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# EXPLORATORY FISHING FOR MAINE HERRING

by Keith A. Smith

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## ABSTRACT

Exploratory herring fishing operations were carried out along the Maine coast during the summers of 1955 and 1956 using the research vessel *Theodore N. Gill* and the chartered small otter trawler *Metacomet.* The coastal and Gulf of Maine waters were sounded and fished with a lampara seine, gill nets, midwater trawls, and otter trawls. Inshore explorations located zero-year-class herring in the bays and inlets and traced their development in these areas until they became sardine-sized fish in late fall. Sardine-sized and large herring were found occupying an ocean-bottom habitat during the winter. A scattering of large unschooled herring was found in coastal waters during the summer of 1956.

## INTRODUCTION

The Maine Herring Exploration and Gear Research Project of the Bureau of Commercial Fisheries began in the spring of 1955 to conduct exploratory fishing for Atlantic herring and to carry on research and developmental work on sardine fishing gear. Original efforts and facilities were directed toward seeking additional herring resources that might be used to augment the rather erratic supply available to fishermen and sardine packers. In 1955 and 1956 herring populations were sought along the Maine coast and in the Gulf of Maine. Otter trawl surveys were made during the winters of 1957, 1958, and 1959 to gain more information on the life history of the herring. This report is concerned with the results of these explorations.

After 1956, the major efforts of the project were directed toward the development of new fishing equipment and the introduction of modern methods to the sardine fishing industry. The project also did considerable work on oceanic collection of planktonic and postlarval herring, data from which were processed and reported on by the Bureau's Atlantic Herring Investigations (Biological). This report was submitted as Chapter 5 of Appendix III (U.S. Biological Studies), Report of the International Passamaquoddy Fisheries Board to the International Joint Commission.

## INSHORE EXPLORATIONS

Initial exploratory fishing work was done in the spring and early summer of 1955. The coastal Maine waters were echo sounded intensively by the Fish and Wildlife Service research vessel *Theodore N. Gill* during May 24 through July 8, 1955, and were fished with a 100-fathom lampara seine where echo-sounding recordings indicated the presence of schools of fish. Populations of juvenile herring, fish that were in their first year of life and would be barely large enough to be utilized as sardines during

the fall season, were located at that time in or near every major bay between Portland, Maine, and Machias Bay, Maine (fig. 1). The location, date, and average length of each catch are shown in table 1.

That zero-year-class herring brit generally occur in the inside waters of the coast of Maine was again demonstrated in the 1956 season when the young herring, progressing in size through the season from larval-size taken during the early spring to sardine-size taken in the autumn, were detected by echo sounding and caught. Midwater trawl tows made with the chartered vessel *Metacomet* took herring from Casco Bay waters that averaged 1.42 inches in standard length on May 9. Schools of the young fish were found by echo sounding and sampled during succeeding cruises of the *Metacomet* through the summer of 1956, again indicating the presence of populations of growing herring. The most eastward catches of these small fish were taken in Passamaquoddy Bay near East Quoddy Head. Locations of the 1956 soundings and catches of herring brit are plotted by month in figure 2. A large part of the catches plotted were made during August, and the reason for this is primarily increased fishing effort. A special brit survey was made during August 1956 to obtain as complete as possible an inventory of the amount and location of the young herring that might be large enough to be utilized for sardines during the last 2 or 3 months of the sardine season. Herring were found along the entire coast from Casco Bay to Passamaquoddy Bay, in the Bay of Fundy near Grand Manan Island, at Petite Passage, Nova Scotia, and in St. Mary Bay during August, (table 2).

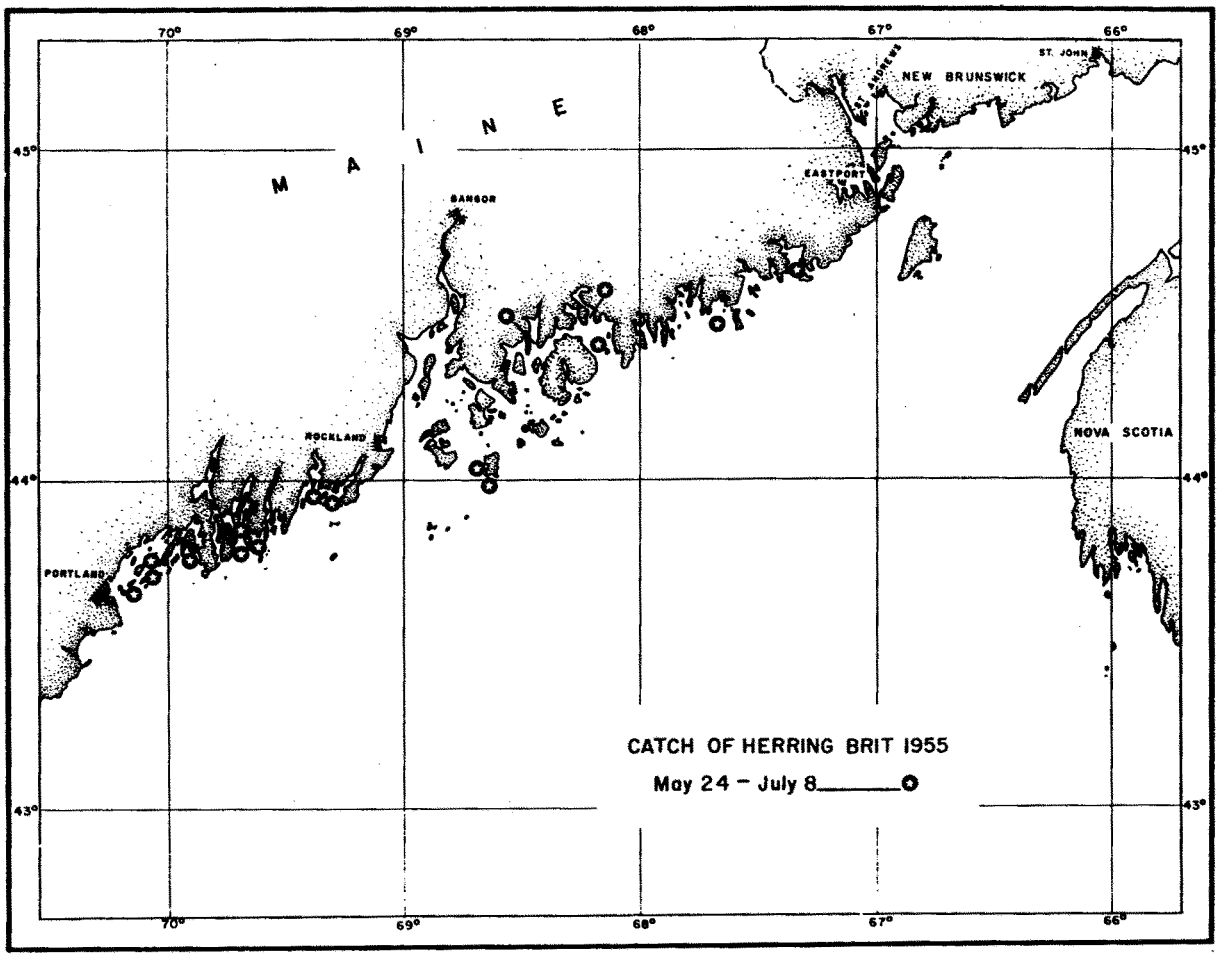


Figure 1.--Locations of catches of zero-year-class herring made by the research vessel *Theodore N. Gill*, spring and summer of 1955.

Table 1.--Catch location and average standard lengths of Maine herring "brit" samples, 1955

| Location | *Gill* cruise 2 | | *Gill* cruise 3 | |
|---|---|---|---|---|
| | Date | Length | Date | Length |
| Casco Bay: | | | | |
| | | *Inches* | | *Inches* |
| Middle Bay | May 24 | 2.4 | - | - |
| Hussey Bay, south | - | - | June 28 | 2.8 |
| Broad Sound | - | - | June 28 | 2.6 |
| Cundy Harbor | - | - | June 29 | 2.2 |
| Sheepscot Bay: | | | | |
| Mouth of Ebenecook Harbor | May 26 | 1.8 | - | - |
| Off mouth of Hendricks Harbor | - | - | July 6 | 1.9 |
| West of lower Mark Island | May 27 | 1.9 | - | - |
| Muscongus Bay: | | | | |
| Marsh Island, ½ mile east of | May 27 | 1.9 | - | - |
| Port Clyde | May 28 | 2.1 | - | - |
| Penobscot Bay: | | | | |
| Isle au Haut, Duck Island | - | - | July 7 | 2.1 |
| Isle au Haut | - | - | July 7 | 2.1 |
| Blue Hill Bay: | | | | |
| Union River | Jan. 10 | 2.0 | - | - |
| Frenchman Bay: | | | | |
| Skillings River | June 11 | 2.2 | - | - |
| Great Moose Island | June 11 | 1.7 | - | - |
| Nash Island, 5 miles south of | - | - | July 8 | - |
| Machias Bay | - | - | July 8 | 2.1 |
| Average | | 2.0 | | 1.9 |

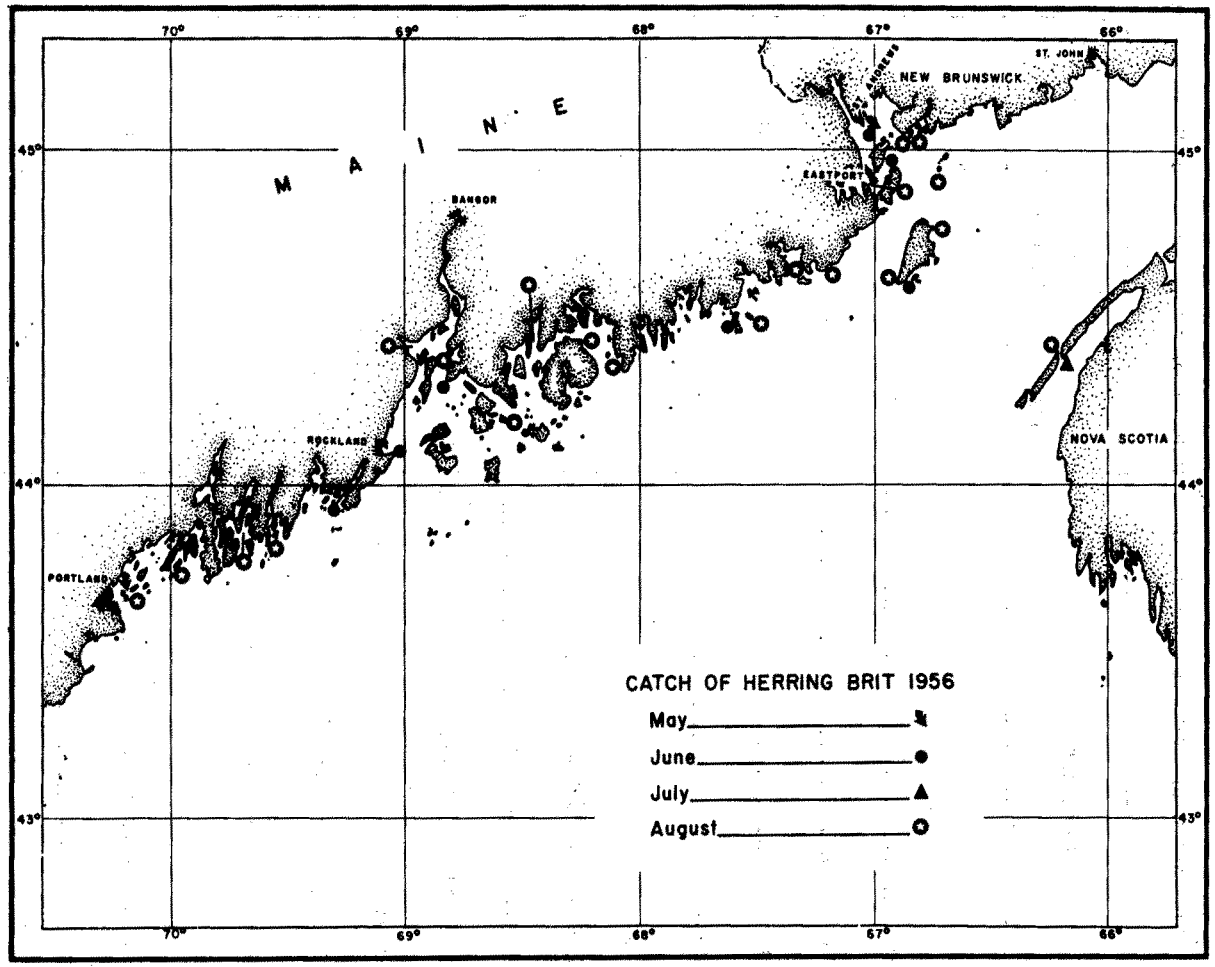


Figure 2.--Locations of catches of zero-year-class herring brit, spring and summer of 1956.

Table 2.--Catch locations and average standard lengths of Maine herring brit samples, 1956

| Date | Location | Average standard length |
|---|---|---|
| | Casco Bay: | *Inches* |
| May 9 | Middle Bay | 1.4 |
| | Penobscot Bay: | |
| June 1 | Northeast part | 5.6 |
| | Passamaquoddy Bay: | |
| 17 | St. Andrews Bay | 4.0 |
| | Bay of Fundy: | |
| 18 | East Quoddy Head | 2-2.5 |
| 19 | Grand Manan, Seal Cove | 2-2.5 |
| | Machias Bay: | |
| | Center | 2.1 |
| | Penobscot Bay: | |
| 25 | Rockland, 2.8 miles east | 2.0 |
| | Western Bay: | |
| 27 | Ram Island | 2.2 |
| | St. Mary Bay: | |
| July 18 | East Petit Passage, 2 miles northeast | 2.5 |
| 18 | Petit Passage, south entrance | 4.6 |
| 18 | Tiverton N. S., 2.2 miles south of (in St. Mary Bay) | 4.7 |
| 19 | Tiverton N. S., 3 miles south of (in St. Mary Bay) | 4.7 |
| | Bluehill Bay: | |
| Aug. 8 | Tinker Island | 3.2 |
| | Penobscot Bay: | |
| 8 | Spectacle Island | 2.6 |
| 9 | Long Island, northeast end | 3.0 |
| | Passamaquoddy Bay: | |
| 21 | 1½ miles southeast by south of Oak Point, St. Croix Island | 4.7 |
| 21 | Off Letite Passage | 2.2 |
| 21 | Channel between Shackleford Head and Sewards Neck | 2.8 |
| 22 | Deer Island, off Mascabin Point Light | 3.7 |
| | Bay of Fundy: | |
| 22 | Wolves Islands | 2.3 |
| 23 | Digby Gut, 2 miles northwest | 2.4 |
| 24 | Grand Manan, North Head Bay | 2.9 |
| 24 | Grand Manan, Bradfords Cove | 3.0 |
| | Cutler Bay: | |
| 24 | Mouth | 2.7 |
| | Machias Bay: | |
| 25 | Stone Island, 1.2 miles east of | 3.0 |
| | Eastern Bay: | |
| 25 | Head Harbor Island, 1 mile off Black Head | 3.1 |
| 26 | Sunken Ledge Buoy | 2.9 |
| | Frenchman Bay: | |
| 2 | Ironbound Island, southeast shore | 3.2 |
| | Bluehill Bay: | |
| 26 | Union River, Highhead | 2.8 |

Table 2.--Catch locations and average standard lengths of herring brit samples, 1956--Continued

| Date | Location | Average standard length |
|---|---|---|
| | | *Inches* |
| Aug. 26 | Damariscotta River: | |
| 29 | Plummer Point | 4.5 |
| | Sheepscot Bay: | |
| 29 | Ebenecok Harbor | 3.1 |
| 29 | Barter Island, lower tip | 2.6 |
| | Casco Bay: | |
| 29 | New Meadows River, mouth | 5.3 |
| 30 | Hussey Sound, entrance | 3.6 |
| Sept. 27 | Little Chebeague Island | 3.6 |
| 27 | Hussey Sound, mouth | 3.6 |
| Oct. 4 | Little Chebeague Island | 3.4 |
| 4 | Broad Bay, Little Whaleboat Ledge | 3.8 |
| 4 | Hussey Sound, mouth | 4.0 |
| | Penobscot Bay: | |
| 11 | Great Spruce Head | 3.5 |
| 11 | Long Island, east | 2.7 |
| 11 | Between Rockland and North Haven Island | 3.3 |
| | Passamaquoddy Bay: | |
| 25 | Center | 2.7 |

## HERRING WINTER HABITAT

During the winter and early spring, herring are generally absent from the surface waters of the Maine coast. From December 1 to April 15, the Maine sardine season is legally closed, primarily due to the lack of fish in these waters. Sardine seiners, packers, and biologists have speculated on the whereabouts of the sardines in the winter. It has been generally suspected that they either go offshore, perhaps appearing later as the mature sea herring of the open ocean, or that they seek deeper waters and spend the winter in warmer water layers near the ocean's bottom. Information gained from occasional reports of trawler and gill net fishermen have indicated through the years that either or both areas may be the winter habitat of the Maine sardine.

Otter trawl tows were conducted aboard the Fish and Wildlife Service research vessel *Delaware* along the Maine coast, on Georges Bank, and in Passamaquoddy Bay during December and January of 1957-58 in search of bottom-dwelling herring. Areas of trawlable bottom are uncommon and difficult to find along the Maine coast and many inside locations were too restricted to operate a vessel of this size. Where suitable bottom was found, however, most of the inside tows (within bays or estuaries) and a high percentage of the outside tows yielded small quantities of herring (fig. 3). As shown on this diagram, tows were made from Cape Ann, Mass., to Mt. Desert Rock, Maine, ranging offshore to Jeffreys Ledge and to 40 miles south of Monhegan Island. Small catches (up to 75 pounds per tow) of small herring, measuring 4 to 6 inches in standard length, were made in Luckse Sound of Casco Bay, and East Penobscot, West Penobscot, and Bluehill Bays. Catches of a few to 25 small herring, measuring 5 to 6 inches in standard length, were taken in several tows made in positions 12 to 36 miles south by east of Monhegan Island. Small catches of large sea herring were

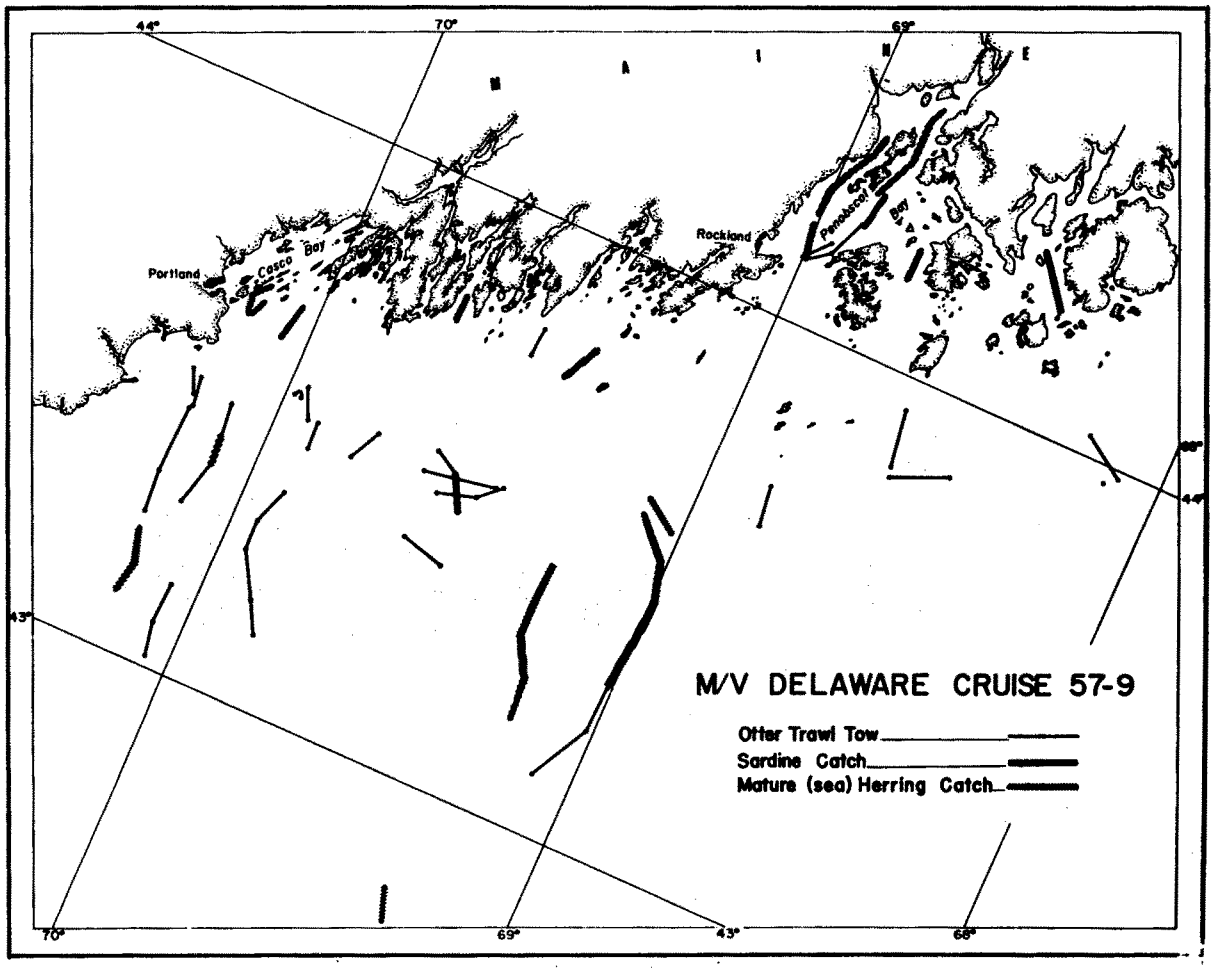


Figure 3.--Cruise No. 57-9 of the research vessel *Delaware*.

made on Fippennies Ledge and 6 miles east of Jeffreys Ledge.

During this cruise, four tows were also made along the Perry Shore of Passamaquoddy Bay and near the center of St. Andrews Bay. Only 48 large herring, measuring approximately 9 inches in total length, were taken in Passamaquoddy Bay; all were taken in tows near the inside (northern) end of Western Passage. Thirteen tows were made on the northern edge of Georges Bank using a No. 41 otter trawl equipped with rollers and a small mesh cod end. Some herring were taken in all but one of these, the largest catch being approximately 350 pounds and the average catch, 100 to 150 pounds. These herring were large and mature, many showing evidence of having spawned. This northeastern edge of Georges Bank is a well-known spawning area of the sea herring, because many catches have been reported there during autumn by both fishing and research vessels.

The catches from Cruise 57-9 of the *Delaware* indicate that many of the 1-year-plus fish (in their second year of life) remain in the inside areas or relatively near the shore in the Gulf, not schooled but apparently scattered over a wide area. The fact that these fish were taken with bottom trawls is evidence that at least part of the herring population remains near the bottom during this season.

The inside waters of Casco Bay, Sheepscot River, BoothBay Harbor, and Penobscot Bay were fished again with otter trawl gear during the winter of 1958-59 using the 38-foot Fish and Wildlife Service research boat *Blueblack*. Sardine-sized herring as well as smaller ones

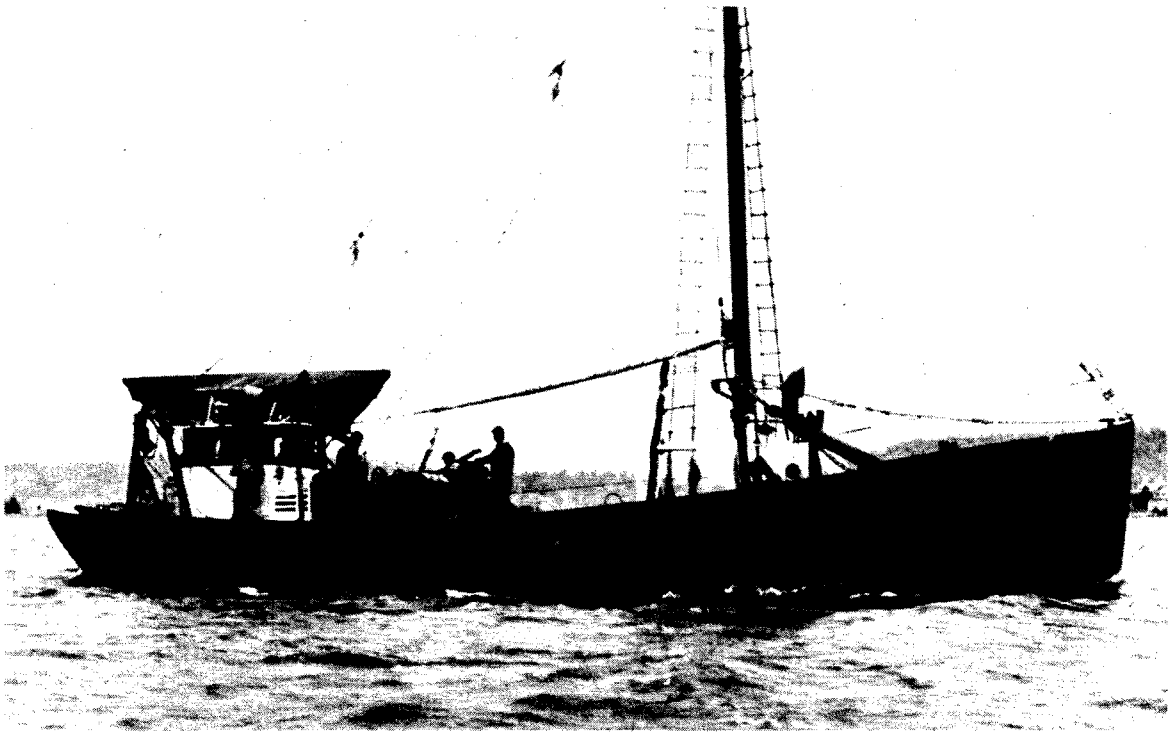

Figure 4.--Chartered otter trawler *Metacomet* used for 1956 Maine exploratory herring fishing.

were again found inhabiting the bottom layers in the deeper areas of the inside waters at the time. Echo-sounding recordings showed fish lying near the bottom in some of the areas where herring were caught in the otter trawl.

## COASTAL GILL NET FISHING

During June, July, and August 1956, on Cruise Nos. 3, 4 and 5 of the chartered vessel *Metacomet* (figs. 4 and 5), sets of anchored and drifting gill nets were made along the Maine coast from the Isle au Haut to Passamaquoddy Bay during a period when sardines were scarce in that area. Although 48 individual sets of gill nets, varying in length from 50 to 250 fathoms, were made, only a very few herring were taken, the largest catch being of 22 herring averaging 8.3 inches in standard length that were caught in 100 fathoms of net set 2 fathoms below the surface on August 1, 1956, and drifted overnight at a position starting 3.25 miles northwest of Matinicus Island. Twenty herring were caught in St. Andrews Bay on June 16 with 50 fathoms of gill nets set on the bottom, and 19 herring were taken from a similar set in Machias Bay on June 19. A scattering of herring catches with only a few individual fish per set were taken in 18 of the 48 sets made during this period. (A complete log of 1956 gill net sets is contained in Smith (1957)).[1] Thus, a very sparse scattering of unschooled herring appeared to be present in coastal waters between the coastline and 15 miles offshore in the summer of 1956.

[1] Keith A. Smith. Maine herring explorations and fishing gear experiments. U.S. Fish and Wildlife Service. Commercial Fisheries Review, vol. 19 (1957), no. 9, p. 1-15.

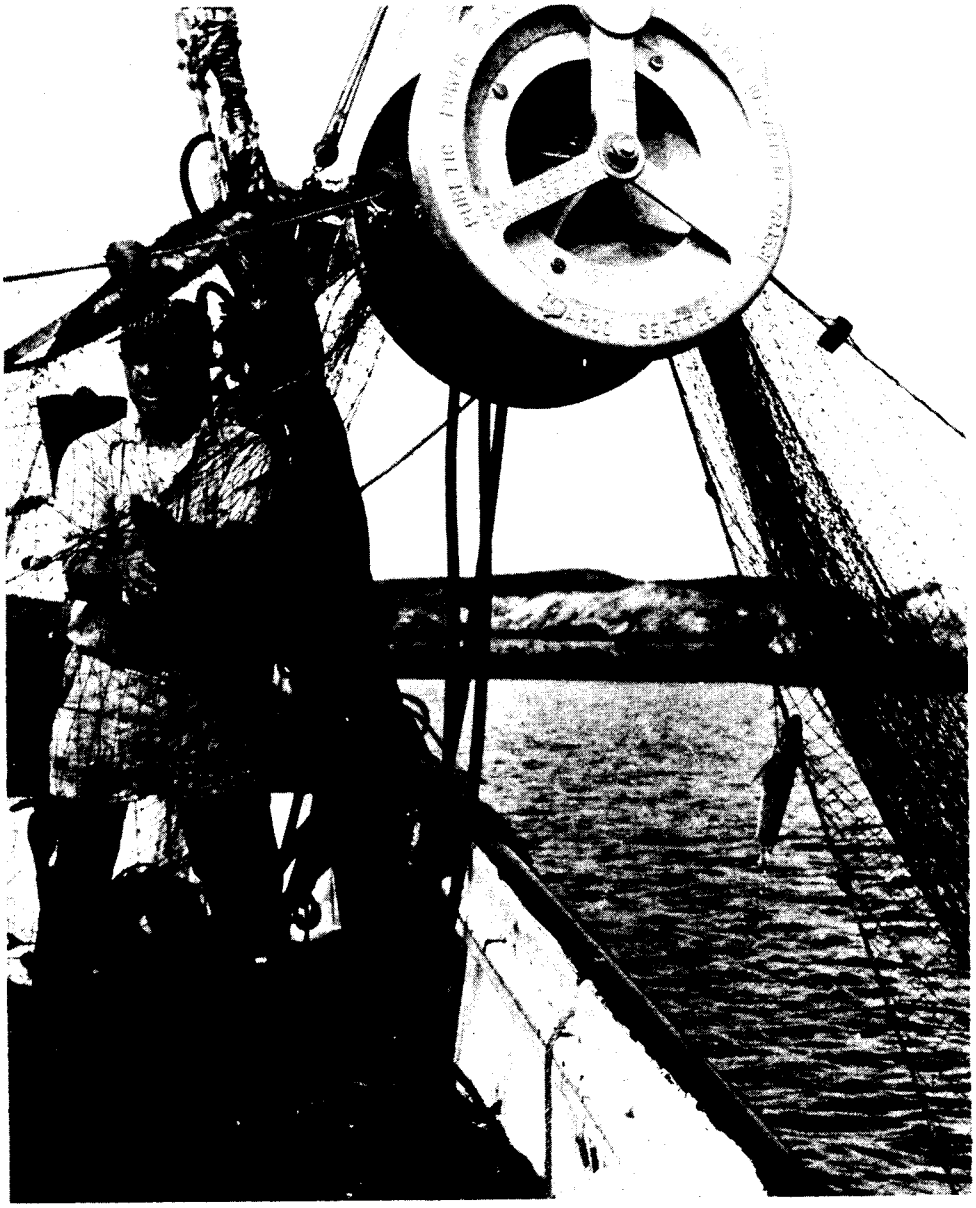

Figure 5.--Hauling herring gill nets aboard the *Metacomet*.

## SUMMARY


Findings of the limited exploratory fishing activities during 1955-59 are:

1. Zero-year-class herring appear in the winter and early spring in the protected bays and inlets of the Maine coast between Portland and Eastport and remain until late in the following fall when they are usually barely large enough for utilization as sardines.

2. Sardine-sized herring can be found during winter, when they are generally absent from upper strata of the water, lying close to the bottom in deeper areas of large bays; they also occur near the bottom in offshore waters of the Gulf of Maine and Georges Bank in the winter.

3. A scattering of apparently unschooled large herring sometimes exists in open ocean waters when schools or large numbers of the fish are not in evidence.



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