INTERNATIONAL COMMISSION FOR THE CONSERVATION
OF ATLANTIC TUNAS

COMMISSION INTERNATIONALE POUR LA CONSERVATION
DES THONIDES DE L'ATLANTIQUE

COMISION INTERNACIONAL PARA LA CONSERVACION
DEL ATUN ATLANTICO

RECORD OF THE MEETING ON THE WESTERN ATLANTIC BLUEFIN MANAGEMENT MEASURES

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MINUTES DE LA REUNION SUR LES MESURES DE GESTION DU THON ROUGE DE L'ATLANTIQUE OUEST

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INFORME DE LA REUNION SOBRE NORMAS DE ORDENACION PARA EL ATUN ROJO EN EL ATLANTICO OCCIDENTAL

8 – 12 FEB. 1982

Miami, Florida, U. S. A.

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8-12/II/82

Miami, Florida, U. S. A.

May, 1982

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English version

Version française

Versión española

Original language

RECORD OF THE MEETING ON THE WESTERN ATLANTIC BLUEFIN MANAGEMENT MEASURES

Miami, Florida, U.S.A. Feb. 8-12, 1982

In accordance with the recommendations made by the International Commission for the Conservation of Atlantic Tunas (ICCAT) concerning bluefin management measures at its Seventh Regular Meeting (Tenerife, November, 1981), a meeting was held among the Contracting Parties whose nationals have been actively fishing for bluefin tuna in the western Atlantic. The objective of the meeting was to consult and conclude such consultations in order to develop the conditions under which fishing by their nationals will be carried out, as provided in the Commission's recommendation to Contracting Parties.

The U.S. Government hosted the meeting at the National Marine Fisheries Service, Southeast Fisheries Center, Miami, Florida, from February 8 to 12, 1982. Notice of the meeting was sent to the Governments of Brazil, Canada, Cuba, Japan and U.S.A. Representatives of Brazil, Canada, Japan and U.S.A. participated in the meeting, and the ICCAT Secretariat was also present. A list of participants is attached as Appendix 3.

I. Opening Comments

The Honorable E. B. Forsythe, U.S. Congressman, welcomed all the participants and expressed his hope that the ICCAT would demonstrate its effectiveness in conserving Atlantic bluefin tuna for present and future use (Appendix 1).

II. Selection of the Chairman

The Executive Secretary, Dr. O. Rodríguez-Martín, asked for nominations for the Chairman of the meeting. Dr. F. E. Carlton (U.S.A.) was unanimously elected Chairman. Dr. P. M. Miyake (Secretariat) was nominated rapporteur.

III. Approval of the Agenda

The Tentative Agenda was distributed and adopted with a slight modification (Appendix 2).

IV. Review of Scientific Considerations

Dr. W. W. Fox (U.S.A.) summarized the scientific findings and conclusions by the Standing Committee on Research and Statistics (SCRS) at its last regular session (Tenerife, November, 1981). He also reported on the recent results of U.S. scientists' studies of the sensitivities of the cohort analysis and projected surplus production analyses using wide ranges of variable input parameters and recently provided 1980 Japanese catch figures (Table 1 and Figs. 1 - 3).

Japanese scientists presented results of various analyses they had performed. In cohort analyses they used age specific starting F - values and they projected surplus production under the hypothesis that middle-age fish are less available for fisheries. The documents presented by the Japanese scientists are attached as Appendix 5.

The Chairman asked the scientists of participating countries to meet and study the results of their recent analyses.

The scientific delegations of Canada, Japan, and U.S.A. presented the group's statement which is attached as Appendix 4.

This Record was drafted and adopted in English. French and Spanish translations were done by the Secretariat.

As noted in Appendix 5, it was recognized that the general consensus could not be obtained at this time on the level of surplus production for 1982 and that the whole matter should be further examined through the SCRS.

V. Views of Scientific Monitoring Needs

The U.S. delegation presented its views on the scientific monitoring needs (Appendix 6). The following five criteria were presented for consideration:

1. Minimal catch sufficient for scientific purposes be permitted;
2. Catch to cover as many age groups as possible;
3. Fishing effort be related to the fishing mortality rate;
4. Catch be available for scientific samples; and
5. Minimal by-catch be allowed.

The Canadian delegation expressed general agreement of their view on these criteria.

The Japanese delegation presented a paper (Appendix 7) stating its view on the scientific monitoring needs and presented the following criteria:

1. Entire stock distribution be sampled;
2. Historical data continuity be maintained;
3. As many age groups as possible be sampled;
4. Effort data be substantial enough to generate reliable CPUE data; and
5. Data to be of good quality.

VI. Economic Consideration of Each Element in the Fishery and Country

Mr. A. Peterson (U.S.A.) outlined the U.S. bluefin fisheries and their economic importance. There are several thousand vessels and many thousands of individual fishermen directly involved in the fishery. The ex-vessel commercial catch value was approximately U.S. $5.6 million. The total economic value of the combined commercial and recreational fisheries is in excess of U.S. $36.0 million.

Mr. H. Rosa (Brazil) stated that the industrialized Brazilian tuna fishery has developed since 1977 with leased foreign longliners and since 1979 with local and leased baitboats. The development has been rapid and continuing. Since the bluefin catch by Brazil has been very minimal, Mr. Rosa requested special consideration be given to the Brazilian fishery when bluefin regulations are discussed, so that the development of the Brazilian tuna fishery will not be hindered.

Mr. T. Isogai (Japan) emphasized the importance of the Japanese longline bluefin fishery and possible economic repercussions of the bluefin regulations on the fishery. The total landing value of bluefin by the Japanese fishery from the western Atlantic is roughly estimated at $40 million, and the possible loss suffered by the Japanese fishery in case this regulation is enforced would be $38-39 million.

Mr. M. Hunter (Canada) stated that the total value of the Canadian bluefin tuna fishery is less than that of the U.S.A. and Japan, but the value this fishery has for local economies in the southern Gulf of St. Lawrence is very significant.

VII. Level of Scientific Monitoring, the Quota for Each Country and Date of Implementation

Mr. C. J. Blondin (U.S.A.) presented the U.S view on this agenda item. He emphasized the early concern which the U.S. expressed regarding the bluefin stock conditions and the U.S. effort in regulating its own fishery. When applying

the 1975 ICCAT fishing mortality regulation, the U.S. limited its fishery to a total quota of considerably less than the 1970-74 average catch of bluefin tuna. He noted that Japan used the year of maximum catch as the recent level and shifted much of its effort from the eastern to the western Atlantic. Emphasizing that the U.S. has borne a conservation burden greater than any other country, Mr. Blondin noted that the U.S. purse seine fleet voluntarily abstained from taking the large 1973 year-class in order to increase the future spawning stock. In contrast, the Japanese longline fleet fished the 1973 year-class heavily. While U.S. regulations prevented a directed fishery for the spawning stocks of bluefin tuna in the Gulf of Mexico, the Japanese fleet concentrated on those stocks. The U.S. emphasized that no directed fishery should be allowed in this area. Mr. Blondin presented a table showing average catches by the U.S., Canada and Japan during the 1970-74 period before the Japanese tuna fleet shifted its effort to the western Atlantic.

	Western Atlantic bluefin 1970-74 average catch (MT)	*Percentage*
Canada	997	21
Japan	720	15
U.S.A.	3070	64

Mr. Blondin indicated that the U.S. could not accept a sharing of the resource in proportion to catch levels since 1975 because of the reasons addressed earlier. He also emphasized that a U.S. coastal fisherman has very little flexibility with regard to fishing grounds and should be given special consideration. The U.S. stated that it is willing to give special consideration to developing tuna fishing countries such as Brazil and Cuba.

Mr. Isogai (Japan) commented that all the history of fisheries in the last ten years, present and future population conditions, as well as economic impacts of regulations on the fishery should not be ignored. He stated that Japan cannot accept the sharing ratio suggested by U.S. delegates, and he also pointed out the Japanese effort in protecting the spawning stock in the Gulf of Mexico by consulting with the U.S. Government and adopting a voluntary catch quota for this fishery. He stated that the continuous heavy utilization of the juvenile bluefin tuna by the U.S. and Canadian fisheries should not be ignored. Particularly these U.S. catches represent a substantial amount in number of fish over the past ten years. Such utilization should have had a great effect on the present stock condition.

Mr. Hunter (Canada) concurred with most of the U.S. view. Canada has been dismayed at the way the ICCAT 1975 bluefin regulations have been implemented by Japan, i.e., Japan's taking the highest catch as the recent level of fishing mortality and shifting fishing efforts from the east to west Atlantic. Canada was also dismayed by the fact that Canadian proposals for more effective bluefin management schemes did not get full support by the U.S. at the 1977, 1978, 1979 and 1980 ICCAT sessions. He stressed the Canadian effort in bluefin conservation through regulating its own fishery by catch quota and limiting entries, as well as through limiting the Japanese longline fishing activities within the Canadian 200-mile zone. He also felt that special consideration should be given in applying bluefin regulations to countries such as Brazil and Cuba which are developing these tuna fisheries.

Mr. Isogai expressed his willingness to give special consideration to the Brazilian developing tuna fishery.

Mr. Rosa (Brazil) thanked all the delegates for giving special thought to the developing tuna fishery of his country and emphasized that Brazil is located in the southwestern Atlantic while the Commission's direct concern is for the northwestern bluefin stock.

The meeting recessed at this point and closed sessions were held with the heads of delegations of the countries present. Later, when the meeting was resumed, the heads of delegations reported back to the meeting that they had discussed the levels of monitoring needed, their allocations among the fisheries and countries, and date of implementation. They presented the following statement:

Recognizing that the International Commission for the Conservation of Atlantic Tunas at its Seventh Regular Meeting in Tenerife, Canary Islands, recommended that the Contracting Parties prohibit the capture of bluefin tuna for a period of two years in the western Atlantic Ocean except under conditions to be agreed upon by the Contracting Parties whose nationals have been actively fishing for bluefin tuna in the western Atlantic,

Noting that these Contracting Parties were to consult and conclude such consultations prior to February 15, 1982, in order to develop the conditions under which fishing by their nationals in the western Atlantic would be carried out,

Further noting that these consultations were held February 8-12 in Miami, Florida, among officials from the Governments of Brazil, Canada, Japan, and the United States,

These officials have agreed to recommend to their Governments the following:

FIRST: That measures will be taken to limit the annual catch of bluefin tuna in the western Atlantic during 1982 and 1983 to 1,160 metric tons (MT) taking into consideration: (1) a review of the status of the bluefin tuna stocks, and (2) catch levels necessary to provide data to index the abundance of the stock.

SECOND: That the quota of 1,160 MT will be divided among Canada, Japan, and the United States as follows:

Canada	250 MT
Japan	305 MT
U.S.A.	605 MT

THIRD: That the developing bluefin tuna fisheries in the western Atlantic of Brazil and Cuba, which currently take less than 50 MT annually, shall not be subject to the limitation addressed herein.

FOURTH: That during 1982 and 1983 there will be no directed fishery on the bluefin tuna spawning stocks in the Gulf of Mexico.

FIFTH: That the Governments of Canada, Japan and the United States take steps to implement these provisions as soon as possible and simultaneously in accordance with the regulatory procedures of each country.

SIXTH: That the matters noted in the recommendations contained in paragraphs one to five above be reviewed by ICCAT at its Third Special Meeting in November, 1982.

VIII. Adoption of the Report

The Meeting Record was presented and adopted by the Group.

Table 1. Summary of U. S. Sensitivity Studies

JUVENILES (AGES 1 - 4)

1982 stock size (MT)		*1982 surplus production (MT)*		*Including latest changes in Japanese statistics*
Estimate	*Range*	*Estimate*	*Range*	*Estimate*
691	591 to 1125	121	121 to 303	493

ADULTS (AGES 5 - 30)

1982 stock size (MT)		*1982 surplus production (MT)*		
Estimate	*Range*	*Estimate*	*Range*	*Estimate*
13165	9164 to 21887	-394	-1962 to 367	-368

TOTAL STOCK (AGES 1 - 30)

1982 stock size (MT)		*1982 surplus production (MT)*		
Estimate	*Range*	*Estimate*	*Range*	*Estimate*
13855	9755 to 23012	-272	-1822 to 670	125

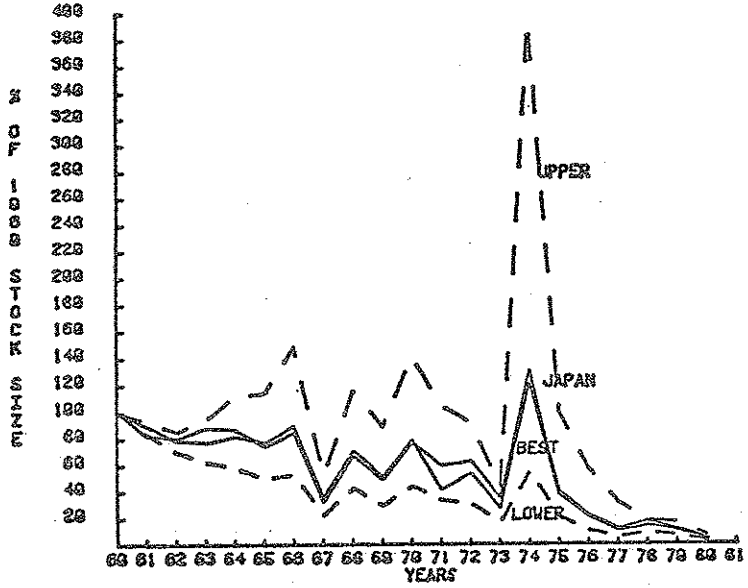

Fig. 1. Western Atlantic age-1 bluefin tuna stock sizes.

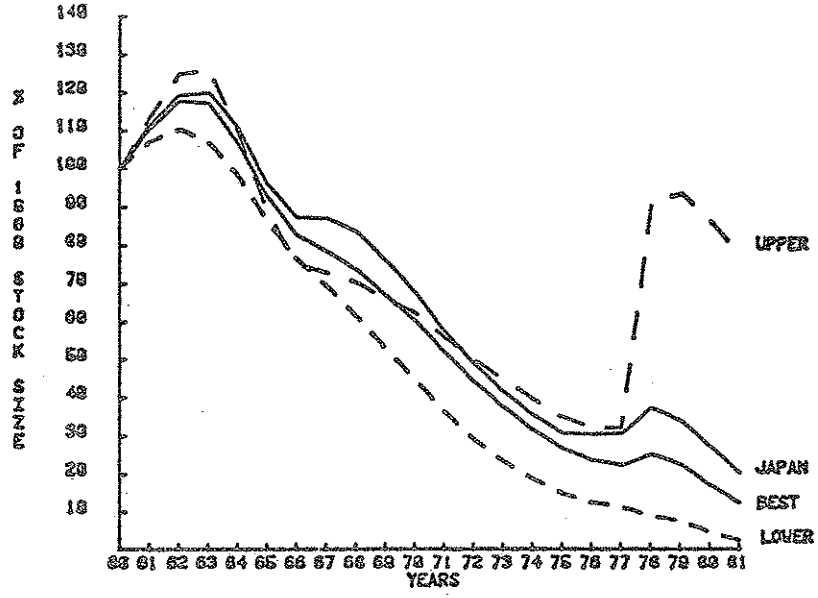

Fig. 2. Western Atlantic adult bluefin tuna stock sizes.

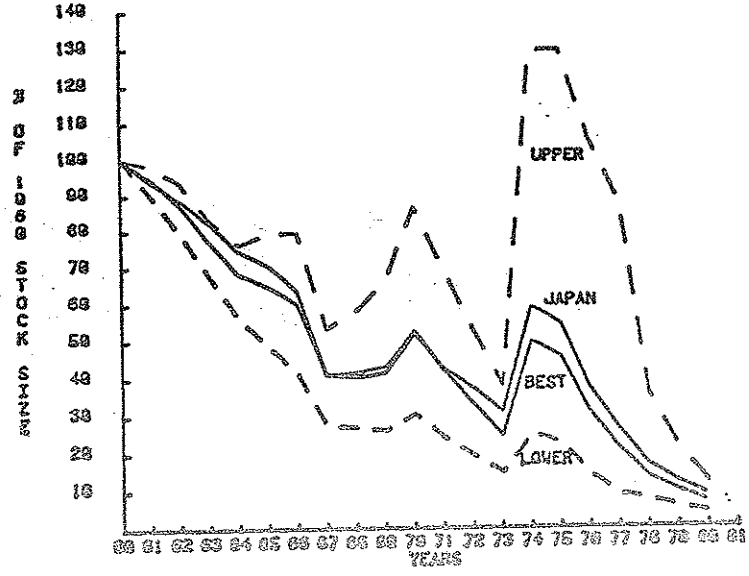

Fig. 3. Western Atlantic age 1-4 bluefin tuna stock sizes.

APPENDIX 1

STATEMENT BY THE HONORABLE EDWIN B. FORSYTHE

February 8, 1982

The Seventh Regular Meeting of the International Commission for the Conservation of Atlantic Tunas was a historic event. For the first time, ICCAT faced the reality of the need to take strong action to conserve the bluefin tuna resource in the western Atlantic. The issue which was confronted at the November meeting was the future of the resource itself. Without adequate and effective action to slow or reverse the dramatic downward trend in stock size, the availability of this resource for present and future generations was in serious question. I was pleased to see the member nations willing to make the hard decisions necessary for the conservation of the resource.

I recognize, however, that some questions have been raised regarding the harvest level which can safely be allowed. This is a critical issue because no person present in this room desires to ask the fishermen of his nation to accept a burden which is not justified by the scientific realities of the status of the western Atlantic bluefin. Yet I believe that all of us share the same goal. That goal is, quite simply, to ensure the present and future viability of the bluefin resource. Conservation is, indeed it must be, our main goal. We cannot sacrifice the future of this resource for whatever immediate gains we may realize.

As we begin these consultations, I believe we have two objectives before us. The first, and most important, is to ensure that the quota level which we establish for the taking of western Atlantic bluefin tuna is sufficient to ensure the conservation of the resource without imposing an unreasonable and unnecessary economic burden on the fishermen who depend upon this resource. If we establish a quota which exceeds that which can safely be taken from the resource, we are doing our fishermen a disservice because we will have sacrificed their industry by sacrificing the resource upon which it is based.

The second objective before us is to divide the quota among our nations. In arriving at this decision I believe two principles are important. The first is that those nations which have in the past taken conservation measures to protect this resource should not now be asked to bear the lion's share of the conservation needs. The second principle is that coastal fishermen who have limited alternative fishing opportunities should bear a lesser burden.

I appreciate the opportunity to speak to you and look forward to the successful conclusion of these consultations -- for if we fail, we have failed our fishermen and we have failed the resource.

APPENDIX 2

AGENDA

I. Opening Comments

II. Selection of the Chairman

III. Approval of the Agenda

IV. Review of Scientific Considerations

V. Views on Scientific Monitoring Needs

VI. Economic Consideration of Each Element in the Fishery

VII. Level of Scientific Monitoring, the Quota for Each Country and Date of Implementation

VIII. Adoption of the Report

APPENDIX 3

LIST OF PARTICIPANTS

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East Coast Tuna Assoc.

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Director, Office of International Fish.
National Marine Fisheries Service

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Member of Congress, U.S.A.

FEINBERG, WILLIAM
Mid-Atlantic Council

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HADER, WARREN F.
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Montauk Boatman's Assoc.

HARRY, ELWOOD K.
President
International Game Fish Assoc.

HART, DAVID H.
Chairman
Mid-Atlantic Council

HESTER, FRANK
Biologist
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HILLHOUSE, ROGER
Ex-tunaboat operator
East Coast Tuna Purse Seiners

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Capt. Seafood Center, Inc.

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President, Viking Village
Director, American Tuna Action Committee

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Assistant Chief, Intelligence &
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STEWART, KAREN B.
Fishery Affairs Officer
U. S. State Department

STONE, RICHARD B.
Recreational Fishery Officer,NOAA-NMFS

TAYLOR, ARNET
Executive Director
American Tuna Action Committee

ICCAT

MIYAKE, PETER M.
Assistant Executive Secretary

RODRIGUEZ-MARTIN, OLEGARIO
Executive Secretary

APPENDIX 4

STATEMENT OF SCIENTIFIC DELEGATES
OF JAPAN, UNITED STATES AND CANADA

Surplus production estimates are very sensitive to input parameters such as stock recruitment relationships, starting fishing mortality rates, and present age composition.

Analyses were conducted by scientific delegates of the United States in which these input parameters were varied. The results presented for 1982 surplus production in the western Atlantic ranged from minus 1822 metric tons to plus 670 metric tons.

The scientific delegates of Japan tested an alternative analytical method and the result was an estimate of 1868 metric tons surplus production in 1982.

The Japanese scientists also hypothesized that medium aged bluefin (ages 4-14) are less available to the fishery and that this affects the assessment procedure. Their results in this analysis concluded that surplus production in 1982 for fish eleven years old and older was 3062 metric tons. However, no estimate of surplus production was made for fish ten years old and younger in 1982. Therefore, no estimate of total surplus production was available from this analysis.

The Canadian scientists tested another alternative and estimated surplus production of 431 metric tons.

The results of Japanese analyses were accompanied by written documents, whereas the United States and Canadian results were only described by the scientists. No time was available to provide an adequate review of the data and results. Therefore, no agreement was reached among the scientific delegates as to the level of 1982 surplus production. It is recommended that scientific research be conducted to determine if, indeed, ages 4-14 are less available and whether or not this has an impact on the assessment procedure. Also, methods of estimating surplus production should be investigated. Results of such research should be reviewed through the established procedures of SCRS.

APPENDIX 5 — SCIENTIFIC DOCUMENTS PRESENTED AT THE MEETING

APPENDIX 6 — WEST ATLANTIC BLUEFIN MONITORING PLAN INVOLVING CATCHES FROM THE STOCK (MEMORANDUM FROM W.W. FOX, JR. TO C. J. BLONDIN)

APPENDIX 7 — MONITORING PLAN OF STOCK CONDITION OF BLUEFIN TUNA IN THE WESTERN ATLANTIC - ESTIMATION OF NECESSARY CATCH AMOUNT (PELAGIC RESOURCES DIVISION-FSFRL)

These appendices can be found on Page 43. They are in the original language (English) only.

MINUTES DE LA REUNION SUR LES MESURES DE GESTION DU THON ROUGE DE L'ATLANTIQUE OUEST

8-12 Février 1982 - Miami, Floride, Etats-Unis

Conformément aux recommandations concernant les mesures de gestion du thon rouge formulées par la Commission internationale pour la conservation des thonidés de l'Atlantique à sa Septième réunion ordinaire (Tenerife, novembre 1981), les Parties contractantes dont les ressortissants prennent une part active à la pêche de cette espèce dans l'Atlantique ouest ont tenu une réunion. Le but de cette dernière était de permettre un échange d'opinions dont les conclusions serviraient à définir les conditions selon lesquelles les ressortissants des divers pays pourront pêcher, suivant les recommandations de la Commission aux Parties contractantes.

La réunion a été accueillie par le gouvernement américain, et a eu lieu à Miami, Floride, les 8-12 février 1982, dans les locaux du "Southeast Fisheries Center" du "National Marine Fisheries Service". Les gouvernements suivants avaient été invités: Brésil, Canada, Cuba, Etats-Unis et Japon. Le Brésil, le Canada, les Etats-Unis et le Japon, ainsi que le Secrétariat de l'ICCAT, étaient représentés. La liste des participants est jointe en tant qu'Appendice 3.

I. Ouverture

L'Hon. E.B. Forsythe, membre du Congrès des Etats-Unis, a souhaité la bienvenue à tous les participants, et a exprimé l'espoir que l'ICCAT fasse preuve de son efficacité pour la conservation des ressources en thon rouge de l'Atlantique en vue de son exploitation présente et à venir (Appendice 1).

II. Nomination du président

Le Secrétaire exécutif, Dr. O. Rodriguez-Martin, a sollicité les votes pour la désignation d'un président pour la direction des débats. Le Dr. F.E. Carlton (Etats-Unis) a été nommé président à l'unanimité. Le Dr. P.M. Miyake, du Secrétariat, a été désigné rapporteur.

III. Approbation de l'ordre du jour

L'Ordre du jour provisoire a été diffusé et adopté avec une légère modification (Appendice 2).

IV. Examen des considérations d'ordre scientifique

Le Dr. W.W. Fox (Etats-Unis) a résumé les résultats et conclusions de la dernière réunion ordinaire (Tenerife, novembre 1981) du Comité permanent pour la recherche et les statistiques (SCRS). Il a également signalé les résultats obtenus par les chercheurs américains dans leurs études sur la sensibilité de l'analyse des cohortes et leurs analyses de la production excédentaire escomptée, au moyen d'un éventail étendu de valeurs pour les paramètres d'entrée variables et de chiffres japonais de capture récemment fournis pour 1980 (tableau 1 et figures 1-3).

Rapport rédigé et adopté en langue anglaise. Traduction en français et en espagnol du Secrétariat.

Les chercheurs japonais ont présenté les résultats de diverses études, d'analyses de cohortes au moyen de valeurs F de départ, et de production excédentaire escomptée selon l'hypothèse d'une moindre disponibilité à la pêcherie des poissons d'âge moyen. Les travaux présentés par les scientifiques japonais figurent à l'Appendice 5 ci-joint.

Le président a prié les chercheurs des pays représentés de se réunir pour étudier les résultats de leurs dernières études.

La délégation scientifique du Canada, des Etats-Unis et du Japon a présenté la déclaration du groupe, qui figure ci-joint à l'Appendice 4.

Comme l'indique l'Appendice 4, on a reconnu qu'il était impossible d'arriver à un accord général à l'heure actuelle concernant le niveau de production excédentaire pour 1982, et qu'il convenait que le SCRS reprenne l'étude de l'ensemble de cette question.

V. Contrôle scientifique nécessaire

La délégation américaine a fait part de son opinion à cet égard (Appendice 6). Cinq critères étaient soumis par les Etats-Unis pour examen:

1. Capture minimum permettant de répondre aux besoins scientifiques,
2. Prise couvrant le plus grand nombre possible de groupes d'âge,
3. Effort de pêche associé au taux de mortalité par pêche,
4. Prises disponibles à l'échantillonnage, et
5. Prises accessoires minimum.

Le Canada a fait part de son accord général avec ces critères.

La délégation du Japon a présenté un document (Appendice 7) résumant son opinion sur les besoins en contrôle scientifique, et offrant les critères suivants:

1. Echantillonnage de la distribution du stock entier,
2. Maintien de la continuité historique des données,
3. Echantillonnage du plus grand nombre possible de groupes d'âge,
4. Données d'effort suffisamment abondantes pour fournir des données fiables de CPUE, et
5. Bonne qualité des données.

VI. Considérations économiques - Pêcheries et pays

M. A. Peterson (Etats-Unis) a fait un exposé schématique des pêcheries américaines de thon rouge, et de leur importance du point de vue économique. Cette pêcherie met en jeu plusieurs milliers de bateaux et de pêcheurs individuels. La valeur au déchargement des prises commerciales s'élève à environ US$ 5,6 millions. Celle des prises commerciales et sportives combinées dépasse US$ 36,0 millions.

M. H. Rosa (Brésil) a indiqué que la pêche industrielle brésilienne est en essor depuis 1977 avec l'introduction de palangriers en location, et depuis 1979 avec celle de canneurs locaux et en location; il s'agit d'une croissance rapide et continue. Les prises brésiliennes de thon rouge étant minimes, M. Rosa a demandé qu'une attention particulière soit accordée aux pêcheries thonières brésiliennes au moment de prendre des mesures de gestion pour le thon rouge, afin de ne pas entraver leur essor.

M. T. Isogai (Japon) a insisté sur l'importance de la pêche palangrière japonaise et les répercussions économiques éventuelles de réglementations du thon rouge sur la pêcherie. La valeur totale au déchargement des prises japonaises de thon rouge dans l'Atlantique ouest est grossièrement estimée à US$ 40 millions, et la mise en vigueur de la réglementation entraînerait pour le Japon des pertes de quelque US$ 38-39 millions.

M. M. Hunter (Canada) a indiqué que la valeur totale de la pêche canadienne au thon rouge est moindre que celle des Etats-Unis et du Japon, mais que son importance dans le cadre des économies locales du secteur méridional du golfe du Saint-Laurent est hautement significative.

VII. Degré de contrôle scientifique, quotas et date d'application

M. C.J. Blondin (Etats-Unis) a présenté l'opinion des Etats-Unis sur ce sujet. Il a insisté sur les inquiétudes dont son pays a fait part depuis le début concernant l'état des stocks de thon rouge, et sur les efforts qu'il a réalisés pour contrôler sa propre pêcherie. Lors de l'application de la réglementation ICCAT de 1975 portant sur la mortalité par pêche, les Etats-Unis se limitèrent à capturer une quantité considérablement inférieure à la prise moyenne 1970-74. M. Blondin a fait remarquer que le Japon avait utilisé comme niveau récent l'année de prise maximale, et avait déplacé une grande partie de son effort de l'Atlantique est à l'Atlantique ouest.

En insistant sur le fait que les Etats-Unis avaient assumé, quant à la conservation, une chage plus lourde qu'aucun autre pays, M. Blondin a signalé que les senneurs américains s'étaient volontairement abstenus de capturer la forte classe de 1973, afin d'accroître le futur stock reproducteur. Par contre, les palangriers japonais ont fortement exploité cette classe. Alors que les réglementations américaines interdisaient la pêche visant directement les stocks de thons rouges géniteurs dans le golfe du Mexique, la flottille japonaise s'est concentrée sur ces mêmes stocks. Les Etats-Unis insistent sur le fait qu'aucune pêcherie visant directement cette espèce ne devrait être autorisée dans cette zone.

M. Blondin a présenté un tableau montrant les prises américaines, canadiennes et japonaises en 1970-74, avant que la flottille japonaise n'ait déplacé son effort vers l'Atlantique ouest.

	Prise moyenne de thon rouge Atlantique ouest, 1970-74	*o/o*
Canada	997	21
Etats-Unis	720	15
Japon	3.070	64

M. Blondin a déclaré que les Etats-Unis ne pouvaient pas, pour les raisons exposées ci-dessus, accepter une répartition des ressources proportionnelle au niveau des prises depuis 1975. Il a également souligné le peu de flexibilité dont dispose un pêcheur sur les côtes américaines en ce qui concerne le choix de lieux de pêche, et que ceci doit faire l'objet de considérations spéciales. Les Etats-Unis sont disposés à accorder une attention spéciale aux pays dont la pêche thonière est en développement, tels que le Brésil et Cuba.

M. T. Isogai (Japon) a commenté qu'il ne fallait pas négliger les considérations concernant l'histoire de la pêche ces dix dernières années, les conditions actuelles et futures des populations, et les répercussions économiques de réglementations sur la pêcherie. Il a déclaré que le Japon ne peut accepter la répartition de quotas mentionnée par la délégation américaine, et a signalé en outre les efforts réalisés par le Japon vers la protection du stock reproducteur du golfe du Mexique en consultant les autorités américaines et en adoptant un quota volontaire de capture pour cette pêcherie. M. Isogai a noté que l'exploitation intense et continue de thons rouges juvéniles de la part des Etats-Unis et du Canada ne pouvait pas être négligée. En particulier, les prises américaines de ces poissons ont été depuis dix ans d'une importance numérique substantielle. Cette exploitation ne peut manquer d'avoir gravement affecté l'état actuel du stock.

M. M. Hunter (Canada) a repris la plupart des points de vue des Etats-Unis. Le Canada a été tristement surpris de la façon dont les réglementations de 1975 sur le thon rouge avaient été appliquées par le Japon, concrètement le fait de prendre la plus forte prise comme niveau récent de mortalité par pêche, et celui de déplacer l'effort de l'Atlantique est à l'Atlantique ouest. Le Canada déplore également que les propositions canadiennes portant sur des schémas plus efficaces de gestion du thon rouge n'aient pas reçu l'appui intégral des Etats-Unis aux réunions ICCAT de 1977, 1978, 1979 et 1980. M. Hunter a insisté sur les efforts du Canada vers la conservation du thon rouge à travers la réglementation de sa propre pêcherie par le contingentement des prises et la limitation des licences de pêche, ainsi qu'en limitant les activités de pêche japonaises dans les limites de la zone des 200 milles du Canada. Il estime également qu'il convient de tenir compte, au moment d'appliquer des réglementations pour le thon rouge, du cas de pays comme le Brésil et Cuba dont la pêche thonière est en développement.

M. Isogai s'est déclaré disposé à accorder une attention particulière à la pêche brésilienne en essor.

M. H. Rosa (Brésil) a remercié les délégués de leur considération envers la pêche thonière en développement de son pays, et a souligné que le Brésil se trouvait dans l'Atlantique sud-ouest, alors que les inquiétudes de la Commission portent plus directement sur les stocks nord-ouest de thon rouge.

Les débats furent alors levés, et les chefs de délégation présents tinrent des réunions à huis clos. Par la suite, à la reprise des délibérations, ils informèrent les assistants qu'ils avaient traité du degré de contrôle nécessaire, du quota à allouer aux différents pays et pêcheries et de la date d'application, et présentèrent la déclaration suivante:

Attendu que la Commission internationale pour la conservation des thonidés de l'ATlantique, lors de sa Septième réunion ordinaire, a recommandé que les Parties contractantes interdisent la capture de thon rouge pendant une période de deux ans dans l'Atlantique ouest, sauf dans certaines conditions à convenir par les Parties contractantes dont les ressortissants ont pris une part active à la pêche du thon rouge dans l'Atlantique ouest,

Prenant note du fait que ces Parties contractantes devaient conférer et conclure leurs délibérations avant le 15 février 1982, afin d'être à même de définir les conditions dans lesquelles leurs ressortissants pourront pêcher dans l'Atlantique ouest,

Prenant note également du fait que ces délibérations ont eu lieu les 8-12 février à Miami entre des représentants des gouvernements du Brésil, du Canada, des Etats-Unis et du Japon,

Les représentants sont convenus de recommander ce qui suit à leur gouvernement:

PREMIEREMENT: Que des mesures soient prises pour limiter à 1.160 tonnes métriques (TM) la prise de thon rouge dans l'Atlantique ouest en 1982 et 1983, en tenant compte de: (1) l'examen de l'état des stocks de thon rouge, et (2) le niveau de capture nécessaire pour fournir des données permettant de juger de l'abondance du stock.

DEUXIEMEMENT: Que ce quota de 1.160 TM soit réparti comme suit entre le Canada, les Etats-Unis et le Japon:

Canada	250 TM
Etats-Unis	605 TM
Japon	305 TM

TROISIEMEMENT: Que les pêcheries thonières en développement dans l'Atlantique ouest, du Brésil et de Cuba, qui prennent à l'heure actuelle moins de 50 TM par an, soient exemptes des contingentements ci-dessus.

QUATRIEMEMENT: Qu'en 1982 et 1983 il ne se produise pas dans le golfe du Mexique de pêche visant directement les stocks de thons rouges géniteurs.

CINQUIEMEMENT: Que les gouvernements du Canada, des Etats-Unis et du Japon prennent des mesures pour appliquer ces dispositions dès que possible et simultanément, en accord avec les normes de chaque pays portant sur les réglementations.

SIXIEMEMENT: Que le contenu des paragraphes I à V ci-dessus soit révisé par l'ICCAT à sa Troisième réunion ordinaire au mois de novembre 1982.

VIII. Adoption du rapport

Les minutes de la réunion ont été présentées et adoptées par le groupe.

Tableau 1

Récapitulation des études américaines sur la sensibilité

JUVENILES (AGES 1-4)

Taille du stock 1982 (TM)		*Production excédentaire 1982 (TM)*		*Y compris dernières modifications statistiques japonaises*
Estimation	*Gamme*	*Estimation*	*Gamme*	*Estimation*
691	591 à 1125	121	121 à 303	493

ADULTES (AGES 5-30)

Taille du stock 1982 (TM)		*Production excédentaire 1982 (TM)*		
Estimation	*Gamme*	*Estimation*	*Gamme*	*Estimation*
13165	9164 à 21887	-394	-1962 à 367	-368

TOTAL STOCK (AGES 1-30)

Taille du stock 1982 (TM)		*Production excédentaire 1982 (TM)*		
Estimation	*Gamme*	*Estimation*	*Gamme*	*Estimation*
13855	9755 à 23012	-272	-1822 à 670	125

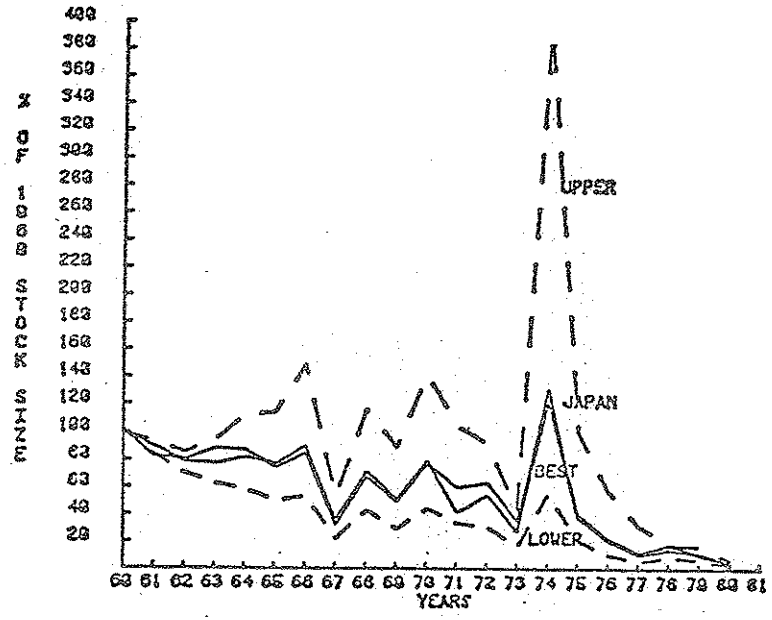

Fig.1. Taille du stock de thon rouge d'âge 1, Atlantique ouest.

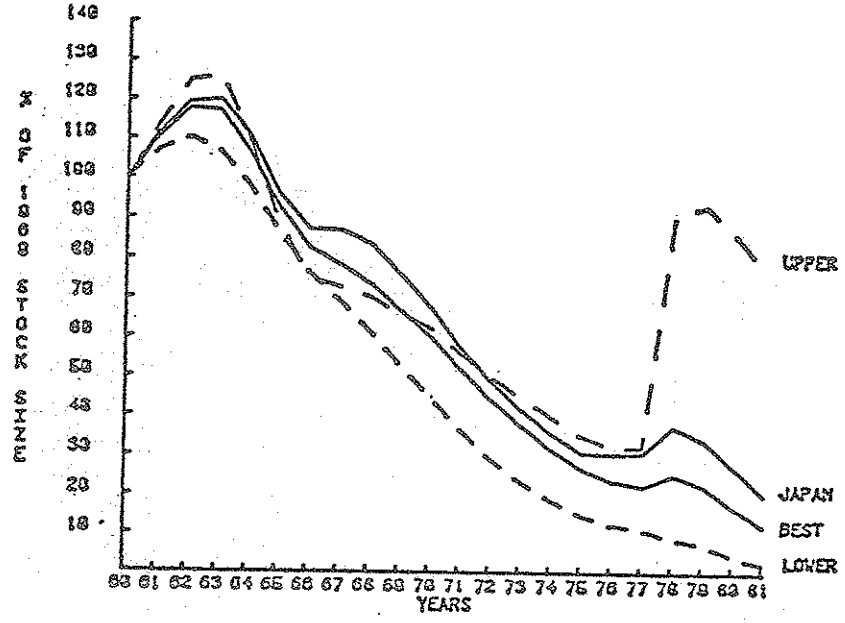

Fig. 2. Taille du stock de thon rouge adulte, Atlantique ouest.

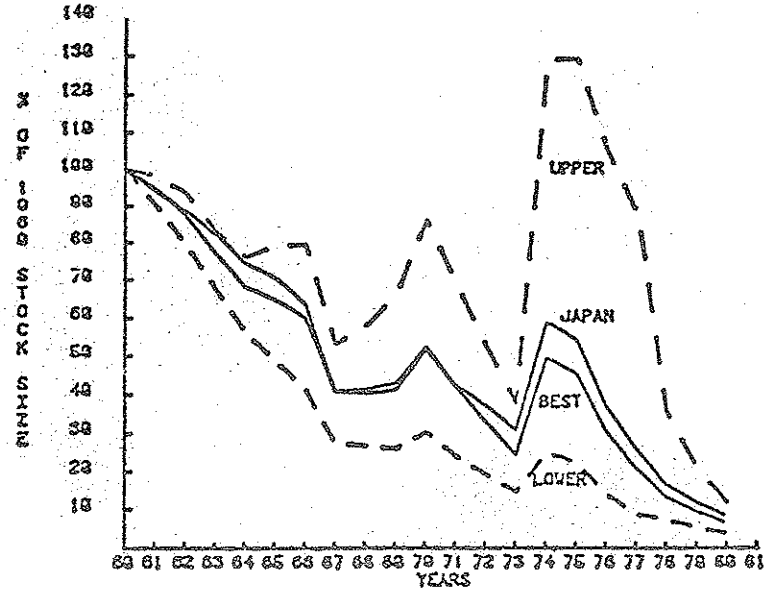

Fig. 3. Taille du stock de thon rouge, d'âge 1-4, Atlantique ouest.

APPENDICE 1

ALLOCUTION PRONONCEE PAR L'HONORABLE E.B. FORSYTHE

2 février 1982

La Septième Réunion Ordinaire de la Commission internationale pour la conservation des thonidés de l'Atlantique a été un événement marquant. En effet, pour la première fois depuis ses débuts, l'ICCAT a fait face au besoin bien réel de prendre des mesures énergiques vers la conservation des ressources en thon rouge de l'Atlantique ouest. Il s'agissait de considérer l'avenir de la ressource elle-même. En l'absence de mesures adéquates et efficaces visant à ralentir ou renverser la spectaculaire tendance à la baisse de la biomasse, la disponibilité de la ressource aux générations présentes et à venir était en jeu. J'ai été heureux de constater que les pays membres étaient disposés à prendre des décisions énergiques en vue de la conservation de la ressource.

Je reconnais, cependant, que des doutes ont été exprimés quant au niveau d'exploitation qui peut être autorisé sans danger. Il s'agit d'un sujet délicat, car aucune des personnes ici présentes ne peut souhaiter devoir demander aux pêcheurs de son pays d'assumer une charge qui n'est pas justifiée par les preuves scientifiques sur l'état du thon rouge de l'Atlantique ouest. Je suis néanmoins certain que nous poursuivons le même but, qui est tout simplement de garantir la viabilité présente et future des ressources en thon rouge. La conservation est, et doit en fait être, notre objectif principal. Nous ne devons pas sacrifier l'avenir des ressources au nom des avantages immédiats que nous pouvons en tirer.

En ouvrant ces débats, je crois que nous devons faire face à deux objectifs. Le premier, et principal but est de nous assurer que le quota fixé pour la capture de thon rouge de l'Atlantique ouest permettra d'assurer la conservation des ressources sans imposer aux pêcheurs qui en dépendent de charge inutile ou excessive. Si le quota fixé dépasse ce qui peut être prélevé sans danger pour les ressources, nous rendrons en fait un mauvais service à nos pêcheurs dont l'industrie se verra endommagée du fait des coups portés aux ressources sur lesquelles elle se fonde.

Le deuxième objectif visé est la répartition du quota entre les divers pays. J'estime que deux principes s'imposent dans ce cas. En premier lieu, que les pays qui ont déjà pris des mesures de conservation en vue de la protection des ressources ne doivent pas avoir à assumer maintenant la majeure partie du travail de conservation. Ensuite, que les pêcheurs du littoral, dont les possibilités de choix sont limitées, aient à porter un fardeau plus léger.

Je suis heureux d'avoir cette occasion de m'adresser à vous et attends avec impatience une issue positive des débats, car si nous échouons, nous aurons trahi nos pêcheurs et, partant, les ressources.

APPENDICE 2

ORDRE DU JOUR

I. Allocution d'ouverture

II. Election du président

III. Adoption de l'ordre du jour

IV. Examen des considérations d'ordre scientifique

V. Opinions sur les besoins en contrôle scientifique

VI. Examen de l'aspect économique de chacun des éléments de la pêcherie

VII. Niveau de contrôle scientifique, quota pour chaque pays et date d'entrée en vigueur

VIII. Adoption du rapport

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APPENDICE 4

DECLARATION DE LA DELEGATION SCIENTIFIQUE
DU JAPON, DU CANADA ET DES ETATS-UNIS

Les estimations de la production excédentaire sont très sensibles aux paramètres d'entrée tels que la relation stock-recrutement, aux valeurs de départ de mortalité par pêche et à la structure démographique actuelle.

Des analyses ont été effectuées par les délégués scientifiques des Etats-Unis en variant ces paramètres d'entrée. Les résultats présentés pour la production excédentaire de 1982 dans l'Atlantique ouest allaient de -1822 TM à + 670 TM.

Les délégués scientifiques du Japon ont mis à l'épreuve une autre méthode d'analyse, qui a donné un chiffre de production excédentaire de 1868 TM pour 1982.

Les scientifiques japonais ont également postulé que le thon rouge d'âge moyen (âges 4-14) est moins disponible à la pêcherie, et que ceci ne peut manquer d'affecter les processus d'évaluation. Les résultats de leur analyse signalaient une production excédentaire de 3.062 TM en 1982 pour les poissons de onze ans et plus. Aucune estimation n'a été faite pour les poissons de dix ans et au-dessous pour la même année. On ne disposait donc d'aucune estimation de la production excédentaire globale selon cette analyse.

Les scientifiques canadiens ont mis une autre méthode à l'épreuve et ont estimé une production excédentaire de 431 TM.

Les résultats des analyses japonaises étaient accompagnés d'une documentation de référence, alors que les conclusions américaines et canadiennes ont simplement été exposées par les chercheurs. Le manque de temps n'a pas permis de procéder à un examen adéquat des données et résultats. Il n'a donc pas été possible d'aboutir à un accord entre les délégués scientifiques quant au niveau de production excédentaire de 1982. Il est recommandé que des recherches scientifiques soient effectuées pour déterminer si en réalité les âges 4 à 14 sont moins disponibles, et si ceci a ou non des conséquences sur les processus d'évaluation. Il faut également tenter de trouver une méthode d'estimation de la production excédentaire. Les conclusions de ces recherches seront examinées selon la facon normale de procéder du SCRS.

Ces Appendices figurent à partir de la page 43; ils ne sont disponibles que dans la langue de l'original (anglais).

INFORME DE LA REUNION SOBRE NORMAS DE ORDENACION PARA EL ATUN ROJO EN EL ATLANTICO OCCIDENTAL

Miami, Florida, Estados Unidos, 8-12 de Febrero 1982

De acuerdo con las recomendaciones respecto a normas de ordenación de los recursos de atún rojo hechas por la Comisión Internacional para la Conservación del Atún Atlántico (ICCAT) en su Séptima Reunión Ordinaria (Tenerife, Noviembre 1981), se celebró una reunión de las Partes Contratantes cuyos súbditos han pescado activamente el atún rojo en el Atlántico Oeste. El objetivo de esta reunión era entablar consultas y concluir la deliberaciones con el fin de establecer las condiciones bajo las cuales se desarrollarán las operaciones de pesca llevadas a cabo por los respectivos súbditos, según la recomendación de la Comisión a las Partes Contratantes.

El Gobierno de Estados Unidos organizó la reunión que tuvo lugar del 8 al 12 de Febrero de 1982 en el National Marines Fisheries Service, Southeast Fisheries Center de Miami, Florida, notificándose su celebración a los Gobiernos de Brasil, Canadá, Cuba y Japón. Asistieron representantes de Brasil, Canadá, Japón y Estados Unidos, así como dos miembros de la Secretaría de ICCAT. La lista de participantes se adjunta como Apéndice 3.

I. Apertura

El Hon.E.B. Forsythe, miembro del Congreso de Estados Unidos, dió la bienvenida a los asistentes y expresó su confianza en que ICCAT demostraría su eficacia en lo que respecta a la conservación de los recursos de atún rojo atlántico en el presente y en el futuro (Apéndice 1).

II. Designación de presidente

El Secretario Ejecutivo de la Comisión, Dr. Rodriguez Martín, pidió que se nombrase un presidente para la reunión en curso, siendo elegido el Dr. F.E. Carlton (EE.UU.) por unanimidad. El Dr. P.M. Miyake (Secretaría) fue nombrado relator.

III. Aprobación del Orden del día

El Orden del día provisional fue distribuído siendo aprobado con ligeros cambios (Apéndice 2).

IV. Examen de las cuestiones científicas

El Dr. W.W. Fox (EE.UU.) resumió las conclusiones del Comité Permanente de Investigaciones y Estadísticas (SCRS) en su última reunión ordinaria (Tenerife, Noviembre 1981); informó tambien acerca de los resultados obtenidos por los científicos estadounidenses por medio de estudios de sensibilidad del análisis de cohortes y análisis de la producción excedente estimada empleando un amplio abanico de parámetros variables de entrada y las cifras de captura japonesa en 1980, recientemente obtenidas. (Cuadro 1a - Figs. 1-3).

Los científicos japoneses presentaron los resultados de varios análisis realizados por ellos. En el análisis de cohortes aplicaron valores iniciales de F específicos de la edad y estimaron una producción excedente bajo la hipótesis de que los

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Este Informe fue redactado y aprobado en inglés. Las traducciones al francés y español se hicieron en Secretaría.

peces de edad mediana están menos disponibles a las pesquerías. Los documentos presentados por los científicos japoneses se adjuntan como Apéndice 5.

El presidente pidió a los científicos de los diversos países representados que se reuniesen con el fin de estudiar los resultados de sus recientes análisis.

Las delegaciones científicas de Canadá, Japón y Estados Unidos presentaron un declaración que se adjunta como Apéndice 4.

Como se indica en el Apéndice 4, se señaló que en aquel momento no era posible establecer un acuerdo general sobre el nivel de producción excedente para 1982 y que el tema debía ser examinado de nuevo en su totalidad por el SCRS.

V. Puntos de vista sobre la necesidad de supervisión científica

La delegación de Estados Unidos expuso sus puntos de vista sobre la necesidad de supervisión científica (Apéndice 6). Se presentaron a estudio los siguientes criterios:

1. Que se permitiese un mínimo de captura, suficiente para los fines científicos;
2. La captura debía comprender la mayor cantidad de grupos de edad que fuese posible;
3. El esfuerzo de pesca debía estar en relación con la tasa de mortalidad por pesca;
4. Debía haber captura disponible para obtener muestras científicas; y
5. Debía permitirse un mínimo de captura accidental.

La delegación de Canadá expresó un acuerdo general con los criterios anteriormente expuestos.

La delegación de Japón presentó un documento (Apéndice 7) manifestando sus puntos de vista sobre la necesidad de supervisión científica, así como los siguientes criterios:

1. Debía muestrearse la distribución de la totalidad del stock;
2. Debía mantenerse una continuidad en los datos históricos;
3. Era necesario muestrear la mayor cantidad posible de grupos de edad;
4. Los datos de esfuerzo debían ser los suficientes para obtener datos fiables de CPUE; y
5. Los datos debían ser de buena calidad.

VI. Consideraciones de índole económica sobre cada uno de los elementos de la pesquería y del país

Mr. A. Peterson (EE.UU.) trató sobre las pesquerías estadounidenses de atún rojo y su importancia en el plano económico. El valor comercial de la captura al desembarque es aproximadamente de 5.6 millones de dólares USA; el valor económico total de las pesquerías comerciales y deportivas combinadas sobrepasa los 36.0 millones de dólares USA.

Mr.H. Rosa (Brasil) manifestó que la pesquería industrial de túnidos brasileña se había desarrollado desde 1977 con palangreros extranjeros alquilados y desde 1979 con barcos de cebo locales y otros alquilados; este desarrollo ha sido rápido y sigue en curso. Dado que la captura de atún rojo por parte de Brasil ha sido mínima, Mr.H. Rosa pidió que al debatir el tema de regulaciones sobre dicha especie se tuviera en cuenta de forma especial a la pesquería brasileña de túnidos, con el fin de no entorpecer su desarrollo.

Mr.T. Isogai (Japón) subrayó la importancia de la pesquería de palangre japonesas de atún rojo y las posibles repercusiones económicas que experimentaría a causa de las regulaciones. El valor total de los desembarques de atún rojo de la pesquería japonesas del Atlántico Oeste se estima se aproximadamente de 40 millones de dólares USA, y las posibles pérdi-

das para esta pesquería, caso entrar en vigor las regulaciones, serían de 38-39 millones de dólares USA.

Mr. M. Hunter (Canadá) declaró que el valor total de la pesquería canadiense de atún rojo es inferior al de las de Estados Unidos y Japón, pero que es de gran importancia para la economía local de la zona Sur del Golfo de St.Lawrence.

VII. Nivel de supervisión científica - Cuota para cada país y fecha de entrada en vigor

Mr. C.J. Blondin (EE.UU.) presentó el punto de vista de Estados Unidos. Subrayó la preocupación ya expresada por su país respecto a la condición del stock de atún rojo, y el esfuerzo que Estados Unidos había realizado regulando su propia pesquería. Al aplicar la regulación sobre mortalidad por pesca establecida por ICCAT en 1975, Estados Unidos había limitado la cuota total de su pesquería a un nivel muy inferior al de la media de captura de atún rojo en el periodo 1970-74. Observó que Japón daba el año de captura máxima como nivel reciente y desplazaba gran parte de su esfuerzo desde el Este hacia el Oeste del Atlántico. Hizo hincapié en que Estados Unidos había soportado un mayor peso en materia de conservación de los recursos que cualquier otro país. Señaló que la flota de cerco estadounidense se había abstenido voluntariamente de pescar la importante clase anual de 1973 con el fin de aumentar el futuro stock reproductor. La flota palangrera japonesa, por el contrario, había explotado fuertemente la clase anual de 1973. Las regulaciones impuestas por Estados Unidos impedían una pesquería dirigida a los stocks reproductores de atún rojo en el Golfo de México, mientras que la flota japonesa se concentraba sobre dichos stocks. Estados Unidos insitía en que no debía permitirse un pesquería dirigida en esa zona. Mr. Blondin presentó un Cuadro que mostraba las medias de captura de Estados Unidos, Canadá y Japón durante el periodo 1970-74, antes de que la flota atunera japonesa desplazase su esfuerzo hacia el Atlántico Oeste.

	Captura media de atún rojo en el Atlántico Oeste, 1970-74 (TM)	*Porcentaje*
Canadá	997	21
Japón	720	15
Estados Unidos	3070	64

Mr. Blondin señaló que por las razones antes indicadas, Estados Unidos no podía aceptar compartir el recurso en proporción a los niveles de captura desde 1975 y destacó que el pescador de bajura norteamericano tiene muy poco margen en lo que respecta a caladeros, hecho que debía ser tenido muy en cuenta. Declaró estar dispuesto a tener especial consideración con los países que tenían pesquerías de túnidos en desarrollo, tales como Brasil y Cuba.

Mr. T. Isogai (Japón) comentó que no se debía ignorar la historia de las pesquerías en el transcurso de los últimos diez años, la condición de la población actual y futura, así como las repercusiones económicas producidas por las regulaciones sobre la pesquería. Declaró que Japón no podía aceptar las tasa de distribución sugerida por los delegados de Estados Unidos y señaló que los japoneses se habían esforzado en proteger el stock reproductor del Golfo de México, entablando consultas con el Gobierno estadounidense y adoptando una cuota voluntaria para esta pesquería. Manifestó que no debía olvidarse la continua y fuerte explotación del atún rojo juvenil por parte de las pesquerías de Canadá y Estados Unidos. Las capturas de este último país, en particular, representan un importante volumen en número de peces a lo largo de los últimos diez años. Tal explotación tiene que haber producido grandes repercusiones sobre la actual condición del stock.

Mr. Hunter (Canadá) manifestó estar de acuerdo con la mayor parte de las opiniones expresadas por Estados Unidos. Canadá estaba desagradablemente sorprendida por la forma en que Japón había puesto en práctica las regulaciones sobre el atún rojo dictadas por ICCAT en 1975, es decir, por el hecho de que Japón tomaba la cifra más alta de captura como el ni-

vel reciente de mortalidad por pesca y desplazaba su esfuerzo de pesca del Este hacia el Oeste del Atlántico. También lamentaba el hecho de que las propuestas canadienses para lograr esquemas de ordenación mas eficaces de los recursos de atún rojo, no hubiesen recibido el apoyo total de Estados Unidos en las reuniones de ICCAT de los años 1977, 1978, 1979 y 1980. Subrayó el esfuerzo hecho por Canadá en materia de conservación del atún rojo, regulando su propia pesquería por medio de cuotas de captura y limitación de licencias de pesca, así como limitando igualmente las actividades del palangre japonés dentro de las 200 millas canadienses. Señaló que la aplicación de la regulación sobre el atún rojo a países con pesquerías de túnidos en desarrollo, como Brasil y Cuba, debía ser objeto de especial estudio.

Mr. Isogai se declaró dispuesto a tener una especial consideración con la pesquería de Brasil.

Mr. H. Rosa (Brasil) agradeció a los delegados el interés motrado por la pesquería de túnidos de su país y destacó el hecho de que Brasil se encuentra en la zona Sudoeste del Atlántico y que la preocupación de la Comisión se centraba sobre el stock Noroeste de atún rojo.

Se levantó la sesión y a continuación los jefes de delegación celebraron reuniones a puerta cerrada. Al reanudarse la sesión, informaron que habían tratado sobre cual era el nivel de supervisión necesario, sus distribuciones entre pesquerías y países y fecha de puesta en práctica. Presentaron la siguiente declaración:

Reconociendo que la Comisión Internacional para la Conservación del Atún Atlántico en su Séptima Reunión Ordinaria, celebrada en Tenerife, Islas Canarias, recomendó que las Partes Contratantes prohiban la captura de atún rojo por un periodo de dos años en el Atlántico Oeste, excepto bajo condiciones que serán objeto de acuerdo entre las Partes Contratantes cuyos súbditos hayan pescado activamente atún rojo en el Atlántico Oeste,

Considerando que dichas Partes Contrantantes debían entablar consultas, concluyendo las deliberaciones antes del 15 de Febrero de 1982, con el fin de establecer las condiciones bajo las cuales se desarrollarán las operaciones de pesca llevadas a cabo por sus súbditos en el Atlántico Oeste,

Considerando también que dichas consultas habían tenido lugar en Miami, Florida, del 8 al 12 de Febrero, entre representantes de los Gobiernos de Brasil, Canadá, Japón y Estados Unidos,

Los mencionados representantes han acordado recomendar a sus respectivos Gobiernos lo siguiente:

PRIMERO: Que se tomen medidas para limitar la captura anual de atún rojo en el Atlántico Oeste durante 1982 y 1983, a 1,160 toneladas métricas (TM) teniendo en cuenta: (1) el estudio de la situación de los stocks de atún rojo y (2) los niveles de captura necesarios para obtener datos que permitan establecer un índice de abundancia del stock.

SEGUNDO: Que la cuota de 1.160 TM se dividirá entre Canadá, Japón y Estados Unidos como sigue:

Canadá	250TM
Japón	305TM
Estados Unidos	605TM

TERCERO: Que las pesquerías en desarrollo de atún rojo de Brasil y Cuba en el Atlántico Oeste, que actualmente obtienen menos de 50TM al año, no estarán sujetas a las limitaciones señaladas.

CUARTO: Durante los años 1982 y 1983 no habrá una pesquería dirigida sobre los stocks reproductores de atún rojo en en Golfo de México.

QUINTO: Los Gobiernos de Canadá, Japón y Estados Unidos, tomarán las medidas necesarias para poner en vigor estas disposiciones lo antes posible y simultáneamente, de acuerdo con las normas regulatorias de cada país.

SEXTO: Que los temas señalados en los párrafos uno a cinco, anteriormente expuestos, sean examinados por ICCAT en su Tercera Reunión Extraordinaria a celebrar en Noviembre de 1982.

VIII. Adopción del Informe

Se presentó el informe que fue adoptado por el Grupo.

Cuadro 1. Resumen de los estudios de sensibilidad realizados por Estados Unidos

JUVENILES (EDADES 1-4)

Tamaño del stock 1982 (TM)		*Producción excedente 1982 (TM)*		*Incluyendo los últimos cambios en las estadísticas japonesas*
Estimación	*Escala*	*Estimación*	*Escala*	*Estimación*
691	591 a 1125	121	121 a 303	493

ADULTOS (EDADES 5-30)

Tamaño del stock 1982 (TM)		*Producción excedente 1982 (TM)*		
Estimación	*Escala*	*Estimación*	*Escala*	*Estimación*
13165	9164 a 21887	-394	-1962 a 367	-368

TOTAL STOCK (EDADES 1-30)

Tamaño del stock 1982 (TM)		*Producción excedente 1982 (TM)*		
Estimación	*Escala*	*Estimación*	*Escala*	*Estimación*
13855	9755 a 23012	-272	-1822 a 670	125

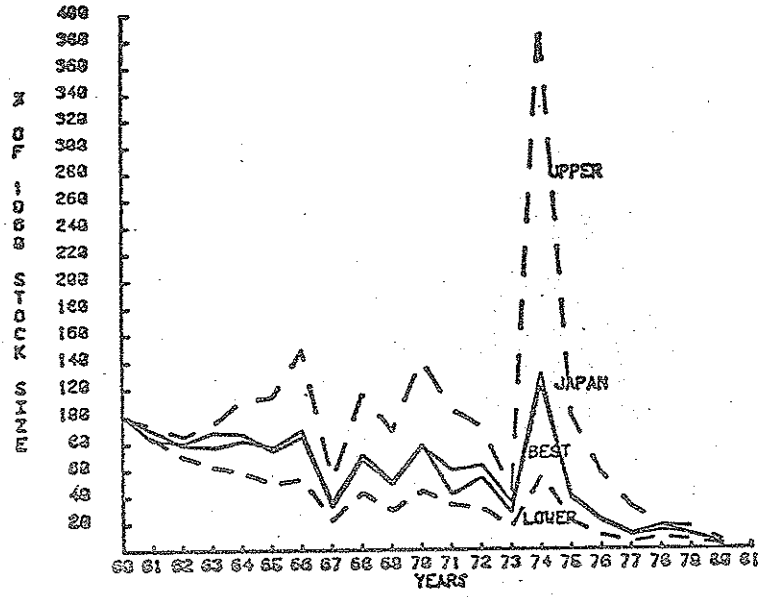

Fig. 1. Volumen del stock de atún rojo de edad 1 en el Atlántico Oeste

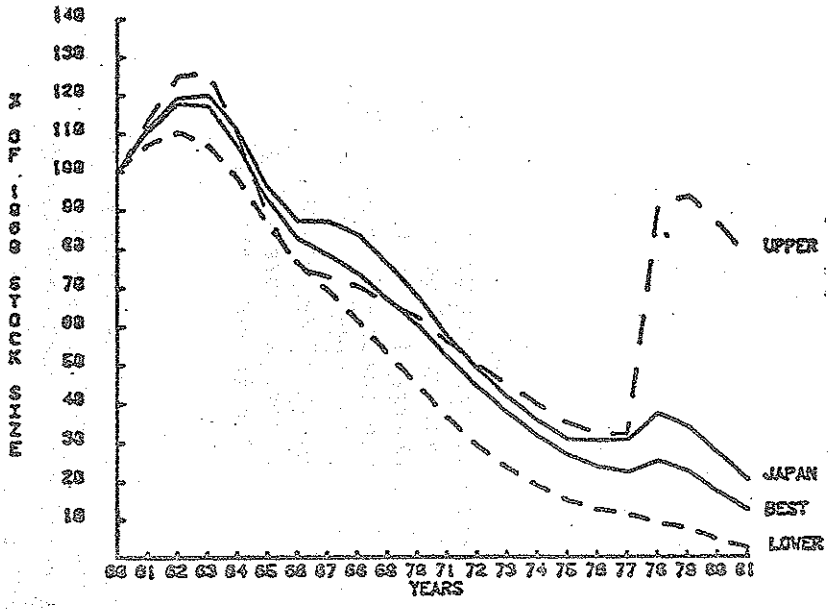

Fig.2. Volumen del stock de atún rojo adulto en el Atlántico Oeste

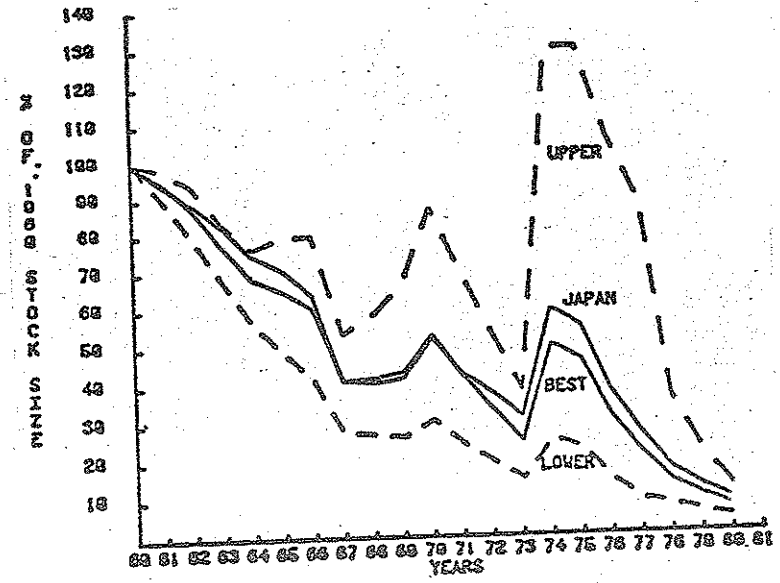

Fig.3. Volumen del stock de atún rojo de edad 1-4 en el Atlántico Oeste

APENDICE 1

DECLARACION DEL HON.EDWIN B. FORSYTHE

8 de Febrero de 1982

La Séptima Reunión Ordinaria de la Comisión Internacional para la Conservación del Atún Atlántico marcó un hito histórico. Por primera vez ICCAT se enfrentó con la necesidad de actuar con firmeza en favor de laconservación de los recursos de atún rojo en el Atlántico Oeste. La cuestión planteada en la Reunión de ICCAT del mes de Noviembre era la supervivencia misma del recurso. De no tomar medidas enérgicas y adecuada para frenar o invertir la tendencia descendente en el volumen del stock, la disponibilidad de este recurso para las generaciones presentes y futuras, estaba en serio peligro. Siento una gran satisfacción al ver a los países miembros dispuestos a tomar las serias decisiones que requiere la conservación del recurso.

Soy consciente de que se han suscitado cuestiones acerca del nivel de captura que puede permitirse sin correr riesgos. Es un tema espinoso, ya que ninguno de los presentes en esta sala desea pedir a los pescadores de su país que tomen sobre sí una obligación que no esté justificada por una realidad científica en lo que respecta a la condición de atún rojo en el Atlántico Oeste. Creo, sin embargo, que todos nosotros perseguimos el mismo fin, que es, sencillamente, asegurar la supervivencia presente y futura del atún rojo como recurso. Su conservación es, y debe ser, nuestra meta. No podemos sacrificar su futuro a cualquier tipo de beneficio inmediato.

Al inicar las deliberaciones tenemos ante nosotros dos objetivos. El primero y primordial es asegurarse de que la cuota de captura de atún rojo en el Atlántico Oeste que establezcamos es suficiente para garantizar la conservación del recurso sin imponer a los pescadosres que de él dependen un sacrificio económico exagerado e innecesario. Si establecemos una cuota que sobrepasa la cifra que puede capturarse sin daño para el stock, haremos un flaco servicio a esos mismos pescadores, ya que habremos sacrificado su medio de vida al sacrificar el recurso sobre el cual se basa.

El segundo objetivo ante nosotros es distribuir la cuota entre los países. En la toma de esta decisión se deben tener en cuenta dos importantes principios. El primero es que no se debe pedir a aquellos países que en el pasado han dado los pasos necesarios a la conservación del recurso, que carguen ahora con la mayor parte de la responsabilidad en materia de conservación. El segundo principio es exigir un menor sacrificio de los pescadores de bajura, cuyas alternativas de peca son mas limitadas.

Agradezco la oportunidad que se me ha brindado para dirigirme a Ustedes y confio en el final feliz de estas deliberaciones, ya que en el caso contrario, habremos defraudado a nuestros pescadores y al mismo recurso.

APENDICE 2

ORDEN DEL DIA

I. Apertura

II. Designación de presidente

III. Aprobación del Orden del día

IV. Examen de las cuestiones científicas

V. Puntos de vista sobre la necesidad de supervisión científica

VI. Consideraciones de índole económica sobre cada uno de los elementos de la pesquería

VII. Nivel de supervisión científica - Cuota para cada país y Fecha de entrada en vigor

VIII. Adopción del informe

APENDICE 3

LISTA DE PARTICIPANTES

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TAYLOR, ARNET
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ICCAT

MIYAKE, PETER M.
Assistant Executive Secretary

RODRIGUEZ-MARTIN, OLEGARIO
Executive Secretary

APENDICE 4

DECLARACION DE LAS DELEGACIONES CIENTIFICAS

DE JAPON, ESTADOS UNIDOS Y CANADA

Las estimaciones de la producción excedente son muy sensibles a parámetros tales como relaciones stock/reclutamiento, tasas iniciales dadas de mortalidad por pesca y actual estructura demográfica.

Los delegados científicos de Estados Unidos efectuaron análisis con variantes de estos parámetros. Los resultados respecto a producción excedente en el Atlántico Oeste presentados para 1982 variaban desde menos 1.822TM hasta mas 670TM.

Los delegados científicos japoneses emplearon un método analítico alternativo y la conclusión fue una estimación de 1.868TM de producción excedente en 1982.

Los científicos japoneses se sirvieron tambien de la hipótesis según la cual el atún rojo de mediana edad (4-14 años) es menos accesible a la pesquería, lo cual afecta al procedimiento de evaluación. En estos análisis, llegaron a la conclusión de que la producción excedente en 1982, de peces de 11 años y mayores, era de 3.062TM. Sin embargo, no se estimó la producción excedente en 1982 de peces de 10 años y mas jóvenes. Por tanto, no se llegó a obtener una estimación de la producción excedente total por medio de este análisis.

Los científicos canadienses probaron otra alternativa y estimaron una producción excedente de 431TM.

Las conclusiones de los análisis japoneses se presentaron acompañadas de documentación escrita, mientras que los resultados obtenidos por canadienses y norteamericanos fueron sólo descritos por los científicos. No se dispuso de tiempo para hacer un adecuado examen de datos y resultados; por tanto, tampoco se llegó a un acuerdo entre los científicos respecto al nivel de producción excedente para 1982. Se recomienda llevar a cabo investigación científica para determinar si, de hecho, los peces de edad 4-14 están menos disponibles y si esta circunstancia repercute sobre el procedimiento de evaluación. Sería igualmente conveniente investigar acerca de los métodos de estimación de la producción excedente. Los resultados de tales investigaciones deberían ser examinados según las normas establecidas por el SCRS.

APENDICE 5 — DOCUMENTOS CIENTIFICOS PRESENTADOS EN LA REUNION

APENDICE 6 — PLAN DE VIGILANCIA DEL ATUN ROJO EN EL ATLANTICO OESTE INCLUYENDO CAPTURAS DEL STOCK(MEMORIA DE W.W. FOX JR. A J.C. BLONDIN)

APENDICE 7 — PLAN DE VIGILANCIA DE LA CONDICION DEL STOCK DE ATUN ROJO EN EL ATLANTICO OCCIDENTAL - ESTIMACION DEL VOLUMEN DE CAPTURA NECESARIO (DIVISION DE RECURSOS PELAGICOS - FSFRL)

Estos Apéndices están en la pág. 43 y sólo en su idioma original (inglés)

APPENDIX 5
APPENDICE 5
APENDICE 5

SCIENTIFIC DOCUMENTS PRESENTED AT THE MEETING

DOCUMENTS SCIENTIFIQUES PRESENTES A LA REUNION

DOCUMENTOS CIENTIFICOS PRESENTADOS A LA REUNION

WABF/1 — A consideration assuming low availability of medium-sized fish to cohort analysis of the Atlantic bluefin tuna — Z. Suzuki and K. Hisada.

WABF/2 — A critical review of the cohort analysis made by Parrack (SCRS/81/55) - Supplement to the report by Suzuki and Hisada — Z. Suzuki.

WABF/3 — Re-evaluation of surplus production of bluefin tuna in the western Atlantic during 1982 — S. Kume.

WABF/4 — Allowable catch of bluefin tuna in the western Atlantic in 1982 -- a minimum improvement of the calculation on the surplus production made by Parrack — I. Ikeda.

WABF/5 — Suspect parameters used by Parrack for estimating the stock size of young ages in the western Atlantic tuna — I. Ikeda.

A CONSIDERATION ASSUMING LOW AVAILABILITY OF MEDIUM-SIZED FISH TO COHORT ANALYSIS OF THE ATLANTIC BLUEFIN TUNA

by

Ziro Suzuki and Koichi Hisada
(Far Seas Fisheries Research Laboratory)

Introduction

Stock assessments of the Atlantic bluefin tuna have been made based primarily on cohort analysis (CA), due to a lack of reliable effort data for most of the fisheries and difficulty in standardizing various kinds of fishing effort. There seem to be several problems, however, in assessing the stock status of this species by CA. For example, a critical reading of the latest work by Parrack (1981) indicates the following points:

1. Parrack estimated input F's for ages 1 to 3 by averaging F's estimated from all past cohorts. However, this procedure tends to overestimate the input F's, judging from the very small catches in 1980 of these younger fish which reflect enforcement of the catch regulations for the younger fish.

2. The catch curve of the Western stock shows characteristic decreased catches for medium sized fish (ages 5-9) and for a part of larger fish (ages 11-15). This phenomenon, as hypothesized later, is assumed to reflect low availability of the medium sized fish. If this assumption is valid, Parrack underestimated the population size of bluefin tuna during the recent ten years or so by inputting constant Fn's for age 8 and older fish.

3. Taking into account items 1 and 2, there is little possibility that a clear stock-recruitment relationship exists for the Western stock, as shown by Parrack. In addition, Parrack regarded age 5 and older fish as spawners. However, no documented evidence is available to support a significant contribution of ages 5 to 9 old fish to spawning, while only the fish over 10 years old are certain to be spawning fish.

4. Input Fn's for ages 4 to 7 given by Parrack for the Western Atlantic stock were calculated on the basis of a correlation between Japanese "direct effort" in the northwestern Atlantic area, and resulting "partial F." Japanese bluefin catches by the direct effort, however, account for only a small fraction of the total bluefin catch by the Japanese fleet there. It is therefore inappropriate to represent this catch as the Japanese F. In fact, low correlation coefficients were obtained with these ages.

In this document, some consideration was made to introduce an availability factor with the medium sized fish into CA, using the catches by age table of the Western stock prepared by Parrack.

Hypothesis on low availability of the medium sized fish

Table 1 shows the catches by age table of the Western stock by Parrack. Except for minor year-to-year fluctuations, the pattern of catches by age groups in calendar years indicates two peaks, one at about age 2 the other at about 15. In the intervals between the peaks, there are markedly small catches for the rest of the age groups. Similar patterns can be observed for 1960 and younger cohorts (Figure 1). Therefore, decreased catches of the medium sized fish is assumed to be caused by the low availability of these fish. As for cohorts older than the 1960 one, the typical hollow in the catches of the medium sized fish is not showed appreciably (Figure 2). This may be explained by small scale operations of the surface fishery.

It is generally recognized for the Western Atlantic that both small fish (ages 1-4) and large fish (age 10 and older) during and after spawning are captured in the coastal areas by various fisheries, while the longline fishery takes a small amount of the medium sized fish (ages 5-9) sporadically in the offshore areas of the middle to higher latitudes. The small fish emigrated from the surface fishing ground probably migrates to the offshore areas and grows there into the medium sized fish. The medium sized fish is assumed to have wide dispersed distribution and is only partially covered by the Japanese longline fishery, most of them distributed in the areas east of 50°W (Figure 3). The areas inhabited by assumed unavailable medium sized fish, in fact, have not been covered as major fishing grounds of any longline fishery. There would be a fraction of medium sized fish that migrates and is caught in the eastern Atlantic. The unavailable medium fish becomes available to the fishery in the coastal areas and the Gulf of Mexico when they attain spawning size. According to this assumption, Parrack's CA accounts only for the available stock of the medium sized fish.

Example model

Point of example model by which correction accounting for the low availability of the medium sized fish was attempted is illustrated in Table 2. Starting with 0.1 million fish population at the beginning of age 1 and decreasing by constant F (0.1) and M (0.1) for all ages with age specific availability (a), changes of population size by age in true population (N) and fishable population (N') and resultant catches by age (C') from N' are shown as well as back calculated population sizes started from ages 7, 11 and 15 using C' with Fn=0.1 and M=0.1. In the right two columns shown are corrected catches (C), calculated as a product of C' and reciprocal of a, and population size back calculated using C' with Fn=0.1 and M=0.1. The results show considerable underestimation of population sizes (N'11 and N'15), especially for N'11 calculated from age with lowest availability, on the basis of fishable population. On the other hand, population size by age basing on the corrected catches accords to that of the true population whichever ages are chosen as starting age of the back calculation (there are minor differences due to roundings).

Calculation of availability factors

Hereafter M is assumed to be 0.18 for all ages. First, correction factors were calculated for 1960 cohort and younger ones. We chose 1960 to 1964 cohorts to calculate average pattern of catches by age because relatively large catches both in younger and older ages were made from these cohorts. Since catches for 1980 are still changeable they were not used.

Two peaks of the catches are shown, one at age 2 and the other at age 15 (Figure 4). If it is assumed that the population at all ages is fully available to fishery, one of possible resultant catches would run on a line between the tops of catches at ages 2 and 15. However, in the case of highly migratory species like bluefin, it will be difficult to assume that fishes in all ages are fully available to the fishery and therefore there may be no logic to assume the catches run on this line. Despite this, correcting observed catch with this line as first approximation would give us a minimum estimation of population size. To obtain roughly the same value of F both at ages 2 and 15, the catch line linking ages 2 and 15 was adjusted lowering the catch line with fixed catches for ages 15 and older. Final catch line thus obtained is shown as line C2 of Figure 4 and the result of the calculating availability factors in Table 3.

Second, as stated previously, low availability of the medium sized fish seems to be fishery dependent as well as cohort dependent. The correction of the cohort 1960 and older may not be covered enough by the previous method alone because about half of the hollow in the medium sized catches during 1967 and 1970 calendar years is left uncorrected. Therefore, average catches by age covering the cohorts 1957 to 1959 that pass through the hollow part of catches in those calendar years were chosen. The same procedure was followed with the previous case to obtain availability factors.

Age	7	8	9	10	11	12	13
Factor	3.956	3.415	4.783	8.158	7.528	4.664	5.538

Age	14	15	16
Factor	4.699	2.209	1.478

For the rest of the ages, availability was assumed to be 1.0.

We multiplied observed catches for ages 4-14 during 1974 and 1979 calendar years (enclosed by lines with b in Table 1) and the catches for ages 7-16 during 1967 and 1973 (enclosed by lines with A in Table 1) by the latter factors estimated.

Cohort analysis

CA was carried out using corrected catches by age for the medium sized fish up to 1979 catch data with a constant Fn for ages 4 and older fish, Two set of a constant Fn were put in, 0.2 and 0.3 which encompassed Parrack's Fn (0.273). Trends of population size at age 1, age 5 and older and age 10 and older are shown in Figure 5. It was not possible to input reasonable Fn for ages 1 to 3. The trend of stock size at age 1 fish presently estimated is similar with that by Parrack until 1970 but diverged after that year. Population sizes of age 5 and older fish decreased until 1973 but turned to increasing trend after that year. Population size of age 10 and older fish showed decreasing trend after 1967. This decreasing trend will turn to increase in the future by the increase of population sizes of younger ages.

Figure 6 shows relationship of population sizes between age 1 and age 10 and older fish calculated by the CA. There are big fluctuations without trend in the recruitment level in contrast to small variations in the spawning population. Therefore, it cannot be postulated that there exists a stock-recruitment relationship.

Although the methodology and data treatment used in this document need refinement, the present estimations give a considerable different conclusion with Parrack's.

Reference

Parrack, M.L., 1981 "Atlantic bluefin tuna resources update", ICCAT, SCRS/81/55.

Table 1. Catches by age table of bluefin from the western Atlantic given by Parrack (1981)

AGE	60	61	62	63	64	65	66	67	68	69	70
0	0	0	0	0	0	0	0	0	0	0	103
1	542	1426	7956	37246	22401	83657	168661	15328	5559	9542	93568
2	640	1687	11405	42451	36370	134523	82548	103359	33908	34185	127783
3	279	940	14426	58269	43560	43040	13642	35345	18374	21042	123742
4	1299	4324	66343	26854	16627	2646	178	7881	3766	10725	12946
5	2050	5923	22595	45833	39309	14632	63	4482	5808	3581	15551
6	696	1062	2800	31131	35504	11542	552	0	12200	1641	2590
7	1570	2184	1009	10022	7140	5193	182	2	4900	156	1160
8	904	2136	2611	2635	4000	8021	765	2589	1	347	593
9	519	688	3055	3529	7598	21195	5538	654	159	93	351
10	440	489	2416	7696	7053	15248	9228	2236	260	419	160
11	191	343	5602	17356	6784	12617	6313	6774	150	1776	549
12	559	678	9395	15456	11990	4985	3604	4400	282	1937	713
13	1007	1184	12157	10058	11235	776	2237	2303	350	2101	924
14	878	1146	7798	6346	6455	1365	2901	349	310	1930	970
15	497	519	4106	3438	2903	1883	1759	327	409	1362	885
16	423	356	1694	1791	1768	430	1586	270	444	1802	759
17	84	103	580	601	1052	621	1766	190	302	1457	563
18	34	77	214	275	382	182	1155	81	125	1029	306
19	11	0	1	150	66	266	1084	42	58	233	237
20	0	0	0	46	3	4	603	12	65	216	162
21	0	0	0	0	0	2	25	10	26	149	37
22	0	0	0	0	0	0	18	6	18	122	29
23	0	0	0	0	0	0	10	5	0	93	25
24	0	0	0	0	0	0	0	0	0	17	17
25	0	0	0	0	0	0	0	0	0	2	15
26	0	0	0	0	0	0	0	0	0	0	16
27	0	0	0	0	0	0	0	0	0	0	13
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0		0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0

AGE	71	72	73	74	75	76	77	78	79
0	0	0	0	0	26	59	24	61	0
1	73211	54529	8584	61242	48951	5457	1322	5448	2589
2	179254	109278	83306	23564	173790	20100	23657	10995	11192
3	39612	37161	33371	25498	5165	73201	6749	15991	13977
4	53860	3590	6955	4564	16503	4479	22603	10821	7150
5	4981	9856	6310	5113	2694	2936	19140	9939	14912
6	1126	2763	2293	2478	961	1775	3186	8523	2064
7	2033	240	814	913	490	281	3208	2710	3962
8	1620	822	52	385	297	150	1141	588	2988
9	1249	430	132	577	409	484	383	577	1077
10	707	189	155	281	783	794	863	264	344
11	901	230	84	714	1009	400	794	215	269
12	480	413	238	438	931	736	476	234	270
13	542	598	372	365	1008	1068	461	422	531
14	658	868	376	1259	1262	2112	935	790	1026
15	606	983	437	1753	1511	2400	1580	1408	1639
16	545	711	541	1192	1985	2052	1906	1316	1599
17	396	585	558	1625	1034	1643	1682	1716	1838
18	218	485	490	2561	1001	1063	1687	1418	1358
19	132	392	362	854	631	935	1238	1339	1107
20	114	182	318	660	448	733	962	1055	1004
21	29	125	114	647	249	519	677	784	733
22	25	87	52	472	106	324	378	355	541
23	10	27	26	58	71	169	257	379	478
24	1	13	12	28	31	96	152	264	336
25	0	7	6	12	22	51	65	130	152
26	0	0	1	10	17	54	57	129	147
27	0	0	0	5	15	12	37	62	80
28	0	0	0	0	8	18	24	103	109
29	0	0	0	0	0	12	9	55	49
30	0	0	0	0	0	0	0	31	39

NOTE: Catches enclosed by lines with A and B are corrected by availability factors (see text).

Table 2. Example showing underestimation of population size by cohort analysis when constant F is input as starting F (Fn) to the catches of medium-sized fish not fully available to the fishery.

Age	N	a	N'	C'	$\hat{N7}$	$\hat{N'11}$	$\hat{N'15}$	C	$\hat{N15}$
1	100000	1.0	100000	9063	100214	65508	88655	9063	100017
2	81873	1.0	81873	7421	82078	50677	71598	7421	81891
3	67032	1.0	67032	6075	67165	38810	57735	6075	67051
4	54881	1.0	54881	4974	54963	29353	46471	4974	54900
5	44933	1.0	44933	4072	44978	21837	37325	4072	44950
6	36788	1.0	36788	3334	36807	15893	29906	3334	36791
7	30119	1.0	30119	2730	30120	11219	23896	2730	30123
8	24660	0.8	19728	1788		7563	19029	2235	24664
9	20191	0.6	12114	1098		5147	15519	1830	20194
10	16530	0.4	6612	599		3616	12997	1498	16535
11	13534	0.2	2707	245		2703	11191	1225	13538
12	11080	0.4	4432	402			9892	1005	11085
13	9072	0.6	5443	493			8570	822	9076
14	7427	0.8	5942	539			7285	674	7431
15	6081	1.0	6081	551			6079	551	6084

F and M are assumed to be 0.1 for all ages.
N: hypothetical population starting with 0.1 million fish at the beginning of age 1.
a: availability.
N': available population (N' = aN).
C': catches from N'.
$\hat{N7}$, $\hat{N'11}$, $\hat{N'15}$: back calculated populations started from ages 7, 11 and 15 with Fn = 0.1.
$\hat{C}$: corrected catches (1/a x C').
$\hat{N15}$: back calculated population size from age 15 with Fn = 0.1.

Table 3. Correction factors (1/a) estimated from average catches by age from 1960 to 1964 cohorts

Age	C1	F1	N1	C2	F2	N2	1/a(C2/C1)
1	15245	0.03677	461823	15245	0.02396	707426	1.0
2	45524	0.14328	371819	45524	0.09018	576904	1.0
3	34961	0.15274	269112	34961	0.09079	440318	1.0
4	2969	0.01694	192942	16233	0.05417	335864	5.467
5	2436	0.01694	157247	13256	0.05600	265470	5.442
6	2310	0.01968	129138	10825	0.05814	209663	4.686
7	1164	0.01205	105763	8840	0.06027	165235	7.595
8	724	0.00900	87282	7219	0.06241	129943	9.971
9	296	0.00443	72251	5895	0.06516	101971	19.916
10	260	0.00473	60081	4814	0.06821	79801	18.515
11	417	0.00931	49948	3931	0.07156	62260	9.427
12	494	0.01328	41334	3210	0.07523	48413	6.498
13	590	0.01907	34070	2621	0.07919	37507	4.442
14	1200	0.04807	27920	2141	0.08408	28943	1.784
15	1748	0.08957	22226	1748	0.08957	22226	1.0
16	1669	0.11337	16974	1669	0.11337	16974	1.0
17	1698	0.15793	12658	1698	0.15793	12658	1.0
18	1113	0.14420	9029	1113	0.14420	9029	1.0
19	1108	0.20440	6529	1108	0.20440	6529	1.0

C1: average catches by age from 1960 to 1964 cohorts.
C2: corrected catches adjusted by assumption of low availability of the medium-sized fish.
F1, N1 and F2, N2: fishing mortality coefficients and population sizes calculated from C1 and C2, respectively.

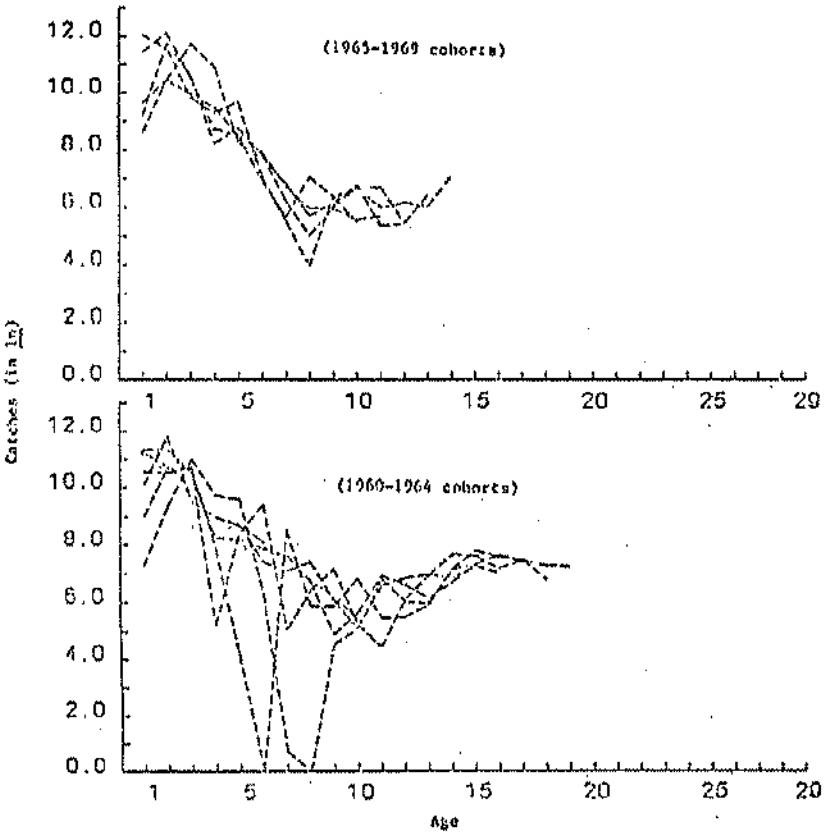


Fig. 1. Catch curves of bluefin from the western Atlantic for 1960-1969 cohorts (from Parrack, 1981).

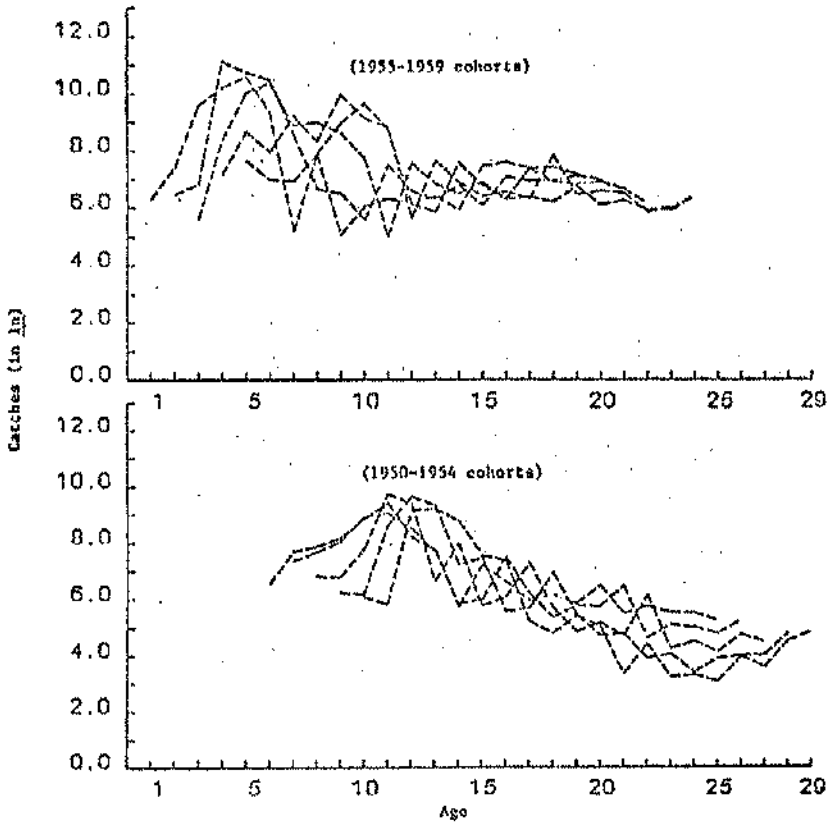


Fig. 2. Catch curves of bluefin from the western Atlantic for 1950-1959 cohorts (from Parrack, 1981).

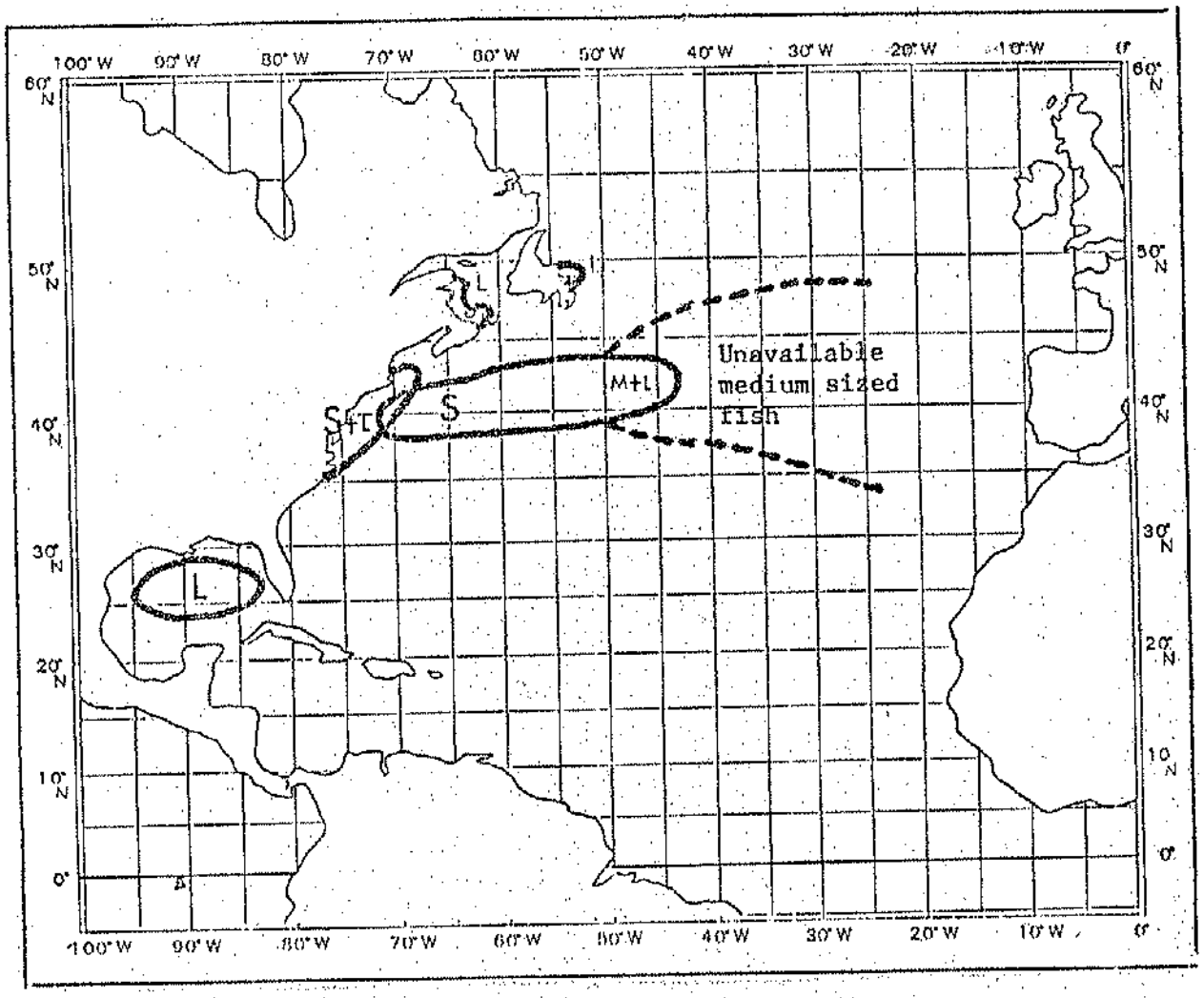


Fig. 3. Schematic representation of bluefin fishing grounds in the western Atlantic by sizes of fish taken (solid lines) and hypothetical distribution of unavailable medium-sized fish (broken lines).

L (10+), M (5-9) and S (~4) denote large, medium and small-sized fish taken and size of the symbols expresses relative magnitude of the catches.

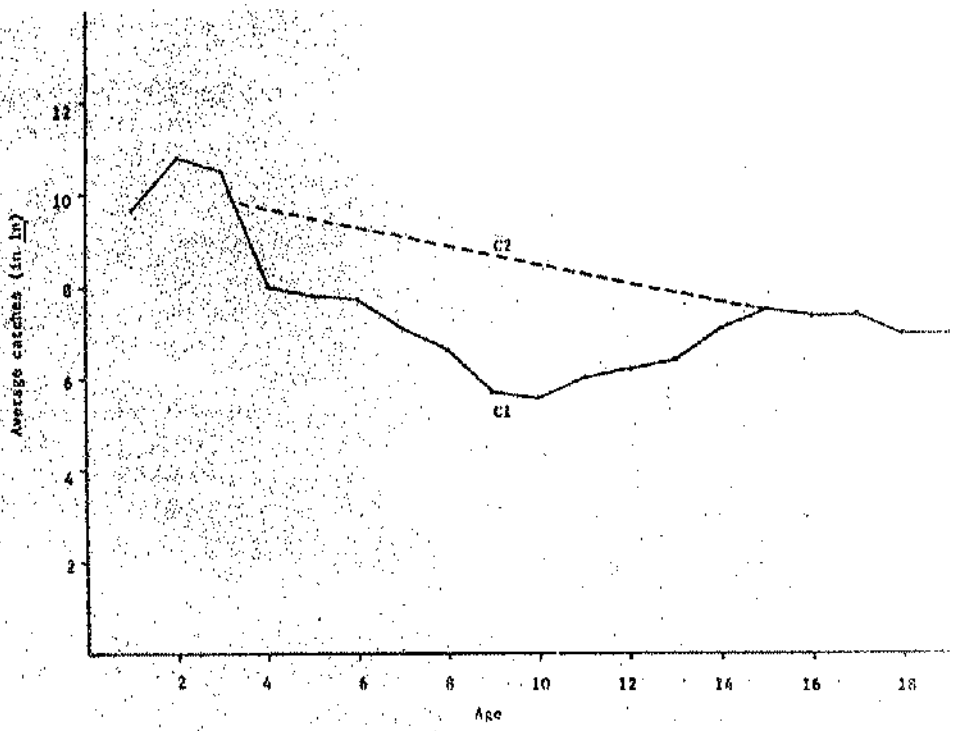


Fig. 4. Average catch curve of 1960-64 cohorts (C1) and expected catches of the medium-sized fish (C2) when those fish (ages 3-14) are assumed as equally available to the fishery as other size fish.

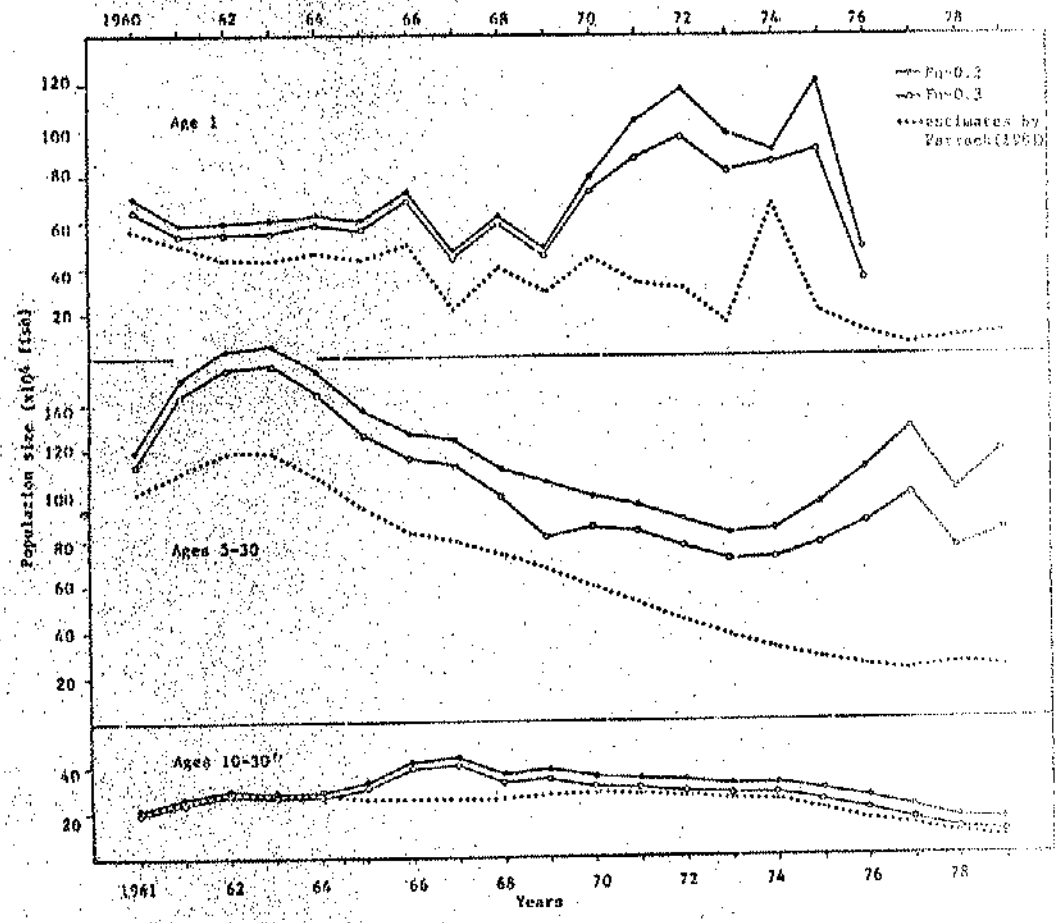


Fig. 5. Trends of population sizes for age 1, ages 5-30 and ages 10-30 fish calculated from cohort analysis adjusted for low availability of the medium-sized fish.

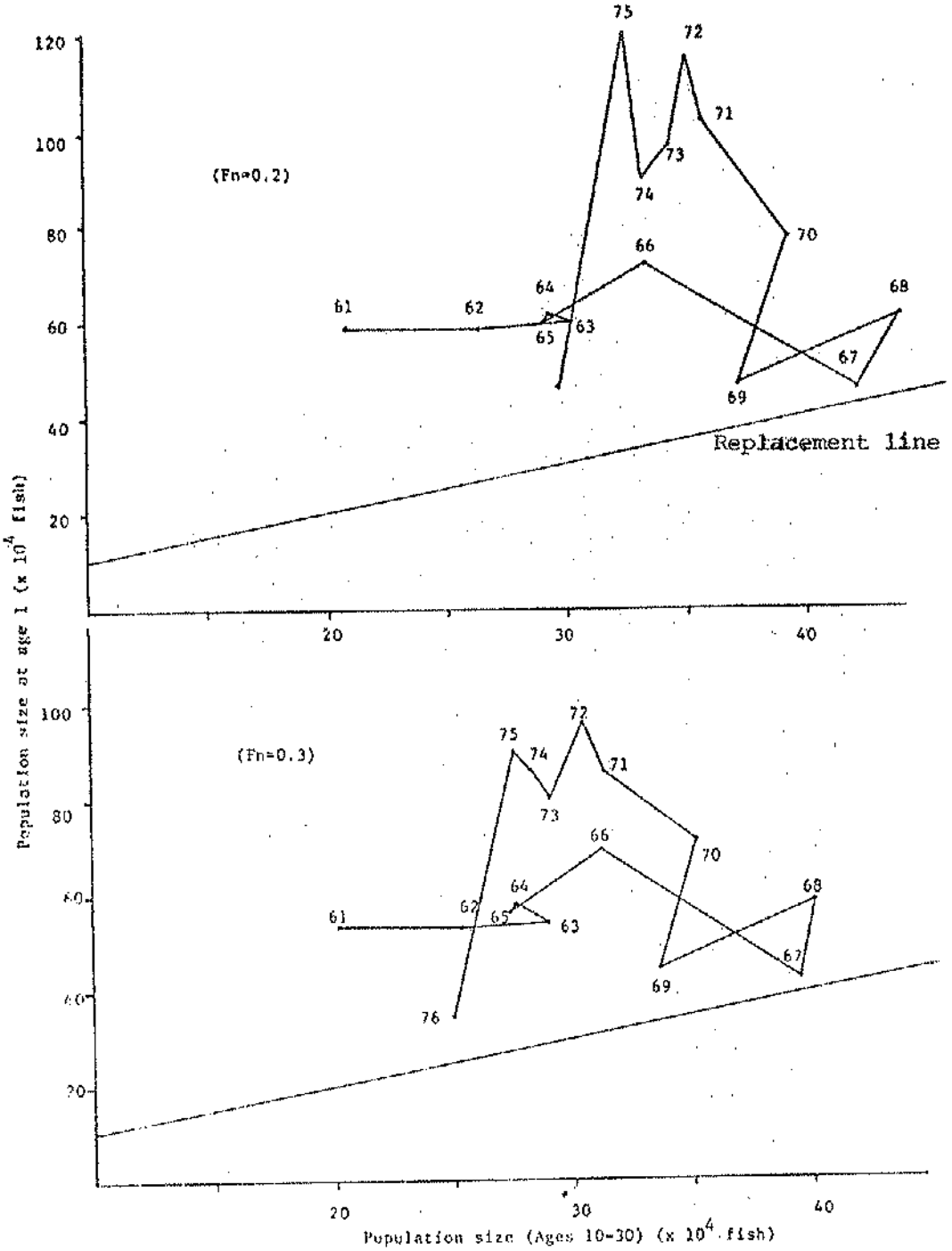


Fig. 6. Relationship of population sizes between age 10 and older and age 1 fish.

Upper and lower panels are the results of cohort analysis with input Fn = 0.2 and 0.3 for age 4 and older fish, respectively.

WABF/2

A CRITICAL REVIEW OF THE COHORT ANALYSIS MADE BY PARRACK (SCRS/81/55)

by

Ziro Suzuki
(Far Seas Fisheries Research Laboratory)

(Supplement to WABF/1 by Suzuki and Hisada)

As a result of review, critical errors were found in the cohort analysis of Atlantic bluefin tuna made by Parrack (1981), particularly in respect to his Western Atlantic stock analysis. Most of the errors were incurred by inputting a constant fishing mortality (F_n=0.2726) for ages 8 and older fish in the latest catches of 1980. Figure 1 shows catch curves by cohort originating from years 1960 to 1972 (ages 8 and older in 1980) to which the constant F_n were applied. Compared with the cohorts older than 1960, these cohorts have similar catch curves indicating a clear decrease in catch in the age group category 4-15. The consequences generated by giving constant F_n to this age group (ages 8 and older) are as follows:

I. (1) A consistently decreasing trend of recruitment level at age 1 fish from 1960 to 1972 could be derived. Because, as indicated above, the cohorts of 1960 and younger year classes have similar catch curves, the longer the time period during which the cohort is exploited by the fishery, the larger the stock level at recruitment and vice versa. This underestimation of stock size affects all the cohorts which have not yet passed beyond exploitation by the longline fishery (age classes of approximately younger than 20 years in 1980) (Fig. 2 and Table 1).

(2) Parrack employed very inaccurate starting F_n's for ages 4 to 7 (shown by his correlation coefficients between f' and F' by the Japanese longline fleet: Table 3b on page 16 in Parrack (1981)), among which the starting F_n's for ages 4 and 5 (0.5781 and 1.2206, respectively) were considerably high compared with the fishing mortality coefficients for those ages in the middle 1970's and later. Therefore, his results probably underestimated the stock size of those cohorts.

(3) Further, he used in his analysis F_n's for ages 1 to 3 that are averages for each age group for the years 1960 to 1977. However, those averages are overestimated as indicated in Item I-1 above and catch regulation for small fish after 1976 further more magnifies overestimation of the input F_n's for those ages.

Therefore, the level of recruitment from 1960 to 1980 was consistently underestimated more seriously in the recent years, due to the inadequate procedures employed.

II. Although Parrack regarded ages 5 and over as spawners, the spawning population in his calculation is underestimated from 1965 and this underestimation is magnified in the progression over time (Fig. 2). In fact, estimates of the spawning population size for the years 1960-1965, that could be regarded as reasonable ones, show a stable condition (about 0.9-1.2 million fish, on page 9 in Parrack [1981]).

Therefore, it is concluded that the clear spawner recruitment relationsip shown by him (on page 10 in Parrack [1981]) for the stock in the Western Atlantic is simply a product of artifact. Such relationship created by Parrack should be rejected: his total analysis, consequently, becomes invalid.

Literature

Parrack, M.L. 1981. Atlantic bluefin tuna resource update. ICCAT Working Doc. SCRS/81/55.

Table 1. An example of underestimation caused by inputting a constant F_n (0.2) for a cohort with smaller catches at intermediate ages.

Age	C	N_1	N_2
1	1500	15136	5551
2	1000	11040	3197
3	500	8136	1722
4	200	6206	961
5	100	4898	607
6	200	3925	
7	500	3033	

$M = 0.2$, $F_5 = 0.2$ and $F_7 = 0.2$.

NOTE: Underestimation of N_2 stock back calculated from age 5 compared with N_1 stock started from age 7 ($M = 0.2$ for all ages and a constant $F_n = 0.2$).

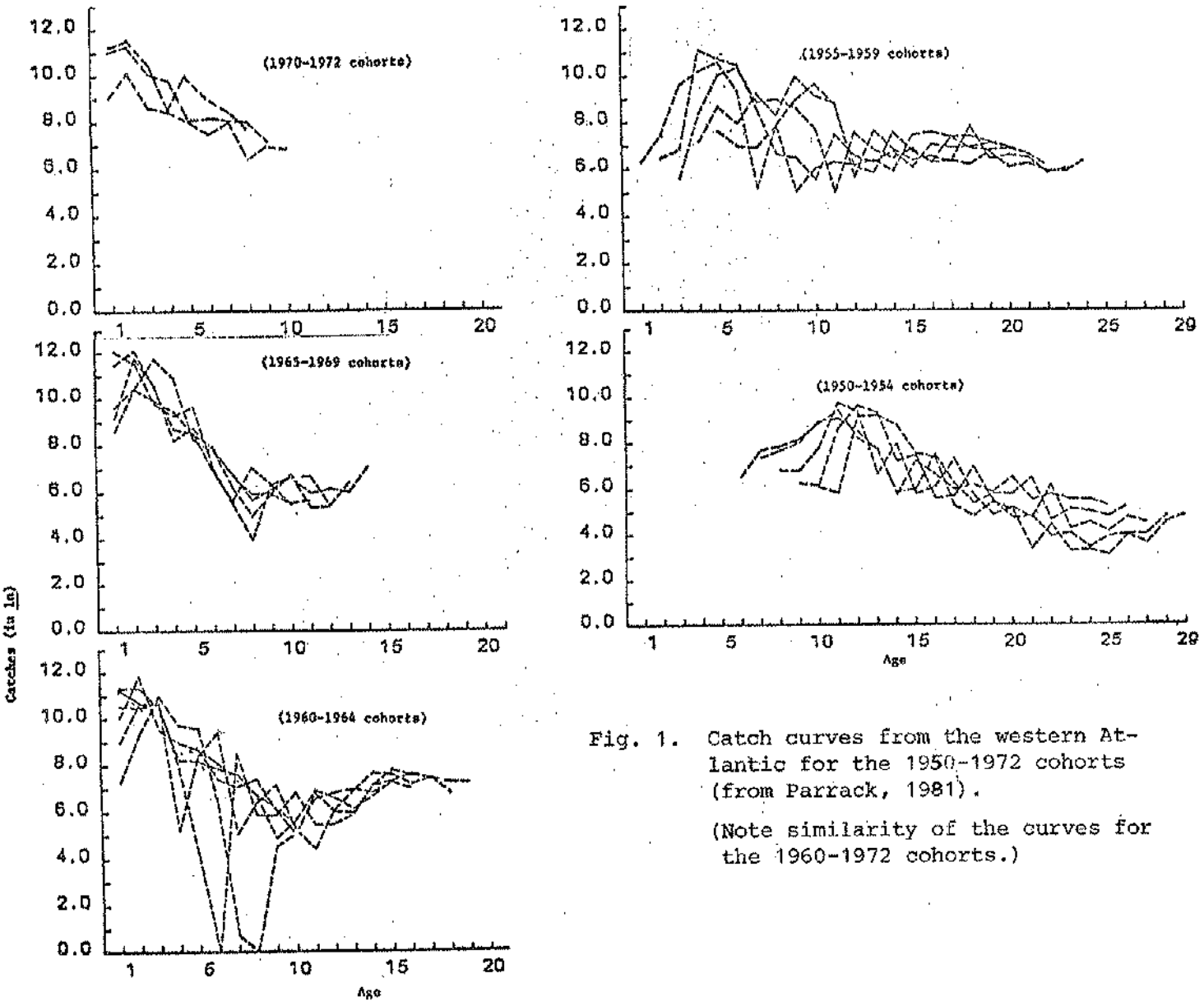


Fig. 1. Catch curves from the western Atlantic for the 1950-1972 cohorts (from Parrack, 1981).

(Note similarity of the curves for the 1960-1972 cohorts.)

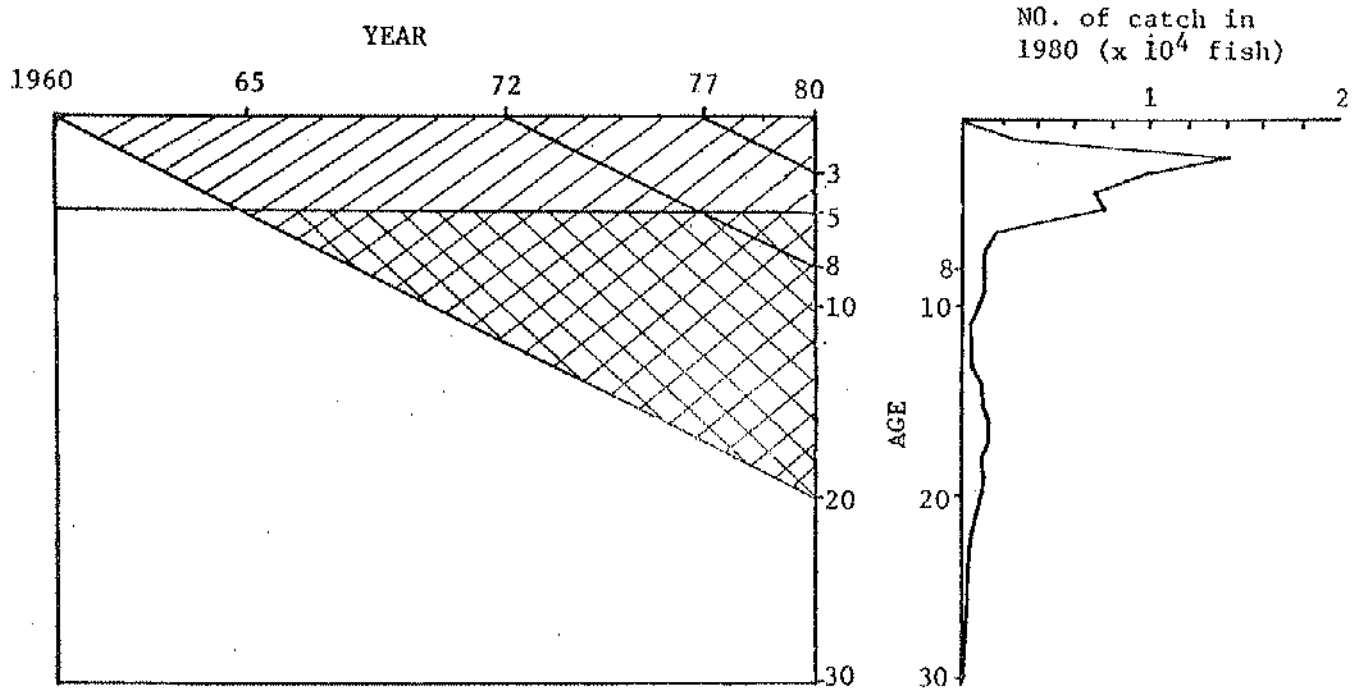
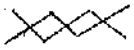


Fig. 2. Schematical representation showing underestimation of population size when a constant F_n (0.2726) is input for ages 8 and older.

/ / / / = underestimated population size of ages 1-4 fish.

 = underestimated size of spawning population, ages 5 and older.

WABF/3

RE-EVALUATION OF SURPLUS PRODUCTION OF BLUEFIN TUNA IN THE WESTERN ATLANTIC DURING 1982

by

Susumu Kume

(Far Seas Fisheries Research Laboratory)

1. INTRODUCTION

Concerning the scientific basis upon which the recommendation of new Atlantic bluefin tuna regulatory measures was adopted at 1981 ICCAT regular meeting, it is recognized that it is necessary to improve several points. Among these points, the catches by age and fishing mortality coefficient (F) for 1980 are of critical importance in order to project the future surplus production, especially those in the western Atlantic. In the SCRS/81/55 (Parrack), the main paper upon which was based the SCRS conclusion on the regulatory recommendation, it was revealed that an essential revision is needed for the catch by age and F's in 1980. This report investigates the re-evaluation of surplus production in the western Atlantic by making the needed revisions of the data base and F-values under question.

2. REVISION OF DATA FOR CATCH BY AGE IN 1980

According to SCRS/81/55, the catch by age estimates of the Japanese longline fishery in 1980 was obtained from data derived from U.S. observer's program conducted on Japanese longliners. The data were preliminary due to the limited coverage of area sampled. By using the most updated size data collected at FSFRL (Far Seas Fisheries Research Laboratory) and final TASK II statistics (catch and effort data), the catch by age revision was made following the age assignment method defined by Parrack (1981, p. 261). The results are tabulated in Table 1, some of which are remarkably different from those in Table 2 of SCRS/81/55.

Catches by age for U.S. and Canadian bluefin in 1980 were estimated from the Data Record of ICCAT (1981, Vol. 18), and are shown in Table 1. Thus, the resulting calculations of overall 1980 catches by age data in the western Atlantic turned out to be significantly different from those presented in SCRS/81/55. These calculations show a marked increase in numbers for ages younger than 10, than are shown in SCRS/81/55.

3. EXAMINATION OF AGE-SPECIFIC F's in 1980

The starting F for cohort calculation or F's in 1980 employed by SCRS/81/55 were based in essence on catch per unit of effort of the historical Japanese longline fishery up to 1979. In the first place, the F's for ages greater than 8 in SCRS/81/55 were assigned as a constant (= .2726) under the assumption that q (catchability coefficient) is equivalent for those ages. This is unreasonable because (1) catches for ages from 8 to about 15 have been consistently smaller than for other ages within a cohort and also in the catch of a calendar year. This implies that the availability of such medium-sized bluefin tuna to the fishery should be relatively smaller in nature as a species biological characteristic. Moreover, the longline fishery operating for large bluefin tuna in the Gulf of Mexico has been harvesting mainly ages 14 and up for the recent several years. Separately and together, these facts suggest that the assumption of constant F's for ages 8+ by SCRS/81/55 is inadequate. In addition, it should be considered that there has been no effective fishery taking medium-aged bluefin in the western Atlantic.

Taking into account the foregoing, and also considering that the fishing pattern for bluefin tuna has not changed in the recent several years due to bluefin regulations initiated since 1976, F's for ages 8+ should be applied age-specifically. The following estimating procedures were taken in this report:

(1) Catches by age in 1980 in the age table in the Appendix of SCRS/81/55 were substituted by revised age data described in Section 2.

(2) Using 0.2627 as starting F in 1980 (SCRS/81/55), cohort calculation was conducted.

(3) Resultant age-specific F's ($F_{t,i}$: t=age, i=year) of ages 8+ for the years 1976-1978 were indexed to the average of $F_{t,i}$ of each year, and then three years' average of indexed F_t were calculated (Fig. 1). F_t, 1979, were excluded due to the direct influence of the starting F in 1980. It is observed that the averaged index-F_t indicates inflection points against the radix of 1.0 at about ages 15 and 24, obviously suggesting the pattern of fishing power is age-specific in the bluefin fishery.

(4) In this report, F_t, 1980, were hereafter employed as 0.1954 for ages 8~;5 (average index-F_t = 0.7169), 0.3359 for ages 16-24 (1.2322) and 0.2745 for ages 24+ (1.0069).

Secondly, F_t, 1980, for ages 4-7 in SCRS/81/55 were estimated by the same procedure as for ages 8+ using Japanese catch and effort data in the north western Atlantic. The longline operation in the area, however, has been principally directing at bigeye tuna, so that the amount of basic catch and effort data to calculate the CPUE in SCRS/81/55 was very limited, as is shown in Table 2. Furthermore, reflecting this situation, SCRS/81/55 recognized fairly low correlation between F_t and f_t (effective effort of Japanese longline fishery. In this report, F_t, 1980, for ages 6 and 7 were adopted from the results of SCRS/81/55. However, considering the uncertainty of the stock size of younger ages (e.g., expressed by Parrack 1980 and Hisada and Suzuki 1981), the employed F_t, 1980, for ages 1-5 were the average F_t of the years 1976-1979, assuming that F_t, of these years did not change due to the bluefin regulations. Table 3 shows the relevant results.

4. RE-EVALUATION OF SURPLUS PRODUCTION IN 1982

Employing catch by age in 1980 and F_t, 1980, obtained above:

(1) Recruiting strength of age 1 during 1981-1983 was assumed to be an average of preceding five years, 1976-1980.

(2) The same pattern of fishery with the same fishing intensity in 1980 would have been exerted in 1981.

(3) If there is no bluefin fishing in 1982, then surplus production was calculated in the difference of the initial stock size between 1982 and 1983.

Applying the same weight and age relationship that was used by SCRS/81/55, the surplus production of bluefin tuna in the western Atlantic during 1982 was projected as follows (Table 4):

1-4	ages	640 MT
5-30	ages	1,228 MT
1-30	ages	1,868 MT

Thus, by revising the catch data in 1980 and F_t, 1980, to mirror the realities of the status of the bluefin stock and fishery as much as possible, the amount of surplus production in this examination turned out to be conspicuously different from the results obtained by SCRS/81/55.

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Table 1. Catch by age in number of bluefin tuna in the western Atlantic in 1980.

Age	Japan	U.S.	Canada	Total
1	9	2,956		2,965
2	535	13,630		14,165
3	1,809	11,610		13,419
4	2,656	6,672		9,328
5	928	4,365		5,293
6	1,337	458		1,795
7	2,225	80	5	2,310
8	3,703	46	6	3,755
9	4,255	314	8	4,577
10	1,220	269	8	1,497
11	514	117	2	633
12	239	115	4	358
13	279	97	3	379
14	439	87	3	529
15	810	74	11	895
16	1,146	116	9	1,271
17	1,669	143	26	1,838
18	1,517	198	54	1,769
19	943	224	88	1,255
20	531	216	90	837
21	624	177	73	874
22	344	144	94	582
23	211	115	62	388
24	139	78	40	257
25	62	51	84	197
26	46	37	36	119
27	15	19	23	57
28	58	13	15	86
29		8	19	27
30	4	7	1	12

Table 2. Original catch and effort data of the Japanese longline fishery in the northwestern Atlantic, on which SCRS/81/55 estimated starting F of ages 4-7 in 1980.

year	directed strata on bluefin tuna		data obtained		overall data	
	catch(#)	Hooks	month	# of 5x5	catch (#)	effective effort (hooks)
1971	538	203,698	8,9	2	6,454	2,443,619
1972	542	151,574	6,8	2	1,172	327,758
1973	720	78,868	8	3	5,988	655,919
1974	373	136,554	2,6,7,8	6	10,332	3,782,509
1975	-	-	-	-	1,295	-
1976	2,584	85,294	12	2	14,027	463,010
1977	-	-	-	-	21,819	-
1978	5,174	269,588	1	2	12,638	658,495
1979	497	83,243	2,3,4	4	10,757	1,801,700

NOTE: SCRS/81/55 assumed directed effort on bluefin tuna by the longline fishery obtained from such stratum (month, 5 x 5 area) where more than 45% of the catch was bluefin tuna.

Table 3. The results of stock size (N_t) and F_t obtained by cohort calculation on bluefin tuna in the western Atlantic, for ages 1-9 during 1976-80.

F_t age	1976	1977	1978	1979	1980
1	0.0463	0.0083	0.0425	0.0231	0.0300
2	0.1946	0.2704	0.0867	0.1128	0.1661
3	0.2236	0.0905	0.2892	0.1483	0.1879
4	0.0514	0.0967	0.2003	0.1982	0.1367
5	0.0437	0.3119	0.0549	0.4534	0.2160
6	0.0718	0.0598	0.2174	0.0143	0.0868
7	0.0274	0.1755	0.0648	0.1454	0.0193
8	0.0270	0.1452	0.0431	0.0925	0.1954
9	0.0723	0.0875	0.0994	0.1014	0.1954

N_t age	1976	1977	1978	1979	1980
1	136,271	174,265	142,909	123,611	109,573
2	123,790	108,663	144,352	114,398	100,887
3	400,460	85,106	69,259	110,551	85,356
4	97,905	267,450	64,935	43,318	79,611
5	74,924	77,674	202,793	44,392	29,675
6	27,937	59,904	47,491	160,323	23,560
7	11,325	21,717	47,130	31,914	132,012
8	6,132	9,203	15,219	36,896	23,049
9	7,253	4,985	6,648	12,176	28,094

Table 4. Projected stock sizes of bluefin tuna in the western Atlantic for 1982 and 1983. Natural mortality coefficient was given as 0.18.

age	1980 catch (N)	1980 stock size (N)	1980 F	1981* stock size (N)	1982 stock size (N)	1983 stock size (N)
1	2,965	109,573	0.0300	137,325	137,325	137,325
2	14,165	100,887	0.1661	88,819	111,313	114,703
3	13,419	85,356	0.1879	71,371	62,834	92,976
4	9,328	79,611	0.1367	59,082	49,402	52,483
5	5,293	29,675	0.2160	52,481	43,569	41,264
6	1,795	23,650	0.0868	19,971	35,320	36,392
7	2,310	132,012	0.0193	18,044	15,294	29,502
8	3,755	23,049	0.1954	108,158	14,784	12,775
9	4,577	28,094	0.1954	15,835	74,306	12,349
10	1,497	9,188	0.1954	19,302	10,879	62,065
11	633	3,885	0.1954	6,313	13,261	9,087
12	358	2,197	0.1954	2,669	4,337	11,077
13	379	2,326	0.1954	1,510	1,834	3,623
14	529	3,247	0.1954	1,598	1,037	1,532
15	895	5,493	0.1954	2,231	1,098	866
16	1,271	4,843	0.3359	3,774	1,533	917
17	1,838	7,004	0.3359	2,891	2,253	1,280
18	1,769	6,741	0.3359	4,181	1,726	1,882
19	1,255	4,782	0.3359	4,024	2,496	1,442
20	837	3,189	0.3359	2,855	2,402	2,085
21	874	3,330	0.3359	1,904	1,704	2,006
22	582	2,217	0.3359	1,988	1,137	1,423
23	388	1,478	0.3359	1,324	1,187	950
24	257	979	0.3359	883	790	991
25	197	893	0.2745	585	527	660
26	119	539	0.2745	567	371	440
27	57	258	0.2745	342	360	310
28	86	389	0.2745	164	217	301
29	27	122	0.2745	247	104	181
30	12	54	0.2745	78	157	87

*F_t in 1981 was assumed to be the same as that in 1980.

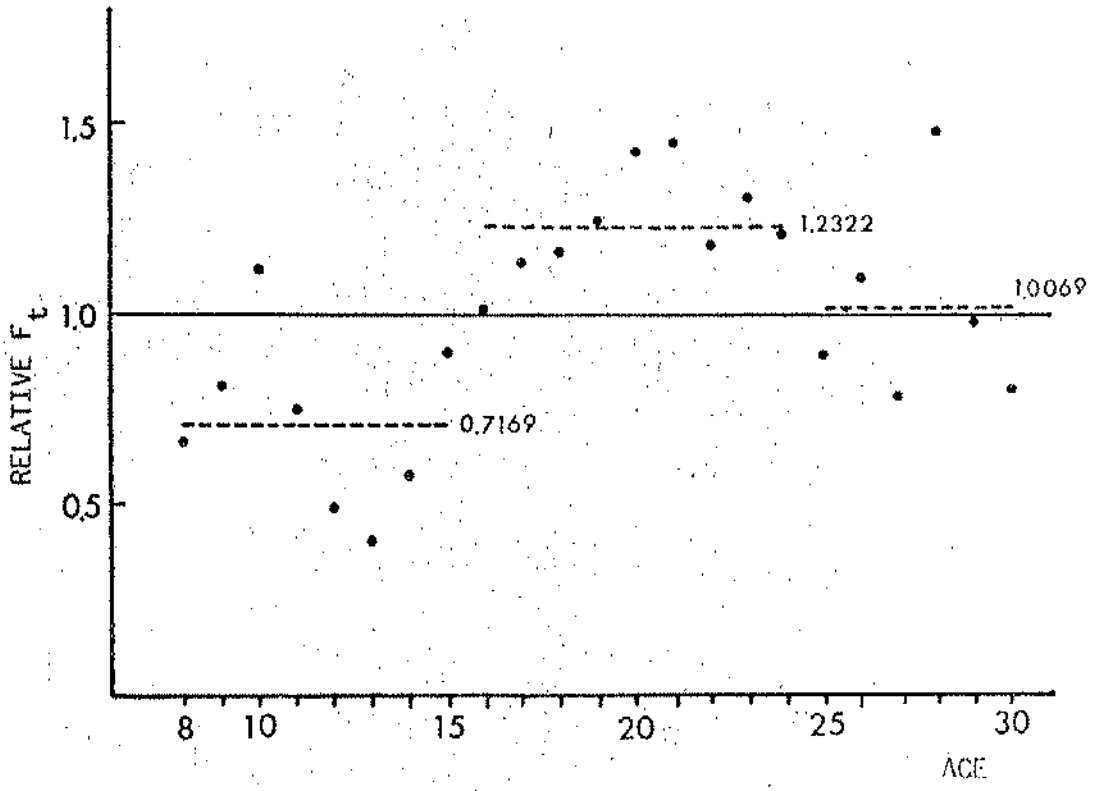

Fig. 1. Average relative age-specific F (age 8+) of bluefin tuna in the western Atlantic, during 1976-78, obtained from cohort calculation (starting F = 0.2726 for 1980).

WABF/4

ALLOWABLE CATCH OF BLUEFIN TUNA IN THE WESTERN ATLANTIC IN 1982 - A MINIMUM IMPROVEMENT OF THE CALCULATION ON THE SURPLUS PRODUCTION MADE BY PARRACK

by

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The trend of stock size and the surplus production during 1982 of the western Atlantic bluefin tuna were calculated by Parrack (1981) using cohort analysis. However, we seriously consider that his report presented unsupportable conclusions on the stock trend and surplus production when viewed in the light of actual aspects of the fisheries, biology and analytical procedures relevant to bluefin tunas. In this paper, we have made a minimum estimate of the surplus production during 1982, as the basis for evaluating the allowable catch of the bluefin tuna fisheries in the western Atlantic. Our estimates were calculated using a minimum improvement of the basic catch data and analytical procedure used by Parrack.

Problems

Main points of data handling by Parrack are as follows:

In the field of the cohort analysis:

(1) The fishing mortality coefficient in 1980, that is assigned as the starting F, is assumed and handled as the same figure for age 8 and over. This means that the real aspects of the age-specific availability are neglected from Parrack's consideration.

(2) The assumed constant fishing mortality over the age 8 for 1980, 0.273, is substantially over-estimated. This point is clearly shown in his tables.

(3) His analyses and conclusions are based on preliminary catch figures for 1980.

In the field of the estimation of surplus production:

(1) He omitted the essential factor of the age-specific availability, and consequently,

(2) Serious confusion of the concepts of total and catchable stocks was introduced to his paper.

As a result of erroneous data handling mentioned above, the Parrack estimates of the stock size and the surplus production imply the following defects:

(1) underestimation of the catchable stock size in 1980,

(2) underestimation of the stock sizes in younger ages of 1967 and the following year classes,

(3) introduction of an erroneous method in calculating the surplus production, and

(4) inappropriate estimates of the surplus production in 1982.

Age-specific Availability

As was seen in the Parrack table, the estimates of the rate of exploitation in every fishing year, excepting the cases of 1980 and the first few years, are characterized by lower figures in the middle-age group than for the young and old-age groups. This resulted from the assumption that the fishing mortality coefficient in the starting year of the calculation is the same figure, 0.273, for age 8 and over. It is suggested, therefore, that the availability may vary with the age of the fish. The definition of "availability" follows Ricker (1975).

In the case of the catch at age in the newest fishing year as shown in Fig. 1, catches of the 11- and 12-ages are lower than those of most age groups 16 and over. This type of the catch curve in a fishing season is interpretable with following reasons:

(1) reflection of the variation of number of fish spawned or hatched in each year class,

(2) reflection of the non-uniform age-specific availability, and

(3) both of the above.

Under the assumption that the availability of old-age groups approximates 1.0, we can derive the unbiased fishing mortality estimates in middle-age caused by decreasing age-specific availability from the cohort analysis when we use the catch records on 1960 to 1964 year classes, namely, age groups of 16 to 20 in the 1980 fishing year. And it is evident that the attention to the reason (1) mentioned above is no longer taken into account for this data base.*

The average fishing mortality at age calculated from data between 1960 and 1964 year classes is extracted from Parrack's table and converted to the rate of exploitation from fishing mortality as shown in

*It is essential that the fish of middle ages were not caught in other areas. Bias in the estimates generating from incorrect starting F are unavoidable. And, how to handle the effects on changes of the rate of exploitation among the fishing years is shown just after.

Fig. 2. The estimates of the rate of exploitation of 4- to 13- ages are remarkably low in comparison with those of the young and old age groups.

When we pick up the fishing mortality estimates of ages 3 and 4, and years from 1964 to 1967, and perform the analysis of variance, results are shown as below.

Item	Sum of squares of deviations (10^{-3})	Degree of freedom	Mean square (10^{-3})
Age	50.2445	1	50.2445**
Year	18.4345	3	6.1448
Age x Year	6.0870	3	2.0290
Total	74.7660	7	

**1% of the level of significance.

The between-age variation is significantly big in spite of a small between-year variation.

In this case, we trace back the rate of exploitation of the same year class, and it is, therefore, not necessarily considered that the variations of year class strength of middle-ages make a change in the catch of the ages. Finally, we may conclude that the non-uniform age-specific availability is essential in making the cohort analysis for western Atlantic bluefin tuna.

By using the estimates of the rate of exploitation shown in Fig. 2, where the rate of exploitation between two consecutive fishing years is assumed to be the same, the change rate of age-specific availability is estimated as follows:

$$r_i = E_{i,t}/E_{i-1,t-1} \qquad (1)$$

r_i = change rate of age-specific availability in i age to the previous;

$E_{i,t}$ = rate of exploitation in i-age and t-year.

Hereafter, the change rate of age-specific availability is simply rewording the age-specific availability in this paper.

It is clearly shown that a large portion of the 4-age group escapes from the catchable stock and the age groups of 11 and over reparticipate successively to the catchable stock. Focusing on the characteristics of the species that some fish between 4- to 7- ages separate more or less from the catchable stock, the estimates of stock sizes at 1-age based on

the catch data of 1963 and the following year classes in 1980 are biased under. The number of fish in young age categories estimated by Parrack, therefore, is erroneous. Also, due to unequal age-specific availability, the degree of the error from the true stock size is also unequal among the year classes. Consequently, it is not beneficial to use these estimates for an analysis of spawner-recruitment relationship.

Estimation of Surplus Production

We have two catch data, one from the preliminary catch at age in 1980 handled by Parrack, and others from Kume (1982) which estimate the catch at age with information from the final Japanese fishery, for estimation of the surplus production.

In the performance of the calculation, the fishing mortality coefficient of ages 8 and over in 1980 and 1981 is extracted tentatively from Parrack. The figures of 1- to 7- ages estimated by Parrack vary among ages and we meet with difficulty of interpretation on those estimates of the fishing mortality of the young ages. We, therefore, omit an analysis of the stock size projection of the young groups.

The following equations are adopted for projection of the stock sizes in 1981 and 1982, and the surplus production. We also assume 0.18 and 0.273 of natural and fishing mortality coefficients, respectively, and 1.0 of the availability for age of 20 and over:

$$N_{81,i} = N_{80,i-1} \cdot e^{-Z_{i-1}} \cdot r_i \qquad (2)$$

$$N_{82,i} = N_{81,i-1} \cdot e^{-M} \cdot r_i \qquad (3)$$

$$RY_{81} = \sum_{10}^{30} W_i \, (N_{82,i} - N_{81,i}) \qquad (4)$$

where, RY is surplus production, W_i is mean body weight at age calculated from Parrack's growth curve.

(1) Trial by catch data extracted from Parrack's

Results are shown in Table 1. Catchable stock size over 10-age in 1982 shows an increase of 5,118 in number and 1,368 metric tons from that in 1981. This estimate of surplus production may have a bias on the low side because of the adoption of over-estimated fishing mortality and the use of preliminary catch data by Parrack.

Taking into account the above-mentioned reasons, this estimate may not properly be used as the basis for fishery management.

(2) Estimation of the surplus production based on Kume's catch data in 1980

The same figures used in the previous section are applied to E, r and W. Catch data in 1980 used here are virtually final statistics.

The results are shown in Table 2. The surplus production of 10- and over-age groups in 1981 is estimated as 15,438 in number and 3,438 metric tons.

In order to estimate the surplus production in 1982, we assume the fishing mortality in 1981 to be the same as in the previous year. Catchable sizes of the beginning of 1982 and 1983 fishing seasons are calculated, as is shown in Table 3, for age 10 and over. From this table, when catch in 1981 is 3,412 metric tons for age 11 and over, the surplus production of large fish in 1982 is estimated as 12,020 in number and 3,062 metric tons. This estimate does not deviate greatly from the surplus production in 1981 just mentioned above.

Both estimates of surplus production in this section may make some underestimation, for the same reasons as in the previous section.

Conclusions

Parrack evaluated, without consideration of non-uniform age-specific availability for ages of 8 and over, the surplus production in 1982 to be negative as a whole. His method calculating the surplus production may only apply in the case that there is a non-selective catch on age, and no appreciable part outside of the catchable stock. However, we can read his figures on the fishing mortality coefficient as parts of stock coming into and out of the catchable stock with the age-specific availability. Therefore, we need to evaluate an accurate number of the catchable stock in order to investigate the surplus production.

The estimates of surplus production made by Parrack's 1980 catch data should not be used for evaluating the allowable catch because of the provisional catch at age.

Due to the use of an erroneous large fishing mortality figure for the calculation of stock size in 1980, both figures of catchable stock size and the surplus production based on the catch data of Kume's may be underestimated. Conclusively, we consider the best available estimation of the surplus production, as the bases evaluating the allowable catch in 1982, to be at least 3.438 metric tons for ages 10 and over.

We also call attention to the difference of the two estimates of surplus production which were calculated from two different catch data.

As was shown in Fig. 1, we can see that the two data indicate a not-so-large discrimination of catch at age, especially over 10-age. But estimates of surplus production yielded a discrepancy of twice and more. This indicates that the method of calculating the surplus production which is used for bluefin tuna, is largely sensitive to the data bases.

In order to overcome the weakness included in the method, and to make a rational figure of the allowable catch, an evaluation including and synthesizing other various information, such as CPUE, etc., may be required.

Literature

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Ricker, W. E. 1975. Computation and Interpretation of Biological Statistics of Fish Populations. Bull. Fish. Res. Bd. of Canada (191): 1-382.

Table 1. Projection of stock size and surplus production in 1981 of bluefin tuna in the western Atlantic (Catch and F_i from Parrack).

Age	F_i	r_i	N_{81}	N_{82}
8	0.273	0.754		
9	"	0.494	1,376	
10	"	1.055	3,649	1,213
11	"	1.942	4,600	5,919
12	"	1.440	1,345	5,533
13	"	1.443	1,640	1,621
14	"	2.484	3,169	3,403
15	"	1.829	4,725	4,842
16	"	1.251	3,787	3,938
17	"	1.365	5,050	4,318
18	"	0.919	3,445	3,877
19	"	1.376	3,810	3,960
20	"	1.000	2,940	3,183
21	"	"	2,824	2,456
22	"	"	2,140	2,359
23	"	"	1,542	1,787
24	"	"	1,319	1,288
25	"	"	757	1,102
26	"	"	652	632
27	"	"	458	545
28	"	"	449	383
29	"	"	409	375
30	"	"	247	341
Population number (10-30)			48,957	54,075
Surplus in number (10-30)			+5,118	
Surplus in tons (10-30)			+1,368	

NOTE: r_i age-specific availability (see text).

Table 2. Projection of stock size and surplus production in 1981 of bluefin tuna in the western Atlantic (Catch from Kume and F_i from Parrack) - Case 1.

Age	Catch	N_{80}	N_{81}	N_{82}
8	3,755	17,104		
9	4,577	20,849	5,371	
10	1,497	6,819	13,983	4,735
11	633	2,883	8,418	22,682
12	358	1,631	2,639	10,126
13	379	1,726	1,496	3,181
14	529	2,410	2,726	3,104
15	895	4,077	2,802	4,165
16	1,271	5,790	3,242	2,928
17	1,838	8,372	5,024	3,697
18	1,769	8,058	4,891	3,857
19	1,255	5,717	7,049	5,642
20	837	3,813	3,634	5,888
21	874	3,981	2,424	3,036
22	582	2,651	2,531	2,025
23	388	1,767	1,685	2,114
24	257	1,171	1,123	1,408
25	197	897	744	938
26	119	542	570	622
27	57	260	345	476
28	86	392	165	288
29	27	123	249	138
30	12	55	78	208
Population number (10-30)		63,135	65,818	81,256
Surplus in number (10-30)			+15,438	
Surplus in tons (10-30)			+3,438	

NOTE: F_i and r_i are the same as those in Table 1.

$$N_{81} = N_{80} e^{-(F+M)r}$$

$$N_{82} = N_{81} e^{-M r}$$

Table 3. Projection of stock size and surplus production in 1982 of bluefin tuna in the western Atlantic (Catch from Kume and F_i from Parrack) - Case 2.

Age	N_{80}	N_{81}	N_{82}	N_{83}
8	17,104			
9	20,849	5,371		
10	6,819	13,983	3,602	
11	2,883	8,418	17,263	5,843
12	1,631	2,639	7,706	20,764
13	1,726	1,496	2,421	9,288
14	2,410	2,726	2,362	5,023
15	4,077	2,802	3,170	3,608
16	5,790	3,242	2,228	3,312
17	8,372	5,024	2,813	2,540
18	8,058	4,891	2,939	2,159
19	5,717	7,049	4,278	3,373
20	3,813	3,634	4,479	3,573
21	3,981	2,424	2,310	3,741
22	2,651	2,531	1,581	1,929
23	1,767	1,685	1,609	1,321
24	1,171	1,123	1,071	1,344
25	897	744	714	895
26	542	570	473	596
27	260	345	362	395
28	392	165	219	302
29	123	249	105	183
30	55	78	158	88
Population number (11-30)	56,316	51,835	58,257	70,277
Surplus in number (11-30)			+12,020	
Surplus in tons (11-30)			+3,062	

NOTE: F_i and r_i are the same as those in Table 1.

$$N_{81} = N_{80}\, e^{-(F+M)r}, \qquad N_{82} = N_{81}\, e^{-(F+M)r}$$

$$N_{83} = N_{82} e^{-M r}$$

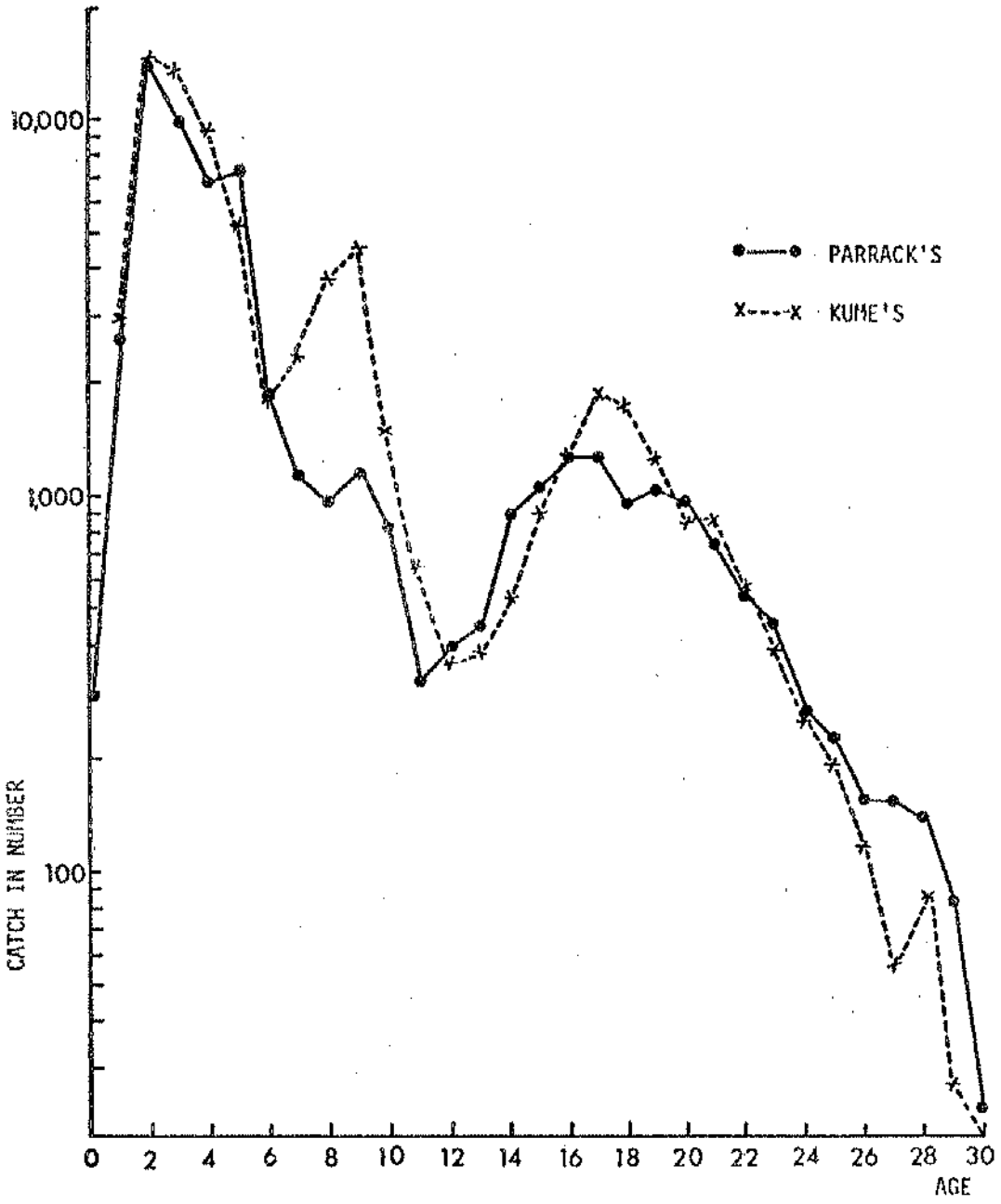

Fig. 1. Catch at age of the western Atlantic bluefin tuna in 1980.

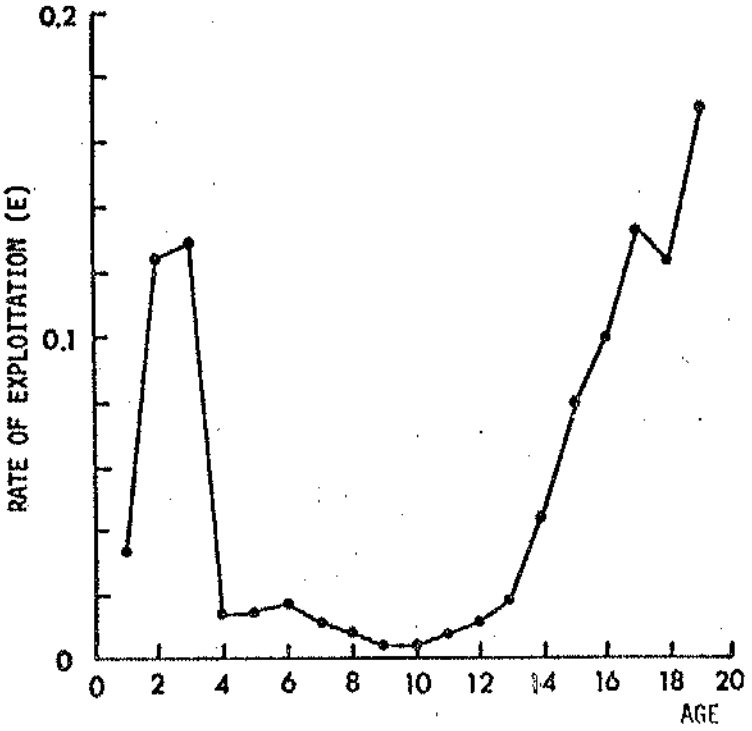

Fig. 2. Rate of exploitation at age calculated from data of 1960 to 1964 year-classes presented by Parrack (starting E = 0.220).

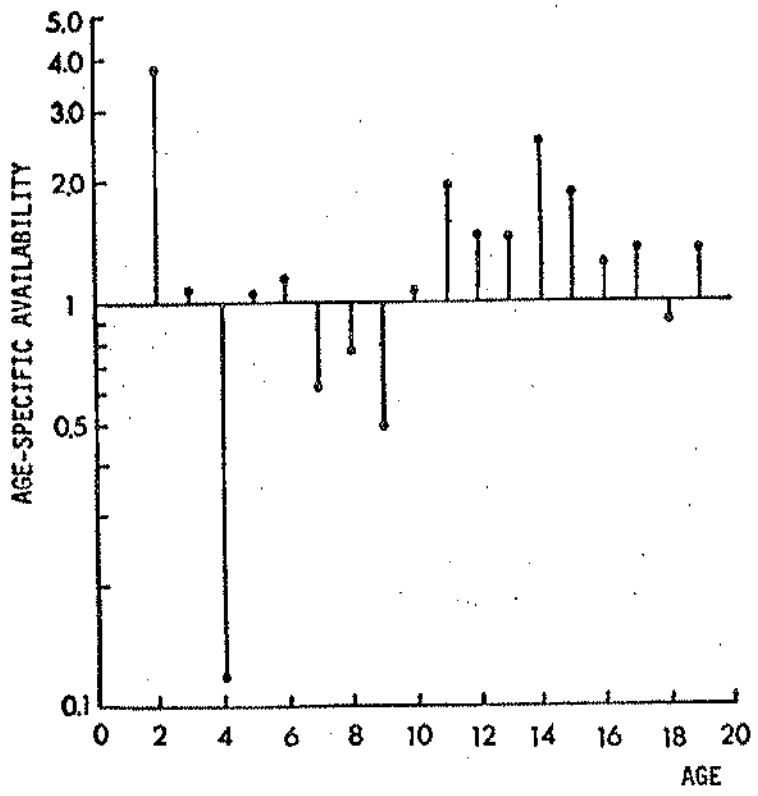

Fig. 3. Age-specific availability ($r_i = {}^{E_{i,t}}/_{E_{i-1,t-1}}$, where r_i = availability in i-age, and $E_{i,t}$ = rate of exploitation in i-age and t-year).

WABF/5

SUSPECT PARAMETERS USED BY PARRACK FOR ESTIMATING THE STOCK SIZE OF YOUNG AGES IN THE WESTERN ATLANTIC TUNA

by

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1. Age-specific catchability

Some parameters extracted from Parrack's are shown in Table 1.

Table 1. Parrack's parameters.

Age	F_t in 1980	Total Atlantic		Western Atlantic	
		$q(10^{-8})$	rho	$q(10^{-8})$	rho
1	0.1392				
2	0.4004				
3	0.3194				
4	1.2206	0.281	0.82	1.799	0.60
5	0.5781	0.570	0.82	1.396	0.34
6	0.0868	1.076	0.80	1.133	0.23
7	0.0193	1.110	0.82	4.690	0.47

Relation between F_t and q for respective areas is shown in Fig. 1.

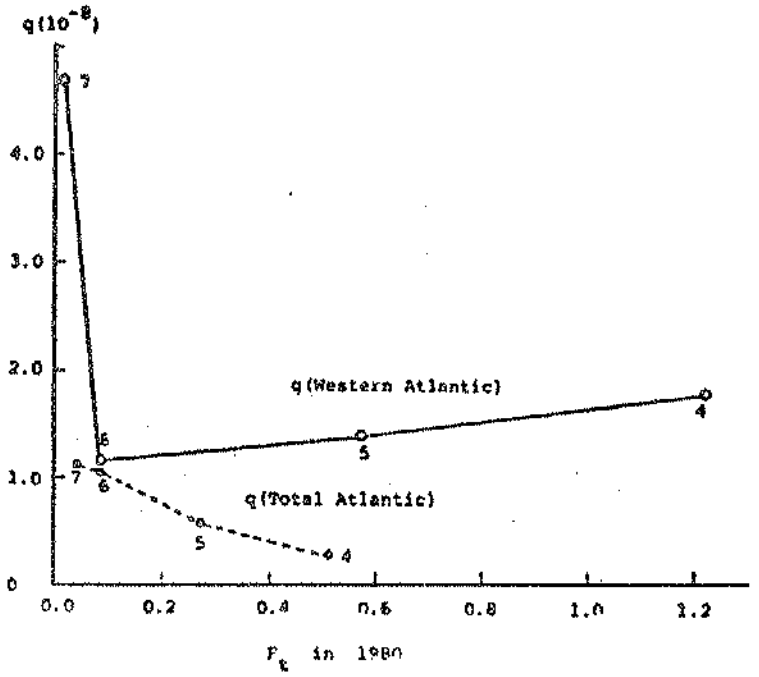


Fig. 1. Relation of F_t and q (Numerals attached to the points show age).

One question is generated from the thought that F for each age in a given fishing year may directly correlate to the age-specific catchability where total fishing effort is constant for each age. Assuming a constant fishing effort over ages 4 to 7 in 1980:

(1) Why does the relation in the total Atlantic indicate reverse correlation? and,

(2) Why does the relation between 7- and 6- ages reversely correlate?

Other questions are:

(3) Why does it show a wide discrepancy of q estimates between western and total Atlantic, excepting for age 6? and,

(4) Why do the q estimates in the western Atlantic appear bigger than those in the total Atlantic, notwithstanding that the same passive fishing gear is applied to catch the fish?

2. Surplus production of young ages

If we follow the q values estimated to the total Atlantic by Parrack because high product moment correlation coefficient is in the total Atlantic, we can obtain more reliable F_t in 1980. Before starting the calculation of stock size in 1980 and the projection of stock size, we assume the correction factors of 1- to 3- ages to be the average of those for 4- and 5- ages.

Estimates of the stock size in 1980 are shown in Table 2 and Table 3 on the surplus production of fish from 4- to 7- ages in 1982.

Table 2. Preliminary estimates on stock size of the western Atlantic bluefin tuna.

Age	Correction factor[a/]	F'_t	Catch[b/]	Stock size in 1980
1	0.283	0.0393	2,965	84,020
2	0.283	0.1131	14,165	144,494
3	0.283	0.0902	13,419	169,774
4	0.157	0.1917	9,328	58,261
5	0.408	0.2360	5,293	27,415
6	0.949	0.0824	1,795	24,767
7	0.238	0.0046	2,310	549,960

a/ q (Total Alantic/q western Atlantic) for ages 4 to 7, average of ages 4 and 5 for ages 1,2 and 3.

b/ from Kume.

Table 3. Provisional estimate of the surplus production from 4- to 7- ages in 1982.

Age	N_{80}	N_{81}	N_{82}	N_{83}
1	84,020			
2	144,494	67,475		
3	169,774	107,785	50,333	
4	58,261	129,577	74,325	42,042
5	27,415	40,175	89,351	62,081
6	24,767	18,085	26,502	74,632
7	549,960	19,050	13,911	22,137
Total (4 - 7)			204,089	200,892
Surplus in tons(4-7)			+1,518	

a/ Age-specific F as presented in Table 2 is assumed.

b/ only projecting by M = 0.18.

APPENDIX 6

WEST ATLANTIC BLUEFIN MONITORING PLAN INVOLVING CATCHES FROM THE STOCK (MEMORANDUM FROM W. W. FOX TO C. J. BLONDIN)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Fisheries Center
75 Virginia Beach Drive
Miami, Florida 33149

December 21, 1981

TO: F/IA - Carmen J. Blondin

FROM: F/SEC - William W. Fox, Jr.

SUBJECT: West Atlantic Bluefin Monitoring Plan Involving Catches from the Stock

This analysis was prepared jointly among Dr. Joseph Powers, Dr. Ray Conser, and Mike Parrack. I fully concur with it.

BACKGROUND

At the recent meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT), the Standing Committee for Research and Statistics (SCRS) made the following management recommendations to the Commission:

"If the resource is to be managed as though there are separate stocks:

A) EAST STOCK
the east stock seems stable at the current exploitation level, hence current regulations controlling minimum size and fishing mortality (see SCRS Report 1979-80 paragraph C-VCI-3) seem sufficient.

B) WEST STOCK
(i) the west stock of adult fish seems depleted to very low levels. The weight of evidence supports the conclusion that the total stock weight of adult fish will remain constant or perhaps slightly decrease if there is no catch in 1982. Therefore, based on the evidence available, a major reduction in catch is recommended so that catches of large fish are as near zero as feasible in 1982.

(ii) year-classes of age one to four fish do not appear abundant, thus future contributions to the adult component will depend in part on the level of catches from these year-classes. Therefore, it is recommended that catches from these juvenile fish be reduced to as near zero as feasible to improve the stock of adult fish in the future".

The Commission reacted to these SCRS recommendations by proposing that management measures be taken to reduce the catch of bluefin tuna in the western Atlantic. However, they also proposed that some take be allowed such that the status of the bluefin stocks could continue to be scientifically monitored. It was recommended that an annual level of take be limited to 800 metric tons to meet this end.

In the analysis that follows we develop a scientific monitoring plan which can be used to distribute the allowable catch of Western Atlantic bluefin tuna between the various fisheries which exploit it.

SCIENTIFIC CONSIDERATIONS

There are several scientific considerations which must be expressed prior to developing a plan for monitoring the western bluefin tuna stock. The first consideration is the variation of the stock size estimates in future years and the manner in which this variation changes relative to the quota level that is specified. The variance structure of the bluefin tuna estimation procedure is exceedingly complex and it defies simple expression. Therefore, we cannot make statements about the confidence limits in population estimates under alternative catch structures at this point in time. Instead we will develop a plan which minimizes the catch while providing that necessary for scientific purposes and staying within the level of 800 metric tons which was recommended by ICCAT.

Second and third considerations for a monitoring program involve the availability of timely catch and fishing effort data. The catch data should be broadly representative of each age group in the stock. The bluefin stock assessment calculations require that recent catch and effort data be available for each size group represented in the fishery. Therefore, the monitoring scheme should also give priority to those segments of the fisheries which do provide timely fishing effort that is related to the fishing mortality rate.

A fourth consideration is that the catch allowed must be made available for taking specimens for completing stock structure research. As broad a sample as possible over the age groups is required.

A decision must be made regarding allowances for those fisheries in which bluefin tuna are caught incidentally to the capture of other fish stocks. Our plan assumes that minimal bycatches will be allowed. For multistock fisheries, this implies that criteria must be developed to determine when the target stock is something other than bluefin, and when it is, what level of incidental take of bluefin can be expected.

To reiterate simply the criteria:

1. minimal catch sufficient for scientific purposes,
2. catch should broadly cover as many age groups as possible,
3. fishing effort that generates the catch should be related to the fishing mortality rate,
4. the catch must be available for scientific samples, and
5. minimal bycatch will be allowed.

The following analysis addresses the above points to provide a basis for allocating the quota amongst the fisheries directed at each size (age)-group of bluefin tuna.

MONITORING PLAN

This plan is developed separately for the large fish fisheries exploiting western Atlantic bluefin and for the medium and small fish. For purposes of this analysis, large fish are defined as fish which are ten years and older, medium fish are aged five through nine and small fish are aged four years and less.

Large Fish

Canada and the United States have rod and reel fisheries which are directed at large fish. These fisheries exploit different sizes of bluefin within the large fish category (Table 1, Figure 1). Generally, the U.S. fishery catches smaller fish than the Canadian, but the larger sizes are represented in both fisheries. Therefore, the U.S. rod and reel fishery exploits a wider range of sizes such that all sizes are represented in their catch. This characteristic is important because it will allow the stock projections to be more reliable.

Data from the Canadian rod and reel fishery are collected under an extensive logbook system. Reports presented at several SCRS meetings indicate that the CPUE from these data provide indices of stock abundance that closely mirror abundance trends estimated by cohort analysis. Fishing effort from this fishery therefore is related to the fishing mortality rate generated by catches from that fishery. However, the percent of logbook coverage has decreased from approximately 95 percent to 75 percent in 1979 and further to 70 percent in 1980. Hence, the availability of those data in the future may be threatened.

It is recommended that the Canadian logbook system for its rod and reel fishery be upgraded to increase the coverage. Additionally, the U.S. and Canadian rod and reel fisheries must operate under the same regulatory conditions (including data reporting in logbooks) such that the quality of the Canadian CPUE index may be maintained and its use expanded to the U.S. fishery. It is critical that these conditions be met if large fish stocks are to be monitored.

These fisheries take about 350-400 mt (about 1000 large fish) and best meet the criteria. We consider this catch to be sufficient for scientific purposes.

Other fisheries, however direct at large bluefin tuna. Large bluefin have been historically taken from the Gulf of Mexico by longlining vessels. However, this fishery may not meet the criteria as well as the rod and reel fisheries if held to a very low level compared with recent years. The fishery is also directed at spawning fish and while there is no empirical evidence to suggest this is a problem, it seems prudent to avoid the possibility of negative effects if possible. Other fisheries include purse seines, handlines, and harpoons which are directed to large bluefin. In some cases the catches generated from these fisheries are substantial. An example may be seen in the table below:

	CATCH (METRIC TONS)	
	1979	1980
U.S.		
Handline	450	358
Harpoon	141	102
Canada		
Trap	31	47

A United States longline fishery for swordfish has existed in the Gulf of Mexico since the 1960's in which there are records of minimal bycatch of bluefin. In recent years, however, there has been a gear change (wire leaders in use instead of monofilament) and the bycatch of bluefin has increased substantially. However, prior to this change the maximum annual bycatch of bluefin was estimated at approximately two metric tons in 1974. If the U.S. swordfish longline fishery operates as a directed swordfish fishery then an allowable level does not account for any major increases in effort which may have occurred since 1974. We have no estimate at present of what is needed under current conditions. Additionally, Canada reported 18 metric tons of incidental catch in 1980 by various gears, but none for the years 1976-1979. The five year average of incidental catch (1976-1980) was 3.6 mt.

However, effort data from these other large fish fisheries either does not exist or has not provided a reliable CPUE measure to index stock abundance. Therefore, allocating a portion of a quota to these fisheries will not substantially increase the reliability or accuracy of the monitoring. To meet the scientific objective of monitoring large fish stock abundance, the total large fish catch (plus minimal incidental catches from Canadian fisheries and the Gulf of Mexico U.S. swordfish fishery) can be taken by U.S. and Canadian rod and reel fisheries.

Medium and Small Fish

U.S. Purse Seine Fishery

A U.S. purse seine fishery exists off the northeastern coast of the United States. This fishery operates within a narrow belt that extends about 220 km from the coast primarily between Cape Charles, Virginia and Cape Cod, Massachusetts. The fishery primarily catches medium and small bluefin (50 to 122 cm fork length), usually ages two through five. Currently, this fishery operates under a quota of 875 metric tons for which 225 is an allocation for scientific studies (tagging) and 650 for an open season of fishing.

In general there is great difficulty in using purse seine fishing effort to index the fishing mortality rate in small localized fisheries. This U.S. purse seine fishery is no exception in that only a relatively few vessels are active in the fishery. In addition, if the catch were restricted to 100-200 mt, then it becomes more likely that the entire amount could be taken at one point in space and time. Thus, the catches could likely consist of only a few schools with only 1-2 age groups. Therefore, it is unlikely that purse seine catch will be representative of the range of ages that occur in small and medium bluefin; thus, the effort as an index of the fishing mortality rate will not be sufficiently useful for developing stock assessments for bluefin of these ages.

In some years, this fishery catches substantial amounts of skipjack tuna and there are some additional catches of yellowfin. Under these circumstances the fishery will be directed at these tropical tunas. Sakagawa (Marine Fisheries Review, Vol. 37(3):1-8) showed this to occur in 1963 and 1964 in which 33 and 49 percent of the catch was skipjack, respectively. Similar circumstances occurred in 1981, when skipjack catches were high and bluefin catches were relatively low.

Bluefin apparently do not school with the tropical tunas in this area. But, the species in a school cannot normally be determined before making the purse seine set. Once the school has been enclosed, then this determination can be made, at which time it is possible but with some difficulty to release them. Therefore, any fishing mortality of bluefin incidental to directed tropical tuna fisheries in this area should only occur when there are errors or accidents in the process of identifying and releasing the bluefin.

No data are presently available to determine how frequent the above circumstances might occur. From Sakagawa (Ibid.), the average of skipjack in this fishery from 1962-1973 was 840 metric tons. A list of expected takes of bluefin for alternative rates of accidents/misidentifications is given below, based upon an expected skipjack catch of 840 metric tons.

Rate of Take of Bluefin Relative to Skipjack	Incidental Bluefin Catch (MT)
0.01	8.4
0.03	16.8
0.05	42.0
0.08	67.2
0.10	84.0

We expect a low bycatch to occur.

Japanese Longline Fishery

The Japanese longline fishery has taken bluefin tuna since its inception in the Atlantic in 1956. In recent years the majority of the Japanese bluefin catch in the western Atlantic has been taken in the area that has become the U.S. FCZ. From 1971 to 1979, 70% of their western Atlantic bluefin catch was taken from this area. Small to medium fish are generally taken off the eastern coast of the U.S. (Fig.2), while larger fish are taken in the Gulf of Mexico. Historically, the Japanese have taken significant numbers of yellowfin, bigeye, and albacore as well as bluefin in the western Atlantic longline fishery. In recent years, however, their albacore fishery has been greatly reduced and the emphasis has been on bluefin, bigeye, and yellowfin.

Tuna longline gear is relatively unselective for the various tunas and billfishes in the catch and even if the Japanese longline fishery does not target small to medium bluefin, significant bycatch of bluefin may occur from fishing operations directed toward other tunas. Table 2 illustrates the recent year catches of bluefin off the U.S. east coast for various degrees of targeting of yellowfin tuna. The data are from the annual reports of the Fisheries Agency of Japan in which catches are aggregated by month and by 5^0 area. The table entries for > 50%, for example, are the bluefin catches for all month - 5^0 areas in which yellowfin was more than half of the total catch of all species. Although the choice of what percentage level constitutes a directed fishery for yellowfin is somewhat subjective, the table provides the bluefin bycatch over the past four years for any selected level. Considerable variability occurs across years but the average figures indicate that with most any reasonable definition of a directed yellowfin fishery (say 15%-75%), the small to medium bluefin bycatch is minimal. This is probably due to a difference in ecological preference of bluefin and yellowfin but when a similar breakdown is made for the more temperate tunas (i.e. bigeye and albacore), a closer association with bluefin is evident (Tables 3 and 4). Again, considerable variability occurs from year to year but the average figures provide an estimate of bluefin bycatch for any definition of a bigeye or albacore directed fishery. For bigeye and albacore directed fisheries, however, the estimated bluefin bycatch is far more sensitive to the definition of a directed fishery than for a yellowfin directed fishery. This is consistent with our understanding of the ecology of temperate and tropical tunas.

It is recommended that for the purpose of establishing a level of bluefin bycatch for the Japanese longline fishery, a 50% criteria be used for defining a directed fishery for yellowfin, bigeye, and albacore. As discussed above, the choice of percent level makes little difference in a yellowfin fishery; and in a bigeye or albacore fishery, it provides the Japanese an opportunity to fish in a manner which will yield reasonable catches of bigeye and/or albacore while minimizing bluefin bycatch. Employing the 50% criteria in Tables 2-4 gives a total allocation of 81.1 mt (i.e. 1.1 + 36 + 44 = 81.1). It should be recognized that this total allocation is based on an average figure with considerable variability due to differences in fishing strategies, fluctuations in stock sizes, and

other sources. Its use should not be viewed as an attempt to constrain the longline fishery to strategies employed over the 4-year averaging period but rather the allocation should be viewed as a level of bycatch that provides the longline fishery enough flexibility to make adjustments for the year-to-year variability and adjust strategies accordingly.

The data from this fishery is useful for scientific monitoring because:

(1) Sample length frequencies from the Japanese longline fishery off New England indicate a variety of bluefin age groups are taken (ages 3-8).
(2) Effort data is available from the fishery and a long time series of catch and effort data is available (back to 1956).
(3) The fishery operates during the winter months when no fishing is occurring in the U.S. and Canadian fisheries, thereby extending the temporal coverage.

U.S. Recreational Fishery

The U.S. recreational fishery for small and medium fish occurs from June through October off the mid-Atlantic states. Estimated landings were 86 mt in 1979, 137 mt in 1980, and 60 mt through September 1981. Sampled length frequencies from the fishery (1980 ICCAT Data Record) show a wide range of age groups in the catch (Figure 3). Ages 1 through 5 constitute the majority of the catch but frequent samples also occur of ages 6-10 and some age 0 fish are also taken. This range of ages encompasses all of the small and medium age groups, which makes the recreational fishery unique in this respect. Additionally, an annual survey of catch and effort data has been conducted since 1976. This combination of good age group sampling, the availability of catch and effort data, and good temporal and spatial coverage makes the fishery well suited for monitoring of all age groups of small and medium fish. It is recommended that this fishery be used as the primary monitoring mechanism. Its catch of 60-137 mt supplemented by the Japanese longline bycatch (81 mt) and the purse seine bycatch (42 mt) is sufficient to meet the scientific monitoring objective. However, the recreational fishery survey sampling may require an increase on coverage of the fishery to improve its precision.

CONCLUSIONS

The proposed monitoring scheme is summarized in Table 5. This plan has been predicated on the objective of monitoring the stock over all age groups with as minimal a catch as possible. Certain fisheries which currently exploit bluefin have not been included since they would not contribute significantly to improvement of the stock assessment. The catch allowed must be documented carefully and must be totally available for taking specimens for stock structure studies.

The estimates of incidental take are assumed to be uncontrollable quantities. These estimates depend upon assumptions about the rate of incidental take in fisheries not directed at bluefin. Additionally, these rates appear to be highly variable from year to year.

Table 1. Catch and sizes from rod and reel for bluefin tuna by Canadian and United States vessels in 1979 and 1980.

	1979		1980	
	U.S.	Canada	U.S.	Canada
Catch (MT)	164	214	139	259
Number of Fish				
Mean Size (kg)	339.9	412.6	312.1	404.5
Age Range				

Table 2. Catches of bluefin tuna by the Japanese longline fishery off the U.S. east coast (see Fig. 1) broken down by various degrees of targeting on yellowfin tuna, 1976-79. Data are from the Fisheries Agency of Japan.

% Yellowfin in Total LL Catch	Number of Bluefin Caught				4-Year Bluefin Average	
	1976	1977	1978	1979	Number	Weight (mt)*
> 75%	15	0	1	11	7	0.3
> 60%	22	13	1	30	17	0.7
> 55%	28	16	1	44	22	0.9
> 50%	32	16	1	57	27	1.1
> 45%	33	16	1	58	27	1.1
> 40%	33	16	23	58	33	1.4
> 35%	33	16	23	235	77	3.2
> 30%	34	16	35	237	81	3.3
> 25%	37	17	36	237	82	3.4
> 20%	37	17	37	239	83	3.4
> 15%	37	22	37	243	85	3.5
> 10%	38	320	223	965	387	16
> 5%	3263	342	1375	2442	1856	77
> 0%	11433	15652	6417	2506	9002	371

*Total weights assumed an average weight per fish of 41.26 kg taken from a sample of Japanese longline catch off New England, December, 1977 - February, 1978.

Table 3. Catches of bluefin tuna by the Japanese longline fishery off the U.S. east coast (see Fig. 1) broken down by various degrees of targeting on bigeye tuna, 1976-79. Data are from the Fisheries Agency of Japan.

% Bigeye in Total LL Catch	Number of Bluefin Caught				4-Year Bluefin Average	
	1976	1977	1978	1979	Number	Weight (mt)*
> 75%	8	0	44	0	13	0.5
> 60%	14	0	68	0	21	0.9
> 55%	612	4	81	0	174	7.2
> 50%	3306	5	169	0	870	36
> 45%	3306	5	169	0	870	36
> 40%	3708	591	169	2	1118	46
> 35%	3709	1491	169	2	1343	55
> 30%	4693	1761	184	902	1885	78
> 25%	4696	1764	1331	933	2181	90
> 20%	5114	15309	1468	941	5708	236
> 15%	5144	15339	6412	2385	7320	302
> 10%	5155	15636	6417	2406	7404	305
> 5%	7327	15639	6417	2505	7972	329
> 0%	7340	15652	6417	2506	7979	329

*Total weights assumed an average weight per fish of 41.26 kg taken from a sample of Japanese longline catch off New England, December, 1977 - February, 1978.

Table 4. Catches of bluefin tuna by the Japanese longline fishery off the U.S. east coast (see Fig. 1) broken down by various degrees of targeting on albacore tuna, 1976-79. Data are from the Fisheries Agency of Japan.

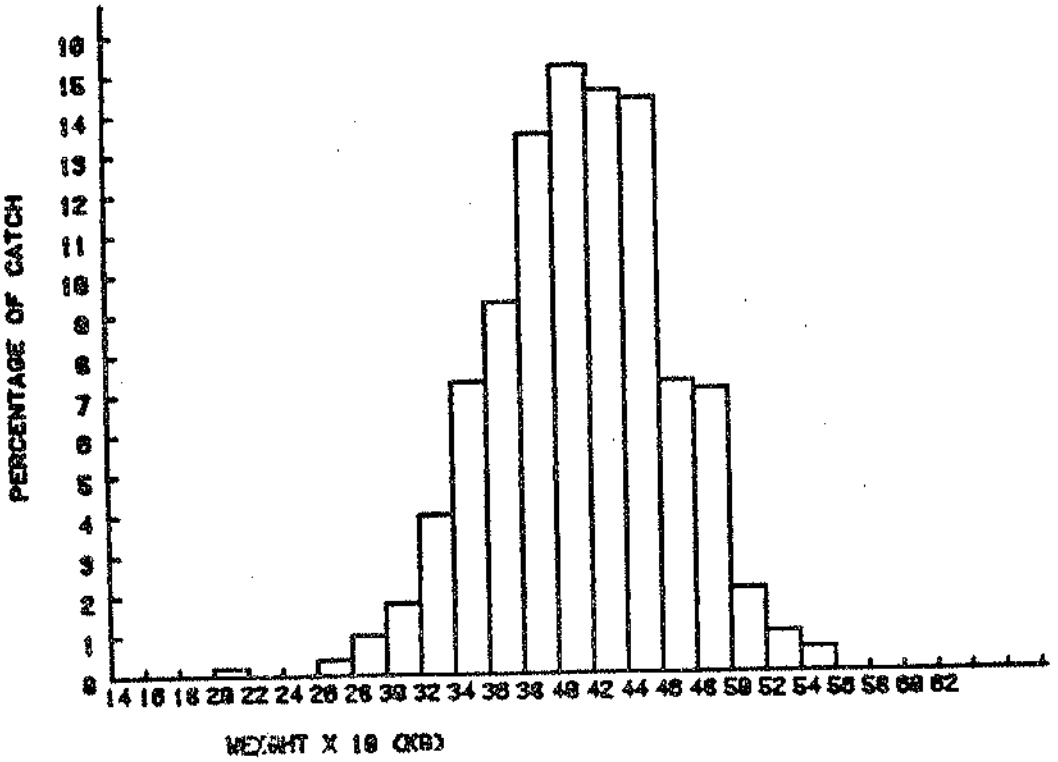
% Albacore in Total LL Catch	Number of Bluefin Caught				4-Year Bluefin Average	
	1976	1977	1978	1979	Number	Weight (mt)*
> 75%	1	0	0	0	0.3	0.001
> 65%	1	33	0	10	11	0.5
> 60%	1	33	0	1481	379	16
> 55%	1	330	0	1481	453	19
> 50%	1	2678	134	1481	1074	44
> 45%	400	3580	134	1481	1399	58
> 40%	400	3830	1219	1481	1733	71
> 35%	7222	15046	1373	2380	6505	268
> 30%	9399	15637	1411	2407	7214	298
> 25%	10981	15641	1413	2409	7611	314
> 20%	10982	15651	1458	2423	7629	315
> 15%	11000	15652	1470	2431	7638	315
> 10%	11000	15652	1470	2431	7638	315
> 5%	11001	15652	1473	2503	7657	316
> 0%	11427	15652	1474	2503	7764	320

*Total weight assumed an average weight for fish of 41.26 kg taken from a sample of Japanese longline catch off New England, December, 1977 - February, 1978.

Table 5. Proposed catch for scientific monitoring of bluefin tuna in the western Atlantic.

Large fish		Small and Medium fish	
TOTAL CATCH (MT)	501	TOTAL CATCH (MT)	267
Canadian and U.S. rod and reel .	400	U.S. recreational.	110
U.S. swordfish bycatch	37	U.S. purse seine bycatch . . .	76
Canadian bycatch	4	Japanese longline bycatch. .	81
U.S. purse seine	60		

Canada Rod and Reel
Weight Composition for 1980



U.S. Rod and Reel
Weight Composition for 1980

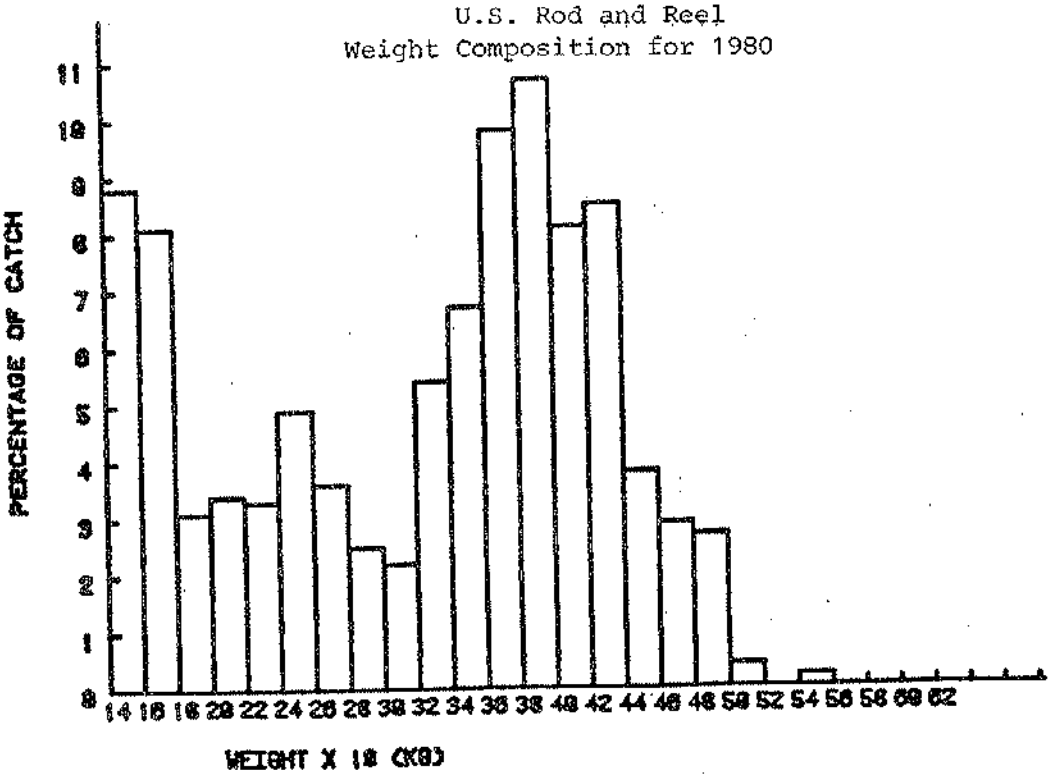


Fig. 1 Canadian and U.S. rod and reel weight distribution for 1980.

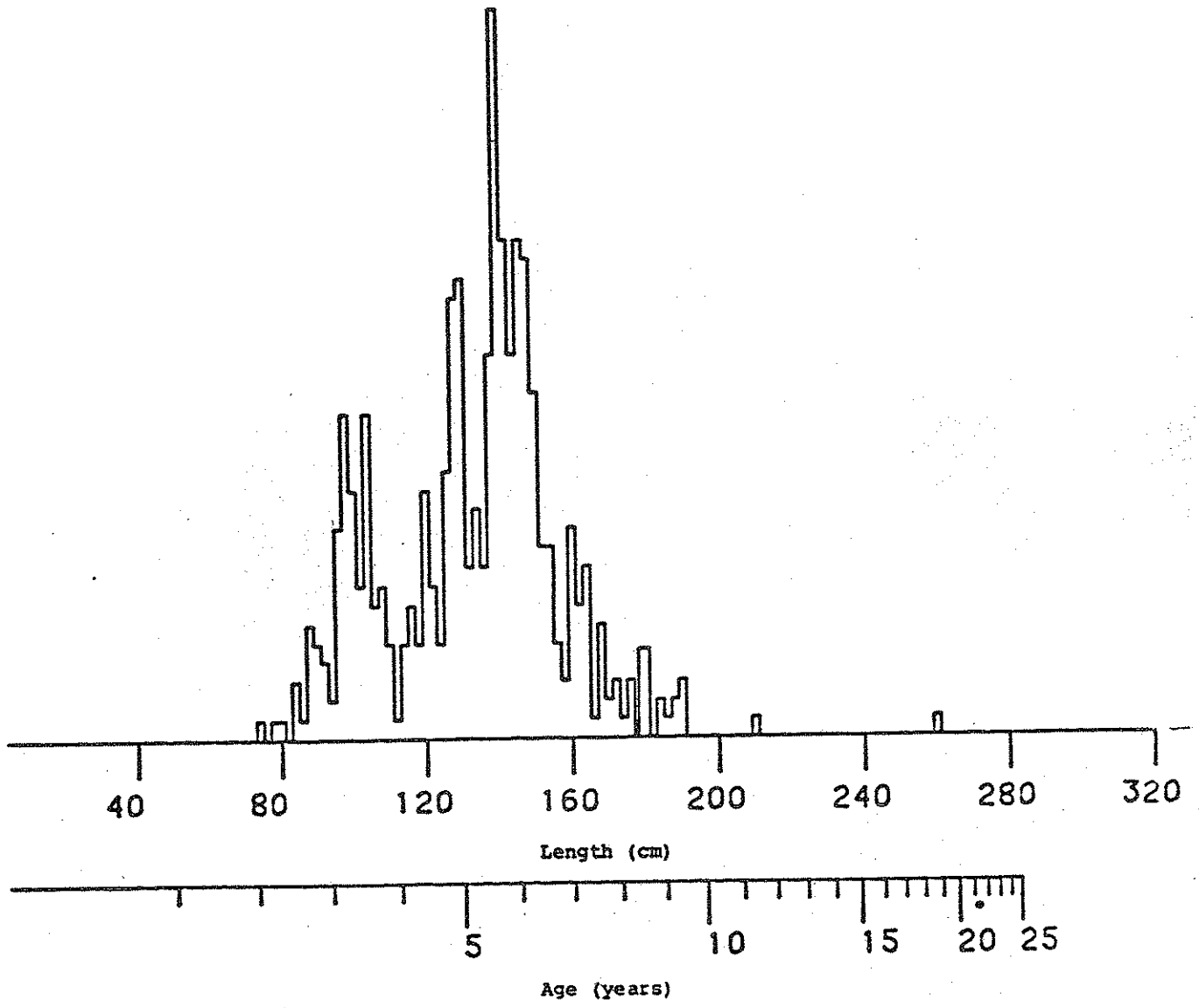


Fig. 2. Japanese longline age-length distribution for January through March, 1978, off the U.S. mid-Atlantic coast (35-40°N Lat., 60-70°W Long.).

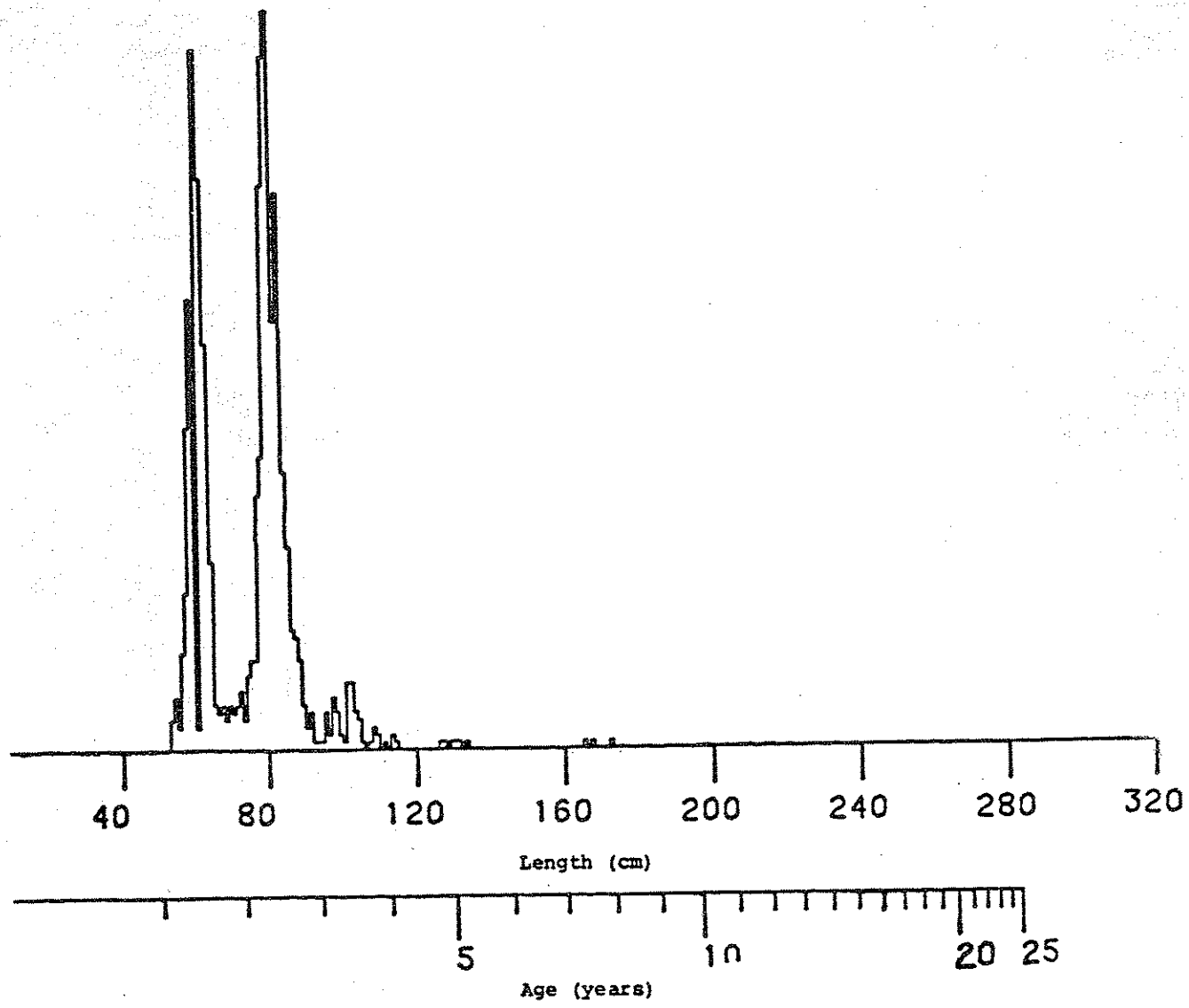


Fig. 3. U.S. small recreational fishery age-length composition for 1979.

APPENDIX 7

MONITORING PLAN OF STOCK CONDITION OF BLUEFIN TUNA IN THE WESTERN ATLANTIC - ESTIMATION OF NECESSARY CATCH AMOUNT

(PELAGIC RESOURCES DIV. - FSFRL)

1. Basic concepts on scientific monitoring.

It is considered that the objectives of scientific monitoring of the bluefin stock in the western Atlantic are: (1) to continue evaluation of the future stock size, and (2) to investigate further whether or not the stock is currently so severely depressed that it may not produce any surplus.

Under such circumstances, it is indispensable to collect scientific data that satisfy the requirements for conducting necessary research tasks. Such data must fulfill the following conditions:

(1) The data should, as much as possible, be sampled from the entire stock distribution in time and space;

(2) The data should maintain historical continuity in terms of quantity and quality.

(3) The size sampling data should, as much as possible, be collected ranging through all ages in order to conduct accurate stock assessments for cohort analysis and other research procedures.

(4) The effort data of the fishery should be substantial enough to generate reliable catch per unit of effort (CPUE) data.

(5) The overall data should be of the good quality needed to improve the evaluation of the stock condition.

Once the amount of catch for monitoring is limited, more effort should be given to obtain the data from medium and large-sized fish to improve the accuracy of the estimates using cohort analysis. Furthermore, biological information on medium-sized fish is needed by SCRS to examine fully its biological features, such as distribution and fecundity status.

Needless to say that when we examine the required amount of data for scientific monitoring, those data should satisfy the conditions described above. In addition, attention should be paid to the fact that bluefin tuna have been caught as by-catch in tuna fisheries directed at other species. Activities of such fisheries will be severely hampered if denied adequate amounts of allowable catches of bluefin tuna.

2. Amount of bluefin catch required for scientific monitoring.

It is stressed that distributional characteristics should not be ignored in the monitoring scheme: bluefin tuna are a highly-migratory species. In the western Atlantic, its distribution clearly extends continuously to the offshore area as far as, and most likely beyond, the 45°W line to the east. It should be recognized as a primary fact that the longline fishery has been covering almost the entire range of bluefin distribution, so that the monitoring strength of the longline fishery is most powerful. On the other hand, coastal bluefin tuna fisheries are often affected by year-to-year changes in the availability of the fish to the fisheries, caused by fluctuations of oceanographic and environmental conditions.

1) Tuna longline fishery

As noted above, bluefin distribution expands from coastal to offshore waters, and the longline fishery can cover best this distribution in time and space. Obviously, the Japanese longline fishery has been operating in a wide area covering bluefin distribution for a long period of yeas, taking non-selectively various sizes of bluefin tuna (Fig. 1). At the same time, the longline catch and effort data are now the only available information which is historically consecutive. These have formed the major basis of data for cohort analysis, from which evaluation of the stock condition has been produced, and by which the relative abundance of the stock has been acquired from the CPUE. It is also expected to obtain information on medium-sized fish from the longline fishery.

The size and ecological feature of the fish taken by the longline fishery in the western Atlantic are remarkably different in two general regions: the northwestern Atlantic (approximately north of 35°N) and the Gulf of Mexico.

i) Northwestern Atlantic

As shown in Fig. 1, the Japanese longline fishery in the area has

been taking small and medium fish covering many age groups. The catch and effort and size data from this fishery provide (1) a trend of CPUE by age and (2) the essential data base needed in the cohort analysis of young and medium-aged fish.

As to the number of longline operations necessary to obtain reliable monthly CPUE data within a 95% confidence limit, this requires 30 operations in a 2 x 2 degree area, as calculated by Suda (1958). In the case of the bluefin CPUE of the longline fishery in the northwestern Atlantic, 25 operations per 2 x 2 area are assumed to be relevant. Also, the overall average bluefin CPUE's for the area north of 38°N were obtained from the longline fishery operation for 1974-1979. Using estimates of number of operations and CPUE, the estimated monitoring amount to be taken by the Japanese longline fishery in the northwestern Atlantic results in 565 MT (Table 1).

ii) The Gulf of Mexico

In this area, the Japanese longline fishery has been operating for large-sized bluefin tuna of spawning stage (Fig. 1). To continue and to improve the present cohort analysis, the CPUE and size data from this fishery are very important. It is considered that the monitoring amount in this area can be assigned to be the same reduction rate as generated in the northwestern area, which will require 1,000 MT of catch (45.5% of the 1976-80 average catch).

2) Surface fisheries

When bluefin tuna migrate into the coastal area mainly in summer and autumn, various coastal surface fisheries harvest this species, the size of which ranges very widely. Large-sized fish are taken by U.S. and Canadian rod-and-reel, and U.S. purse seine and harpoon fisheries. Small-sized fish are taken by U.S. purse seine and rod-and-reel fisheries.

Some of these fisheries can provide the coverage to obtain necessary data on very young ages (e.g. by U.S. rod-and-reel fishery) and very old

ages (e.g. by Canadian rod-and-reel fishery), which cannot be taken by Japanese longline fishery. It is considered that the monitoring amount to be collected for these fisheries may be reduced to the same level by the reduction rate in Section 2-1)-ii).

3. Monitoring plan

Taking into consideration the characteristics and actual condition of various bluefin fisheries, the degree of adequacy to contribute to the objectives of the monitoring is diagnosed as shown in Table 2.

As already noted, the monitoring requirements needed call for a Japanese longline fishery amounting to 1,564 MT, which corresponds to 45.5% of the average catch of the fishery during 1976-80.

Regarding the adequate amount of monitoring for various surface fisheries, an average annual catch of each fishery during 1976-80 was multiplied by 0.455 and then 0.5, except Canadian R/R fishery (Table 2). The resultant amounts are indicated in Table 3. Thus, the total amount for monitoring results in a requirement for 2,157 MT of catch.

Literature

Suda, A. 1958. Attempts at Estimating the Abundance of Fish population from the Data of Tuna Long Line Fishery. Rept. Nankai Reg. Fish. Res. Lab. No. 7, p. 105-126.

Table 1. Catch required for scientific monitoring of bluefin by longline in the northwestern area. Average weight: 60 kg for October-December; 35 kg for January-March.

	Number of Operations	Hook rates (No. fish/1000 hooks)	Catch Tons
October	300	0.1	4
November	425	0.4	25
December	425	4.0	224
January	425	6.3	206
February	125	7.3	70
March	125	3.7	36
		Total	565

Table 2. Diagnosis of various bluefin fisheries for scientific monitoring.

	Fishing effort	Size sampling	Historical continuity	Relative adequacy
Longline fishery	0	0	0	1
Surface fishery				
Canadian R/R	0	0	0	1
U.S. R/	Δ	0	Δ	0.5
U.S. PS	X	0	Δ	0.5
U.S. Hand	X	0	Δ	0.5
U.S. Harp	X	0	Δ	0.5
Others	X	0	Δ	0.5

0: sufficient and important.
Δ: insufficient but important.
X: insufficient or inappropriate.

Table 3. Monitoring plan. ( ) indicates average catch of 1976-80.

Total: 2,152 MT

Longline fishery			Surface fishery		
Gulf of Mexico	1,011	(2,221)	Canada R/R	121	(265)
Northwestern area	565	(1,242)	U.S. R/R	62	(272)
			U.S. Hand	75	(329)
Total	1,576		U.S. Harp.	34	(149)
			U.S. PS	256	(1,127)
			Canada Trap	38	(168)
			Total	586	

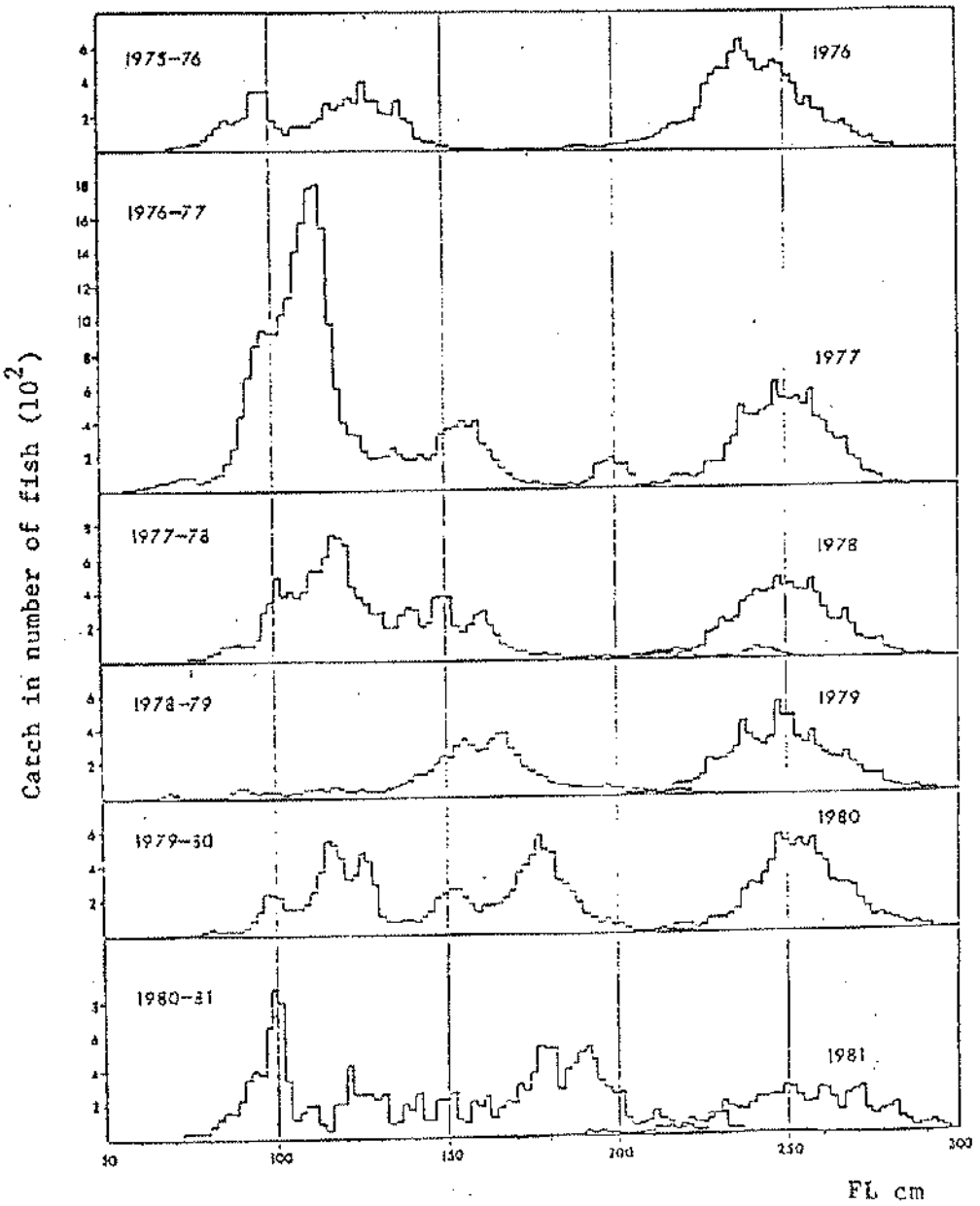


Fig. 1. Number of bluefin catch by 2 cm class from northwestern Atlantic by the Japanese longline boats. Catches from W1, W2 and W3 are combined and shown by fine lines while those from W5 are shown by thick lines.