BLUEFIN YEAR PROGRAM

I. INTRODUCTION

There has been concern about the stock status of the Atlantic bluefin tuna for more than a decade. At present, several strict fishing regulations are being imposed on the Atlantic bluefin tuna fisheries, including a monitoring quota of 2,660 MT for the western stock. On the other hand, general biological information and statistical data on Atlantic bluefin tuna are needed to improve the advice related to management of the stock(s). In retrospect, it is unreasonable that a comprehensive coordinated research program such as already successfully done for skipjack, yellowfin and albacore, has not been conducted for bluefin tuna, despite the urgency in improving the stock assessment for this stock.

To fill the gap between the need for the reliable assessment of the stock status and the need for additional biological information on the Atlantic bluefin, a steering committee was created at the 1990 SCRS meeting to investigate an applicable scientific program for Atlantic bluefin tuna, an "ICCAT Bluefin Year Program (BYP)", and the committee was assigned to report the results of the investigation at the 1991 SCRS. Two Co-Coordinators, Z. Suzuki for the western Atlantic and B. Liorzou for the eastern Atlantic including the Mediterranean, were nominated to carry out the feasibility studies for the BYP. This proposal was prepared to meet the above-mentioned request after consultation with the concerned scientists. This document lists a large number of potential research projects that may be of interest to scientists. However, it is noted as shown in summary table that some of the subjects are given a lower priority for practical reasons, such as costs, or lesser expectations in obtaining results or useful indications during the BYP.

II. RESEARCH ACTIVITIES

1. Improvement of statistics and other databases

Collection of reliable statistics on the fisheries is one of the essentially important tasks to assess the stock status. This task requires substantial numbers of skilled personnel with wide knowledge of the fisheries and the biology of the bluefin tuna. Specific attention should be paid to the bluefin fisheries in the Mediterranean where the fisheries are diverse and complicated and a significant part of the total bluefin catch in the Mediterranean comes from ICCAT non-member countries.

A. Collection of information on bluefin in the eastern Mediterranean and Black Sea

General information on Atlantic bluefin in the eastern Mediterranean is limited despite the existence of active fisheries. Intensified research with the collaboration of scientists from non-member countries will provide more information. Available statistics do not show any significant bluefin fisheries in the Black Sea. However, anecdotal information suggests that bluefin tuna occur there.

Methods

A-1) Correspondence with Turkish and U.S.S.R. scientists.
A-2) Special mission to the areas of interest if A-1) was positive.

B. Identification of non-reported catches

The actual catch may not be completely covered or reported due to several reasons. In past SCRS meetings, import/export statistics were used to correct the catches of some countries. Since the commercial value of bluefin tuna is high and the fisheries regulations have become more severe in recent years, this kind of information should be collected.

Methods

B-1) Encourage all countries, especially non-member countries, to provide catch statistics.
B-2) Cross-check import/export statistics by countries.

C. Establishing a common tag/recapture data file

Despite the high potential value of tagging data for growth, migration, stock structure and mortality studies, such studies have not been conducted

thoroughly on tagging data. This is partly due to the lack of availability of a common data file with a single uniform format which encourages further analysis.

Methods

C-1) Develop a combined tagging file for all bluefin tag/recovery data in the ICCAT database through the collaboration of national scientists.

2. Stocks

Knowledge of stock structure, especially quantitative estimation of mixing rates between the western and eastern stocks, is critical for improving the stock assessment of Atlantic bluefin tuna. CPUE data could be important as well for the assessment because they have been used to tune the VPA.

A. Stock structure and mixing rate

Presently the stock assessment of Atlantic bluefin tuna is done under the assumption of completely separated western and eastern stocks. Tagging experiments and microconstituent analysis indicate that the mixing of the east and west Atlantic bluefin is on the order of a few percent. However, the mixing rate so far available must be investigated further because of tagging results; for example, in the past, the mixing rate was not adjusted for the distribution and intensity of the fishing effort; also validation by microconstituent analysis of this assumption has not been made. Further, tagging experiments from the North American side have been reduced in recent years to a low level which discourages the study on mixing. Tagging activities in the Mediterranean were very low or non-existent in most areas although some tagging has been started recently. In addition, given the current estimates of the population size imbalance between the west and east stocks (the estimated ratio of stock size between the west and east is approximately 1 to 50), even a small mixing rate from east to west could influence our understanding of stock status.

Methods

A-1) Intensify opportunistic and scientific tagging for small fish from the eastern and western Atlantic and Mediterranean, including double tagging to compare old and new nylon streamer tags which have lower tag shedding rates than ordinary tags.

A-2) Feasibility study on genetical approaches through electrophoretic and mtDNA methods.

A-3) Verification of micro-constituent analysis.

B. Absolute stock size for small fish

A comparative study of the world bluefin stocks (Atlantic bluefin, Pacific bluefin and southern bluefin) shows that for the western Atlantic stock, the number of recruitment of age-1 fish is extremely small, in the thousands compared to millions for all other stocks, including the eastern Atlantic stock (Mediterranean). Other independent approaches are necessary to check the estimates derived from the VPA.

Methods

B-1) Experimental design for scientific tagging

B-1a) Same as A-1).
B-1b) More publicity on tagging activities for better recovery of tagged fish, especially in the Mediterranean.

B-2) Feasibility study of a direct counting method such as aerial survey and remote sensing.

C. Development of abundance indices for spawning fish

The declining trend in the adult population size, especially for the west stock is of serious concern. However, questions exist about the credibility of available abundance indices of the adult stock. The success of coastal fisheries may be subject to environmental factors while the effect of shifting the target species may have influenced the bluefin catch rate in the high seas fisheries. Therefore, the development of refined abundance indices for the large fish population is urgently needed. In this regard, it is noteworthy to mention that one potentially reliable index of the large fish population is the historical data from the Japanese longline fishery from the mid-1970's to 1981 in the Gulf of Mexico where the spawning of the western stock takes place in a relatively small time-area stratum.

Methods (Feasibility study)

C-1) Experimental longline fishing in the Gulf of Mexico including methods compatible with existing data series.

C-2) Aerial survey in the North American fishing grounds.

C-3) Study of detecting fish schools using microwave radar in the Mediterranean.

C-4) Study of feasibility of using egg abundance as spawning stock indices.

D. Development of abundance indices for the major Mediterranean fisheries

One of the reasons for the poor knowledge on the stock status of the east Atlantic stock (including the Mediterranean) is the lack of standardized CPUE for the major Mediterranean fisheries. The refinement of the present CPUE could be made more smoothly by coordinating activities with GFCM scientists.

E. Feasibility study of restocking the bluefin population

As well documented, the bluefin stock shows large fluctuations in stock size. It may be pertinent to consider the possibility of the restocking the population or artificially raise and release juveniles when the stock size decreases to a very low level.

Methods

E-1) Review of the results of the Japanese Marine Ranching Plan for Pacific Bluefin

3. Biology

As already mentioned in the introductory part of this proposal, the stock assessment will be improved through the improvement of biological information. The following comprehensive coordinated tasks are key to improving the accuracy of the present stock assessment.

A. Inter/intra-annual sex-specific growth

Since the stock assessment of Atlantic bluefin is conducted mainly by the VPA, and since bluefin tuna live for many years, probably at least 20 years, and since except for the information from the tagged fish, little validated growth information is available, the studies related to growth should be given high priority.

Methods

A-1) Analysis of hard parts (particularly with the materials obtained from tagged fish given a tetracycline or strontium chloride injection).

A-1a) Comparison of spine and vertebra ageing methods.

A-1b) Further study with the use of marginal increment data obtained throughout the year.

A-2) Tagging experiments.

A-3) Modal progression method for younger age groups.

A-4) Micro-constituent analysis.

B. Study of reproductive biology

Little information is available so far on basic reproductive biology which is important to the stock assessment. In addition, there is a big difference in the size (age) at first maturity between the eastern and western stock: for the western stock, fish over 200 cm (assumed to be age 8 and older) and for the east stock, fish 150 cm (assumed to be age 5 and older). The size at first maturity presently known for the western stock is exceptionally larger (older) than that known of other bluefin stocks. This gap in the size at first maturity can have significant implications to the stock structure and the stock assessment.

Information on fecundity and possible multiple spawnings for Atlantic bluefin tuna could also be useful for further understanding the biology of this species.

Methods

B-1) Histological analysis of gonads from the samples from off the North American coasts and in the Mediterranean.

B-2) Plankton net survey for unsurveyed areas such as in the eastern Mediterranean Sea, the Black Sea and outside the Gulf Stream.

C. Various length and weight relationships by season and by fisheries

Due to complexities in the bluefin fisheries, several different size and weight measurements have been adopted in different areas and fisheries. Therefore, several conversion factors should be developed to have a common size unit throughout the Atlantic. Those conversion factors should also be calculated by season and fishery to account for the change in seasonal obesity mainly due to spawning.

Methods

Information on the Mediterranean conversion factors may be obtained by holding another GFCM/ICCAT Joint Meeting.

4. Environment

The CPUE used to tune the various assessment models may be significantly affected by various natural factors such as ambient temperature, ocean current systems and availability of the prey animals. It is also noted that changes in fishing strategy such as a change in target species due to socio-economic changes should be considered.

A. Relation between distribution (including CPUE) and environment

Methods and Materials

A-1) Analyses on Japanese longline data vs. hydrographic conditions, including surface temperatures in the Mediterranean.

A-2) Analyses on U.S. and Canadian surface data and Japanese longline vs. surface temperature in the west Atlantic.

A-3) Analyses on French purse seine vs. oceanographic conditions in the Mediterranean.

B. Relation between biology of very young fish and environment

Methods

B-1) Collection of biological information on very small juveniles before entering the fisheries in the Gulf of Mexico and adjacent waters as well as in the Mediterranean.

B-2) Experimental fishing of the very small juveniles using methods such as light attracting devices.

III. FOLLOW-UP OF THE WORLD BLUEFIN MEETING AND JOINT GFCM/ICCAT MEETING

The World Bluefin Meeting, held in La Jolla, California, U.S.A., in 1990 was so informative and helpful for understanding the general features of bluefin tunas that a special standing committee (World Working Group on Assessment Methods of Bluefin Tunas) was established under the sponsorship of several national and international organizations. The follow-up meeting during the BYP is expected to provide more information and improve the progress of the stock assessment methods.

In order to improve the statistics and databases for the Mediterranean, the follow-up of the joint GFCM/ICCAT Meeting held in Bari in 1990 should be held during the BYP because it has proved to be very effective for these purposes.

IV. TIME SCHEDULE OF THE PROGRAM PLAN

The BYP is proposed to start in 1992 and run for approximately three years as an ICCAT research program. However, depending on securing funds and the progress of the proposed studies, the duration and starting year remains flexible. Table 1 summarizes the time schedule, priority and approximate costs of the research activities of the BYP. It is anticipated that the studies related to tagging and experimental fishing will require a large part of the funds. However, as explained in the following section on Funds, there would be little hope of obtaining special funds for chartering boats for these surveys. For this reason, the approximate costs shown in Table 1 do not include chartering fees. The participating countries are requested to secure the boats which are being used in on-going research programs of each country.

V. FUNDS

Unfortunately, it is difficult to expect any funding by the ICCAT regular budget for this program due to stringent budget controls. Hence it should be noted that the BYP is not requesting funding by ICCAT. Therefore, each country should try to secure the relevant budget, including the sources from the private sector. The funding thus obtained should be pooled in the ICCAT special budget and redistributed for each activity as decided by the SCRS and Commission. The research activities on a country basis are coordinated under the BYP.

Table 1. Time schedule, priority and research activities and approximate costs of the BYP (Costs in US$ 1,000)*

Activity	Priority	Quarters 1, 2, 3, 4 of 1992	1993	1994	1995	Countries or areas of major involvement
		And Estimated Costs*				
1. IMPROVEMENT OF STATISTICS AND OTHER DATA BASES						
A. General information in the Mediterranean and Black Seas	high	3		3		Mediterranean countries
B. Estimation of non-reported catches	high	1234	1234	1234	1234	All countries involved
C. Common tag/recapture data file	high	1234	1234	1234	1234	ICCAT Secretariat with national scientists
2. STOCKS						
A. Stock structure and mixing rate						
A-1. Intensified opportunistic and scientific tagging for small fish	high	34 $50	1234 $50	1234 $50	34 $50	U.S.A., Spain, France, other Mediterranean countries
A-2. Feasibility study on genetical approaches	medium		1234 $20	1234 $20	1234	?
A-3. Verification of micro-constituent analysis	medium			1234	1234	IATTC?
B. Estimation of absolute stock size of small fish						
B-1. Experimental design of tagging						
B-1a. Intensified scientific design of tagging	high	1234	1234	1234	1234	U.S.A., Spain, France
B-1b. Publicity of tagging	high	1234 $10	1234	1234	1234 $10	All countries, especially non-members
B-2. Feasibility study of direct counting methods	medium	1234	1234	1234	1234	?
C. Development of abundance index for large fish (Feasibility study)						
C-1. Experimental longlining in the Gulf of Mexico	high	1234 $20	1234 $20	1234 $20	1234 $20	Japan, U.S.A.
C-2. Aerial survey in the North American regions	medium	1234	1234	1234	1234	U.S.A., Canada
C-3. Study of microwave radar survey	medium	1234	1234	1234	1234	France
C-4. Study of egg production method	medium	1234	1234	1234	1234	Japan?
D. Development of abundance indices for major Mediterranean fisheries	high	1234	1234	1234	1234	Through GFCM/ICCAT joint meeting
E. Information on restocking	low	1234	1234			Japan
3. BIOLOGY						
A. Inter/intra-annual sex-specific growth						
A-1a. Comparison of spine and vertebra ageing methods	high	1234	1234	1234	1234	Spain, France

*Annual costs in $US 1,000. Costs left blank denote that either they are unable to be estimated at this stage or they should be covered by national research budgets.

Activity	Priority	Quarters 1, 2, 3, 4 of 1992 and Estimated Costs*	1993	1994	1995	Countries or areas of major involvement
3. BIOLOGY (Cont.)						
A-1b. Validation of hard part method	high	1234	1234	1234	1234	Spain
A-2. Tagging	high	34	1234	1234	1234	U.S.A., Spain, France
A-3. Modal progression method	medium	1234	1234	1234	1234	U.S.A., Spain, France, other Mediterranean countries
A-4. Micro-constituent analysis	medium	1234	1234	1234	1234	?
B. Reproductive biology						
B-1. Histological analysis of gonads	high	23 $20	23 $10	23 $10	23 $10	U.S.A., Canada, Japan, Spain, other Mediterranean countries
B-2. Plankton net survey	medium	23	23	23	23	U.S.A., Japan?
C. Various length- and weight-relationships in major Mediterranean fisheries	high	1234	1234	1234	1234	Through GFCM/ICCAT joint meeting
4. ENVIRONMENT						
A. Relation between distribution and environment						
A-1. Japanese longline catches vs. surface temperature	medium	1234	1234	1234	1234	Japan
A-2. U.S. and Canadian surface and Japanese longline catches vs. surface temperature	medium	1234	1234	1234	1234	U.S.A., Canada, Japan
A-3. French purse seiners in the Mediterranean	medium	1234	1234	1234	1234	France
B. Relation between biology of very young fish and environment						
B-1. Collection of information on very small juveniles	medium	1234	1234			U.S.A., Mediterranean countries
B-2. Experimental fishing for pre-recruitment juveniles	medium		23	23		U.S.A., Mediterranean countries
B-3. Study on survival of larvae	medium	23	23	23	23	U.S.A., Mediterranean countries
FOLLOW-UP MEETING OF WORLD BLUEFIN TUNA MEETING	high			1		All concerned scientists
FOLLOW-UP MEETING OF GFCM/ICCAT JOINT MEETING	high	3			3	Major fisheries in the Mediterranean
THE BYP WORKING GROUP MEETING	high	3 $20			3 $20	
PUBLICATION OF THE BYP RESULTS	high				4 $20	
MISCELLANEOUS		1234 $2	1234 $2	1234 $2	1234 $2	
TOTAL COST (in $1,000)		$122	$102	$102	$132	Grand total - $456