Tropical Atlantic Tuna Investigations, 1966[1]

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Abstract

The Atlantic Tuna Convention, approved by representatives of 17 nations at a meeting in Rio de Janeiro in May 1966, establishes a framework for the investigation and possible management of the Atlantic tuna fisheries. The harvest from these fisheries has increased rapidly in the last decade and recent developments suggest that this growth will continue. To date, tuna research has been carried out at a number of national laboratories, but knowledge of the biology of most species is rudimentary. Information of the most elementary nature required for scientific management of the fisheries is generally incomplete or unavailable. Research programs in stock composition and environmental studies at the Tropical Atlantic Biological Laboratory are described. Cooperative programs with West African laboratories and with the Caribbean Fisheries Development Project of the United Nations Special Fund are discussed.

THE OBJECTIVES OF THIS REVIEW ARE:

1. To outline the present development of the Atlantic tuna fisheries
2. To discuss the function of the Atlantic Tuna Convention in the conservation of tuna stocks
3. To list certain scientific knowledge needed to regulate these stocks for maximum sustained yield.

Tuna catches from the Atlantic Ocean have nearly doubled in the last decade. Landings of tunas and bonitos, recorded as 180,000 metric tons in 1954, were 330,000 metric tons in 1964 (FAO, 1966). A large part of this catch was taken from the tropical and subtropical Atlantic Ocean. Several nations recently have added new vessels to their Atlantic tuna fleets. Probably fishing pressure on Atlantic tuna stocks will continue to increase, with a possible resultant rise in catch.

ATLANTIC TUNA FISHERIES

Presently the Atlantic tuna fisheries are carried out by large modern vessels of several nations and by small vessels of numerous indigenous fishing fleets. The rapid increase in catches in the last decade has resulted from the development of new fisheries and, to a lesser extent, from growth of older, established fisheries.

Of the five principal large-scale tuna fisheries in the Atlantic Ocean, two have been categorized by the species selected and three by the fishing gear used (Shomura, 1966). These fisheries are: the north-

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east Atlantic bluefin tuna, the Bay of Biscay albacore, the western Atlantic purse-seine, the Cuban live-bait, and the Japanese long-line.

The northeast Atlantic bluefin tuna fishery extends from the coast of Norway and the North Sea to Spain, Portugal, and Morocco (Tiews, 1963). The fishery is seasonal, from about May to October, and lasts only 2 to 3 months in any one area. The fish are taken by traps along the coasts of Spain, Portugal, and Morocco; by hooks and lines off Portugal and France and in the North Sea; and by purse seines off Norway. Landings have declined in the last decade. Catches by representative countries totaled 38,300 metric tons in 1955 but dropped to 15,600 metric tons in 1964 (Table 1). In recent years the bulk of the catch was taken by Spain and Morocco; catches were few in the northern areas of the fishery.

The Bay of Biscay albacore fishery, the largest of the older tuna fisheries, was the largest tuna fishery in the Atlantic until the Japanese long-line fishery gained first place in the late 1950's. The fishery is seasonal. Albacore appear in the southern Bay of Biscay in June and remain until November (Postel, 1963). Before 1946, albacore were caught principally by trolling but pole and line fishing (introduced by the French in 1947) is now the principal method. Albacore catches by Spain and France increased from 39,000 metric tons in 1956 to 45,700 metric tons in 1963.

TABLE 1

CATCHES OF SELECTED ATLANTIC OCEAN TUNA FISHERIES AND TOTAL ATLANTIC CATCHES OF TUNAS, 1955-1964

Year	Fishery					
	NE Atlantic bluefin[1]	Bay of Biscay albacore[2] (10^3 metric tons)	Cuban tuna[3]	NW Atlantic tuna[4]	Japanese Atlantic long-line[5] (10^3 fish)	Atlantic tuna, bonito, and skipjack[6] (10^3 metric tons)
1955	38.3	30.5	1.4	0.4	—	180.0
1956	24.5	39.0	1.5	0.2	13	180.0
1957	34.6	37.2	1.9	0.5	299	200.0
1958	30.6	49.8	0.9	1.1	859	230.0
1959	21.9	46.9	1.7	1.3	1495	230.0
1960	21.2	46.5	3.2	0.6	1702	280.0
1961	19.7	38.1	3.0	1.0	1653	290.0
1962	24.5	44.0	1.2	3.2	2488	270.0
1963	11.1	45.7	2.4	7.4	2373	310.0
1964	15.6	37.4	1.6	9.2	—	330.0

[1]FAO, 1966. Totals include catches reported by Morocco, Denmark, France, Germany, Norway, Spain, Sweden, Netherlands, and Belgium.

[2]FAO, 1966. Totals include catches reported by France and Spain.

[3]Suarez and Duarte, 1961 (years 1955-59); FAO, 1966 (years 1960-64).

[4]Wilson, 1965 and Wilson, personal communication. Totals are U.S. catches of bluefin tuna and skipjack tuna from the Atlantic including catches by traps and other gear (Fishery Statistics of the U.S., 1955-64).

[5]Wise, in press.

[6]FAO, 1966.

The African surface fishery for yellowfin tuna and skipjack tuna began off Senegal in late 1955. By 1963, the fishing area extended south to Angola and the fleet consisted of 90 French, 50 Spanish, 7 Japanese, and a few Portuguese live-bait boats (Shomura, 1966). Recently, Yugoslavian and Japanese purse seiners entered the fishery. In addition to yellowfin tuna and skipjack tuna, small quantities of bigeye tuna also were taken.

African surface-fishery statistics are not sufficiently accurate to report year-by-year growth. In 1963, total landings were 25,300 metric tons (Shomura, 1966).

In the western Atlantic Ocean, bluefin tuna for many years formed the basis of a small fishery off the New England coast. A purse-seine fishery was established in the late 1950's and the fishery was extended to offshore waters (Wilson, 1965). Skipjack tuna were discovered in commercial quantities and by 1964 made up 55% of the total landings (Shomura, 1966). The U.S. Atlantic purse-seine landings increased from 200 metric tons in 1958 to 10,000 metric tons in 1964, but catches were considerably less in 1965 and 1966.

A small pole-and-line fishery for skipjack tuna, blackfin tuna, and little tuna developed in Cuba in 1940 (Suarez and Duarte, 1961). Current annual landings from the Cuban live-bait fishery, supplemented by a small long-line fishery, are reported between 1,000 and 3,000 metric tons. Expansion of the Cuban fishing fleet in recent years may cause landings to increase.

The Japanese long-line tuna fishery extends across the entire tropical and subtropical Atlantic Ocean (Shiohama et al., 1965). The fishery started with an exploratory cruise by a Japanese research vessel in 1955; the commercial fleet began fishing in the tropical Atlantic in 1957. Over 90% of the catch in numbers of fish consisted of yellowfin tuna, albacore, and bigeye tuna. Marlins made up less than 5% of the catch through 1959 but increased to about 10% in 1962 and 1963. Landings of the long-line fishery totaled 118,300 metric tons in 1964 (FAO, 1966).

ATLANTIC TUNA CONVENTION

Because the Atlantic tuna fisheries are oceanwide and involve a number of nations, conservation measures must be undertaken at the international level. In 1960 an international convention for the conservation of tunas was proposed by the Commission for Technical Cooperation in Africa/Scientific Council for Africa (CCTA/CSA). In May 1966, delegates from 17 nations drafted an Atlantic Tuna Convention. This convention is unique in several ways:

1. It includes all waters of the Atlantic Ocean and adjacent seas. This area is larger than that covered by any other international fishery convention.

2. It includes many species of Atlantic tunas and tuna-like fishes (at least 20 species), and also bait fishes used in tuna fishing. Exceptions are the mackerels (genus *Scomber*) and the families Trichiuridae and Gempylidae.

3. Membership may be greater than that of any existing international fishery body. All members of the United Nations are eligible.

Almost all nations whose fishermen harvest Atlantic tunas and whose industries process tunas from this area, and those with sea coasts contiguous to areas where fish are taken, are expected to become parties.

Once approved, the Convention will remain in force for at least 10 years; thereafter it may be terminated by a majority decision. Panels to study individual species can be established and a commission can recommend regulations designed to maintain stocks at levels which will permit the maximum sustainable catch.

RESEARCH REQUIREMENTS

Several critical needs will face the Atlantic Tuna Commission as it prepares for management of the Atlantic tuna resources. First is the need for adequate catch statistics, which are basic to the management of any fishery. Because Atlantic tuna fishing is practiced by vessels from several nations, no single organization has the responsibility—and necessary authority—to collect and maintain records. Often national records are inadequate (Chapman, 1963). The Atlantic Tuna Commission specifically will be charged with the collection and analysis of statistics relating to conditions and trends of tuna resources in the area covered by the Convention.

Second is the need for knowledge of stock composition. Distinct population subdivisions (unit stocks) fall into two main categories: geographically isolated groups separated from each other by migration barriers, and reproductively isolated groups which inhabit the same general locality, but possess different vital statistics (Parrish, 1964). Methods for defining these population units can be direct (tagging, exploratory fishing, egg and larval surveys) and indirect (serological biochemical, morphometric.) Results of such studies have important implications for fishery management.

Almost nothing is known about the existence of separate stocks of Atlantic tunas, nor is it known whether a single stock is available to more than one fishery. Possibly albacore in the north and south Atlantic Ocean or yellowfin tuna in the eastern and western tropical Atlantic Ocean represent discrete populations. Several species caught by the subsurface long-line fishery are also taken in various surface fisheries.

Third is the need for knowledge of the relation between environmental fluctuations in time and space and the distributions and abundance of tunas. An understanding of this relation represents a potentially great contribution to the fishing industry from biology and oceanography. Scientific research will become meaningful to fisheries when it can predict the quantities of fish and the locations and periods of greatest availability. At present, our knowledge of the ocean environment is inadequate — information about the climate of the oceans and how it is controlled is limited, and we need to learn much more about the fish in the oceans and their response to environmental stress and variation.

At present, research on tuna in these critical areas of catch statistics, stock composition, and environmental effects is being carried out at laboratories in many countries on both sides of the Atlantic Ocean (Table 2).

TABLE 2

PRINCIPAL LABORATORIES AND AGENCIES CONCERNED WITH RESEARCH ON ATLANTIC TUNAS (FAO, 1965; AND OTHER SOURCES).

Country	Station	Location
Angola	Centro de Biologia Piscatoria. Instituto das Industrias de Pesca de Angola	Baia Farta (Benguela) Luanda
Congo-Brazzaville	Centre ORSTOM* de Pointe-Noire	Pointe Noire
Ghana	Fisheries Division, Ministry of Agriculture	Tema
Republic of Ivory Coast	Centre de Recherches Oceanographiques (ORSTOM staff)	Abidjan
	Service des Peches Maritimes	Abidjan
Senegal	Center d'Oceanographie de Dakar (ORSTOM)	Thiaroye (Dakar)
Sierra Leone	Fisheries Division	Freetown
South Africa	Division of Sea Fisheries	Capetown
	South African Museum	Capetown
Argentina	United Nations Development Programme in Argentina	Buenos Aires
Brazil	SUDENE	Recife
	Marine Biology Station, University of Ceara	Fortaleza
	Univ. of Sao Paulo	Santos
	Divisao de Caca e Pesca	Santos
Venezuela	Fisheries Agency	Caracas
Barbados	United Nations Caribbean Fishery Development Project	Bridgetown
United States of America	Tropical Atlantic Biological Laboratory	Miami
	Institute of Marine Sciences	Miami
	Exploratory Fishing and Gear Research Base BCF	Pascagoula
	Woods Hole Oceanographic Institution	Woods Hole

	Exploratory Fishing and Gear Research Base	
	BCF	Gloucester
	BCF Ichthyological Laboratory	Washington, D. C.
Denmark	Fishery Research Institute	Charlottenlund-Slot
France	Museum National d'Histoire Naturelle	Paris
	ORSTOM*	Paris
	Institut des Peches de Sete	Sete, Herault
	Office Scientifique et Technique des Peches Maritimes	La Rochelle (Charente Maritime)
Norway	Institute of Fisheries Research	Bergen
Portugal	Centro de Biologia Piscatoria	Lisbon
	Instituto de Biologia Maritima	Lisbon
Spain	Laboratorio del Instituto de Investigaciones Pesqueras de Cadiz	Cadiz
Canada	St. Andrews Biological Laboratory	St. Andrews, N. B.
Japan	Nankai Regional Fisheries Laboratory	Kochi
U.S.S.R.	VNIRO	Moscow
	Atlant NIRO	Kaliningrad
Cuba	University of Villanueva	Havana
	Instituto Cubano de Investigaciones Tecnologicas	Havana
	Fisheries Research Center	Havana
Germany	Institut fur Kusten und Binnenfischerei der Bundesforschungsanstalt fur Fischerei	Hamburg-Altona

*Office de la Recherche Scientifique et Technique Outre-Mer

The U. S. Bureau of Commercial Fisheries Laboratory in Miami (Florida) conducts a variety of studies on the biology and ecology of tropical Atlantic tunas. Some of them are:

1. Cooperative biological sampling programs with laboratories in Republic of Ivory Coast, Congo-Brazzaville, Senegal, Ghana, Angola, and Sierra Leone which provide information on the landings and samples from the catch.

2. Studies to determine the feasibility of using enzymes as genetic markers characterizing subpopulations of tropical Atlantic tunas. The object of this study (under a contract with the University of Miami) is to determine whether certain enzymes occur in genetically controlled patterns and whether these patterns differ in frequency among geographically isolated stocks of fish. Tunas from three general areas are being studied: the eastern Atlantic, the western Atlantic (including the Caribbean), and the Pacific. The enzymes to be assayed are lactic acid dehydrogenase (LDH), malic acid dehydrogenase (MDH), hexose-6-phosphate dehydrogenases, xanthine dehydrogenase, and the non-specific esterases.

3. Studies in biological and physical oceanography designed to understand better and thus eventually predict the distribution, abundance, and availability of tunas. Field work in 1963 to 1965 was done in the eastern tropical Atlantic. The Bureau of Commercial Fisheries vessel GERONIMO made four cruises to the Gulf of Guinea and off the northwest coast of Africa. The first and second cruises were part of the EQUALANT surveys of the International Cooperative Investigations of the Tropical Atlantic (ICITA). Vernon Brock and Thomas S. Austin, successive directors of the laboratory, served as international coordinators of the ICITA study, and scientists at the laboratory processed data and samples. Studies of the distribution and ecology of tuna larvae and of primary and secondary organic production were included.

Field work in 1965 and 1966 was also performed in the western tropical Atlantic. Procedures were similar to those followed in the eastern Atlantic — combined fishery and oceanography surveys were made to achieve a better understanding of the observed distribution and concentrations of tunas.

On a fishery-oceanography survey in the spring of 1966, the research vessel UNDAUNTED discovered a concentration of skipjack tuna near St. Vincent and Grenada Islands in the southern Lesser Antilles. The distribution of the tuna schools appeared to be related to the presence of turbulence and biological enrichment west of the islands. Repeated surveys, in cooperation with the Caribbean Fisheries Development Project of the United Nations Special Fund, are planned to determine the distribution of fish seasonally in this particular area and how this distribution relates to environmental conditions.

The research programs of national laboratories like the Tropical Atlantic Biological Laboratory and the establishment of the Atlantic Tuna Commission represent an attempt to combine scientific knowledge and international cooperation to manage a biologically complex fishery resource. The success of this attempt will no doubt be judged at future meetings of the Gulf and Caribbean Fisheries Institute.

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