

U.S. BLUEFIN TUNA RESEARCH IN SUPPORT OF BYP

As part of its commitment to the Bluefin Year Program (BYP) research supported by the U.S. has concentrated on improving catch and effort statistics from US fisheries catching bluefin, ichthyoplankton sampling, reproductive biology, and stock structure of bluefin. Other activities initiated under the BYP umbrella include evaluation of aerial surveys as a fishery independent means of assessing BFT abundance, evaluation of the information on mixing rates estimated from available tagging data, cooperating in biological sampling of hardparts for age validation studies, and some physiological evaluations of stress induced to individual fish by certain kinds of capture.

IMPROVEMENTS IN FISHERY STATISTICS DATA COLLECTIONS

Several documents have been submitted to the SCRS (1992, 1993, 1994) which document improvements made in data collection activities relating to US fishery statistics. Most improvements have been made in the data collection mechanisms used to monitor the US rod&reel catches of small and large bluefin. The Large Pelagic Survey (LPS) has undergone substantial review and improvement in survey design and sampling levels for the various components of this survey have been increased to produce estimates of catch and CPUE with increased precision. The increased sampling levels for the LPS will continue in 1995. Expansion of the LPS into areas south of North Carolina is also being evaluated in 1995. Although this expansion would not affect catch and CPUE estimates for bluefin, geographical expansion is expected to improve catch and effort statistics for other large pelagics harvested by US rod&reel fisheries (e.g. yellowfin, billfish, etc.). Other improvements in US bluefin fishery statistics data collections include requiring permits of all fishermen intending to capture bluefin (to better establish a sampling frame for surveys of these fisheries), implementation of improved near real-time quota monitoring procedures as well as implementation of the ICCAT Bluefin Statistical Document program.

ICHTHYOPLANKTON RESEARCH

Ichthyoplankton surveys in the Gulf of Mexico were continued in 1993 and 1994 (surveys will also be undertaken in 1995). Data resulting from these surveys are used to develop a fishery-independent abundance index the abundance of spawning west Atlantic bluefin tuna. This index has continued to provide one measure of bluefin abundance that is used in SCRS assessments of the status of the resource.

U.S. and Japanese scientists conducted a joint survey of bluefin ichthyoplankton in the Gulf of Mexico in 1994 during the course of the annual U.S. survey. Results of that survey are not yet available, but should permit (1) comparison of catch rates between the different fishing methods used by the two nations, (2) comparison of Gulf of Mexico catch rates with catch rates from other bluefin spawning areas sampled by the Japanese and (3) should provide samples for genetic studies.

REPRODUCTIVE BIOLOGY

The research on reproductive biology is centered at the New England Aquarium's Edgerton Research Laboratory and is a component of the Aquarium's federally funded study of basic biology and productivity of bluefin tuna. That program has successfully maintained small bluefin in a closed sea water system for more than two years. A limited number of samples for studying maturation and fecundity have been collected in 1993 and 1994 and some processing has been completed. In 1995, this research will continue through a contract established with the New England Aquarium. Samples of fishes from approximately 120-220cm SFL will continue to be collected from various US fisheries (Northeastern US, from off Cape Hatteras, North Carolina, and from the Gulf of Mexico). Preliminary results from the NEA studies on reproductive biology and fish physiology have been submitted as contract reports to the NMFS.

STOCK STRUCTURE

Studies related to stock structure of Atlantic bluefin are being coordinated by the NMFS laboratory in Charleston, South Carolina. Research will concentrate on regions in the mtDNA or genomic DNA that contain a sufficient amount of genetic variation to be informative in stock structure analyses. A meeting of scientists from several organizations was held in 1994 to develop a plan for examining the feasibility of determining bluefin tuna stock structure from genetic material. A report of the meeting was submitted to the 1994 SCRS meeting. During 1993 limited sampling of bluefin and other tunas was conducted for use in developing methods of studying genetics. Samples of bluefin were obtained from both the west Atlantic and the Mediterranean Sea. During 1994 additional samples were obtained from the west Atlantic and a cooperative sampling program for obtaining additional Mediterranean Sea samples was established with the Spanish Institute of Oceanography's Oceanographic Center of Malaga. During 1995, the research plan documented in the referenced meeting report will be implemented for the purpose of evaluating methods to test hypotheses about bluefin stock structure and interchange rates. Additional samples of young of the year bluefin from various eastern and western Atlantic fisheries will be needed to fully evaluate the proposed methods. Cooperation of national scientists participating in the BYP is needed.

In addition to the genetic analyses underway, in 1995, research will be undertaken to review the use of microconstituent analyses for stock classification and to develop a pilot study design specifically for Atlantic bluefin tuna. This research will be coordinated through the NMFS Charleston, S.C. Laboratory.

EVALUATIONS OF TAGGING DATA FOR ESTIMATING TRANSFER RATES

At the request of the National Marine Fisheries Service, the U.S. National Academy of Sciences, National Research Council (NRC) reviewed the scientific basis of U.S. management of fisheries for Atlantic bluefin tuna. The council reviewed bluefin biology, tagging data and the 1993 SCRS assessment. A copy of the NRC report was submitted as an ICCAT document at the Bluefin Working Group meeting in September. The NMFS is working with the NRC through a series of meetings to develop procedures to implement the NRC's research recommendations. Initial evaluations of the precision (and accuracy) of estimates of transfer rates between the eastern and western Atlantic bluefin have been addressed in several working documents submitted to 1994 SCRS. It has been demonstrated that the available tagging data alone are insufficient to allow discrimination between a wide range of possible transfer rates. Evaluations need to be conducted on the number and distribution of tags between the various fisheries that would be necessary to estimate with a high degree of precision and accuracy, annual rates of transfer between the eastern and western Atlantic fisheries. In 1995, preliminary evaluations of these issues will be conducted. In addition, initial evaluation of the feasibility of external attachment of archival tags and the use of archival tags for estimation of bluefin transfer rates will be conducted. A pilot study is planned in cooperation between US, Canadian, and Australian scientists to monitor the application of some archival tags on large bluefin tuna held in traps.

AERIAL SURVEY EVALUATIONS

Pilot aerial surveys were conducted in 1993 and 1994. Two types of surveys were evaluated. The first, undertaken as a cooperative study between the New England Aquarium and fish spotter pilots operating off the northeastern US coast, was used to examine the potential for photodocumenting fish school abundance from spotter pilot search effort. This survey demonstrated the feasibility of using spotter pilot search effort to photodocument bluefin schools. It is not yet clear if data collected in this fashion can be used to either index or estimate bluefin abundance, due to uncertainty about quantifying the effective effort applied by spotter pilots used in the survey. Further research on this topic will be undertaken in 1995. Another pilot aerial survey, which used a statistically valid sampling design (using line-transect and photogrammetric sampling techniques), which in theory, should permit development of a consistent index of bluefin abundance off the northeastern US coast. A report on the field activities of this survey has been prepared and the pilot survey results will undergo analysis in 1995 to allow development of a sampling design that is expected to produce a reasonably precise (target CV of 20% or less) estimate of fish density. This degree of precision in an index should allow for a relatively high degree of confidence of detecting a halving or doubling in the estimates of fish density. Aerial surveys of the Bahama Banks region have also been proposed. A pilot survey of the region is anticipated to be undertaken in 1995.

SAMPLING FOR AGEING VALIDATION

As part of BYP, the US will continue cooperation in a program of hard part collection to investigate timing and periodicity of annulus formation. This sampling is to be coordinated between U.S., Canada and Japan.

PHYSIOLOGICAL STUDIES

Two physiological studies examining capture induced stress in bluefin have been initiated. One is being conducted by the New England Aquarium as part of its biological research program directed at evaluating the feasibility of bluefin aquaculture. Another is being conducted by research scientists from the Massachusetts Division of Marine Fisheries. This research is directed at evaluating the potential for stress-induced mortality in bluefin (and other large pelagics) in capture and release fisheries. This research is continuing in 1995.