The Western Atlantic Bluefin Tuna Situation

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In recent years there has been increasing concern over the status of bluefin tuna (*Thunnus thynnus thynnus*) stocks in the North Atlantic Ocean. Catches of giant bluefin by almost every fishery in the North Atlantic have declined to the point where many have closed because of a lack of fish. Some statistical and biological indicators such as tag returns and size distribution suggest that the stocks of North Atlantic bluefin tuna have been depressed below a level that is desirable from a biological as well as an economic standpoint. As we examined the available statistical and biological data on bluefin, it became obvious that a major research effort was required to clarify some of the questions and confusion that had developed over the status of this species.

In February 1974 NOAA/NMFS directed that a research program be developed at the Miami Laboratory of the Southeast Fisheries Center (SEFC) to obtain the necessary statistical and biological information to permit rational management and allocation recommendations on the bluefin tuna stocks in the North Atlantic.

In May one of our immediate actions was to initiate discussions with Canadian scientists to determine what could be done in 1974 to control fisheries for bluefin in the western North Atlantic. Both Canadian and U.S. scientists felt that the high prices being offered by the Japanese would encourage a large increase in the harvest of giant fish. From these discussions, we agreed to recommend voluntary catch quotas on both giant (mature) and small (immature) fish. We also recommended reducing landings of bluefin below a size of 14 pounds to protect the 0- and 1-year-old fish. The preliminary catch figures for 1974 show that the recommended quotas were exceeded in some cases but the overall goal of restricting expansion of the fishery was successful (Table 1).

The purse seine fishery observed the 14-pound minimum size restriction except when small schools were set on specifically for the purposes of tagging. Large numbers of 6-8 pound bluefin appeared along the eastern coast of the U.S. this year, and the seiners could have filled their quota with these fish if they had not observed the minimum size guidelines.

Our research activities this year have been involved with organizing and operating a network for data collection. Under NMFS contract Woods Hole Oceanographic Institution continued their involvement with bluefin tuna by catch sampling and tagging aboard the three New England-based seiners that fish for

Table I. Catches of Atlantic Bluefin Tuna
Canada to Bahamas, 1973-1974

(Figures in parentheses are estimates)

Area	Gear	Fish Size	Short Tons 1973 Catch	Short Tons 1974 Catch
Canada	rod-reel, trap	giant	408	760
Maine to Cape Cod	seiners-U.S.	giant	353	53
	hook, harpoon	giant	320	425
	sport	giant	?	?
Cape Cod to Cape Hatteras	seiners-Canada	school	676	120
	seiners-U.S.	school	983	870
	sport	school	?	(248)
		giant	?	(6)
Bahamas	sport	giant	17	(9)
Totals			2757	2491

bluefin. Over 1,400 bluefin were tagged from the seiners this year. About 1,000 of these were 1-year-olds.

Cooperative sampling was also developed with NMFS Northeast Region in Gloucester. Samplers from the Statistics and Market News Division obtained biological and statistical bluefin data from all of the major landing ports from New Jersey to Maine. Additional data were obtained from the processing plant at Cambridge, Maryland, through the cooperation of Bumble Bee Seafoods. SEFC staff worked in Portland, Maine, sampling large bluefin brought in for sale to Japanese freezer vessels.

Several experiments were initiated to obtain direct counts on the size of the post-spawning stock migrating through the Florida Straits. Information on larval abundance and distribution recently obtained from Cuban researchers provided an estimate of 42,000 spawning adult bluefin in the Gulf of Mexico in 1973. Aerial surveys were made during the spring migration off Cat Cay and Bimini, Bahamas, to establish procedures to make counts and estimates of the magnitude of the runs (Fig. 1) in future years. Some 3,079 giant bluefin tuna in 72 schools were sighted. Most of these sightings occurred within the span of a few days. An extrapolation of these counts to 24-hour periods permits estimates that 65,000 giant tuna passed by Bimini and Cat Cay this year.

We also attempted to conduct aerial surveys in Cape Cod Bay this fall testing the feasibility of low light level image intensifier systems to detect tuna

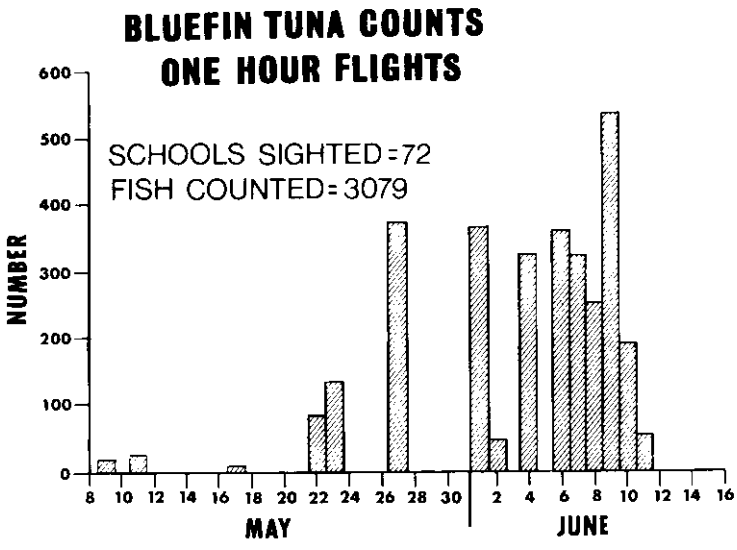

Fig. 1. Numbers of bluefin tuna sighted per day in 1-hour aerial flights from May 8 to June 16, 1974, off Cat Cay, Bahamas.

schools at night. Inclement weather and wind induced surface disturbances obscured any tuna schools that were present during the test period.

Additional experiments in the future include underwater directional hydroacoustic sensors off Cat Cay scanning seaward for about 2 miles. These can obtain highly accurate counts of bluefin during the entire run. The hardware is available from other federal agencies but financial constraints have delayed this for the present.

To provide information on where these fish go after they pass the Bahamas we plan to tag giant tuna with an array of radio transmitter tags equipped with time-delay releases that will be sent to the surface at pre-set intervals where they can be detected and positioned by satellite sensors.

We have airborne remote sensors that can detect schools of bluefin and using modern photo-interpretation techniques determine lengths to within a few centimeters. This will provide additional basis for an estimate of the size composition of the migrating tuna.

Some effort is being spent on a more detailed analysis of age and growth, last looked at in 1960. There is an indication that growth rates may have changed since that period. Size frequencies can be used to age the first few age groups and vertebrae can be used to age tuna up to about 10 or 12 years of age. We are making fairly extensive collections of vertebrae and other hard parts to re-evaluate past bluefin age and growth estimates.

We have recently learned how to easily extract otoliths from giant bluefin,

and this looks like a promising technique for age determination for the very large fish. A biologist from the Northeast Fisheries Center examined otoliths from 20 giant tuna captured in Canada and easily read as many as 25 clear rings on specimens weighing up to 900 pounds.

We also have been examining historical and new data on sex ratios. When bluefin migrate past the Bahamas their sex ratio is about two females to one male. This has been checked several times and seems to be consistent. In the coastal waters off New England and the Canadian Provinces, however, the sex ratio reverses to 2:1 with the males more abundant. The implications from this information are various. One hypothesis is that the northward migrating group separates somewhere between the Bahamas and northeastern U.S. and Canada, the males moving into coastal waters while the females continue their migration elsewhere, perhaps to waters off Norway. This is not unreasonable when we examine the number of tag returns from Norway from fish tagged off the Bahamas compared to returns from other areas.

For years it was suspected that the large fish that appear off New England and Canada in late summer were the same fish that moved past the Bahamas in spring. This year was the first time, however, that any fish tagged in the Bahamas has been recaptured in these coastal areas despite over 1,000 releases in the Bahamas over the years. The apparent change in distribution of the sexes as indicated by sex ratios between the two areas may partially explain this since out of these 1,000 releases probably only about 300 or 400 came in close enough to be available to the coastal commercial or sports fishery.

A close examination of sex ratios throughout the North Atlantic may determine if there are any different migrational and distributional patterns according to sex and what this might mean as far as management is concerned. If in fact we are harvesting only the male segment of the population off the northeastern U.S. and Canada we might be able to adjust our management recommendations to reflect this. Our proposed tagging experiment may be an excellent technique to determine if, when, and where the northward migration separates.

The International Commission for the Conservation of Atlantic Tunas began its annual meeting in Madrid on November 13, 1974. On October 11 a group of U.S. scientists met in Washington to review the status of bluefin stocks and to develop a scientific position in regard to management recommendations on an international basis. Two weeks later an open meeting was held in Washington to review our proposed position with representatives from both commercial and sports fishing industries. The consensus of these meetings was that the scientific evidence warranted the proposal of three basic recommendations: (1) Reduction in the harvest of adult bluefin to protect the spawning stocks. (2) Reduction in the harvest of young fish to increase recruitment to the spawning stocks. (3) Observance of a minimum size sufficient to protect the age-0 and age-1 fish.

The exact amount of the reductions as well as the recommendations will obviously be the focal point of considerable discussion among the nations that have significant fisheries for bluefin. We believe nevertheless that we have a sound case and we are optimistic that we can obtain international action on conservation and rational management of bluefin tuna stocks in the North Atlantic.