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REVIEW OF THE DEVELOPMENT OF THE ATLANTIC COAST TUNA FISHERY

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ABSTRACT

Bluefin tuna are seasonally abundant along the New England coast where they have been of minor commercial importance for many years. In 1951 the U.S. Fish and Wildlife Service began investigating that resource to determine whether a New England tuna fishery was feasible. The results of those investigations showed that several different species of tuna were present in the Northwest Atlantic beyond the U.S. Continental Shelf. The Fish and Wildlife Service sponsored purse-seine trials in 1951 and 1954, and the 1958-61 operations of a commercial vessel (with which the Service's Bureau of Commercial Fisheries cooperated) demonstrated that commercial quantities of bluefin tuna could be harvested in New England waters. During 1962 and 1963 the new tuna fishery had a purse-seine fleet of 16 United States and 2 Canadian vessels. The season lasted 5 months and the fishing area included all of the Continental Shelf from Virginia to Massachusetts. A skipjack resource was also discovered. In 6 years the Atlantic Coast tuna purse-seine catch rose to 9,000 short tons, including 3,000 tons of skipjack.

BACKGROUND

Until recent years the tuna stocks off the Atlantic Coast of the United States were largely ignored because no ready market for them existed. Other tuna species were noted occasionally, but the bluefin tuna (*Thunnus thynnus*) was long considered the major tuna resource in the Northwest Atlantic.

This belief can be attributed to seasonal catches and occurrence of "horse mackerel" or bluefin tuna from Cape Hatteras to Nova Scotia, and to the substantial catches made by commercial and sport fishermen in the northern part of the tuna's range (table 2).

Annual tuna movements into the coastal waters of the Northwest Atlantic had received very little attention prior to 1950. Bluefin tuna generally arrive on the Continental Shelf north of Cape Hatteras during June and remain as late as October. It is not known where they come from or where they go between their seasonal visits. Records show that arrivals, departures, abundance, and availability of differ-

Table 1 - Summary Data on the U. S. Atlantic Coast Purse-Seine Tuna Fishery^{1/}

	2/1963	2/1962	1961	1960	1959	1958
	(Tons)					
Catch:						
Bluefin	5,933	3,379	1,032	338	757	185
Skipjack	3,195	479	-	-	-	-
Total	9,128	3,858	1,032	338	757	185
Number of vessels	18	7	2	1	1	1
Total capacity (tons)	5,525	1,015	125	45	45	45
Average capacity (tons)	307	145	63	45	45	45
Catch per vessel (tons)	507	551	516	338	757	185
Number of trips	128	100	86	20	30	29
Catch per trip (tons)	71.3	38.6	12.0	16.9	25.2	6.4
Days fished (all vessels)	3/	387	96	22	31	32
Catch per fishing day (tons)	3/	10.0	10.8	15.4	24.4	5.8
Length of season (days)	126	120	90	38	55	72
Number days fish caught	3/	59	44	12	21	18

^{1/}Data based on logbooks and interviews; catches do not reflect landed tonnage.
^{2/}1962 and 1963 figures are preliminary; data from 2 Canadian vessels are included in 1963
^{3/}Data not completed.

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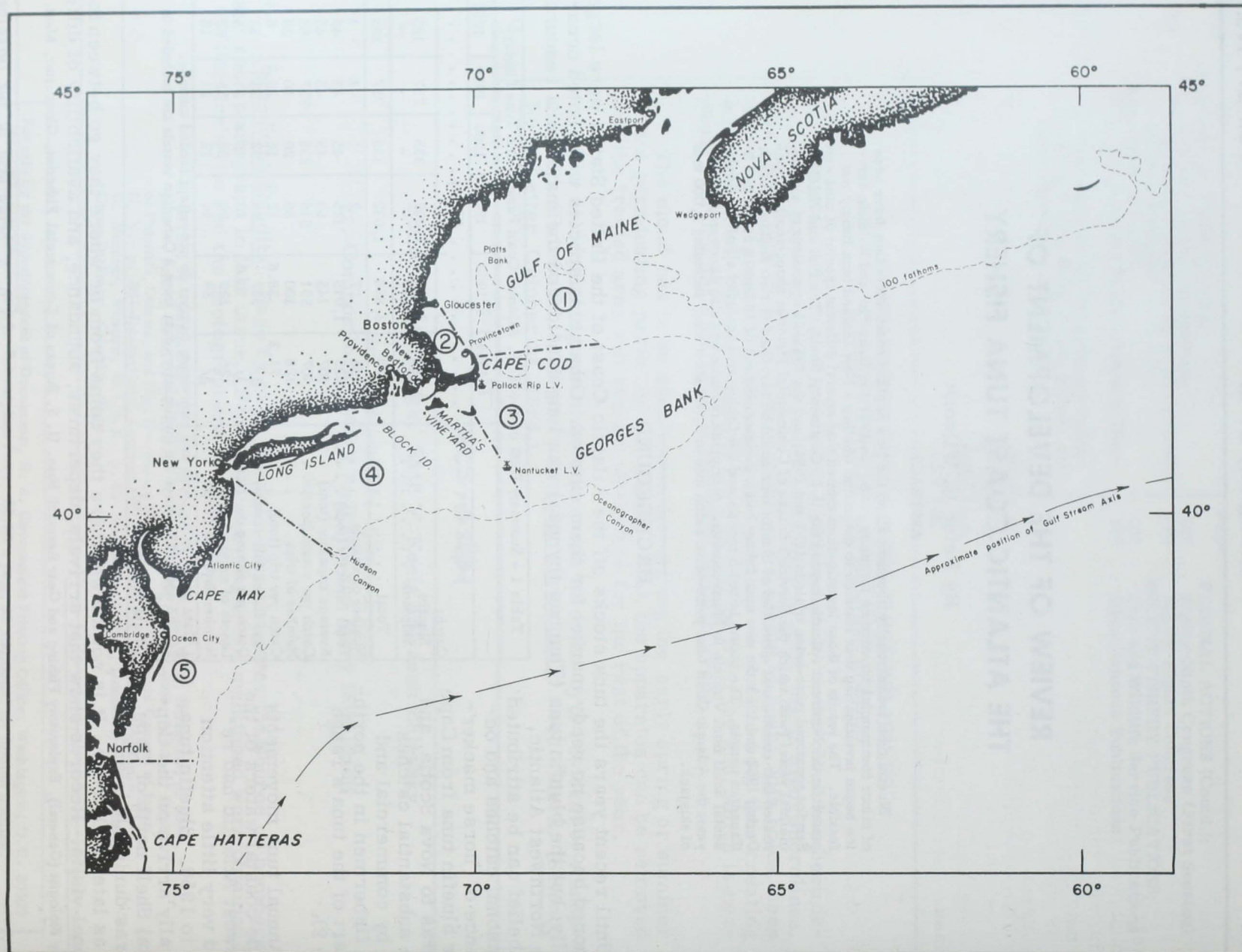


Fig. 1 - Fishing areas of the Atlantic Coast tuna purse-seine fishery: Area 1 - Gulf of Maine, Area 2 - Cape Cod Bay, Area 3 - Pollock Rip-Channel, Area 4 - Martha's Vineyard-Long Island, Area 5 - New Jersey-Virginia.

ent size groups vary considerably from year to year. The larger tuna (over 100 pounds) have dominated the catches north of Cape Cod, while the smaller sizes were caught frequently from Cape Cod Bay south (Bigelow and Schroeder 1953).

COMMERCIAL CATCHES: The Atlantic Coast tuna resource has been a matter of commercial speculation as long as tuna have been observed and taken in those waters. Until 1959, with some exceptions, Massachusetts pound nets caught most of the bluefin tuna landed in New England. Most of those tuna were marketed as fresh fish in New England and New York.

Several vessels operating out of Gloucester, Mass., during the period 1937 to 1941, attempted purse seining for bluefin tuna (Murphy 1952; table 2). Except for the Western Explorer, a California purse-seine vessel using a West Coast tuna seine, the small fleet was equipped with modified mackerel seines. The low price paid for the fish and the extensive damage to the light mackerel nets eventually resulted in discontinuation of the fishery. In 1937 the first bait-fishing for bluefin tuna in the Northwest Atlantic was tried. The Gloucester schooner-dragger Elvira Gaspar was rigged with two racks, a bait tank, and poles, and fished with live herring bait during July and August off southern Maine and on the southeast part of Georges Bank. Failure to catch any tuna was attributed to "wild" fish and difficulty in keeping the bait alive.

In years of abundance, significant bluefin tuna catches in New England have been made with other types of gear. During 1949, harpoons accounted for 160,000 pounds and hand lines for 1,415,300 pounds. Occasional large catches have been made from small boats using long-line gear (Wilson 1960).

PROCESSING: Lack of uniform-size fish in the catches and an unpredictable supply complicated early processing attempts. Several small-scale canning operations were established for short periods, starting as early as the late 1920's in Gloucester, Mass. Raw tuna supplies consisted almost entirely of local bluefin from purse seines, traps, harpoons, and hand lines. One notable exception was the 1952 landing of 172,300 pounds of skipjack and 412,000 pounds of yellowfin tuna in Gloucester by the West Coast bait-boat Sun Jason (Slavin and Smith 1963). None of that catch was taken from the Northwest Atlantic, and the vessel did not fish in those waters after leaving Gloucester.

EXPLORATORY FISHING

GULF OF MAINE EXPLORATIONS: A number of interrelated factors hindered development of a tuna fishery. These were: (1) the shortness of the season, (2) uncertain annual availability of raw tuna supplies, (3) excessive size range, (4) lack of proper vessels and gear, and (5) lack of adequate canning facilities. In 1950, Congress took an early step to resolve

Table 2 - Atlantic Coast Bluefin Tuna Catches Landed in the United States, 1930-63^{1/}

	Purse Seine	Traps	Other	Total
	(1,000 Pounds)			
1963 ^{2/} . . .	12,456	3/	3/	3/
1962 ^{4/} . . .	6,620	3/	3/	3/
1961 . . .	1,992	174	201	2,367
1960 . . .	611	450	343	1,404
1959 . . .	1,722	667	429	2,818
1958 . . .	304	1,916	256	2,476
1957 . . .	-	891	110	1,001
1956 . . .	1	399	59	458
1955 . . .	1	830	65	896
1954 . . .	122	1,170	136	1,428
1953 . . .	-	1,688	257	1,945
1952 . . .	-	298	267	565
1951 . . .	221	1,081	458	1,761
1950 . . .	2	764	501	1,267
1949 . . .	1	1,100	1,637	2,738
1948 . . .	1	1,881	1,113	2,995
1947 . . .	1	435	651	1,087
1946 . . .	-	668	517	1,185
1945 . . .	-	446	937	1,383
1944 . . .	10	321	498	829
1943 . . .	1	170	309	480
1942 . . .	1	231	595	827
1941 . . .	3/	3/	3/	3/
1940 . . .	302	321	532	1,155
1939 . . .	311	202	437	950
1938 . . .	978	598	247	1,823
1937 . . .	137	672	213	1,022
1936 . . .	3/	3/	3/	3/
1935 . . .	17	234	317	567
1934 . . .	3/	3/	3/	3/
1933 . . .	-	318	130	448
1932 . . .	43	156	117	316
1931 . . .	-	157	165	322
1930 . . .	-	131	165	296

1/Traps include pound nets, floating traps, and weirs; other includes hand lines, otter trawls, harpoons, troll gear, etc.
 2/Preliminary, includes 2,118,000 pounds skipjack and 3,272,000 pounds mixed bluefin and skipjack in 1963; additional 5,800,000 pounds bluefin and skipjack were landed in Canada and Puerto Rico.
 3/Data not available.
 4/Preliminary, includes 942,000 pounds skipjack in 1962; additional 690,000 pounds bluefin tuna were landed at Puerto Rico.
 Source: 1930-61--Fishery Statistics of the U.S., Annual Reports, and 1962-63--Fishery Market News Service, Boston, Mass., logbooks, and interviews.

some of these problems through initiation of a Fish and Wildlife Service exploratory study of the New England bluefin tuna potential. One of the principal objectives was the testing of various fishing gears to determine the most efficient methods for capturing tuna in commercial quantities. Purse-seine operations were started with two West Coast-type vessels, the Western Explorer in 1951 and the Western Pride in 1954 (Murray 1952, 1955). Long-line, gill-net, and trammel-net trials were conducted from the chartered schooner Marjorie Parker in 1952 and 1953 (Murray 1953, 1954).

Results of the explorations were encouraging but inconclusive. The purse-seine method was found to be the most promising, and stocks of bluefin tuna sufficient to support a New England tuna industry were observed in coastal waters during summer.

Four years of explorations generated interest in a New England tuna fishery but very little activity on the part of the industry. A sardine cannery, located at Eastport, Maine, installed tuna-canning equipment in 1951 and operated intermittently. In 1954, a Bureau-owned tuna purse-seine and accessory gear were offered for loan to any commercial fisherman who would convert his vessel for tuna seining in New England waters and thus undertake a cooperative tuna-seining operation with the Bureau. The offer was not accepted until 1958. No additional vessels entered the fishery at that time.

CONTINENTAL SHELF EXPLORATIONS: The Bureau began two new projects to help develop a tuna fishery. The Bluefin Tuna Exploration project, initiated in 1955, made further investigations on the Continental Shelf off New England. The Oceanic Tuna Exploration project, started in 1956, concentrated on tuna surveys beyond the Continental Shelf. After those two projects ended in 1960, the Pelagic-Oceanic project, started in 1961, continued oceanic tuna survey work.

Under the Bluefin Tuna Exploration project live-bait fishing for bluefin tuna was tried during two cruises in waters south of Cape Cod in the summer of 1955. During one of the cruises (aboard the chartered vessel Stormy Weather II), 2,500 pounds of tuna were caught 20 miles south of Martha's Vineyard on August 16--the first tuna catch in the Northwest Atlantic by that method. Poles were rigged with feathered barbless hooks, and live butterfish were used as bait.

The most important single development in the establishment of the New England tuna fishery came in 1958 when the owner of a Provincetown, Mass., trawler, the Silver Mink, agreed to fish for bluefin tuna in New England waters using the Bureau's purse seine and other gear originally offered in 1954 (Squire 1959). After initial success, a 28-inch power block was added under the agreement in 1959--the first application of such equipment to tuna purse seining in New England. Beginning in 1959, the linen and cotton seine net was replaced gradually with nylon webbing.

OCEANIC EXPLORATIONS: Explorations on the Continental Shelf were designed to provide a base for the immediate development of the tuna fishery. To aid in the long-range support of the fishery, oceanic tuna explorations were planned to provide background knowledge of the tuna resource over a much wider range of the Northwest Atlantic.

No knowledge of extensive tuna stocks beyond the Continental Shelf was available, but Bigelow and Schroeder (1953) had suggested that New England bluefin tuna may winter in deep water along the Continental Slope off the Middle Atlantic coast. Eight cruises of the Bureau's vessel Delaware (Squire 1962) and one cruise of the Woods Hole Oceanographic Institution's vessel Crawford (Mather and Bartlett 1962) resulted in significant catches of bluefin and yellowfin tuna (Thunnus albacares) on long-line gear fished in those waters at various times of year.

While long-line tuna catches have no direct correlation with commercial purse-seining potential, the catch rates do indicate relative abundance of tuna in subsurface layers, and provide distributional information unobtainable with surface sampling gear. Long-line catches in waters south of New England from the Continental Slope to the northern edge of the Gulf Stream

indicated unusually high concentrations of bluefin tuna just before the fish appear in the in-shore fishery and shortly after they depart. The recovery, from the inshore purse-seine fishery, of five bluefin tuna tagged and released from the offshore catches (F. J. Mather III, personal communication, and Mather 1960) suggests that availability of bluefin tuna in the seasonal fishery may be related to subsurface bluefin distribution and abundance observed from long-line catches in the adjacent oceanic waters.

CAPE COD FISHERY, 1958-61

"SILVER MINK:" The first tuna purse-seining season was an experimental one for the Silver Mink, a southern shrimp vessel that had been converted to trawling for industrial fish (Fig. 2).¹ Other than 2 days spent scouting east of Cape Cod, and 3 days off Block Island, the entire 72-day season was fished in Cape Cod Bay and adjacent waters (table 3). Twenty-six out of 42 sets were successful. Average size of the fish in the catches ranged from 60 to 80 pounds; schools ranged from 1 to 60 tons and averaged about 16 tons. Shoal-water fishing, with resultant mudding of the nets, and large schools caused extensive net damage. Fish were landed the day they were caught and trucked from Provincetown to the cannery at Eastport, Maine.

In 1959 the Silver Mink quadrupled its previous year's catch in a shorter fishing season of 55 days. An all-nylon seine and a power block, in addition to experience gained the first year, contributed to this success. Daily average size of the fish ranged from 118 to 142 pounds during the season, and the size of the fish for the entire season averaged 131 pounds. The smallest day's catch was about 10 tons; the largest was 130 tons, requiring aid from several vessels to land the catch. All operations were within a day's run from Provincetown and catches again were trucked to the Maine cannery. A decrease in the 1960 catch (table 3) resulted primarily from decreased fishing effort, caused by unsettled market conditions.

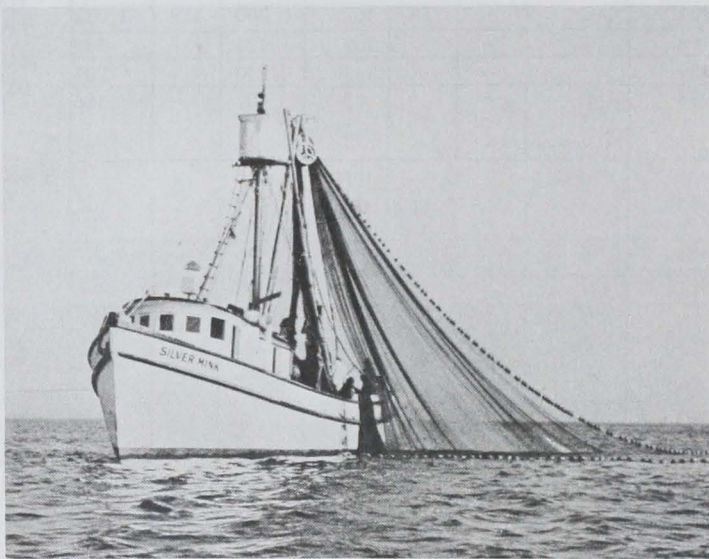


Fig. 2 - The Provincetown, Mass., purse seiner Silver Mink working a 10-ton set of bluefin tuna in Cape Cod Bay, September 1961.

NEW TUNA PACKING CORPORATION: Two events in 1961 gave the struggling tuna fishery a renewed outlook for the future. A newly formed tuna packing corporation leased the Eastport, Maine, facilities. This provided a ready market for local purse-seine caught tuna. Secondly, the new corporation started construction of a small purse seiner at Warren, R.I., to supplement its raw tuna supply. Although the 80-ton capacity F. Nelson Blount did not commence fishing until August 24 (the middle of the tuna season), that vessel and the Silver Mink together produced over 1,000 tons of bluefin tuna by mid-October (table 3). Both vessels fished Cape Cod Bay exclusively. Daily average sizes of fish during July and August were high--80 to over 200 pounds; but in September and October they were noticeably smaller--80 to 85 pounds. School size averaged nearly 18 tons; the smallest schools were less than a ton and contained very few large (300-530 pounds) fish; the largest school was 71 tons of 180-pound fish. Most catches were landed fresh daily, but occasional small catches were held over in ice for 1 or 2 days. The use of spotter aircraft, started in 1959 to locate tuna concentrations, was continued in 1961; planes seldom were used to set the seine around tuna schools.

ATLANTIC COAST EXPANSION, 1962-63

What had been a New England effort, by virtue of the fishery centered in Cape Cod Bay for 4 years, expanded in 1962 to become an Atlantic Coast tuna fishery. Several notable events mark the metamorphosis of the fledgling fishery to major industry stature.

¹During the winter of 1963 the Silver Mink also converted to scallop dragging in Cape Cod Bay waters.

Year	Area ^{2/}	June	July	Aug.	Sept.	Oct.	Total
A - Catch							
. (Tons)							
Bluefin Tuna							
1963 ^{3/}	4	-	48	-	-	-	-
	5	625	790	-	-	-	-
1962	1	-	-	-	185	-	185
	2	-	116	501	146	166	929
	3	-	-	215	1,047	36	1,298
	4	4	245	718	-	-	967
	5	-	-	-	-	-	-
1961	2	-	51	462	360	159	1,032
1960	2	-	-	207	131	-	338
1959	2	-	-	517	240	-	757
1958	2	-	3	75	107	-	185
	3	-	-	-	-	-	-
	4	-	-	-	-	-	-
Skipjack							
1963 ^{3/}	4	-	66	-	-	-	-
	5	-	38	-	-	-	-
1962	4	-	108	371	-	-	479
B - Effort							
. . . . (Days Fished - All Vessels)							
1963 ^{3/}	2	-	9	-	-	-	-
	4	1	50	-	-	-	-
	5	7	68	-	-	-	-
1962	1	-	-	1	16	-	17
	2	1	30	63	48	38	180
	3	-	-	7	54	10	71
	4	6	55	56	-	-	117
	5	-	2	-	-	-	2
1961	2	-	9	30	38	19	96
1960	2	-	-	11	11	-	22
1959	2	-	-	17	14	-	31
1958	2	-	3	8	13	3	27
	3	-	-	1	1	-	2
	4	-	-	3	-	-	3

1/Source: Logbooks and interviews.

2/Areas shown in figure 1.

3/1963 data are preliminary; data not available for August-October.

SKIPJACK: A most important development was the discovery of sizable commercial quantities of a second tuna species, skipjack (*Euthynnus pelamis*), in the Northwest Atlantic (tables 1 and 3). A series of 17 successful sets between July 30 and August 26, 1962, was the first indication that commercial quantities of skipjack existed in that area. A 479-ton catch was taken 30 miles south of Long Island and Martha's Vineyard (area 4) in surface water temperatures of 69° to 78° F. The two West Coast vessels making the catch had a relatively high average catch of 28.17 tons per successful set (Bureau of Commercial Fisheries 1963).

Available records for 1963 indicated that skipjack were on the Continental Shelf off Cape May, N.J., by mid-July and as far north as the Block Island area by the end of the month. Large fish (10 to 15 pounds) were followed by smaller and medium-size individuals (5 to 10

Class	Capacity	Number of Vessels Operating by Year					
		1963	1962	1961	1960	1959	1958
	Tons						
1	0-50	1	1	1	1	1	1
2	51-100	4	2	1	-	-	-
3	101-200	4	2	-	-	-	-
4	201-300	3	1	-	-	-	-
5	301-400	1	1	-	-	-	-
6	Over 400	5	-	-	-	-	-
Total Vessels		18	7	2	1	1	1

1/Classification is that used by the Inter-American Tropical Tuna Commission

2/Data for 1963 include 2 Canadian vessels of 100-ton capacity each.

pounds) and often were mixed with bluefin tuna schools. When surface temperatures reached 78° F. off Long Island, about August 9, the catches declined and did not recover until temperatures dropped to 72° F. on August 28. From August 31 to September 3, skipjack schools, according to reports by fishermen, covered an area of 60-miles square, 40 miles south of Long Island. One airborne observer counted from one position 40 skipjack schools of 200 tons or more each. Surface temperatures were 67° to 70° F. Sizes were between 5 and 10 pounds.

Records for 4 vessels in July, 8 vessels in August, and 2 vessels in September indicate that the catch per successful set increased markedly until September 9 when the fish left the area. The average catch in July of skipjack (not mixed with bluefin tuna) was 4.1 tons per successful set (7 sets). In August the catch rate rose to 13.3 tons per successful set (49 sets), and in September ended at 34.4 tons per successful set (7 sets).

VESSELS: In 1962, the two small New England purse-seine vessels were joined by 3 medium seiners from the West Coast (two of which were purchased by East Coast interests and two large seiners from West Africa owned by a West Coast tuna canner). The following year the fleet increased to 16 United States vessels and 2 new Canadian purse seiners (table 4). Total capacity of the Atlantic Coast fleet reached 5,525 tons in 1963, five times that of the previous year (table 1). Addition of large-capacity vessels permitted fewer trips at greater distances from landing ports and provided more fishing time in the course of a season.

Several vessels with capacities of more than 400 tons made single trips and landed their catches at Puerto Rico.

Before 1962, the fishing area was restricted to Cape Cod Bay and adjacent waters. This restriction was based primarily on limitations of the small vessels. Their nets were rigged for shoal-water fishing, generally 20 fathoms or less, and were used occasionally in waters as deep as 30 fathoms. In 1962, with the arrival of larger vessels, the fishery was quickly expanded as these vessels explored a wider area and found better fishing than that in Cape Cod Bay. They were able to withstand heavier seas while pursing and brailing and could fish greater depths with their larger nets. Conversely, they had difficulty in fishing Cape Cod Bay waters without reducing the depth of the nets.

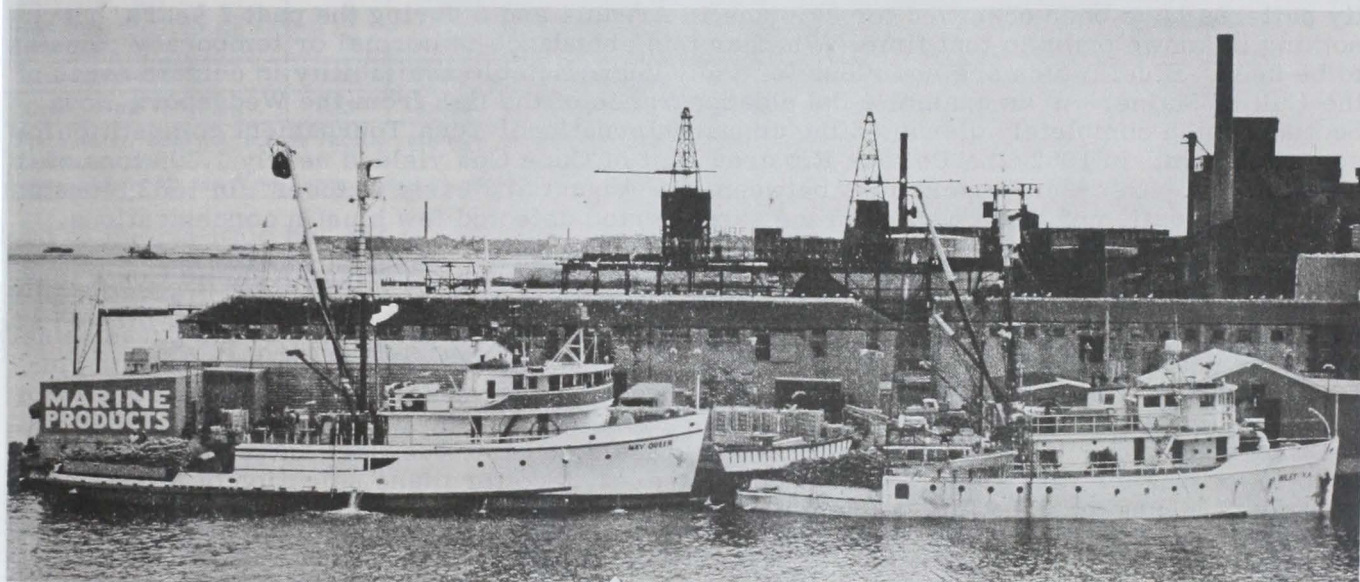


Fig. 3 - Two West-Coast tuna purse seiners, May Queen and Wiley, V.A., at New Bedford, Mass., for unloading during the 1963 season.

The size of the vessels and gear tended to divide vessel classes into two groups, each having greater efficiency in separate fishing areas. Class 1 and 2 vessels (table 4) comprised the group of small seiners which generally worked in Cape Cod Bay and occasionally fished successfully south of Martha's Vineyard during moderate weather. Class 4, 5, and 6 vessels fished outside of Cape Cod Bay for most of the 1962 and 1963 seasons. Class 3 seiners were in a unique position, being able to fish in all areas, with the exception of deep-water areas in rough weather. One of those vessels made a remarkable total catch, in excess of 1,000 tons of bluefin and skipjack, during 105 days of the 1963 season.

The Pollock Rip area east of Cape Cod (Area 3) was highly productive of bluefin tuna between August and October 1962, and the results there clearly illustrate the relative efficiencies of the vessel classes fishing in less protected waters. The catch rates and days fished for vessel classes 1 to 5, respectively, were as follows: 1.1, 3.6, 18.6, 20.0, and 38.9 tons per fishing day in 6, 8, 22, 26, and 9 days of fishing.

FISHING SEASON AND AREA: The fishing season started earlier during the latter part of June 1962 and 1963, and ended later, at the end of October 1963 (table 3). This was 5 weeks more than the 1961 season and nearly 8 weeks longer than in 1958.

The fishing area expanded from Cape Cod Bay in 1962 north to Platts Bank, east to the waters off Pollock Rip, and south to the waters off Long Island and New Jersey (fig. 1). During 1963 the area extended south to Cape Hatteras and included waters off the Middle Atlantic States to the 100-fathom curve. The additional numbers and greater capabilities of the vessels contributed to the expansion, but equal credit is attributed to the use of spotter aircraft

in scouting new fishing areas before, during, and at the end of the tuna fishing season. Aerial surveillance of the Cape May-Norfolk region (Area 5) in June 1963 located an early body of bluefin tuna in an area that was not fished the previous year.

Bluefin tuna generally frequent Cape Cod Bay on an average of 5 months a year, whether they arrive early (May) or late (July). This may be true in other areas where the season begins or ends earlier or later than in Cape Cod Bay, although not enough fishing has been done to clearly show seasonal patterns. Extended fishing time has been the result of shifting the fishing effort to the south where bluefin tuna have been available a month earlier (table 3).

The season and area for bluefin and skipjack availability are difficult to project from one year to the next on the basis of current knowledge and fishing experience. Seasonal availability patterns have been observed for skipjack in Areas 4 and 5 during the past 2 years, but nothing is known prior to that time. Whether this abundance is normal or temporary remains to be seen. Bluefin tuna are notorious for their unpredictable availability in certain areas of the Gulf of Maine. As an example, the disappearance of the fish from the Wedgeport, Nova Scotia, region completely disrupted the annual International Tuna Tournament competition for several years. In 1962, the Pollock Rip area east of Cape Cod yielded nearly 1,300 tons of bluefin from purse-seine operations between late August and early October. In 1963, constant aerial observation of those waters in the same period detected few bluefin concentrations.

FISHING EFFORT: During 1962 and 1963 the purse-seine effort for Atlantic Coast tuna jumped ahead at a prodigious rate. The number of fishing days not only increased, but the average value of the fishing day changed with the increase in average size of the purse seiners and their gear (tables 3B and 4). Experienced captains and crews have accompanied the influx of vessels from Puerto Rico and the West Coast. Less vessel time is needed away from the fishing grounds to unload catches, and operations now are possible under less moderate weather conditions. Aerial scouting, plus the vessels added to the fleet, have reduced time used in looking for tuna schools in the expanded area. Spotter plane selection of accessible schools of adequate-sized fish has reduced lost time resulting from unsuccessful sets. Also, much of the setting now is directed from the plane. Finally, the use of loran navigation systems available on the Atlantic Coast has made possible precise positioning of schools, planes, and vessels.

PROCESSING: More tuna canneries have started operations on the Atlantic Coast to handle the tuna. In 1962, a large Pacific coast salmon and tuna packing corporation established a subsidiary production center at Cambridge, Md. (Pacific Fisherman 1962). The three-line plant, with supporting cold storage for 7,500 tons of frozen fish, is one of the largest tuna canning facilities on the Atlantic Coast. A second Maryland cannery, which has canned imported raw tuna since 1958, began processing Atlantic Coast tuna during 1963. Although much of the supply is imported Japanese-caught Atlantic tuna, an increasing quantity of domestic-caught tuna was processed in 1963 (table 5). Four large canneries now operate in Puerto Rico and, as their requirements increase, Atlantic Coast-caught tuna is supplementing Pacific and foreign supplies.

UNLOADING AND TRANSPORTATION:

Changes in handling and disposition of the catch have reflected problems brought on by the rapid development in the past 2 years. The larger vessels with modern refrigeration ability landed catches at six additional Atlantic Coast ports in 1962 and 1963 (table 6). Several trips were unloaded directly at Puerto Rican canneries. Canadian catches were landed in Canada and transhipped to Eastport, Maine, for processing. Shipments of frozen tuna from New Bed-

Table 5 - Canned Tuna Pack by Areas, United States and Possessions, 1961-63^{1/}

Area	1963	1962	1961
	(1,000 Std. Cases-- (48 No. $\frac{1}{2}$ Tuna Cans Per Case)		
California	9,064	10,511	10,546
Washington and Oregon . .	1,449	1,471	1,262
Atlantic Coast	839	765	$\frac{3}{/}$
Puerto Rico	3,464	$\frac{2}{/}$	$\frac{3}{/}$
American Samoa and Hawaii	1,439	$\frac{2}{/4}, 271$	$\frac{3}{/3}, 960$
Total	16,255	17,018	15,768

^{1/}Preliminary.

^{2/}Puerto Rican pack included with American Samoa and Hawaii in 1962.

^{3/}Atlantic Coast and Puerto Rican pack included with American Samoa and Hawaii in 1961.

Source: "Fishery Products Report", Fishery Market News Service, San Pedro, Calif., and Fishery Statistics of the United States, 1961.

Table 6 - East Coast Tuna Landings by Port and Species, 1962-63^{1/}

Port	1963					1962			
	Trips	Bluefin	Skipjack	Unclass.	Total	Trips	Bluefin	Skipjack	Total
(Short Tons)									
New England:									
Eastport, Maine	2	100	121	210	431	-	-	-	-
Sagamore, Mass.	48	1,002	82	-	1,084	50	684	-	684
Provincetown Mass.	27	405	-	-	405	13	229	2/	230
New Bedford, Mass.	24	646	354	635	1,635	34	1,431	380	1,811
Providence, R. I.	4	336	317	-	653	3	495	90	585
New England Total	105	2,489	874	845	4,208	100	2,839	470	3,310
Mid-Atlantic:									
Jersey City, N.J.	2	758	-	-	758	-	-	-	-
Cape May, N.J.	5	-	-	791	791	-	-	-	-
Cambridge, Md.	3	286	185	-	471	-	-	-	-
Mid-Atlantic Total	10	1,044	185	791	2,020	-	-	-	-
Grand Total	115	3,533	1,059	1,636	6,228	100	2,839	470	3,310

^{1/}Preliminary, does not include Pacific yellowfin and skipjack landed on the Atlantic Coast in 1963.

^{2/}Less than a ton.

Source: Fishery Market News Service, Boston, Mass.

ford to Puerto Rico by "Sea-Land" trailers enabled some vessels to continue fishing during the peak of the season. Several hundred tons of the larger bluefin tuna were exported to the Italian market. Most of the tuna required transportation from dockside to canneries or storage facilities, and this need posed a major problem to the growing industry. The costs, borne by the vessels in most cases, tended to offset the profits made during a short season.

PRELIMINARY SCIENTIFIC FINDINGS

Since the start of continued purse-seine fishing for bluefin tuna in Cape Cod Bay in 1958, the U. S. Bureau of Commercial Fisheries has collected records of catch and effort that pertain to abundance and availability of tuna off the Atlantic Coast of the United States. In collaboration with the Woods Hole Oceanographic Institution, the Bureau initiated in 1962 a tuna purse-seine logbook system, similar to that used by the Inter-American Tropical Tuna Commission in the Pacific.

It is too early to determine any real effects of fishing on tuna abundance because the fishery has not been stabilized in any one area for a sufficient period of time. Preliminary information from collected data indicates a normal change in the catch rate per fishing day for a new fishery using an undeveloped resource (tables 1 and 7). Very little information is available on the relative abundance or availability of either bluefin or skipjack during those years. Fluctuation in these factors could certainly have had considerable effect on the catch per day's fishing.

The Woods Hole Oceanographic Institution has tagged tuna in the Northwest Atlantic since 1954. About 1,500 tagged bluefin tuna had been released by December 1963. Of 32 recaptures, 25 were taken in Continental Shelf waters from Maryland to Massachusetts. Although the numbers have been small, a significant increase in returns was noted: from 6 recoveries between 1954 and 1962 to 19 in 1963 alone (Mather 1963).

Tag recoveries by tuna purse-seine vessels suggest that in 1963 a group of bluefin tuna in the 100-pound class moved west southwest from Oceanographer Canyon (fig. 1) to coastal waters off Ocean City, Md. (Area 5), then northward and eastward to off Block Island (Area 4), and finally into the Cape Cod Bay area (Area 2); while smaller individuals moved from off Long Island (Area 4) eastward toward Martha's Vineyard (Area 4) and then west again (F. J.

Table 7 - Atlantic Coast Tuna Purse-Seine Catch Per Day Fished, 1958-62^{1/}

Year	Area ^{2/}					East Coast
	1	2	3	4	5	
(Tons Per Day Fished--All Vessels)						
1962	10.9	5.1	18.2	8.3	0	10.0
1961	-	10.8	-	-	-	10.8
1960	-	15.4	-	-	-	15.4
1959	-	24.4	-	-	-	24.4
1958	-	6.9	0	0	-	5.8

^{1/}Data based on logbooks and interviews; for breakdown of days fished in each area, see table 3B.

^{2/}Areas are shown in fig. 1.

Mather III personal communication). With the exception of bluefin tuna tagged during exploratory long-line cruises farther offshore, most of the marked fish recovered in the 1963 seine fishery were released by cooperating sport fishermen in the seining area since 1960.

Other interesting bluefin tuna tag recoveries are two fish released off Martha's Vineyard in 1954 and caught in the Bay of Biscay in 1959 (Mather 1960), and 5 fish released from Cat Cay, Bahamas, from 1960 to 1962 and taken in tuna purse seine catches off Norway during 1961 and 1962. One of those fish, tagged June 15, 1962, was recaptured August 4, 1962, off Bergen, Norway--a trans-Atlantic crossing of 50 days (Mather 1962b, 1963).

Although these data are fragmentary and subject to the possibilities of chance, they do indicate a need for further investigation and evaluation of the tuna resources of the Northwest Atlantic if we are to determine their commercial potential. Continued observations through exploratory sampling, tagging, and logbook analysis should provide further insight into the distribution, abundance, and movement of the several tuna species known to frequent waters off the Atlantic Coast of the United States.

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