

# A SMALL-BOAT TUNA LONG-LINE FISHERY

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## SUMMARY

Small fishing vessels from Gloucester, Mass., have successfully fished subsurface bluefin tuna (*Thunnus thynnus*) on Stellwagen Bank in Massachusetts Bay using long-line gear especially adapted to inshore operations for large tuna. During the short season between mid-August and late October, boats 35 to 40 feet in length have made catches of approximately 60,000 pounds per vessel.

## BACKGROUND

Seasonal bluefin tuna stocks in waters off the New England coast have for some time appeared to be substantial. However, to date, this resource has been exploited only to a limited degree.

**OFFSHORE TUNA:** Studies made by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel *Delaware* over the last five years indicate the feasibility of the development of a long-line fishery in oceanic areas off New England at certain seasons, and a recent attempt by the Gloucester medium trawler *Golden Eagle*, using Bureau gear<sup>1/</sup> and assisted by technical personnel, met with limited success in one of these areas.

**INSHORE TUNA:** Bluefin tuna are usually found in large schools in the Massachusetts-Cape Cod Bay areas from June through October. These schools have supported a growing sports fishery as well as small commercial fisheries for several years.

Small boats had fished surface-swimming bluefin tuna with standard swordfish harpoon-and-keg gear for many years prior to World War II. During that period several enterprising vessel owners also fished subsurface tuna with drifting baited keglines--a precursor to the development of tuna long-line fishing in the area. Since the War, the keg-line method has been largely abandoned, but small boats continue to engage in harpooning surface-swimming tuna on a small scale during June, July, and early August.

Tuna explorations with long-line gear by the chartered schooner *Marjorie Parker* in 1952 and 1953 (Murray 1953, 1954) indicated that appreciable tuna stocks were

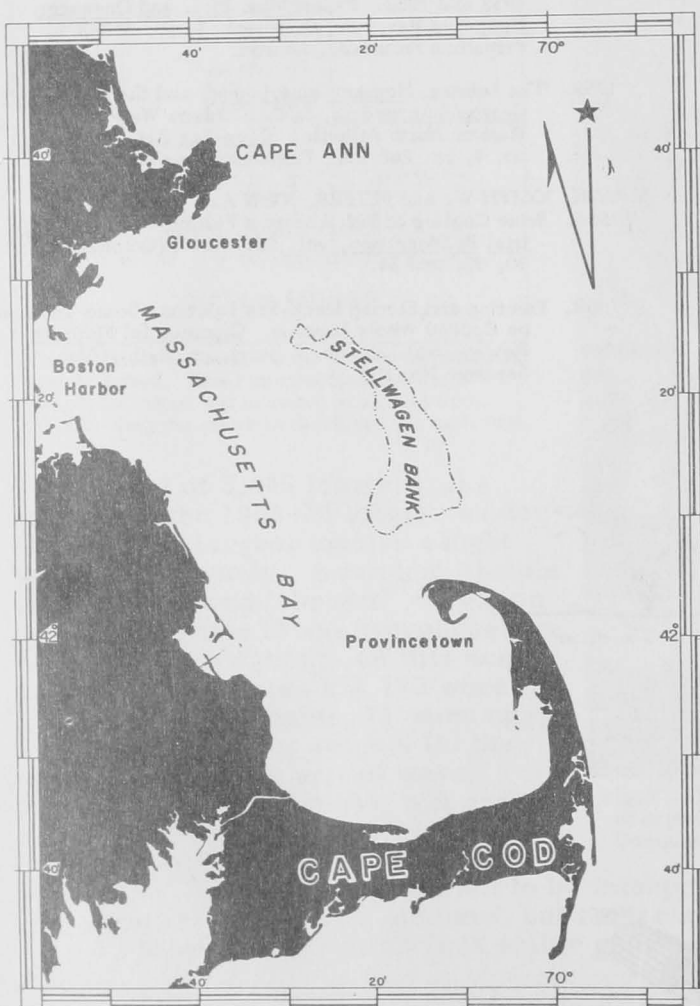


Fig. 1 - The Massachusetts Bay-Stellwagen Bank area. Small-boat long-line tuna operations are conducted in this area during a 3-month season beginning in August.

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<sup>1/</sup>Long-line gear belonging to the U. S. Bureau of Commercial Fisheries was made available to commercial vessels in a cooperative agreement designed to encourage establishment of the fishery and to add to the knowledge of the resource by the collection of data to supplement that recorded aboard Bureau vessels.

present in waters off New England, but heavy shark damage during those years discouraged initiation of a tuna long-line fishery at that time.

Commercial operations utilizing purse-seine gear have also been attempted several times during the past 20 years (Murray 1952), but substantial production of tuna by this means has been attained only recently. In the summer of 1958 the 62-foot converted shrimp trawler Silver Mink of Provincetown, Mass., produced 179 tons of bluefin tuna in a 73-day season (Squire 1959), and in 1959 the vessel set a new East Coast record for production of purse-seine caught tuna when 750 tons were landed in a 56-day season. The accessibility of the fishing areas to Provincetown was significant in the success of the Silver Mink. The majority of the operations were carried out in the immediate vicinity of Cape Cod, within a day's run to and from Provincetown. The fishing areas included Cape Cod Bay and Stellwagen Bank.

The Cape Cod Bay trap-net fishery, although not a large-scale segment of the tuna fishery, has accounted for considerable numbers of school tuna each season, particularly during the months of July and August. Three traps set for mackerel on August 5, 1948, impounded 336 tuna weighing a total of 75,000 pounds (Bigelow and Schroeder 1953).

Although the presence of tuna schools on the surface has been evident to sports and commercial fishermen for many years, the occurrence and movements of subsurface-swimming bluefin tuna have remained largely matters of conjecture. One of the best indications, to date, of the continued occurrence of these subsurface fish has come from long-line operations conducted recently on the 15- to 20-fathom northern edge of Stellwagen Bank (Middle Bank). The long-line catches indicate that subsurface bluefin tuna schools occur in the inshore area from mid-June to the end of October.

Inshore long-line fishing originated shortly after the end of World War II when the keg-line- and the halibut-line-trawl were combined and modified to form a prototype of the tuna long-line gear now in use on Stellwagen Bank. Gear used since then has been similar in principal, but has differed in construction with the ideas of the individual fishermen, the number of men used to operate the gear, and the availability of material.

Small-boat long-lining operations on Stellwagen Bank, in contrast with trap fishing and purse-seining, require only a fraction of the investment for vessels, gear, and crew. In addition, the long-line vessels can be converted readily to other types of seasonal fishing and can, thus, supplement the income of the owners and operators. For example, long-lining during June, July, and early August is hindered by the presence of large numbers of dogfish (Squalus acanthias) which often strip the long-line gear of bait. The local small boats, therefore, conduct harpooning operations until the dogfish move off the Bank in mid-August and the commercial long-line fishery, which continues through October, can be initiated. Estimated daily operating costs, based on figures obtained from 3 small Gloucester long-line boats, range from 15 to 20 dollars each.

#### EQUIPMENT AND METHODS

Typical of the small boats operating in the inshore long-line fishery is the Julie Ann, a Nova Scotia lobster boat, 40 feet in length with an 11-foot beam (fig. 2). Built in 1946, the Julie Ann has been fishing tuna from mid-June to the end of October since 1954. This boat normally converts from harpoon fishing to a single-man long-line operation at the end of August. On an aver-



Fig. 2 - The Gloucester tuna long-line boat Julie Ann.

age day's fishing, within 30 miles from Gloucester, a single basket (box) of gear is set. In a 4-hour fishing period the main line is under-run through a snatch block at the side of the pilothouse from 1 to 3 times depending on the size of the catch, number of snags, or amount



Fig. 3 - Baiting a branch line with butterfish aboard the Julie Ann. Box contains a 200-fathom main line with 40 hooks.

of bait loss. Hooked tuna are gaffed and hauled aboard either by hand or with a double block. Manila branch lines<sup>2/</sup> are weighted with three 2-ounce seine weights and attached to the steel-cable leaders by 1 1/4-inch heavy-duty brass swivels. Japanese-style tuna hooks are bent to the leaders by crimped nico-press sleeves. Double-size lobster-pot buoys, 5-gallon cans, kegs, and groups of 2 trawl-net floats are used alternatively for buoys on the drop lines; and a standard-size steel beer keg buoys each end of the main line and the upper ends of the 25-fathom anchor lines. An improvised 25-pound mushroom anchor made from a truck wheel on one end of the long-line, and a 30-pound kedge anchor on the other end, holds the long line in fishing position. Depth recorder and portable RDF serve to locate fishing areas on the Bank.

The Gloucester boat Here We Go, also of Nova Scotia design (36 feet in length with an 11-foot beam), was built in 1950 (fig. 5). The vessel

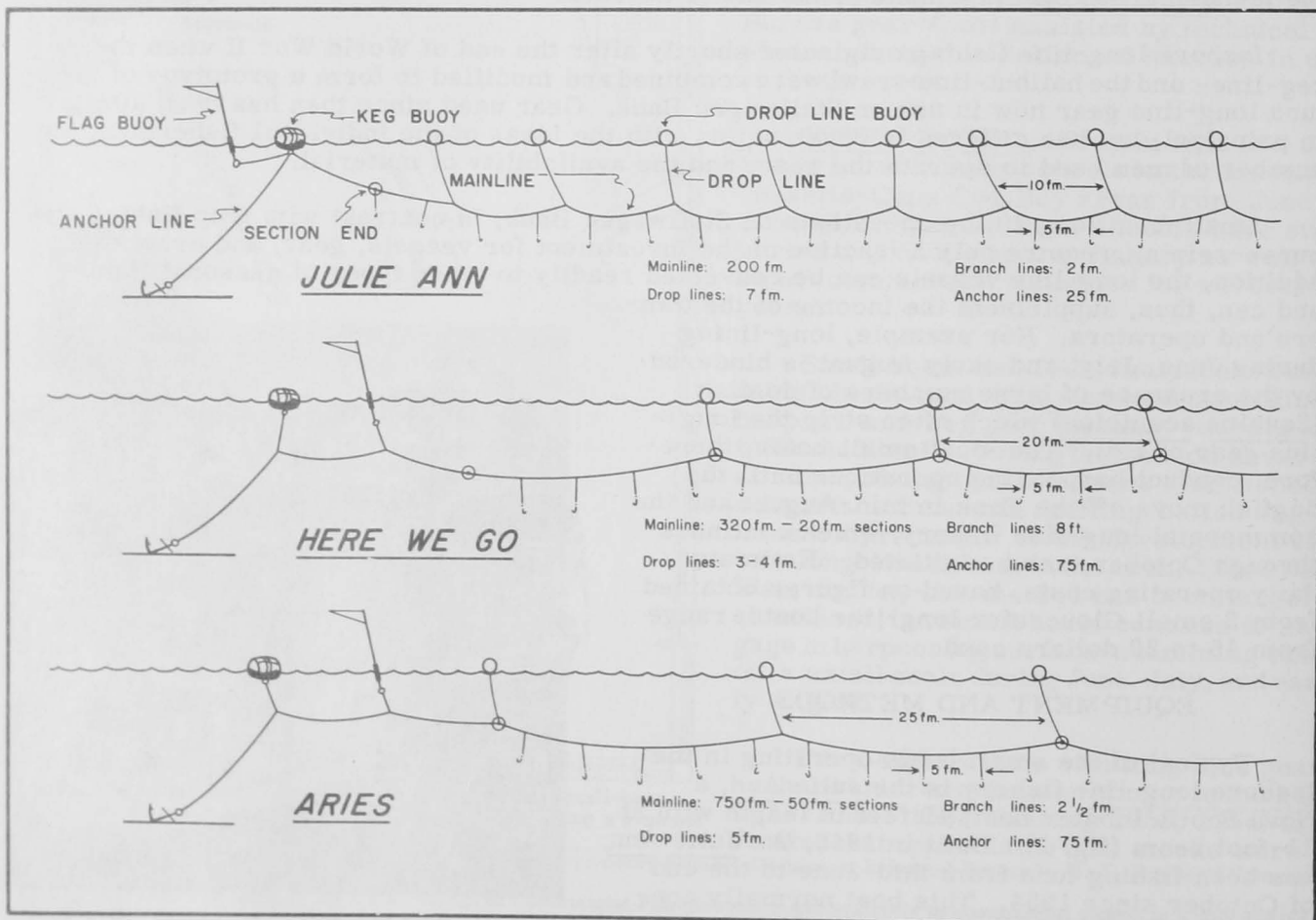


Fig. 4 - Diagram of long-line gear used by three Gloucester boats fishing for bluefin tuna on Stellwagen Bank. (Not drawn to scale.)

<sup>2/</sup>The branch lines are referred to in the New England area as "gangions"--a term derived from the halibut line fishery. In some other areas, this term apparently has been corrupted to "gangions."

owner, long-lining bluefin tuna since 1947, fishes alone. The main line is tended with the help of a lobster davit, which is equipped with an open snatch block, and a small winch head. Fish are hauled aboard over a side-rail roller. Long-line gear (table 1 and fig. 2) is set at 5 fathoms and worked 4 hours with 2 to 3 under-runs. Chum is utilized, when available, with reported success. Drop lines are spliced into the main line every four hooks and these are buoyed by seine-cork bobber sets, supplemented every sixteen hooks by a standard swordfish keg. The leaders are crimped to the gangings by nico-press sleeves, with intermediate heavy-duty brass swivels. Japanese-style 14/0 extra-heavy giant tuna hooks are also attached to the leader by nico-press sleeves. Fifteen-pound kedge anchors on 75-fathom anchor lines at each end of the set stretch the main line in a fishing position. A 15-gallon oil drum buoys the anchor line on a 4-fathom drop line attached 20 fathoms from the end of the main line. A flag buoy, also on a 4-fathom drop line, is placed on the anchor line 10 fathoms from each end of the main line. Supplementary equipment consists of radiotelephone, depth-recorder, and a 12-volt electric tuna shocking device used in surface-trolling operations.



Fig. 5 - Baskets of long line used on the Gloucester boat Here We Go. Two baskets are set to make a 320-fathom main line with 64 hooks. Note seine-cork bobber sets used as drop line buoys.

Table 1 - Small-Boat Tuna Long-Line Gear Used on Stellwagon Bank

Gear	Vessel			
	Julie Ann	Here We Go	Aries	Marianna II
<b>Baskets:</b>				
Construction and type	Wood, box 14x18x40 inches	Wood, trawl tub 2-bushel capacity	Wicker, garden basket, 3 bushel	Galvanized metal No. 2 tub.
Number fished	1	2	3	15
<b>Mainline:</b>				
Type	6-thd. synth.	5" 16 synth.	5" 16 synth.	11" 64 synth.
Length/basket	200 fm.	160 fm.	250 fm.	138 fm.
Sections/basket	1	8	5	1
<b>Drop Lines (float lines):</b>				
Type	6-thd. manila	14 lb. ground trawl or 6-thd. synth.	6-thd. synth.	11" 16 synth.
Number/basket	21	8	10	1
Length	7	3-4 fm.	5 fm.	5 fm.
<b>Branch Lines (gangings):</b>				
Type	6-thd. manila	3" 16 synth. gill net maitre line	5" 16 synth.	11" 16 synth.
Number/basket	40	32	50	1/
Length	1 1/2 fm.	3 ft.	1 fm.	3 fm.
<b>Leader:</b>				
Type	3" 32 galv. steel cable	3" 32 galv. steel cable	3" 32 galv. steel cable	3" 32 stainless steel wire
Length	81-24"	5 ft.	11 fm. 2	1 fm.
<b>Tuna Hooks:</b>				
Size	9/0	14/0	12/0, 9/0	9/0
<b>Anchor Lines:</b>				
Type	6-thd. manila	6-thd. synth.	9-thd. synth.	None
Length	25 fm.	75 fm.	75 fm.	None

1/ Five baskets with 20 gangings and 10 baskets with 10 gangings.

The ex-Coast Guard buoy tender Aries (38 feet in length with a 12 foot beam) was built in 1945 and has been used for long-lining tuna since 1947 (fig. 6.). On a 4-hour set the main line is under-run through an open snatch block on a lobster davit 2 to 3 times by a 2-man crew,

and fish are hauled aboard with a winch head and a block on the side of the pilothouse. The gangings are spliced into the main line 5 fathoms apart with leaders, swivels and Japanese-style tuna hooks attached by crimped nico-press sleeves. Kedge anchors, weighing 25 pounds each and located at the ends of 75-fathom anchor lines, are used to spread the set. Two 40-fathom drop lines are attached to each anchor line. The first, attached at a distance of 10



Fig. 6 - Long-line gear aboard the Aries out of Gloucester, Mass. Three baskets are fished to make a 750-fathom main line with 150 hooks. Note rubber mackerel lure on center basket.



Fig. 7 - Bureau of Commercial Fisheries' long-line tubs aboard the small Gloucester trawler Marianna II.

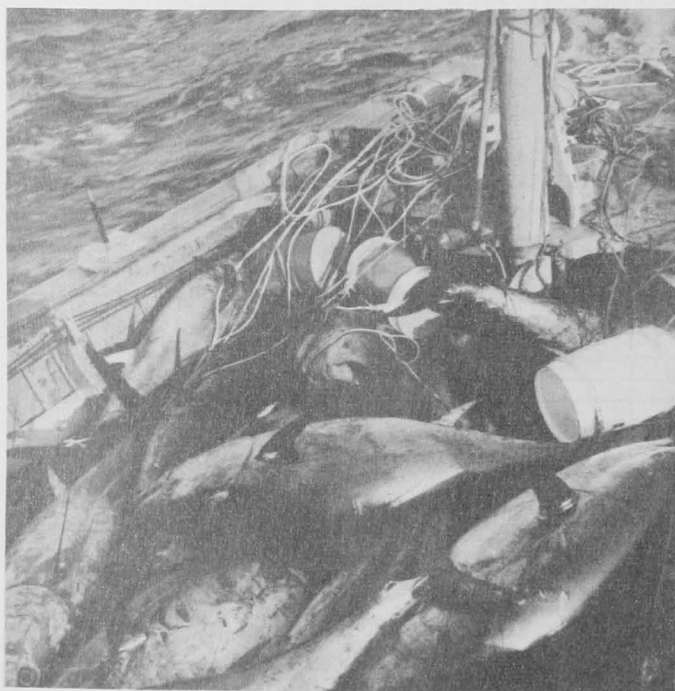


Fig. 8 - A few of the 40 bluefin tuna taken in a  $3\frac{1}{2}$ -hour set made from the Julie Ann. The catch rate for this set was 57.1 bluefin tuna per 100 hooks baited.

<sup>3</sup>/See footnote 1.

feet from the end of the main line, bears a flag buoy; the second, positioned 20 feet from the end of the main line, terminates in a 20-gallon keg buoy.

Using long-line gear obtained on loan from the Bureau of Commercial Fisheries<sup>3</sup> (Bullis and Captiva, 1955), the small Gloucester trawler Marianna II (fig. 7) fished for bluefin tuna on September 26, 27, and 28, 1959. A single 15-basket set was made each day at 7 a.m. and gear was hauled aboard at 5 p.m. On two occasions the gear was under-run from a skiff and the main line was pulled by hand.

Bait used by the three vessels was not restricted to any one fish. Blueback herring, menhaden, mackerel, whiting, and butterfish are said to fish equally well, on the hook or when used for chum. Daily bait requirements on the Julie Ann are approximately 50 pounds, whereas the Here We Go and the Aries need from 200 to 500 pounds each to chum. The cost ranges from 1 to 3 cents a pound. Availability of bait for these operations has been dependent upon the catches of Gloucester-

ter trap boats, draggers, and seiners. Although availability of fresh bait fish has been no problem, practical use of fresh bait has been prevented by the dogfish shark population on Stellwagen Bank during the early part of the season. On one occasion the Aries used a rubber mackerel lure with success (fig. 6).

Catch records for small commercial craft are sketchy, but the annual catch (for the 3-months fishing season) of three commercial boats fishing the inshore area is estimated roughly to exceed 30 tons per boat. Catch rates varied with the individual boat, areas fished, and other factors. On September 30, 1959, the operator of the Julie Ann achieved a catch rate of 57.1 fish per 100 hooks baited when 40 bluefin tuna were taken in the course of a 3½-hour set consisting of 1½ under-runs. Total weight of the catch was estimated at 5,255 pounds (fig. 8.). Throughout the season, catch rates for the other two boats fishing the same area were estimated at between 30 and 40 fish per 100 hooks baited; and, in September, the small trawler Marianna II, fishing in a nearby area, averaged 15.4 fish per 100 hooks baited in the course of a 3-day fishing period. Total catch for the period was 139 bluefin weighing 14,000 pounds dressed.

Only 7 sharks were taken on the Marianna II's gear during this 3-day period. This represents a catch rate of only 0.78 sharks per 100 hooks, and no shark damage was noted. Information from other boats indicated that few sharks were taken on long lines and no shark-damaged tuna were recorded. This is in sharp contrast with the reports of shark damage incurred while long-lining in inshore waters during the 1952-53 seasons (Murray 1953, 1954).

### CONCLUSIONS

The success of long-line tuna operations on Stellwagen Bank indicates the feasibility of expanding the present small-boat tuna fishery within the Massachusetts Bay area, and the possibility of establishing similar fisheries in other selected areas off northeastern United States. The size of the vessels, low operating costs, small crews, and ability to convert readily to other types of fishing, are positive advantages of these operations.

The present short season in the Stellwagen area might be extended by developing a suitable artificial lure to overcome the dogfish problem.

Further evaluation of seasonal bluefin stocks and fishing methods on inshore waters could contribute substantially to an expansion of this fishery in the New England area.

### LITERATURE CITED

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