

MODIFIED PROGRAM PLAN (Second Generation of the BYP)

I. INTRODUCTION

There has been concern about the stock status of Atlantic bluefin tuna for more than two decades. Improvement in knowledge of biological characteristics of and improved statistical data on Atlantic bluefin tuna are needed to provide a basis for more precise scientific advice related to management of the resource. The Bluefin Year Program (BYP) started in 1992 as a collaborative research program to improve our understanding of Atlantic bluefin. The first phase of the BYP was reviewed in early 1995. Based on this review, a modified program plan (BYP-Second Generation) was developed and is described in this document.

An ICCAT Planing Session for BYP was held on March 13 and 14, 1995, at the University of Genoa, Institute of Zoology, in Genoa, Italy, to review activities during the first generation of the Program and to develop a proposal for modifications needed for the second generation.

This review of BYP concluded that, in general, the initial phase of the Program has been quite successful. Although funding for BYP activities has not been available directly from ICCAT, BYP and the concern over the status of the Atlantic and Mediterranean bluefin resource, resulted in increased funding for various national and international research programs directed at bluefin.

This Modified Program Plan (BYP-next generation) is based on progress made during the first generation and also takes account of recent technological advances. It is anticipated that the second generation BYP will begin in 1996. Annual progress reviews will be held for the first three years, followed by a more detailed Program Review after 3 years to determine if further modification of the Program is necessary. For the second generation BYP, two Co-Coordinator, S. Tsuji (Japan) for the western Atlantic and J. Cort (Spain) for the eastern Atlantic and Mediterranean, were nominated to facilitate collaboration among research efforts.

Because funding has not been available directly through ICCAT, some important research activities have not yet received adequate attention. It is apparent that funding the BYP directly through ICCAT might help to focus and coordinate the research already underway within various national or international research programs. Greater progress on BYP research recommendations could also be made if additional funds for research were identified.

II. RESEARCH ACTIVITIES

1. Improvement of statistics and other databases

Collection of reliable statistics on the fisheries is one of the essential tasks needed to monitor and more precisely assess stock status. Although splendid progress was made for improvement of statistics during the first generation of BYP, additional areas for improvements were identified.

These improvements in the catch statistics are the result of two ICCAT activities. The joint GFCM/ICCAT meetings including the recent work by the Permanent GFCM/ICCAT Ad Hoc Working Group has resulted in great improvement in Mediterranean fishery statistics, especially catch and size composition and for some species catch per effort data. In addition the recent implementation of the Bluefin Statistical Document Program has been associated with a recent increase in the number of countries reporting bluefin catches.

A. Improvement of catch statistics

Despite the above improvements, further improvements in the catch statistics and reporting are necessary. The problems of non-reporting or under-reporting of catches continues to be a major problem especially in recent years.

Methods

- A-1) Encourage all countries, especially non-member countries, to provide catch statistics.
- A-2) Investigate market-based methods for controlling these catches.

B. Review and updating a common tag/recapture data file

During the first generation of Program, the ICCAT Secretariat has developed a new format for the tag file, on a fish basis, and most of the release and recovery information has been incorporated into the new tag data base. Further efforts to continue correcting and updating of the base are still required.

Methods

- B-1) Review of historical tag release and recapture information for accuracy
- B-2) Update the ICCAT tag/recovery data file on annual basis.

2. Stocks

A. Stock structure and mixing rate

Several studies were made on the theoretical aspects of the stock structure and mixing rate during the first generation. ICCAT has made several preliminary trials to incorporate possible mixing between stocks into the assessments models.

An increased number of young fish have been tagged and released in the east Atlantic and Mediterranean. The west Atlantic releases have been on an opportunistic basis by recreational fishermen, while the recent Mediterranean tagging has been conducted by scientists. Double tagging experiments designed to estimate tag shedding rates were conducted in the west Atlantic during the 1970's. However additional research is needed to estimate tag shedding rates for different sizes of fish released, different types of tags, and different tagging experts. The tagging results have been used in studies to estimate the exchange rate between east and west Atlantic, however the reliability of those estimates is low in part because the data are still quite limited. In the next generation of the BYP, designed tagging experiments should be included to address specific questions such as tag reporting rates, spawning site fidelity and mixing rates.

Some studies have been carried out using mtDNA. Also, some preliminary studies have been conducted using electrophoretic techniques. For these studies, an exchange of samples has taken place among some of the scientists involved. The preliminary results of these studies are promising, although no conclusions have yet been reached. Further exchange of scientists and/or samples will be required. Joint research work is encouraged and applications of various techniques for the same sample could serve to verify the results. In order to avoid duplication of efforts and for purposes of comparisons of results of various research studies, it is requested that the results be made available to all the scientists involved, even before such results are finalized.

Continued research on these topics is considered to be high priority in the next generation of BYP.

Methods

- A-1) Continue theoretical investigations on an effect of different level of mixing rate on stock assessment and fishery management.
- A-2) Design and seek sufficient funding to implement experimental tagging for the purpose of precise estimation of annual age-specific transfer rates using both conventional and archival tags, as appropriate..
- A-3) Estimate differences in reporting rates among different nations and fisheries as well as develop various measures to estimates reporting rates.
- A-4) Establish coordination for genetic studies including exchange of scientists as well as samples and encourage joint studies as well as applications of various techniques for the same samples.

- A-5) Verification of past studies and feasibility studies on the use of other markers to identify the spawning grounds, including micro-constituent analysis.

B. Development of abundance indices and direct measures of stock size.

Questions exist about the reliability of available abundance indices for various size or age groups. The success of various fisheries may be subject to environmental factors which may not be adequately accounted for in analyses of fishery-based catch rate series. Shifting the target species may have also influenced catch rate in fisheries, although many analyses of bluefin catch rates have been developed which attempt to control for these effects through modelling of gear effects or general catch levels of other species. Fishery-independent approaches are necessary to provide improved bases for indexing abundance and to provide additional tuning data for assessments. The development of refined abundance indices for the various ages of population is urgently needed. Development is also needed of methods which are robust and also accommodate the structure of the available data, since it is unlikely that in the short term, sufficient fishery independent measures of abundance can be developed to substitute for the available fishery-based measures.

Methods

- B-1) Develop the abundance indices for the major Mediterranean fisheries.
- B-2) Establish various approaches of fishery independent indices including aerial surveys, hydro-acoustic surveys, and the use of micro-wave radar.
- B-3) Continue a study of using egg and larval abundance as spawning stock indices, including the scope of reproductive biology.
- B-4) Continue development of methods for abundance index standardization and sequential population assessment modelling that are robust and accommodate the available data structures. It is important to test the methods applied to see if applications to the available data meet the basic underlying assumptions of the models used.

C. Feasibility study of restocking the bluefin population

Studies have progressed to the extent that bluefin spawning is induced and larvae collection can be made from the bluefin spawners in captivity. With the present level of technology, it would not be practical to expect large scale restocking would start in near future. Basic studies on the biology and behavior of larvae and juveniles of bluefin produced from spawners in captivity should be continued. At the same time, any effects on the genetics of these juveniles should be investigated.

- C-1) Continue studies on the biology and behavior of larvae and juveniles of bluefin produced from spawners in captivity.
- C-2) Investigate effects in genetics to release fish produced from spawners in captivities to wild population.

3. BIOLOGY

A. Inter/intra-annual sex and area-specific growth

The current stock assessment of Atlantic bluefin is conducted mainly by the VPA using catch at age derived from age at length relationship based on tagged fish information. However, little validated growth information is available, the studies related to growth should be given high priority.

Methods

- A-1) Validate hard tissue aging techniques using various approaches including comparison among different techniques, analysis of marginal increment, use of tagging information, and micro-constituent analysis. These analyses should be done in both eastern and western Atlantic.
- A-2) Develop year/area/sex specific age-length keys.

B. Study of reproductive biology

The study of fecundity of bluefin tuna in the Mediterranean area demonstrated a relation between fecundity and size of fish with large variability for a single spawning during the first generation of Program. However, little additional information became available for the western Atlantic. 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 assumed for the western stock is larger than that estimated for other bluefin stocks, but it is noted that it is thought that west Atlantic bluefin achieve larger sizes than bluefin from other stocks. This difference in the size at first maturity can have significant implications to the stock structure and the stock assessment.

Methods

- B-1) Continue histological analysis of gonads especially for samples collected in the west Atlantic.
- B-2) Develop methods of estimating fractions of the population in each age group that are mature, recognizing that the reproductive sampling occurs primarily near the spawning areas while immature fish of potentially mature ages might occur at the same time in unsampled areas.
- B-3) Plankton net survey for unsurveyed areas such as in the eastern Mediterranean Sea, the Black Sea and outside the Gulf Stream.

C. Length and weight relationships by season and by fisheries

This was considered to be completed for the west and east Atlantic. For example, for bluefin tuna caught in the Bay of Biscay, studies were carried out on seasonal length-weight relationship for fish measuring 50 cm to 2 meters. Similar studies should be carried out for Mediterranean fish.

Methods

- C-1) Develop length and weight relationship by season and by fisheries in the Mediterranean.

4. Environment

A. Relation between CPUE and 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.

Several efforts were made on this subject in advance of and during the first generation of Program. Some of the CPUE standardization methods applied, notably those from the U.S. fisheries, make use of surface temperature information. Additional research on this topic is needed. The effect of environmental condition to the behavior, distribution, and transfer rate of bluefin might be investigated using archival tagging, although tagging experimental designs need to be developed.

Methods

- A-1) Examine relationships between oceanographic conditions including surface temperature and CPUEs derived from various fisheries, including Japanese longline, and Canadian surface fisheries, and French purse seine fishery.
- A-2) Incorporate effects of oceanographic conditions to standardize CPUEs for abundance indices, when appropriate.
- A-3) Design and implement a collaborative research program using archival tags to investigate environmental effects on biology of fish. (See also 2. A)-2.)

III. FUNDS

Several research activities were identified as those which ICCAT should either consider funding directly or identify sources of, and attempt to arrange for, external funding to conduct these studies. Among the projects identified as in need of ICCAT funding within the next year were:

- (1) Funding to support for travel (between Europe and the U.S., estimated at \$25,000) required to improve the scientific exchange of information, specimen sharing, and coordination of the various genetic-based studies (e.g. U.S., Spain, Italy, Japan) examining stock discreteness questions;
- (2) Funding support (estimated at \$10,000 for the initial project) to establish a "clearing house" for eastern Atlantic and Mediterranean biological specimen materials to be shared among the various studies involved in examination of the genetic differences between bluefin tuna from the Gulf of Mexico and Mediterranean spawning areas;
- (3) Funding to support characterization of the developing, small boat, deep handline fishery for large bluefin tuna off Morocco and the collection of biological specimen materials from fish taken in scientific fishing experiments in the region (estimated at \$20,000 charged to Morocco, and \$20,000 charged to ICCAT, for initial phase of the project); and
- (4) Funding support for larval surveys and biological specimen collections of bluefin tuna from off Turkey, conducted by scientists at the University of Istanbul (estimated at \$20,000 charged to the University of Istanbul and \$20,000 charged to ICCAT, for the initial phase of the project).