

REPORT OF THE CANADIAN RESEARCH PROGRAM ON LARGE PELAGIC FISHES

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SUMMARY

Canadian bluefin tuna and swordfish tagging release and recapture data are updated. The significance of several returns is discussed and preliminary results of a tag shedding experiment are presented. Attempts to use tetracycline antibiotics for age validation are discussed. The results of bluefin tuna port sampling and shipboard swordfish sampling are summarized.

RESUME

Les données de marquage et de récupération de marques pour le thon rouge et l'espadon sont actualisées dans le présent document, qui signale plusieurs retours significatifs. On présente des résultats préliminaires obtenus au cours de l'expérience visant à étudier le degré de rejet de marques. Les tentatives d'utilisation d'antibiotiques type tétracycline pour vérifier

les méthodes de détermination de l'âge font l'objet d'un exposé critique. On récapitule les résultats de l'échantillonnage du thon rouge dans les ports, et de l'espadon à bord des navires de recherche.

RESUMEN

Se actualizan los datos de atún rojo canadiense y pez espada marcados y recapturados. Se habló de la trascendencia de varias devoluciones. Se presentaron resultados preliminares del experimento de pérdidas de marcas. Son debatidos intentos para utilizar antibióticos a base de tetraciclina para validación de la edad. Se resumen los resultados del muestreo en puerto del atún rojo y muestreo a bordo del pez espada.

TAGGING

The particulars of five tag returns, two swordfish and three bluefin tuna, are reported in Table 1.

Two of the recaptured bluefin had been tagged as giants from rod and reel capture in Chaleur Bay in the Gulf of St. Lawrence in 1975 and 1977. They were both recaptured by rod and reel in 1979 within 30 miles of their release location and within a few days of the exact date of release. The third bluefin had been tagged off the Atlantic coast of Nova Scotia in 1977, also by rod and reel capture, and was recaptured by rod and reel in April 1979 off the south coast of Puerto Rico. This is the first Canadian bluefin tag return from the Caribbean Sea, and together with a similar U.S. tag return (pers. comm., F. Mather), extends the area of documented seasonal migration into this area.

These returns bring the total number of Canadian bluefin tag returns to 173 fish, of which 36 were "giants." One swordfish was recaptured by harpoon in 1978, 320 miles southwest of its point of release in 1975. This swordfish was tagged and released during an experimental longline research cruise off Nova Scotia. No size or weight data were available from the recapture. The other swordfish was recaptured in 1979 after 3995 days at large. This 11-year return exceeds the record return of last year by two years and establishes a new record for a tagged swordfish. Further, this swordfish tagged by harpoon off Nova Scotia was recaptured off Florida, presenting concrete evidence that the same stock of fish migrated between the waters off Florida and Nova Scotia. The date of recapture is contrary to past experience with swordfish tagged in Canadian waters since most recaptures occur to the northwest during the summer in the same area as

release. This reinforces questions regarding the accepted pattern of distribution movements of swordfish that are now being raised as a result of new data available from the expanding fishery off the coast of Florida. The estimated weight at release and weight at recapture calculated from dressed weight (conversion factor 1.32 (Beckett 1974) indicate an increase in weight of approximately 105 kg in 11 years. Preliminary age estimates by Beckett (1974) would suggest this specimen to have been 4 years at time of release, producing an age of 15 years at time of recapture and increasing the documented maximum age for this stock to at least 15 years. This would imply values of the von Bertalanffy K to be even lower than those suggested by Caddy (1977).

These two returns bring the total number of Canadian swordfish tag returns to 23 of 231 releases.

The only tagging of large pelagic species conducted in 1979 has been of 28 blue sharks and 4 mako sharks tagged and released during a swordfish longline trip.

TAG SHEDDING

During the course of experiments with bluefin tuna held in impounding nets in St. Margaret's Bay, Nova Scotia in 1978, 16 WH01 type-H tags were placed to examine tag shedding rates and the effects of tagging.

The tags were applied in the manner typical of Canadian tagging operations with large fish. Tag numbers were recorded prior to tagging so that individual tags could be accounted for. Time on the fish ranged from 8 to 14 weeks before harvesting of the fish.

Periodic examinations by scuba divers were made of the sea floor

beneath and surrounding the impoundment to determine when tags were shed. The results of this experiment are presented in Table 2. The Type-I shedding ratio was calculated as .06 and Type-II rate as .25. These values are only approximate because of the low number of tags examined. The extremely low number of bluefin impounded in 1979 and the resulting value of each fish precluded the planned continuation of this experiment in 1979.

Examination of the carcasses of these tagged bluefin just prior to processing revealed that all tag wounds were clean and healing well. However, during the telemetry experiments conducted in 1978, a 250-g transmitter (weight in air) was attached to the monofilament of a WHOI type-H tag and harpooned into a fish. This tag did not remain on the fish for more than a week at a time but produced a large open wound approximately 3 cm in diameter that was still not healing after 8 weeks. This wound was quite similar to the wound produced by the American "ST" type streamer tag examined at St. Margaret's Bay in 1977. The wound is believed to be a result of excessive movement of the monofilament caused by the drag of the heavy non-streamlined transmitter in one case and the "fluttering" of the long streamer in the other.

AGEING VALIDATION

The use of tetracycline antibiotics as calcium-specific agents to produce marks on the hard parts of various fish species has been reported extensively (Vitinich, 1978; Odense & Logan, 1974; Yamada, 1971; Scidmore & Olsen, 1969; Weber and Ridgway, 1967). Wild and Foreman (1978) documented the use of tetracycline injected intramuscularly into skipjack and yellowfin tuna. At the Atlantic Bluefin Tuna Ageing Workshop held in New York City,

March 1977, it was recommended that chemical tagging be used as a method of validating present ageing procedures in bluefin tuna (Hunt, 1978). As a result, experiments were conducted in 1977 in the St. Margaret's Bay impoundments to determine whether the tetracyclines could be used to mark the hard parts of giant bluefin tuna.

In an impoundment established for experimental purposes, 14 fish were administered tetracycline hydrochloride orally. Doses ranging from 4 to 40 gm were administered from four to eight weeks prior to the fishes' death (Butler, 1977). Otoliths, dorsal spines and caudal vertebrae were collected, cleaned and air dried in darkness. Otoliths were sectioned and examined microscopically under ultraviolet light. Dorsal spines and vertebrae were also examined under ultraviolet light but no fluorescence could be detected.

In 1978, this experiment was repeated using oxytetracycline hydrochloride as well as tetracycline hydrochloride. Doses ranging from 30 to 120 gm were administered orally from 9 to 14 weeks prior to death. Each fish was tagged with a WHOI type-H tag to identify the dose received. Weights were obtained at the time of processing and using these weights, dosages were calculated to range from 65 to 330 mg/kg live body weight. Otoliths, dorsal spines and caudal vertebrae were collected, cleaned, air dried in darkness, and examined under ultraviolet light. Fluorescence could not be detected.

Several possibilities have been proposed to explain the failure of these experiments. Adequate quantities of tetracycline may not be absorbed rapidly enough from a single large dose. A large dose may actually shorten the time the tetracycline is in contact with absorptive surfaces in the gut by seriously altering the normal gut flora. At this point in the life history or at this point in the season, calcification may be minimal,

resulting in no detectable fluorescent from such short term treatment. In addition, dosages, at least at the lower end of the calculated range, may be too low.

Intermuscular injection, used successfully on other species, is out of the question due to the large volume of solution required to dissolve an adequate dosage. Intraperitoneal injection, the most desirable method of administration, is difficult due to the volume of solution, but also due to the problems associated with handling such large fish.

Experiments were planned for 1979 using tetracycline derivatives that are more rapidly absorbed upon oral administration, and using higher dosages. The use of multiple low level dosages and injection were also being considered, but the low number of fish available in St. Margaret's Bay precluded any such experiments in 1979. It would appear that more success would be possible treating large numbers of smaller free swimming fish and examining hard parts on recapture as reported by Wild and Foreman (pers. comm.). Alternatively, the recent success in Japan in rearing juvenile bluefin may provide an excellent opportunity for tetracycline studies.

SAMPLING PROGRAM

Since 1975, weight measurements have been obtained for approximately 90% of the "giant" bluefin catch. Detailed sampling has been conducted on a subsample of catch each year in the major tuna landing ports. Since flank length, a tape measurement, is the most common measurement available from the sport fishery, fork length, flank length and maximum girth are all collected in an effort to produce a reliable conversion factor for flank length to fork length for "giant" bluefin. Round weight and, in some cases, dressed weight are collected to monitor the conversion factor for dressed to

round weight, and to examine the weight-length relationship. Since growth and migration are both sexually dimorphic, gross examination of gonads is used to determine sex. Otoliths are also collected as part of the growth study. Weight, length, sex and otoliths have been collected from 1,048 fish, and weight and length alone have been collected from 1,886. Both a detailed description of the sport fishery and a growth study are ongoing, but neither is yet complete at the time of writing.

The recent annual increases in mean weight of "giant" bluefin fisheries are now well documented, and the Canadian sport fisheries are renowned for establishing world records. In 1978, a new world record for largest bluefin tuna taken by rod and reel was established in North Lake, P.E.I. by a 560.2-kg specimen. This weight was exceeded by a 591.9-kg bluefin removed from an impoundment in St. Margaret's Bay in October 1978. These records have been surpassed in 1979 by a 679 -kg specimen taken by rod and reel off Nova Scotia in the Gulf of St. Lawrence. Since the introduction of regulations to the sport fishery for bluefin in 1975, each boat has been required to complete and submit a log book. A report of the preliminary analysis of these log records has been submitted to this meeting (SCRS/79/113) and a complete analysis covering five years will be performed.

SWORDFISH

With the re-opening of the Canadian swordfish fishery in 1979, sampling of swordfish catches was initiated. Length and weight frequency samples have been obtained from representative catches but no comparison to similar catches prior to the 1971 closure has been made at the time of writing. Detailed log books are being collected and an analysis of catch location and size distribution will be made.

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Table 1. Canadian large pelagic fish release and recapture data, 1979.

Tag no	Species	Release				Wt (kg)	Recapture					
		Date	Method	Position	Date		Method	Position	Wt (kg)	Days free	Dist. (mi)	Direction
B04221	Bluefin	7/VIII/77	R&R	48°02'N 65°07'W	320+	12/VIII/79	R&R	48°02'N 64°20'W	411	736	31	88°
B04382	Bluefin	10/VIII/75	R&R	48°23'N 64°20'W	360	5/VIII/79	R&R	48°02'N 65°07'W	457	1457	37	236°
B04416	Bluefin	10/VII/77	R&R	44°49'N 62°04'W	360+	22/IV/79	R&R	17°40'N 66°25'W	405	642	1770	188°
B03379	Swordfish	22/VIII/75	LL	42°40'N 63°10'W	80+	27/VII/78	Harp	40°21'N 69°31'W	-	1071	320	244°
B01012	Swordfish	24/VII/68	Harp	43°04'N 61°35'W	55+	1/VII/79	LL	28°37'N 74°52'W	160	3995	1170	217°

Table 2. Tag shedding experiment results.

No. of tags	Results	Results	
		%	Remarks
16	Tags placed	100	
11	Recovered from fish in processing plant	69	Successful
1	Broken at tagging between stainless steel dart and nylon monofilament	6	Type I shedding
2	Recovered from bottom of impoundment by divers	12.5	Type II shedding
2	Not recovered - assumed lost during boating or landing of fish	12.5	