt in 1990

and 1991. Dominican Republic catches remained relatively constant at 100-200 mt during 1968-87; in the last three years, however, higher catches of 500-600 mt were taken. Except Venezuela, other countries reported similar absolute catches in 1990 and 1991.

Atlantic bonito *(Sarda sarda)* catches show wide fluctuations throughout the history of the fishery. Highest catches, over 15,900 mt, were taken in 1971 and 1988 (Fig. 5). Most of the catch is apparently taken in the eastern Atlantic, probably because of the large number of purse seiners operating in this area. The low catches recorded by countries such as Venezuela and Martinique, known to fish in the west Atlantic and Caribbean area, may be primarily a I reflection of low effort.

Frigate tuna *(Auxis thazard)* catches show lesser fluctuation but appears to vary more between consecutive years (Fig. 6). Also, except for 1991, catches in the 1980s onwards are \ notably higher than catches of the previous period 1962-79. As in the case of Atlantic bonito, most of the frigate tuna catch is taken in the eastern Atlantic, and this is also likely to be due to the greater number of coastal purse seiners in that part of the Atlantic.

The catch of Atlantic black skipjack *(Euthynnus alletteratus)* ranged from 1,400-8,000 mt during the 1960s to late 1970s (Fig. 7). The catch then increased to 15,100 mt in 1978, and generally increased slightly in subsequent years until 1985-86 when a notable decline occurred. From 1987 to the present, however, there has been a continuous upward trend in catches, with the 1991 catch of 22,200 mt being the highest recorded in the history of the fishery. Most of this catch is taken by vessels operating in the eastern Atlantic and by Brazil in the southern hemisphere. The Venezuelan catch represents only a small portion of the overall total, and may be an indication of either much less effort or less fishing power in the case of the Venezuelan fishing operations.

During 1962-66, the king mackerel *(Scomberomorus cavalla)* catch remained relatively stable at 2,800-3,300 mt. The catch then increased fairly rapidly, reaching 13,600 mt in 1974 (Fig. 8). From 1975 to 1978, a decline was observed, with only 6,700 mt taken in 1978. The catch then increased rapidly again to reach 18,500 in 1981 and 18,000 mt in 1982. After 1982, the catch decreased quickly to reach 9,900 mt in 1985. It then increased slightly to 12,100 mt in 1986 and remained more or less constant until 1990 when the figure again dropped to 9,700 mt. In 1991, the total Atlantic catch of king mackerel was 9,200 mt. A large part of the Atlantic catch is taken by U.S. vessels operating off the southeast coast of Florida and in the Gulf of Mexico. Both Mexico and Venezuela also take measurable portions of the total catch in the north Atlantic. A number of CARICOM countries also fish king mackerel, but these catches are comparatively small. These comparatively low catches may be due to less effort and/or less fishing power in CARICOM fishing operations.

Atlantic catches of spotted Spanish mackerel *(Scomberomorus macitlaius)* increased steadily from 11,600 mt in 1962 to 21,000 mt in 1974. The total catch then decreased to 18,200 mt in 1975 and to 14,600 mt in 1976 (Fig. 9). Catches remained at approximately this level until 1980. During the 1980s to the present, the total catch ranged from 16,100 mt to 22,900 mt. A significant portion of the catch is taken by the surface fisheries of Brazil, Venezuela, U.S.A., Dominican Republic and Cuba. A number of other countries, operating in the north Atlantic

with unclassified gear, also collectively take a large part of the total Atlantic catch. Among the most important of these are Mexico, U.S.A., Trinidad and Tobago and Colombia. It appears that during the 1970s, unclassified gear fisheries took a higher percentage of the catch than surface gear fisheries, while in the 1980s this pattern was somewhat reversed. Examination of the ICCAT data show that U.S.A. reported all Spanish mackerel catches under unclassified gear during the 1970s, and under surface gear from 1980-86. Hence it is possible that some of the U.S. unclassified gear catches may actually have been surface gear catches as well.

Age structured stock assessments of king and Spanish mackerel in the Gulf of Mexico I and off the southeast coast of the U.S.A. are conducted annually and show that these stocks were heavily exploited during the 1970's and early 1980's. In 1983, national fishery management plans introduced catch quotas to try to regulate the fishing pressure on these stocks. Due to over exploitation, present catches are about half the MSY estimates of 11,900 mt and 8,200 mt for the aggregate stocks (Gulf and Atlantic) of king and Spanish mackerel respectively (Powers and Thompson, in press, SCRS/92/125). However, the stocks appear to be recovering as biomasses have increased slightly in recent years *(op.* dr.).

Atlantic catches of cero mackerel *(S. regalis)* have been comparatively low. During 1968-69, the total catch was 100 mt (Fig. 10). This amount increased quickly to 800 mi in 1971-73. The catch then declined to 600 mt and remained relatively stable until 1986 when it began decreasing again. During 1988-91, a constant annual catch of 200 mt has been reported. The Martinique fishery takes most of the cero mackerel catch, while minor catches are reported by a number of other countries. Given the regional distribution of this species, it is possible that CARICOM country catches are being limited by present effort.

Catches of wahoo *(Acanthocybium solandri)* showed gradual increases in the early part of the fishery until 1981 when the Cape Verde fishery began to report large catches (Fig. 11). Hence, the total Atlantic catch increased from 600 mt in 1980 to 2,900 mt in 1981. After 1981, however, the catch gradually decreased until 1985 when a sudden decline was observed and only 900 mt of fish were caught. The catch slowly increased again and, from 1988 to the present, has been in the range 1,400-1,600 mt. The observed fluctuations appear to be strongly influenced by the operation of the Cape Verde fishery.

In summary, in the western Atlantic, most fishing nations catch small tunas. Venezuelan catches of blackfm tuna, Atlantic bonito, frigate tuna and Atlantic black skipjack have increased in recent years. Dominican Republic catches of blackfin tuna have also recently increased. If this trend continues, this may cause a reduction in the total biomass and may result in lower CPUEs for CARICOM Member States. This trend is apparent also for spotted Spanish mackerel. For cero mackerel and wahoo, CARICOM Member States usually do not report catches by individual species, and hence catch trends for these countries cannot be discerned from the existing ICCAT data.

SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *Catch and effort data of all fisheries, as well as data on nominal effort, needs to be improved.*
- *More detailed estimates of Caribbean country catches by species is required.*
- *Further studies are needed which would enable assessment of stocks.*

No regulatory measures were proposed due to the lack of assessment information.

Billfishes

There are no current regulations in effect for any of the Atlantic billfish species, although a few countries have adopted certain local regulations:

- In 1988, Venezuela banned commercial fishing in the north central coastal area (off La Guaira) and in 1990, began restricting recreational billfish landings and sale of billfishes; In -- 1990, Mexico prohibited commercial longlining activities within 50 miles of the coast, and in 1991, banned commercial sale of billfishes;
- In 1988, the U.S.A. prohibited the retention and sale of billfishes by commercial longliners, and passed minimum size regulations for the recreational fishery.

In addition, several countries have developed voluntary release policies for recreational tournaments, in an attempt to reduce the fishing mortality incurred by this fishery.

Generally billfishes comprise the incidental catch of commercial longlme fisheries targeting tunas and swordfish, and catch trends are determined by the activities of these fisheries Separate north and south Atlantic stocks of blue and white marlin are thought to exist. Two Atlantic stocks of sailfish are also thought to exist, separated by an east-west boundary. Blue marlin *(Makaira nigricans)* catches declined from 3,452 mt in 1962 to 1,173 mt in 1967. In the subsequent period 1968-77, catches remained fairly stable, fluctuating between 1,255 mt and 2 076 mt. The catch then decreased until 1979 after which it increased again to levels attained during the 1968-77 period. However, in some recent years, low catches have resulted, with only 953 mt taken in 1991 (Fig. 12).

White marlin *(Tetrapturus albidus)* catches in the north Atlantic are generally lower than the corresponding blue marlin catches, and have showed wider fluctuation (Fig. 13). The catch increased from 381 mt in 1962 to 2,127 mt in 1965, then decreased to 588 mt by 1967. The catch rose to 692 mt in 1968 and to 1,212 mt in 1969 after which it remained fairly stable until 1977 when a decline of about 50% was observed. The catch began to increase again, from a value of 428 mt in 1978 to 1,382 mt in 1983. Since then, the catch has decreased to 202 mt in 1988 and has remained stable at this low level to the present.

Sailfish *(Istiophorus albicans)* catch trends for the west Atlantic show similar but less drastic fluctuations than those of blue and white marlin for the north Atlantic (fig. 14). During 1962-65, the catch rose to over 1,400 mt. In 1972, only 575 mt were taken, and low catches were recorded until 1976 when the figure increased slightly to 813 mt. During 1976-88, the catch

remained relatively constant, ranging between 683 mt and 984 mt. In 1989, the catch decreased to 579 mt and has remained comparatively low to the present.

Due to data preparation and analyses performed during the Second ICCAT Billfish Workshop in July 1992 and during additional Working Group sessions, assessments were updated this year for both blue and white marlin. For both species, north and south Atlantic were analysed separately, and then combined for an overall assessment. The production model, ASPIC was applied to standardised CPUE indices from the Japanese and Taiwanese longlme fisheries for north, south and total Atlantic analyses. Venezuelan and U.S. recreational indices were included in the north Atlantic analyses, and Brazilian longline indices in south Atlantic analyses.

Technical considerations

ASPIC yielded similar results for both blue and white Marlin. The ratio of estimated biomass to biomass at MSY (B/B_{M5V}) has been less than 1 for a number of years, while the ratio of estimated fishing mortality rate to optimal fishing mortality (F/F_{MSY}) has been greater than 1 (Cramer and Prager. in press, SCRS/92/69, in press, SCRS/92/128; Farber and Jones, in press, SCRS/92/129). These results suggest a situation of over-exploitation. Although north Atlantic estimates for blue marlin stock indicate a slight recovery in recent years, there was a persistent downward trend in south Atlantic biomass. Parallel, less optimistic trends were observed for white marlin in both ocean areas. Due to uncertainties in the data, various sensitivity analyses were performed but predicted patterns were similar. With regard to reducing fishing mortality on these stocks, the SCRS suggested that a study be conducted to determine the survival rate of billfishes which are caught by longlines and then released. If the probability of survival is high, then this method, together with an observer program, could be implemented to effect a reduction in fishing mortality.

In view of the assessment results, the SCRS recommendation that these fisheries be carefully monitored was adopted by the Commission. Although sailfish was not assessed this year, additional CPUE data have become available and an updated assessment should be carried out in the near future. SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *Data on billfish landings should be acquired from non-member, non-reporting countries.*
- *Catch and effort data, as well as data on size and sex, should be reported by 5° square and by month.*
- *Catch statistics for sailfish and spearfish (T. pfluegeri) should be recorded separately.*
- *Additional research on age and growth is required.*
- *Standardised CPUE indices on sailfish need to be developed, for updated assessments to be performed.*
- *Large offshore longline vessels should be made aware of tag-recapture procedures of the billfish tagging program.*
- *Further research is needed on billfish reproduction.*
- *There is a need to investigate alternative fishing techniques which would reduce the incidental fishing mortality of martins.*

No regulatory measures were proposed, pending investigation of proposed methods to reduce fishing mortality of billfishes in by-catch fisheries.

Swordfish

The U.S.A., Japan and Canada have adopted national regulations in conformity with the 1990 ICCAT recommendations on swordfish *(Xiphias gladius),* which took effect in July 1991. These are:

- Countries should take measures to reduce fishing mortality in areas north of 5° on fish larger than 25 kg, by 15% from 1988 levels;

- Countries should prohibit taking of swordfish smaller than 25 kg in the entire Atlantic, with a 15% incidental catch allowance/trip;

- Countries with small catches from directed swordfish fisheries, should limit fishing mortality of swordfish in the entire Atlantic to the level of catch in 1988, or limit fishing effort that will result in the equivalent level of fishing mortality;

- Countries whose nationals do not target swordfish in the non Atlantic should take measures to limit incidental catch to no more than 10% of the total weight of the entire catch.

In the north Atlantic, fishing mortality decreased between 1988 and 1991, as catches declined from 19,137 mt to 13,212 mt (Fig. 15). There have been concurrent changes in the amount and distribution of fishing effort for swordfish in the north Atlantic in recent years. A significant proportion of the fishing effort has moved to the south Atlantic where they are fishing on what is assumed to be a separate stock. However, as most of the effort is being deployed just south of the assumed dividing line, and the separation of north and south Atlantic stocks is not clear, the extent to which effort on the north Atlantic stock has been reduced is uncertain.

The changes of distribution in effort by the US swordfish longline fleet between 1987 and 1991 clearly show the aggregation of effort in the vicinity of Puerto Rico, the Virgin Islands, and the Leeward Islands in 1987, just two years after the fleet began to fish in the Caribbean area (Cramer et al., in press, SCRS/92/110) (Fig. 16). In 1988 and 1989, the effort is further south in the eastern Caribbean and in the waters of the Guyanas Brazil shelf. In 1991, there is a concentration of effort off Guyana, but effort is relatively low in the eastern Caribbean islands.

Technical considerations

In the past, age-based virtual population analysis (VPA) has been used to assess north Atlantic swordfish. This year the development of new catch rate indices made it possible to revise previous preliminary runs of a non-equilibrium production model (Hoey el al., in press, SCRS/92/28; Scow et al., in press, SCRS/92/U7; Prager, in press, SCRS/92/114). Both approaches indicated that the stock was overexploiled, and showed similar historical trends; a rapid increase in fishing mortality after 1984, reaching maximum values in the period 1987-1988, and declining since. However, the models disagreed in certain respects. The VPA indicates that fishing mortality rates on the stock have been in excess of F_{BU} estimated by yield-per-recruit analyses, since 1978. In contrast the production analysis indicates that stock biomass remained below the level corresponding to MSY, until 1988. The likely explanation for this difference is the observed increase in recruitment with decreasing stock size. Changes in recruitment are not taken into account in using F_{EU} as a reference point for overfishing.

SCRS recommendations pertaining to statistics and research were also adopted by the Commission. The most important and relevant recommendations are noted here.

- *As far as possible, catches should be reported in round live weight.*
- *Catch and effort data should be reported by small areas and by month.*
- *Reliable conversion factors neeed to be developed, relating gilled and gutted weight to round weight.*
- *The CPUE series need to be revised.*

No additional regulatory measures were proposed, pending clarification of contradictions in the data and consideration of the impact of possible management scenarios.

SUBCOMMITTEE ON STATISTICS

This Subcommittee provides a forum for discussing management of the ICCAT databases including the logistics of data collection and reporting, data dissemination and the Commission's statistical publications. This year, the Subcommittee also discussed other major issues relating to statistics, and those relevant to western Atlantic countries included: the progress of the Data Preparatory meeting for the Southwestern Atlantic, shark statistics and the loss of data from vessels which reflag with non-member countries.

Recife Meeting

An inter-sessional Data Preparatory Meeting for Southwestern Atlantic Tuna and Tuna-like Fisheries was held in Recife, Brazil, during July 1992 (ICCAT, in press, SCRS/92/15). The purpose of this meeting was to review the historical tuna data and sampling system for the southwest Atlantic. During this meeting, Brazilian catch statistics were sorted by base ports and logbook catch records were revised. An improved data collection system was introduced in Brazil to help maintain data quality in the future. Statistics for the southwest Atlantic, urgently required for assessment of west Atlantic stocks, are now considerably improved. Owing to the focus on statistics from Brazil, Argentina and Uruguay, CFRAMP did not attend this meeting as originally scheduled in its 1991/1992 workplan.

CARICOM Data

At present, the ICCAT database includes data from only some CARICOM Member States, and these statistics are usually obtained from FAO data records. The CARICOM delegation reported on the progress of CFRAMP's Institutional Strengthening and Data and Information Subprojects aimed at enhancing data collection systems throughout the region. CARICOM Member States are being requested to collect and report all large pelagic statistics in accordance with the ICCAT format, and especially so in instances of joint venture operations targeting large pelagic species (Appendix 2). The CARICOM delegation also noted that CFRAMP proposes to undertake some biological sampling for the duration of its Large Pelagics Assessment Subproject.

Sharks

The 1991 Subcommittee meeting noted that sharks comprise a significant portion of the incidental catch in tuna fisheries and that there was a need to evaluate the effect of tuna fisheries on shark stocks and the whole marine ecosystem. In consequence, countries were requested to prepare reports on shark catches, both incidental and directed, and on other related information for consideration at this year's meeting.

Generally, reports indicated that many shark fisheries are targeting mainly coastal and demersal species. Some reports also showed that the incidental catch of sharks in tuna fisheries is becoming significant. For instance, Brazil reported that 40% of the total Brazilian longline catch consists of shark species. The dominant species caught is the blue shark *(Prionace glauca),* comprising almost 38% of the total Brazilian fleet catch.

CARICOM noted that the incidental catch of sharks is usually small for the region's fisheries. Local fisheries in Trinidad and Guyana take most of the catch which consists of mainly coastal species. In addition, foreign longline vessels operating out of Trinidad's trans-shipment port, catch and trans-ship an unknown amount of shark. However, it appears that mako shark comprises most of this catch. Like many other countries, CARICOM also noted that its shark catch statistics were not separated by species, and that shark catches are believed to be under-reported.

SUBCOMMITTEE ON THE ENVIRONMENT

This was the second year for this Subcommittee, which provides a forum for consideration of the implications of environmental and ecological research on tuna asessments. The Subcommittee reviewed several areas of concern. The first was the ICCAT Secretariat activity to compile information on data bases on the environment. This was initiated in 1992 and will continue into 1993. Only one study was presented on the topic of environmental anomalies which could affect catches and catch rates of tunas, and further effons in this area are encouraged.

The recent trend by the purse seine fleet in the eastern tropical Atlantic towards the use of artificial FADs for aggregation of tunas (see Mahon and Murray, 1992, and General Observations section) sparked a considerable amount of interest in the ecological basis for the association of pelagic fishes with floating objects. Two meetings during the past year[1] focussed on this subject. Although the meetings resulted in better descriptions of the phenomenon, no satisfactory explanations were derived.

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[1] International Workshop on the ecology and fisheries for tunas associated with floating objects and on assessment issues arising from the association of tuna with floating objects. Inter-American Tropical Tuna Commission, Scripps Institute of Oceanography, La Jolla, California, February 11th – 14th , 1992.

ORSTOM Working Group on the aggregative behavior of pelagic fishes. Centre ORSTOM, Montpellier, France, June 25th-26th, 1992

The Subcommittee noted the importance of this subject given the implications of fishing with artificial FADs: increased risk of overexploitation and disruption of time-series of catch rate indices, both due to greater fishing efficiency of vessels. It further noted the need for studies on the ecology of, and fisheries for pelagic fishes associated with floating objects.

It should be noted that small-scale line fishermen in the eastern Caribbean, and probably in other CFRAMP participating countries, actively seek floating objects to fish around. Furthermore, in the flyingfish fisheries of the eastern Caribbean, large pelagics frequently aggregate around the boats and the tethered FADs as these drift. However, there is no information on the relative proportion of catches coming from the various sources: boats and FADs, other flotsam, tide-lines, open sea trolling. Nor is there any information on the nature, distribution, and seasonally of floating objects in the eastern Caribbean. A proposal for a pilot study to evaluate the importance of this phenomenon in the eastern Caribbean has been developed in collaboration with Marine Resource and Environmental Management Program (MAREMP) (CFRAMP, 1993).

RESPONSIBLE FISHING

The SCRS reviewed the report of the FAO International Conference on Responsible Fishing, Cancun, Mexico, May 6th-8th, 1992, noting that responsible fishing involved not only prevention of overfishing, but attention to environmental impacts of fishing. The 'Declaration of Cancun', prepared by the above meeting, includes 20 statements on issues pertaining to responsible fishing, including improved management systems, research, international cooperation on shared stocks, access to resources, and habitat conservation; several of which are addressed by components of CFRAMP. The 'Declaration' called for FAO to draft an International Code of Conduct for Responsible Fishing. This was reviewed at the FAO Technical Consultation on High Seas Fishing, Rome, Italy, September 7-15, 1992 (ICCAT, in press, SCRS/92/19), where FAO undertook to draft the Code of Conduct, noting that this would take some time, and should be done in stages, according to priorities. The Consultation considered reflagging of vessels for the purpose of avoiding compliance with conservation and management regulations. This issue is dealt with in the following section.

REFLAGGING OF VESSELS

The FAO Expert Consultation on High Seas Fishing devoted considerable time to the problem of reflagging of fishing vessels. The issue was further discussed at the SCRS and Commission meetings (ICCAT, in press, SCRS/92/19 and COM-SCRS/92/19). Reflagging may take place for economic reasons, for example, more favourable labour law and tax environments, or to avoidance compliance with fishing regulations. One of the major concerns of ICCAT is that when the new flag country is not an ICCAT Member, it often does not insist that vessels adhere to logbook and other data recording procedures which have been agreed upon by ICCAT members. This could seriously diminish the availability of data for assessments, and disrupt time-series which have taken many years to develop. This disruption of data flows could jeopardise ICCAT's ability to provide assessments of the status of stocks, and advice on their management.

Consequently, CARICOM Member States which have reflagged vessels, or intend to reflag vessels, are requested to:

- Insist that the vessels observe existing ICCAT regulations;
- Insist that the vessels carry, and complete ICCAT logbooks;
- Put measures in place to collect and transmit these logbooks to ICCAT.

Participating countries should note that CFRAMP can assist with establishing procedures for acquiring data from these and other offshore fishing vessels, and is attempting to establish mechanisms for the regular flow of data from countries to ICCAT.

GENERAL OBSERVATIONS

Methodological Developments

Surplus production models have been widely applied in stock assessment studies, and are especially useful in cases where age-structured data are unavailable or unreliable. These models usually assume that the stock is in equilibrium. Some production models have been developed which do not require this equilibrium assumption. ASPIC or 'A Surplus Production Model Incorporating Covariates' (Prager, 1991) which is based on the logistic (Schaefer) production model, also assumes non-equilibrium conditions. The ASPIC approach provides much flexibility and was used for a number of the ICCAT assessments this year.

Technical considerations

The advantages *of* ASPIC include its non-equilibrium assumption owing to the fact that data are fitted directly using standard optimisation techniques *(op. cit.)* and CPUE is not needed as an index of abundance. In addition, ASPIC is able to handle different patterns of fishing, including gear differences between several fisheries operating simultaneously, changes in gear and catchability over time and density-dependent caichability. The model can also account for periods of no fishing (effort=0) because the dynamics of logistic population growth are retained during these periods and incorporated into the overall fit. To some extent, ASPIC can also handle periods when effort is uncertain or unknown. ASPIC calculates bootstrap estimates of variability, and additional fishery independent data can be incorporated to tune the analysis. An important concern in using ASPIC is that errors in effort can potentially bias the results. This problem has been recently addressed (Prager, in press, SCRS/92/127).

Fishing Methods

Fish aggregating devices (FADs)

During 1988-90, approximately 15% of purse seine catches were taken by fishing tuna aggregations occurring in association with floating logs. The species composition of these log schools generally comprised mostly skipjack (76%), yellowfin (17%) and bigeye (7%) tunas. During 1988-90, the average weight of skipjack taken in the log schools was 2.2 kg, which was equivalent to that observed in free schools. A lower percentage of large bigeye is caught in log schools than in the free schools, while in the case of yellowfin, large number of comparatively small fishes (<5 kg) are taken, together with a significant proportion of large individuals.

Since the extensive introduction in late 1990 of the use of artificial flotsam in purse seining operations in the eastern Atlantic, tuna catches have increased considerably. For skipjack

in particular, purse seine catches in the east Atlantic were higher in 1991 by about 70%. The artificial floating logs are deployed further offshore than the area in which natural logs are usually found, and so has expanded the fishing zone for skipjack. Seasonably of catches may also be affected (Ariz *et a!.,* in press, SCRS/92/39).

Data from FIS and Spanish fleets operating in the east Atlantic also indicated that the mean yield per set for log schools is 41 t which is more than twice as much as the corresponding mean value of 19 t obtained for free swimming schools. In addition, the percentage of null sets is much less for log-associated fishing, 6%, compared to 27% for fishing free schools. Observer data show that a larger percentage of small tunas, such as Atlantic black skipjack and frigate tuna, are also taken in association with floating objects than in other associations. The log schools may also include other pelagic species, such as barracuda *(op. cit.).*

Bird radar

A fish school actively feeding near the surface usually causes visual disturbance which attracts birds to hover over the area and also seize opportunities to feed on the prey fish. Tuna fisheries have often used bird aggregations to help locate such schools. The recent introduction of bird radar has increased the ability to detect these aggregations, and CPUE has increased as a result. For example, a study has shown that mean baitboat CPUE increased by about 44% when fishing was aided by bird radar (Kwei and Bannerman, in press, SCRS/92/151). Also, when bird radar is used together with floating rafts to help attract the tunas, this appears to further increase CPUE; for example, a baitboat using both devices simultaneously showed a mean CPUE approximately 277% higher than one using bird radar only *(op. cit.).* Since the study compared the performance of only three vessels, additional information is needed before firm conclusions could be made.

CFRAMP PARTICIPATION EM ICCAT IN 1993/1994

We recommend CFRAMP participation in the following 1993 ICCAT meetings.

- Special Working Group Meeting to prepare additional data and carry out various assessments of yellowfin tuna, in accordance with the two current hypotheses on stock distribution. This meeting will be held in June 1993 at the Institute Espanol de Oceanographic, Canary Islands, Spain.
- Meetings of the Working Groups on Tropical Tunas, Small Tunas, Western Atlantic Tropical Tunas and Billfishes, to be held during October 27-29 1993 in Madrid, Spain. These meetings will review the available data, update assessments where possible and make recommendations for improving statistics and research.
- Annual SCRS and Commission meetings, to be held during November 1-12 1993 in Madrid, Spain. These meetings review the outputs of the species working group meetings, and prepares management advice.

Regular Working Group meetings usually take place in the week preceding that of the annual SCRS and Commission meetings, and at the same venue.

CFRAMP's participation in ICCAT will require the following inputs:

- Review of the provision of national statistics to ICCAT and proposal of a reporting mechanism for countries;
- Compilation of available data on yellowfin tuna for working group meeting in June 1993;
- Preparation of a CARICOM report updating ICCAT on the status of tuna fisheries research and management in the region, including relevant outputs from the Pelagics, Reef and Deep-Slope Fishes Assessment Subprojects Workshop.

Outputs of other CFRAMP activities in 1993, such as the pilot study on FADs and the i preliminary estimation of potential yield (CFRAMP, 1993), will also be of interest to ICCAT and these should be reported at relevant ICCAT meetings.

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance of the Fisheries Divisions of Trinidad and Tobago, Grenada, St. Lucia, St. Vincent and the Grenadines, and Barbados, in providing information on recent changes in their pelagic fisheries and revising ICCAT pelagic catch statistics for the respective countries. This information was included in the CARICOM report (SCRS/92/154) presented at the 1992 ICCAT SCRS meeting. We also wish to thank Dr. John Neilson for reviewing and providing several useful comments on previous drafts of this document.

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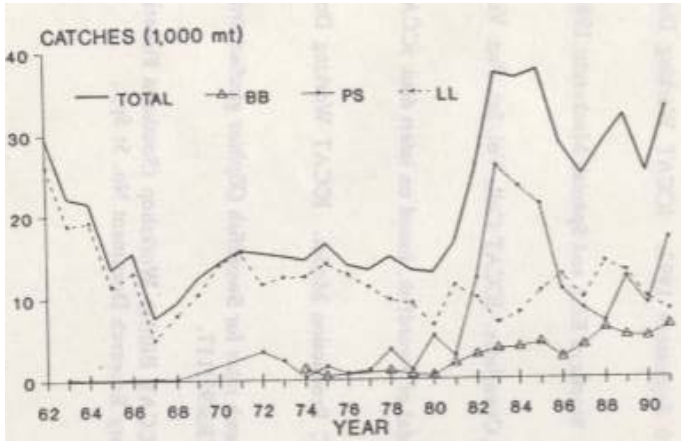


Fig. 1. Annual catches of west Atlantic yellowfin, by major gears (PS-purse seine, BB-baitboat, LL-longline).

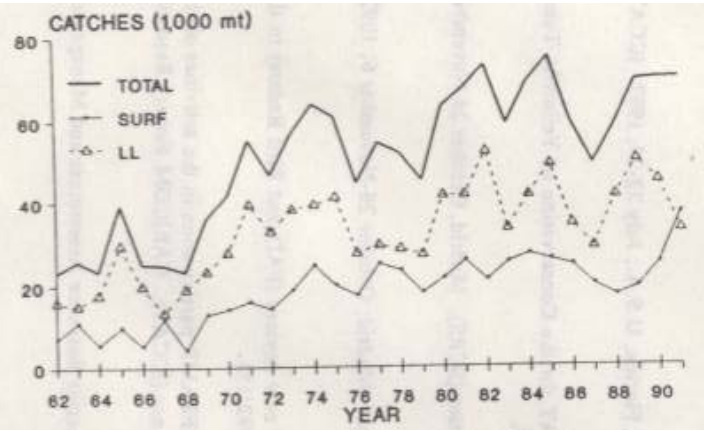


Fig. 2. Annual catches of Atlantic bigeye tuna, by major gears (SURF - surface gear)

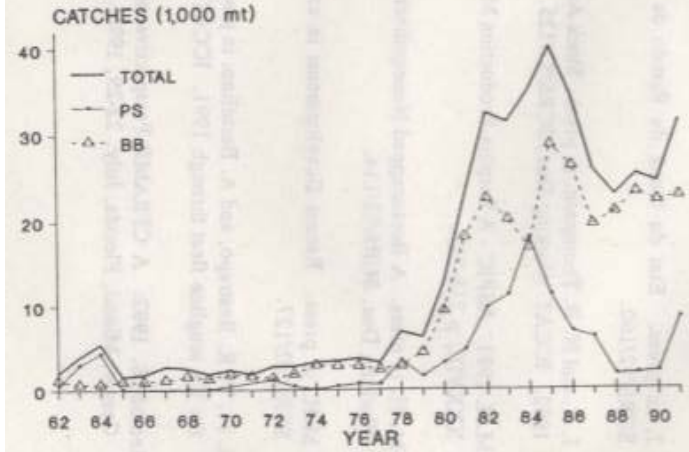


Fig. 3. Annual catches of western Atlantic skipjack tuna, by major gears.

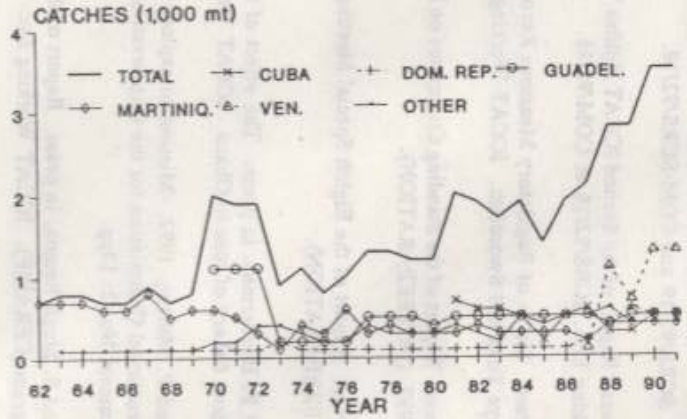


Fig. 4. Annual Atlantic catches of blackfin tuna, by major fishing countries. Gears are unclassified.

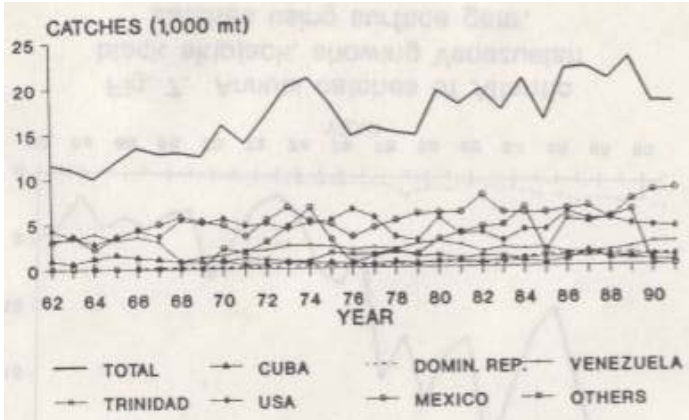


Fig. 9. Annual Atlantic catches of spotted Spanish mackerel by countries. All gears are included.

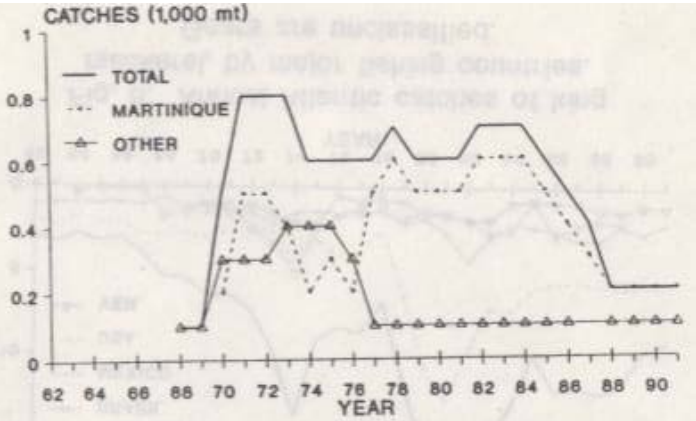


Fig. 10. Annual Atlantic catches of cero mackerel, by country. Gears are unclassified.

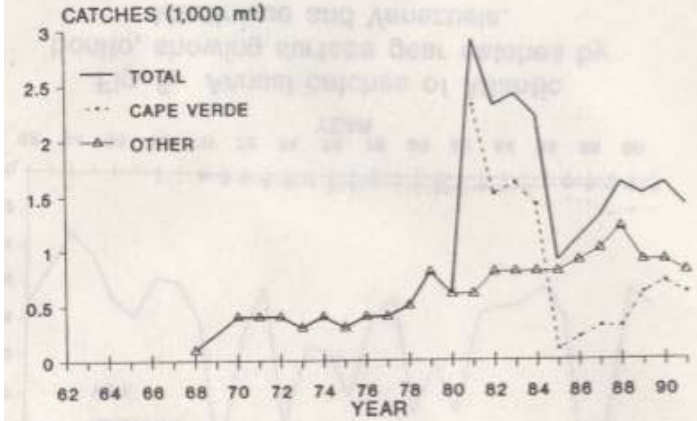


Fig. 11. Annual Atlantic catches of wahoo, by country. Gears are unclassified.

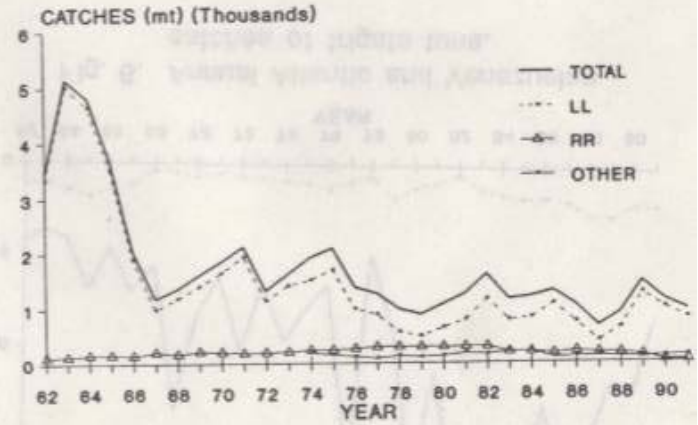


Fig. 12. Annual catches of north Atlantic blue marlin by gear (RR - rod and reel).

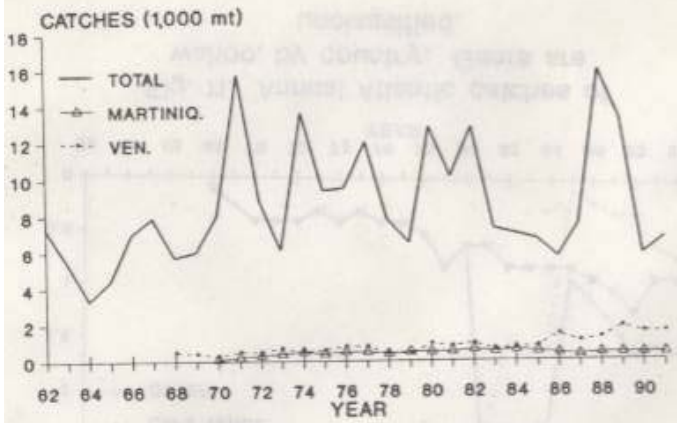


Fig. 5. Annual catches of Atlantic bonito, showing surface gear catches by Martinique and Venezuela.

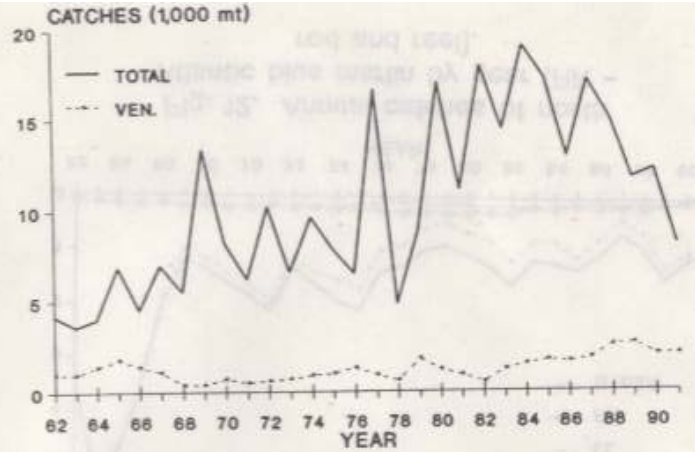


Fig. 6. Annual Atlantic and Venezuelan catches of frigate tuna.

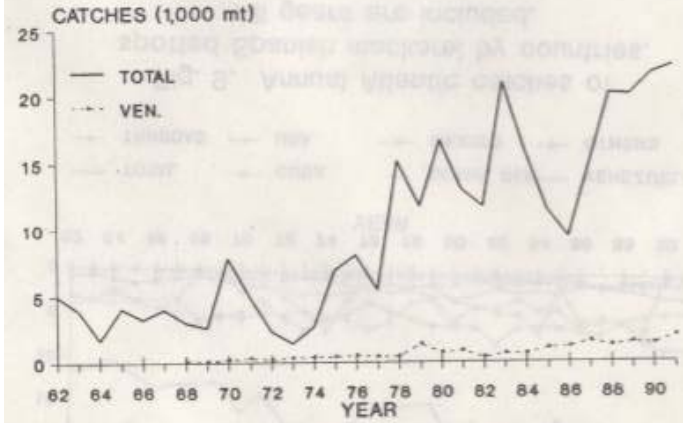


Fig. 7. Annual catches of Atlantic black skipjack, showing Venezuelan catches using surface gear.

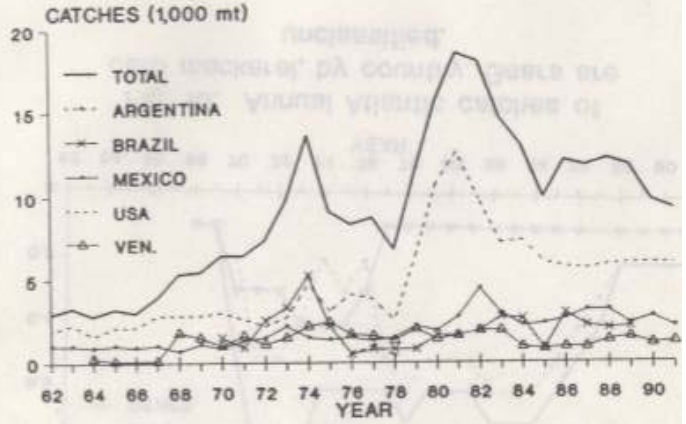


Fig. 8. Annual Atlantic catches of king mackerel, by major fishing countries. Gears are unclassified.

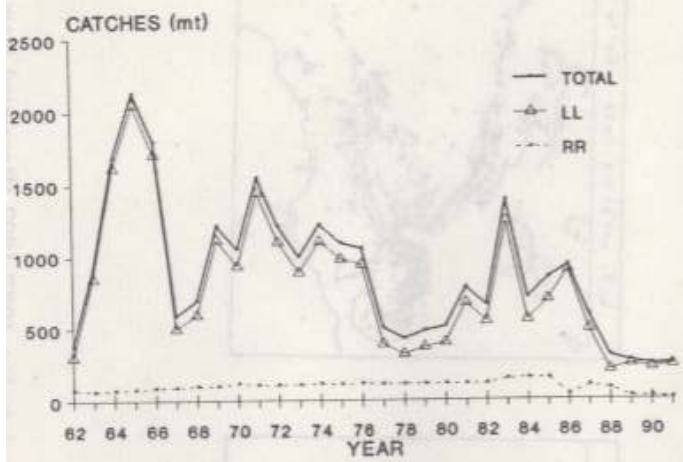


Fig. 13. Annual catches of north Atlantic white marlin, by gear.

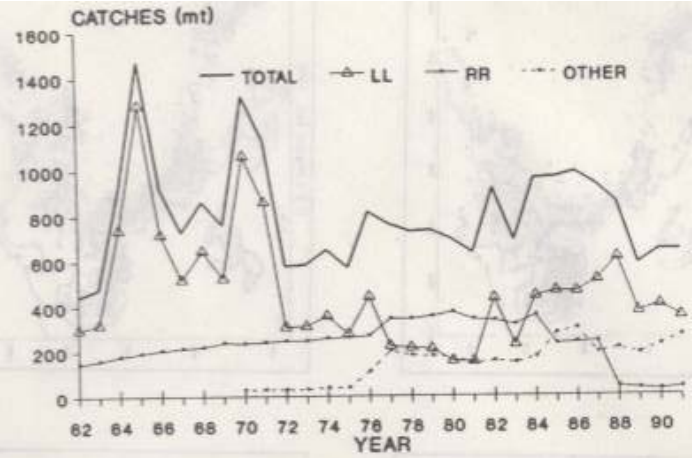


Fig. 14. Annual catches of western Atlantic sailfish, by gear.

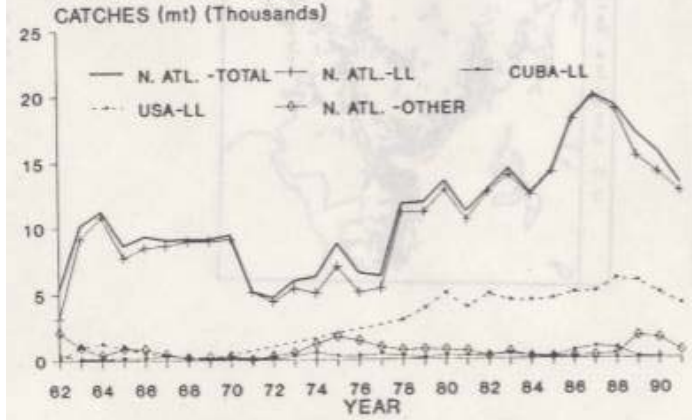
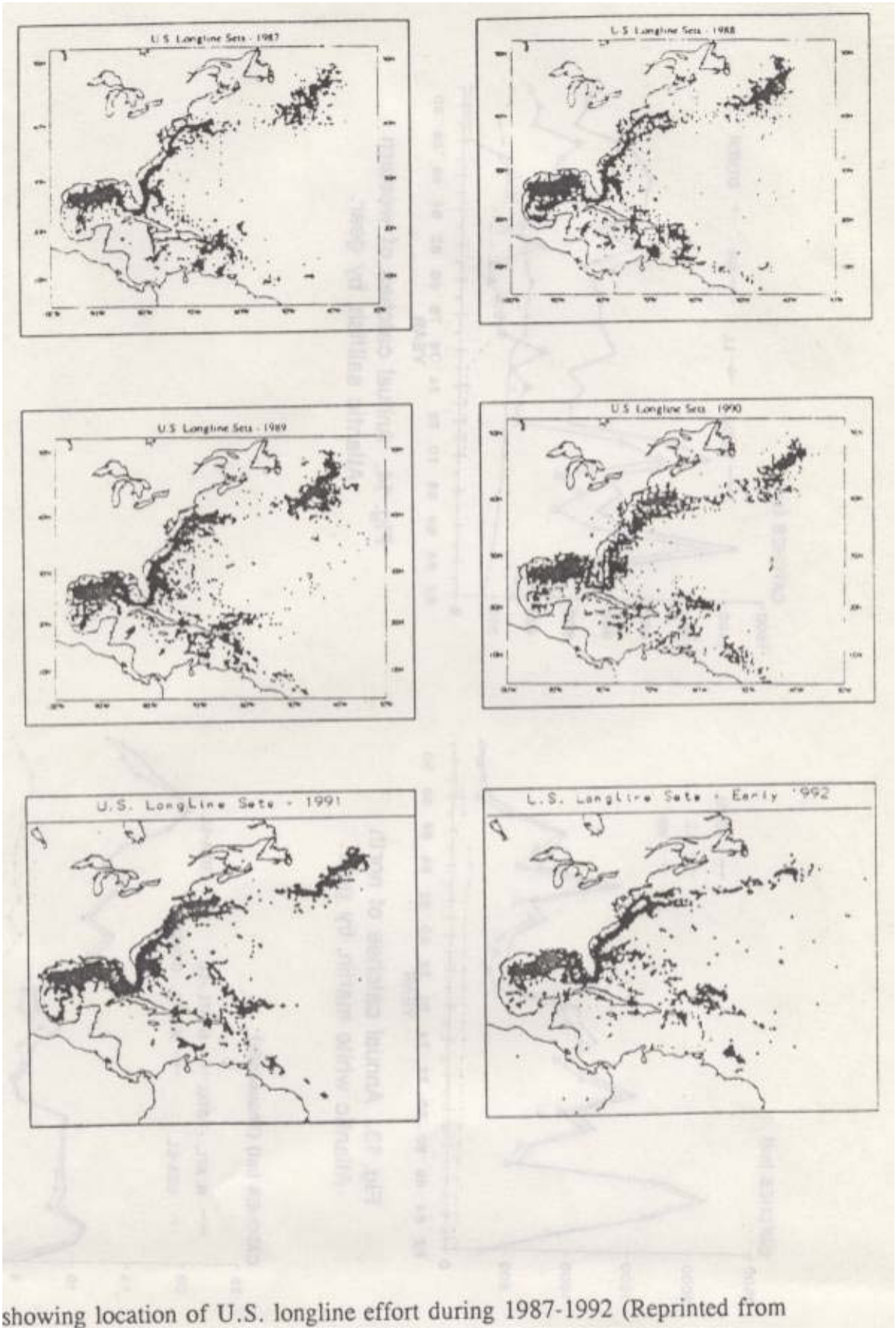


Fig. 15. Annual North Atlantic swordfish catches, by major gear and main fishing countries of the west Atlantic.



showing location of U.S. longline effort during 1987-1992 (Reprinted from

APPENDIX 1

CURRENT REGULATORY MEASURES FOR THE CONSERVATION OF YELLOWFIN TUNA(*Thunnus albacares),* BIGEYE TUNA *(T. obesus),* WEST ATLANTIC BLUEFIN TUNA *(T. thynnus thynnus),* AND SWORDFISH *(Xiphias gladius)*

Yellowfin tuna

1972 - The Contracting States shall take the necessary measures to prohibit ajiy taking and landing of yellowfin tuna weighing less than 3.2 kg. Notwithstanding this regulation, the Contracting States may grant tolerances to boats which have incidentally captured yellowfin weighing less than 3.2 kg, with the condition that this incidental catch should not exceed 15% of the number of fish per landing of the total catch of said boats.

Bigeye tuna

1978 - The Contracting Parties shall take the necessary measures to prohibit any taking and landing of bigeye tuna weighing less than 3.2 kg. Notwithstanding this regulation, the Contracting States may grant tolerances to boats which have incidentally captured bigeye tuna weighing less than 3.2 kg, with the condition that this incidental catch should not exceed 15 % of the number of fish per landing of the total catch of said boats.

Bluefm tuna

1. Size limit and fishing mortality - West Atlantic

1986 - The Contracting Parties shall take measures to prohibit any transfer of fishing effort from the western Atlantic to the eastern Atlantic in order to avoid increasing fishing mortality of bluefin tuna in the eastern Atlantic.

There will be no directed fishery on the bluefin tuna spawning stocks in the western Atlantic in spawning areas such as the Gulf of Mexico.

1991 - The Contracting parties whose nationals have been actively fishing for bluefin tuna in the western Atlantic institute, for the interim, effective measures to limit the quota for scientific monitoring purposes as follows:

Period	*Quota for period (ml)*	*Max in first year (ml)*
1992 and 1993	4,788	2,660
1994 and 1995	3,990	2,261

The catch limits for the western Atlantic bluefin tuna for the years 1993 and 1994 are as follows:

	US	*Canada*	*Japan*	*Total*
1993	693 MT	286 MT	350 MT	1,329 MT
1994	693 MT	286 MT	350 MT	1,329 MT

Beginning with the 1992 catch of the one of the Contracting parties exceeds its annual or biannual scientific monitoring quota, then in the biannual period or year following reporting of that catch to ICCAT, that Contracting Party will reduce its catch to compensate in total for that over-age. Such a reduction will be applied to the domestic catch category of the applicable Contracting Party of the overage.
The three Contracting Parties will prohibit the taking and landing of bluefin tuna weighing less than 30 kg. or in the alternative having a fork length less than 115 cm..

Notwithstanding the above regulatory measure, these three Contracting Parties may grant tolerances to capture bluefin tuna either weighing less than 30 kg., or in the alternative having a fork length less than 115 cm. to limit the take of these fish to no more than 8% by weight of the total bluefin catch on a national basis and would institute measures such that there would not be any economic gain to the fishermen from such fish.
These three Contracting Parties will encourage their commercial and recreational fishermen to tag and release all fish less than 30 kg or in the alternative having a fork length less than 115 cm.

The adoption of the above measures concerning the western Atlantic must not imply any modification in the ICCAT recommendation adopted in 1975 concerning a minimum weight of 6.4 kg adopted for the entire Atlantic; this latter measure having been extended until a new decision is made by ICCAT.

The developing bluefin tuna fisheries in the western Atlantic of Brazil and Cuba shall not be subject to the limitation addressed herein.

Swordfish

1990 - Contracting Parties whose nationals actively fish for swordfish in the North Atlantic shall take measures to reduce the fishing mortality of fish weighing more than 25 kg in thearea north of 5°North latitude by 15% from recent levels. The reduction in fishing mortality shall be determined by the catch in 1988 or may be a reduction of fishing effort that will result in the equivalent reduction of fishing mortality.

The Contracting Parties shall take the necessary measures to prohibit the taking and landing of swordfish in the entire Atlantic Ocean weighing less than 25 kg live weight (125 cm lower jaw fork length); however the Contracting Parties may grant tolerances to boats which have incidentally captured small fish, with the condition that this incidental catch shall not exceed 15% of the number offish per landing of the total swordfish catch of said boats. Other appropriate measures to protect small fish are encouraged.

The Contracting Parties that are directly fishing for swordfish shall take the necessary measures to limit the fishing mortality of swordfish in the entire Atlantic Ocean to the level of catch in 1988, or will limit the fishing effort that will result in the equivalent level of fishing mortality.

Notwithstanding the first and third paragraphs, Contracting Parties whose recent catch levels are small shall keep their annual catches within levels that are reasonable and abide by conservation measures mentioned in paragraph 2.

The Contracting Parties whose nationals do not target swordfish in the North Atlantic Ocean shall take necessary measures to limit the incidental catch to no more than 10% of the total weight of the entire catch so that fishing mortality of swordfish will stay at the current level.

(Full details are given in ICCAT, in press, COM/92/20)

APPENDIX 2

GUIDELINES FOR COLLECTION AND REPORTING OF FISHERY DATA ON ATLANTIC TUNAS, TUNA-LIKE SPECIES AND ASSOCIATED SPECIES

Introduction

These guidelines are for CFRAMP participating countries which operate or license large commercial fishing vessels fishing for pelagics in their EEZs. They are based on the procedures and formats for data collection and reporting outlined by the International Commission for Conservation of the Atlantic Tunas (ICCAT) in their Field Manual (Miyake, 1990). The objective of this document is to promote the collection of data which will be compatible with ICCAT's databases, and which can be incorporated into the national data collection systems currently being developed by CFRAMP's Data and Information Subproject.

In instances where countries are in the process of developing offshore pelagic fisheries through licensing or joint venture operations, it is recommended that the provision of data collected according to the procedures described here be made a precondition of the agreement.

ICCAT Data Requirements

The ICCAT convention proposes three levels of data collection for all fisheries on tuna, tuna-like and associated fisheries. These are referred to as Task I data, Task II catch and effort data and Task II size data (Miyake, 1990). Each additional level provides a further level of detail. It is highly desirable to collect all of the relevant data required. However, if this is not possible, every attempt should be made to collect at least the first level of data. Following is a description of the data required at each of the levels proposed by ICCAT.

Task I data - The nominal annual catch by species, gear and specified ICCAT regions is reported. These data are used to provide an estimate of the total amount of fish removed from each stock for the year. Fishing effort or, alternatively, the number of fishing crafts operating, by gear, should also be reported, for use in evaluating the status of stocks and determining stock trends.

Task II catch and, effort data - Both catch and effort data are collected by species and gears, for small time-area strata (with latitude and longitude boundaries specified). The effort data allow for a more accurate estimation of CPUE which is used as an index of fish abundance, and the smaller time-area strata afford a more detailed interpretation of stock structure and movements.

Task II size data - Size frequency data are collected by species, gears and small time-area strata. Size data facilitate the determination of growth rate and the age structure of the stock which, in turn, contribute essential input parameters for estimating future stock yields.

Acquisition of data

Appropriate methods of data collection will depend on the nature of the fishing operation. CFRAMP's Data and Information Subproject (DIS) will enhance or establish national systems for the collection of at least Task I data (Fanning, 1992; CFRAMP, 1992). CFRAMP'S Assessment Subprojects could undertake a biological sampling program which would include the collection of Task II size data (CFRAMP, 1993). This biological sampling program is likely to be shore-based, and will be conducted only for the duration of the Large Pelagics Assessment Subproject (LPAS). This program will then be evaluated during the final workshop of the Subproject, and the decision to continue biological sampling will rest with participating countries. Table 1 provides a list of suitable methods for gathering data from each type of fishing operation, and shows the relationship of these to CFRAMP'S data collection programs. Data collection systems for each fishery are further described as follows.

Domestic fishery - artisanal: This is composed of small fishing boats which usually land their catch locally. A shore-based sampling program will facilitate collection of both Task I and Task II catch and effort data from this source, and it is anticipated that the Data and Information Subproject will be responsible for this program. The collection of Task II size data and other biological statistics will also be achieved by a shore-based sampling program, which will be undertaken during the course of CFRAMP's Assessment Subprojects.

Commercial _fishery - locally_flagged: These are larger vessels which generally spend longer periods at sea. The shore-based program will be able to capture only Task I data, and only when the catch is landed at a local port. If the catch is landed in another CARICOM country, then it is very likely that the Task I data will be captured by CFRAMP's shore-based program in that country. However, there may be instances where the catch is transshipped or landed in a non-member country. Hence it is advisable that these boats be required to keep logbooks to reflect both Task I and Task II catch and effort data. Also, it should be noted that the systems currently being developed by the Data and Information Subproject and the software for managing those data, provide for the use of logbooks where applicable.

The collection of Task II size data may require at sea sampling. Hence, a country may wish to set up an observer sampling program. Usually, this would involve sending national observers to conduct size sampling on vessels at sea. The country should require that vessels facilitate these observers who could also check on the collection of Task II catch and effort data and the keeping of logbooks.

Commercial fishery foreign flagged: This includes all foreign operations within a country's EEZ. If the catch is landed locally, shore-based sampling may capture Task I data. However, coverage by this system may not be adequate, and vessels should be required to keep logbooks which can be readily accessed by the licensing country for recording of both Task I and Task II catch and effort data. The licensing agreement should also provide for observers aboard vessels during fishing operations. These observers will be responsible both for examining the system of catch and effort data collection and for carrying out biological sampling.

Additional details of data collection systems for tuna and tuna-like fisheries are given in the ICCAT Field Manual (Miyake, 1990). Chapters 2 (pages 11-17) and 3 (page 19) deal with methods for the collection of Task I data. Systems for the collection of Task II catch and effort data, including the use of logbooks, are discussed in chapter 4 (pages 26-30), and various possible logbook formats are given in Appendix 4 (A-C).

Biological (size) data collection and data form formats (forms 3-1 and 3-2) are discussed in chapter 5 (pages 35-50). Also, ICCAT recording forms for use by observers aboard vessels are given in Appendix 4 (Dl and D2). Countries may choose to use these same forms or may wish to modify them to better suit the particular fisheries for which they will be used. CFRAMP will obtain originals of all ICCAT data forms, and will make these available to countries on request.

Reporting Statistics to ICCAT

All data may be forwarded to the CARICOM Fisheries Management Unit (CFMU) in Belize which will be responsible for reporting to ICCAT. Alternatively, a country may choose to report its statistics directly to ICCAT. If the latter decision is taken, a copy of the country's report to ICCAT should be sent to the CFMU office. Figure 1 summarises details of the transfer of data from the field to ICCAT.

Task I data - The Data and Information Subproject will use specially designed forms for the recording of daily catch and fishing craft statistics. For these data, ICCAT forms 1-1 and 1-2 (pages 136-137, Miyake, 1990) are normally used for reporting to ICCAT. Instructions for the completion of these forms are given in chapters 2 (pages 8-11) and 3 (pages 18-19) of the Field Manual.

Task II catch and effort data - The Data and Information Subproject will provide forms which can be used in the field to record Task II catch and effort data. ICCAT form 2 (page 138, Miyake, 1990) may also be used to record catch and effort data on a daily basis, and is the form recommended for use in reporting these data to ICCAT. Instructions for completing this form are given in chapter 4 (pages 20-25) of the Field Manual.

Task II size data - The Assessment Subproject will use forms 3-1 and 3-2, as recommended by ICCAT and with any modifications as required, for recording Task II size data and other biological data in the field (see pages 139-140, ICCAT Field Manual). These data should be reported to ICCAT using forms 3-3 and 3-4 (page 141-143, ICCAT Field Manual). Instructions for completion of forms 3-3 and 3-4 are given in chapter 5 (pages 32-34) of the Field Manual.

Table I- Appropriate mechanisms for collecting each level of data. {DIS -CFRAMP's Data and Information Subproject catch and effort sampling program; LPAS - CFRAMP's Large Pelagic Assessment Subproject shore-based biological sampling program).

Type of fishing operation	Port at which catch is unloaded	Task I data	Task II catch and effort data	Task II size data	Reporting Responsibility
Domestic-Artisanal	Local	Shore -based sampling (DIS)	Shore -based sampling (DIS)	Shore -based sampling (LPAS)	CARICOM country or CFMU
Commercial-Locally flagged	Local	Shore -based sampling (DIS) and /or Logbook	Logbook	Shore -based sampling (LPAS)	CARICOM country or CFMU
Commercial - Locally flagged	Foreign	Logbook and observer recommended	Logbook and observer recommended	At sea sampling by observers	CARICOM country or CFMU
Commercial-Foreign flagged	Local	Shore-based sampling (DIS) and Logbook	Logbook	At sea sampling by observers and/or LPAS	Country of Flag (copy to licensing country)
Commercial-Foreign flagged	Foreign	Logbook and observer recommended	Logbook and observer recommended	At sea sampling by observers	Country of Flag (copy to licensing country)

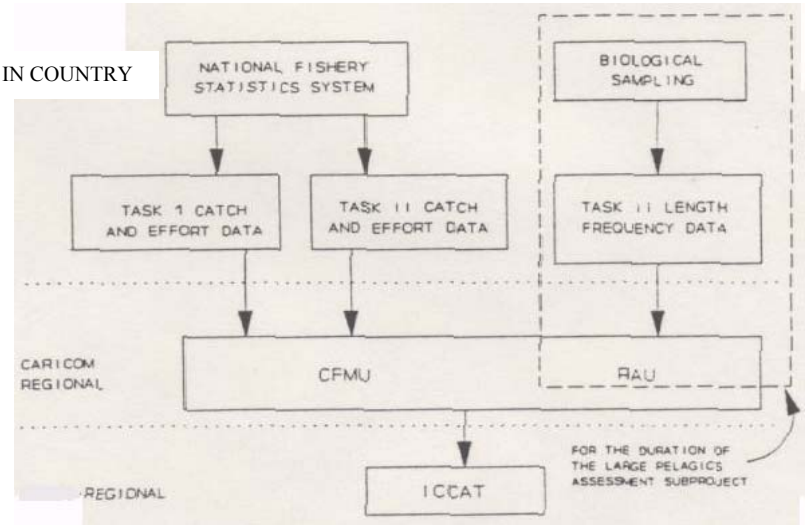


Figure 1. Flow chart showing general categories of data acquisition and reporting to ICCAT within CFRAMP {RAU - Pelagic and Reef Fishes Resource Assessment Unit}.