

A REPORT ON THE PROGRESS OF RESEARCH ON IMPOUNDED BLUEFIN
TUNA IN ST. MARGARETS BAY, NOVA SCOTIA

by

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SUMMARY

The development of an impoundment fishery in St. Margaret's Bay, N.S. involving the holding and feeding of giant bluefin tuna has provided unique research opportunities. In addition to the collection of basic biological and morphometric data and monitoring the seasonal progression of the fishery, research projects in 1978 included studies of: tag retention, ageing, ultrasonic telemetry of physiological and behavioural parameters and nutrition.

RESUME

La création dans la Baie de Sainte-Marguerite, en Nouvelle-Ecosse, d'un élevage de thons rouges géants maintenus en captivité et nourris a représenté une occasion unique du point de vue de la recherche. En 1978, outre le recueil de données de base sur la biologie et la morphométrie, et le contrôle du déroulement de la pêcherie selon les saisons, les recherches ont porté sur: la perte des marques; la détermination de l'âge; l'étude télémétrique par ultra-sons des paramètres de la physiologie et du comportement, ainsi que de la nutrition.

RESUMEN

El desarrollo en St. Margaret's Bay, N.S., de una pesquería de reservas de atunes gigantes que allí mismo se alimentan, ha proporcionado oportunidades de investigación únicas. Además de la recopilación de datos básicos biológicos y morfométricos y la vigilancia de la progresión estacional de la pesquería, los programas de investigación en 1978 incluían: conservación de marcas, determinación de edad, telemetría ultrasónica de parámetros fisiológicos y de comportamiento y nutrición.

Introduction

The impoundment fishery which has developed in St. Margaret's Bay, N.S. in conjunction with the mackerel trap fishery provides an excellent opportunity for research on bluefin tuna. In order to increase the commercial value of giant bluefin tuna captured in mackerel traps early in the season, lean tuna are placed within impounding nets attached directly to the mackerel traps and fed 5% of their body weight per day. From 2 experimental impoundments in 1975, the fishery increased to 18 impoundments in 1977 and was maintained at that number in 1978. The mean weight of 717 bluefin impounded in 1977 was 405 kg. as compared to 335 kg. for 231 fish killed immediately after capture in the mackerel traps, demonstrating the rationale behind this fishery.

Under the general co-ordination of a committee representing interested scientists, management and members of the fishing community, a research program was proposed that would operate within the confines of this commercial fishery. With the co-operation of Janel Fisheries and its Japanese associates, an impoundment containing 10 giant bluefin was established specifically for research purposes. Individual fishermen also co-operated in providing valuable assistance and data.

St. Margaret's Bay operations did not close until November 9, in 1978, at which time the last fish were removed from the impoundments. Therefore many experiments operating on a continuing basis are not complete at the time of writing and can only be outlined in this report.

The 1978 St. Margaret's Bay research program consisted of 7 major projects which are described briefly below.

1. Biological and morphometric data collection

Round and dressed weights were recorded for all bluefin landed within St. Margaret's Bay in 1978. In addition, fork length, flank length, maximum girth and depth were measured, sex determined and otoliths collected from approximately 200 specimens spread over the entire season. Gross organ weights and tissue samples were collected from fish captured in the traps early in the season for comparison to those of fish impounded and "fattened" for 3 to 4 months.

2. Monitoring progress of the fishery

In conjunction with the collection of biological and morphometric information, the date and location of capture of most of the bluefin captured in the traps in 1978 have been collected. In addition, the date and number of fish impounded and date and number killed and their source (trap or impoundment) have also been collected. It is hoped that these data together with feeding records kept for the impoundments, hydrographic observations covering the entire season and information from other fisheries in the area, will lead to further understanding of the biology of this species.

Several noteworthy occurrences were recorded in the area during the 1978 season. Historical records show that "jumpers", or medium size bluefin tuna frequently occurred in large numbers in the area, but have rarely been seen since the late 1950's. During the period of mid-September to early October, at least 43 bluefin in the range of 60 to 120 kg. estimated weight were captured in small schools and subsequently released from traps in the area. In addition, a small school of tuna 4 to 6 kg. estimated weight was captured in late August. Two (2) specimens were examined and tentatively identified as bluefin.

3. Tag and release

Efforts to obtain bluefin early in the season to tag and release were unsuccessful. However 5 small bluefin of an estimated weight of 75 kg. were tagged and released in early October. It was considered imperative that some of these bluefin be tagged because their occurrence has not been recorded in the numbers reported this year since the late 1950's and so little information is available for medium bluefin.

4. Tag retention studies

Approximately 20 WHOI H-type tags have been harpooned into impounded tuna as a continuation of a study to examine the effects of tags and to obtain more accurate estimates of tag shedding rates and insight into the problem of tag shedding. As a result of a co-operative study with American biologists in 1977, the affect of the U.S. "ST" type streamer tag for

bluefin tuna was examined and observed to produce significant areas of abrasion as a result of movement of the plastic streamer against the flank of the fish (Baglin, et. al., 1977). As was expected, no gross problems with the H-type tags have been observed by scuba divers swimming among the impounded bluefin, even in the case where an arterial blood vessel was severed during tagging. Two tags, recovered from the bottom of the impoundment, are known to have been shed, one as a result of breakage of the nylon monofilament, the other as a result of poor placement (through the membrane of the 1st dorsal fin). When the tagged tuna in the impoundment are killed and examined, an accurate accounting of all tags will be made.

5. Ageing validation

The deposition of tetracycline-based antibiotics at the site of active calcification following oral administration has been demonstrated for several species of fish. Under ultraviolet light, the site of tetracycline deposition and therefore the site of calcification, fluoresces at a characteristic wavelength. If the procedure can be successfully applied to bluefin tuna, and a particular hyaline or opaque zone of an otolith marked, then new data pertinent to the controversy surrounding the ageing of giant bluefin, will be available.

In 1977, dosages of tetracycline hydrochloride ranging from 4 to 40 gm/fish in single or multiple doses were administered 4 to 8 weeks prior to the time of the fish's death. Because the 1977 results of otolith sections examined were inconclusive, the experiments were repeated in 1978. Replicate dosages of 30, 40 and 60 gm/fish of 2 antibiotics were administered orally 8 to 14 weeks prior to death. Oxytetracycline hydrochloride, a more soluble compound, was administered in addition to tetracycline hydrochloride. Vertebrae, fin rays, gill rakers and, in particular, otoliths will be collected from the treated fish and examined for signs of fluorescence.

6. Ultrasonic telemetry

Working in co-operation with investigators from the Underwater Telemetry Laboratory, University of New Brunswick, several innovations in ultrasonic telemetry were evaluated in 1978 while monitoring various parameters of free-swimming

bluefin tuna held in an experimental impoundment. The parameters monitored were: gut temperature, ambient water temperature, swimming depth, swim speed and tail beat frequency. Attempts to monitor heart beat were unsuccessful and alternative approaches are being evaluated. Large amounts of raw data have been collected from these experiments in 1977 and 1978 and analysis is still in progress.

7. Nutrition

In order to obtain specific information on factors affecting the quality of product from this fishery, analysis of food fish and of tuna flesh were made by personnel from Halifax Laboratory in 1977. A report of their findings is in preparation. Recommendations were made regarding quality of food fish and species composition of diet and the results of actions taken in 1978 in response to these recommendations will be examined, taking economic feasibility into consideration.

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