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MAINE HERRING EXPLORATIONS AND FISHING GEAR EXPERIMENTS

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SUMMARY

Starting on May 1, 1956, the dragger Metacomet was chartered to continue the field work of the Maine Herring Exploration and Gear Research program started by the Service vessel Theodore N. Gill. The charter continued from May 1 through the spring, summer, and fall of 1956 to October 31.

Exploratory fishing was conducted in the inside waters along the Coast of Maine and in the Gulf of Maine. All areas traversed were sounded with a recording echo-sounder and searched visually for herring. Fishing efforts were made with herring gill nets and a nylon midwater trawl, principally along the eastern part of the coastline from Penobscot Bay to Passamaquoddy Bay and in the eastern part of the Gulf of Maine where there was a scarcity of herring during the entire season.

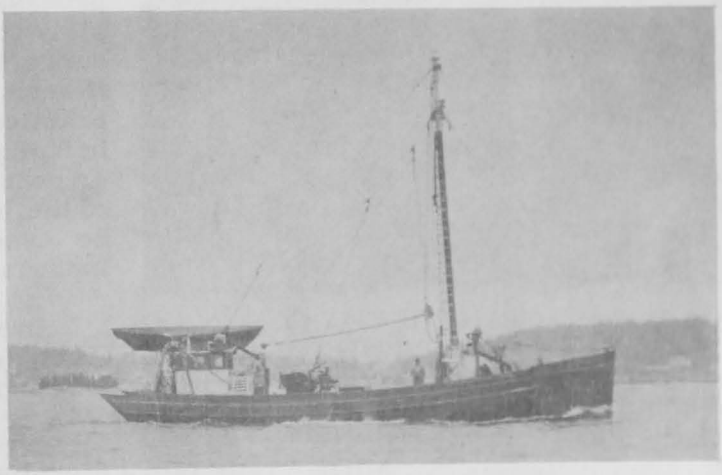

FIG. 1 - THE METACOMET, A GLOUCESTER DRAGGER, WHICH WAS CHARTERED FOR THE 1956 SEASON.

Herring "brit" were found to be present in many of the inside waters of these areas as were sounded and fished with a midwater trawl. A special "brit" survey made in August located schools of young herring in nearly every major inside body of water.

Herring gill-net sets made in June, July, and August, along the eastern part of the coast and in offshore locations in the eastern Gulf of Maine produced only trace catches of herring. The scarcity of sardines in inside waters and the general lack of herring schools found offshore are in agreement with the findings of the industry as reflected in the very poor catches of sardines in this area during the 1956 season.

Fishing gear experiments showed the Barraclough and Johnson midwater trawl to be a useful unit of gear for sampling soundings of herring "brit," but not a dependable method of catching herring or sardines in coastal and Gulf of Maine waters during the sardine season. A smaller midwater trawl patterned after the Barraclough and Johnson trawl but with all measurements cut in half proved as effective as the larger net for sampling soundings of "brit."

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A depth meter was constructed to show the depth of midwater trawls continuously during tows.

Trial sets were made with a modified lampara seine and with a purse seine from the Metacomet using a power block to haul the nets aboard. Results with the lampara were not encouraging. But the method of handling the purse seining showed promise of a successful operation. The method may be of considerable use to the project in succeeding seasons.

BACKGROUND

For many years the Maine sardine industry has been troubled by the erratic occurrence in the usual fishing areas of herring schools suitable for processing into sardines. Early in 1955, the Maine Herring Exploration and Gear Research project and the biological Herring Investigation project were established at the Boothbay Harbor, Me., Research Station of the U. S. Fish and Wildlife Service to assist the sardine industry in solving this problem. Funds for the project were made available through Public Law 466 (The Saltonstall-Kennedy Act).

FIG. 2 - THE CANADIAN-TYPE MIDWATER TRAWL BEING SET FROM THE STERN OF THE METACOMET.

It was believed that unutilized and perhaps unknown schools of the young Atlantic herring (Clupea harengus) that are processed into Maine sardines might possibly occur in the Gulf of Maine waters during the spring, summer, and fall months. If such schools could be located and a practicable method found for catching and bringing the fish to the processor in proper condition for canning, the dependence of the industry upon inshore herring might be lessened and the supply of available fish increased.

In May of 1956, the Metacomet, an East Coast dragger-type vessel of 62 feet overall length, was chartered to continue the herring exploration and gear development work. A series of nine cruises were made between May 1 and October 31, 1956.

MIDWATER TRAWL EXPERIMENTS

Of the nine cruises, four were concerned principally with midwater trawl operations. The midwater trawl was also used during the other cruises for sampling fish schools that were located by echo-sounding. All areas traversed were sounded for herring continuously with a recording-type echo-sounder.

The midwater trawl was patterned after one built by the Fisheries Research Board of Canada (Barraclough and Johnson 1956). This trawl was constructed of nylon with a square opening of 32 feet, and was 170 feet long. The mesh size was graduated in the three body sections from 5-inch to $4\frac{1}{2}$-inch to $3\frac{1}{2}$-inch. Four tapered and two straight cod-end sections were constructed of $1\frac{1}{4}$-inch mesh. After the second cruise, part of the cod end was lined with $\frac{1}{2}$-inch mesh netting so that it could retain approximately 2.5 bushels of small fish.

Work with the trawl had two purposes: (1) to try out a new type of sardine-fishing gear that could be operated in open ocean waters, and (2) to develop a means of sampling at any depth fish that were located with echo-sounding equipment. The period from May 9 to May 19 was devoted to problems of operation. After two trial sets in Casco Bay, the remainder of the cruise was spent searching for schools of herring on which to try the net. Although the coastline and some inside waters of the

Gulf of Maine were sounded at this time, no schools of fish were located on which the net could be set. Two additional trial tows were made, the last one over very small soundings near Race Point, Cape Cod. Only the first trial in Casco Bay took any fish. A small quantity of "brit" (herring under 4 inches total length) was taken in this tow.

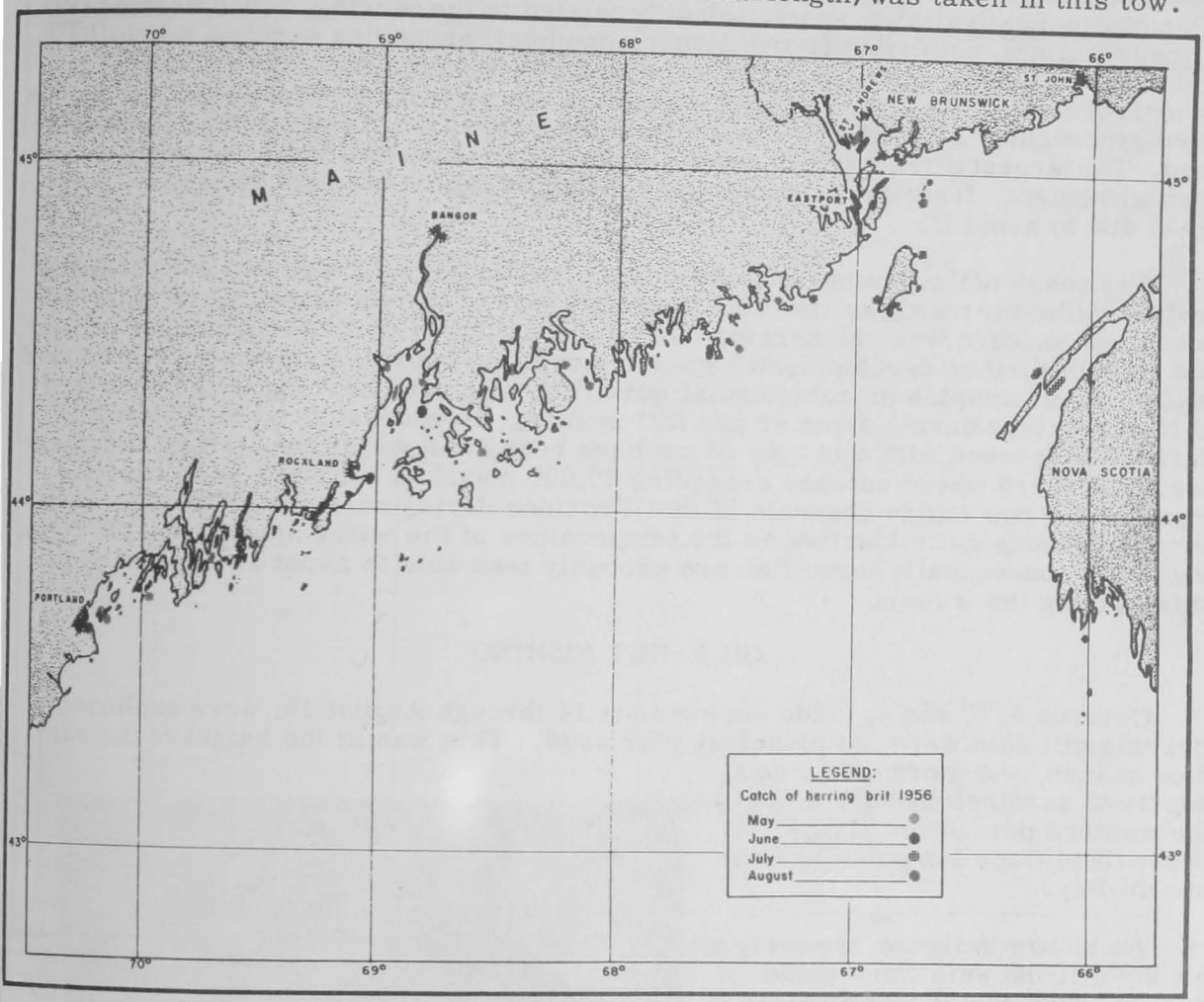

FIG. 3 - POSITIONS OF SOUNDINGS AND CATCHES OF HERRING BRIT, 1956.

Between Cruises 1 and 2, an extra gallows was installed on the Metacomet. This allowed the setting of the trawl from the stern. The trawl could be set and hauled more easily by this method, and since it could be set and hauled while the vessel was moving slowly forward, there was a minimum danger of dragging it on the bottom.

The second cruise (May 30 to June 6) was also spent sounding and fishing with the midwater trawl. Although little time could be spent fishing during this cruise because of heavy fog, 8 tows were made over fish soundings. The first tow in northeast Penobscot Bay caught 29 herring of 5.6 inches average standard length; the other tows took no herring. Small catches of whiting (up to two bushels per tow) were taken on June 5 and 6 where fish were sounded approximately 5 miles southeast of Monhegan Island.

August 20 to August 31 was spent on a survey of the "brit" that might become large enough for canning by the fall months. All inside waters from Portland to Eastport were sounded during this cruise, and fish soundings were sampled with the midwater trawl. As shown in figure 3, small herring were taken at this time in some part of nearly every bay along the coast from Eastport to Portland. By the start of this cruise, the trawl had been developed into a dependable tool for determining whether or not the soundings were of herring "brit." It had not, however, proved to be a dependable method of catching quantities of larger herring.

The period September 5 to 15 was spent sounding for larger schools of mature herring and trying the net on the soundings. During this cruise, fish were sounded and tows made at the Isle of Shoals, Boon Island, on the North, East, and South sides of Cape Cod, and in Narragansett Bay. Small quantities (less than 100 pounds) of bluebacks (Pomolobus aestivalis), a species closely related to the herring, round herring (Etrumeus sadina), butterfish (Poronotus triacanthus), anchovies (Anchoa mitchilli), and whiting (Merluccius bilinearis) were caught. Near the end of the cruise, large schools of fish were sounded in Ipswich Bay. Tows were made through these soundings during the night of September 14-15 with the trawl positioned at the depth of the soundings. The largest catch was 2.5 bushels of bluebacks between 9 and 9.5 inches average standard length. It seemed apparent that the fish were able to detect the approaching trawl and to avoid it.

As a result of the findings of these cruises, particularly Cruise 7, it was concluded that the midwater trawl, as used aboard the Metacomet, would be useful for sampling soundings to learn whether herring "brit" of less than 4 inches length were present. But without further developmental work it would not provide a dependable method of taking either samples or commercial quantities of larger herring in the open Gulf of Maine waters during summer and fall months. It is considered significant that the best successes with this type of net have been achieved in the British Columbia herring fishery where catches exceeding 30,000 pounds a tow have been reported from the narrow inside channels of that Province during cold winter months. The herring become quite inactive as the temperature of the water approaches the freezing point; consequently these fish are probably less able to avoid an approaching trawl during the winter.

GILL-NET FISHING

Cruises 3, 4, and 5, made during June 14 through August 10, were exploratory. Herring gill nets were the principal gear used. This was at the height of the sardine season, and there was a good supply of sardines inshore along the western part of the Maine coast from Cape Porpoise to Penobscot Bay.

As shown in figure 4, nearly all the gill-net sets were made east of Penobscot Bay or offshore.

No schools of herring other than "brit" were located either offshore or inshore. A few small catches were made in various locations as indicated on figure 4. However, in relation to the amount of gear set, these were considered trace catches. In June, the nets were set in the bays and inlets from St. Andrews Bay to North Haven Island. In most cases, they were set blind, i.e., without positive soundings of fish. As shown on the chart, a few herring were taken in scattered locations from Frenchmans Bay to St. Andrews Bay. Negative sets were also made in various locations from North Haven Island to Machias Bay, in many cases close by the positions where the few small catches were taken.

FIG. 4 - GILL NETS BEING HAULED ABOARD THE METACOMET.

The gill-net sets made in July showed the same pattern of catches. In some of the inshore sets, a scattering of sardine-size fish were taken. Offshore sets yielded only 8 herring of 8.7 inches average standard length at Old Proprietor Buoy near

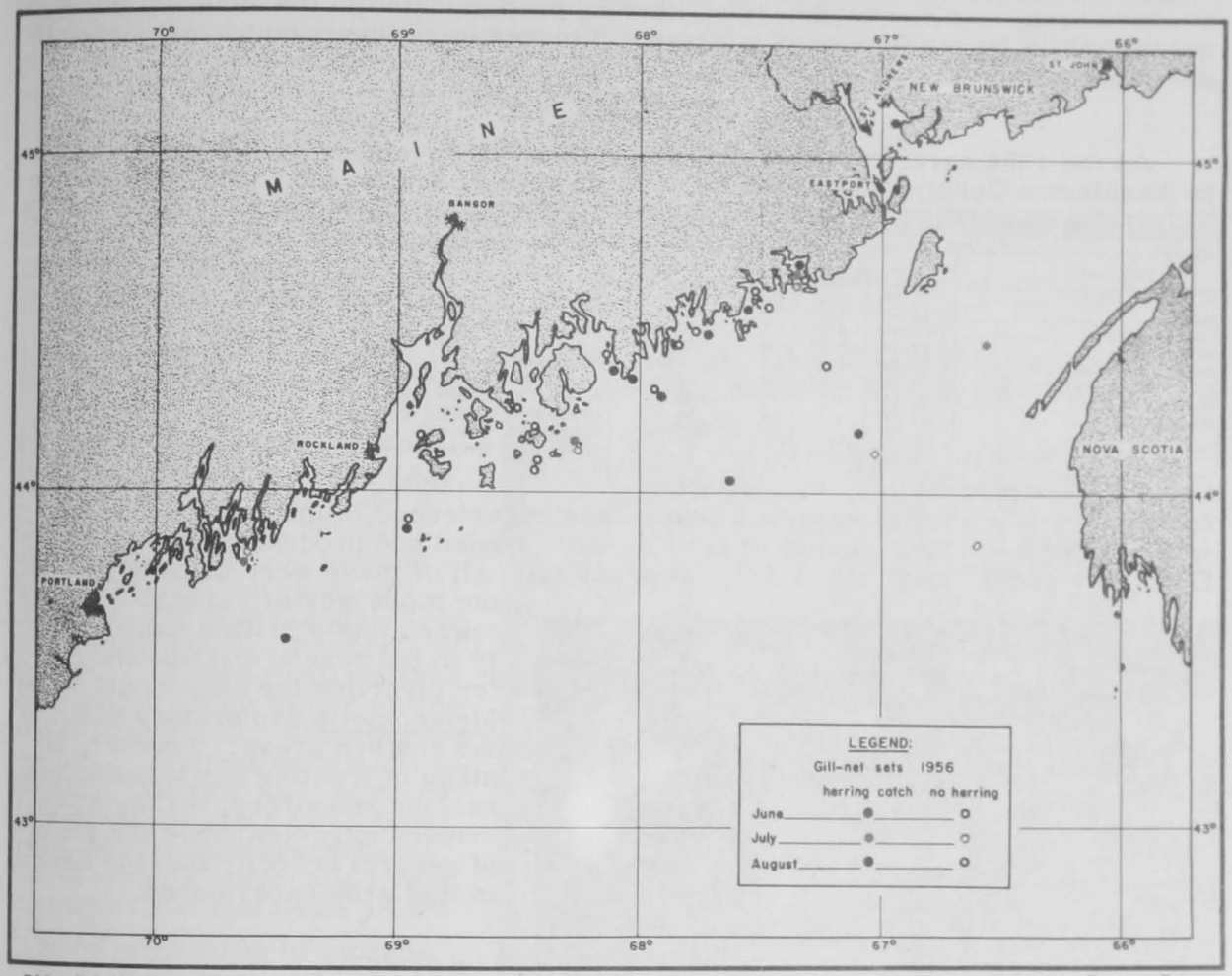

FIG. 5 - GILL-NET SETS MADE BY THE METACOMET DURING JUNE, JULY, AND AUGUST 1956. SMALL "TRACE" CATCHES WERE MADE AT THE POSITIONS INDICATED.

Grand Manan Island, but completely negative results were obtained on Grand Manan Bank and 8 miles northwest of Lurcher Shoal.

In August, the gill nets were set only in open, outside locations. Trace catches were taken in sets on Grand Manan Bank, 25.5 miles southeast of Schoodic Island, $5\frac{1}{4}$ miles southeast Schoodic Island, $3\frac{1}{4}$ miles northwest Matinicus Island, and 13 miles south-southwest Monhegan Island. Negative results were obtained in the sets near Swan's Island and $8\frac{1}{2}$ miles southwest Machias Seal Island.

The same pattern prevailed in gill-net fishing results in all sets made during June, July, and August. Very small catches of herring were made in the eastern coastal and offshore areas. It appears that these catches were made from very small groups of fish or a scattering of individual fish rather than from any large school of fish.

The herring catches in offshore areas were principally larger fish, over 9 inches average standard length and therefore too large for sardines. Fish that averaged less than 9 inches average standard length were taken in only two of the ten small catches which were made in locations considered to be offshore. Fish from these catches measured 8.3 inches and 8.7 inches average standard length and were taken at positions $3\frac{1}{4}$ miles northwest of Matinicus Island and at Old Proprietor Buoy in the mouth of the Bay of Fundy.

Of 8 catches in the inside locations, only one included herring that reached or exceeded 9 inches. The Machias Bay catch was of fish with an average standard length of 9.1 inches. Thus, in the small catches taken in gill nets in the eastern and offshore area, smaller sardine-size herring predominated in the enclosed inside waters, while larger fish measuring over 9 inches were dominant in outside and offshore areas.

DISCUSSION

As the 1956 sardine season came to a close on November 30, the year's catch in Washington County (Statistical Areas 5 through 8, Scattergood 1949) appeared to be one of the poorest in the history of the fishery, while a good to excellent season was experienced in the areas to the westward. Over 56 million pounds of herring were landed and processed in Washington County in 1956 (Anonymous 1956), but practically all of these were brought in from the more western areas. The trend toward this situation was noted early in the season and was the reason for diverting the major part of the Metacomet's exploratory effort to the eastern areas. However, instead of locating any valuable new sardine resources, the Metacomet cruises only confirmed the picture of general scarcity that the fishery in that area experienced.

Table 1 - Average Standard Length of Herring in Gill-Net Catches Taken in Inside Waters Compared to Those Taken in Open Ocean Waters

Inside Areas					Outside Areas				
Location	Date	Avg. Length	No.	Length x No.	Location	Date	Avg. Length	No.	Length x No.
St. Andrews Bay	6-16-56	6.4"	23	147.2	Schoodic Is.	6-28-56	9.1"	6	54.6
Machias Bay	6-19-56	7.5"	19	142.5	Mt. Desert Rock	7-13-56	9.4"	2	18.8
Chandler Bay	6-26-56	8.7"	1	8.7	Mt. Desert Rock	7-13-56	13.4"	3	40.2
Nash Island	6-27-56	8.3"	2	16.6	1 mi. S. Mt. Desert Rock	7-13-56	12.2"	1	12.2
Frenchmans Bay	6-28-56	7.9"	1	7.9	Proprietor Buoy	7-17-56	8.7"	7	60.9
Fisherman Island	7-10-56	8.7"	2	17.4	3½ mi. NW. Matinicus	8-1-56	8.3"	22	182.6
Machias Bay	7-15-56	8.9"	10	89.0	5¼ mi. SW. Schoodic Is.	8-2-56	10.8"	3	32.4
Machias Bay	7-15-56	9.1"	6	54.6	Grand Manan Bank	8-4-56	9.5"	6	57.0
			64	483.1	25½ mi. SE. Schoodic	8-5-56	10.2"	11	111.2
					13 mi. SSW. Monhegan	8-9-56	9.9"	11	108.9
								72	678.8
483.1 ÷ 64 = Average Length = 7.55"					678.8 ÷ 72 = Average Length = 9.45"				

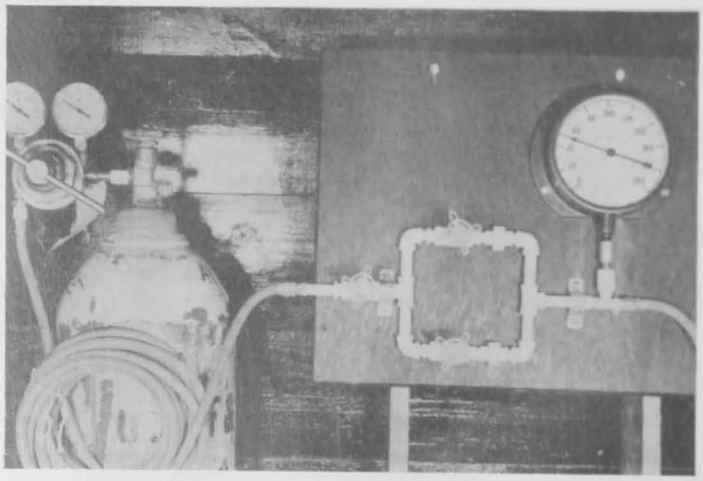

FIG. 6 - AIR SUPPLY AND AIR-PRESSURE GAUGE USED TO SHOW THE DEPTH OF A MIDWATER TRAWL.

Seasons of scarcity in some areas are not new in the sardine and herring fisheries. A decline in spawning activity as presently exists was noted by A. G. Huntsman (1918): "The decline in numbers of spawning herring visiting the Grand Manan Shore has been used as an argument for (a) change in the limits. That there has been such a decline is well established."

It was claimed by some sardine fishermen as early in the fishery as 1896 that a decline in the available supply of sardines was occurring although H. F. Moore (1898) concluded that the decline at that time was limited to the supply of large "stringer" herring.

Bigelow and Schroeder point out that a scarcity of herring in any particular area is not an uncommon occurrence. However, they also show that since the start of the Maine sardine fishery in 1875, Washington County has generally been a top producer of sardines. "The distribution of commercial catches ... shows that herring are far more plentiful from Casco Bay eastward along the coast of Maine, and especially in the Passamaquoddy Bay-Grand Manan region than they are along the western shores of the Gulf on the one hand, or up the Bay of Fundy on the other, or along western Nova Scotia. Thus the landings per unit length of coast averaged 3 times as great for the Passamaquoddy-Grand Manan Region and for the Coast of Maine to Mount Desert, as for the coast sector from Mount Desert past Penobscot

Bay; about 4 times as great as for the Maine Coast as a whole, westward and southward from Penobscot Bay; and 13 times as great as for the Coast of Massachusetts, for the years 1919, 1928, 1929, and 1930" (Bigelow and Schroeder 1953).

It is evident that the 1956 scarcity of herring in Washington County, historically at least, is an anomalous situation; one that has occurred before in various areas, but then has improved in succeeding seasons.

OTHER GEAR TRIALS

Cruise 8 (September 26 to October 12) was devoted to experimentation with three pieces of gear: (1) a modified lampara seine, (2) a half-size (16-foot square opening) midwater trawl, and (3) a depth meter for use in measuring the depth at which midwater trawls are towed.

The lampara seine was patterned after a West Coast tuna bait seine that was used for sampling "brit" during the 1955 season. It differed from the bait seine in the following respects: (1) the wings were of smaller mesh size, 2 inches and 1.5 inches as compared to 4 inches and 3 inches in the original net, (2) it was approximately 50 percent longer than the bait seine, (3) a purse line was added, and (4) less bunt was provided in the center of the net. The latter two changes were made to allow easier setting and partial pursing while hauling the net. Trial sets were made in Boothbay Harbor and on soundings of fish in Casco Bay. However, no herring were caught in the lampara seine, and it was concluded that this seine as set from the Metacomet would probably be of no use in capturing sardines.

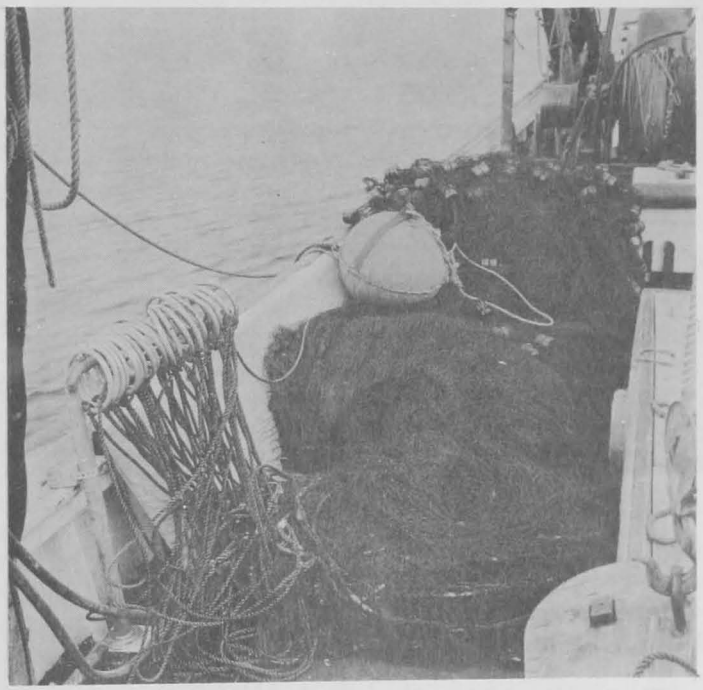

FIG. 7 - PURSE SEINE LYING IN THE NET BIN ON THE METACOMET READY FOR SETTING.

Short trial tows with the small midwater trawl were made in Casco Bay and Penobscot Bay on soundings of fish. The smaller trawl was tried to learn whether or not higher towing speeds that could be attained with it would result in greater catches. As with the larger midwater trawl, the 0-year class "brit" of 2.5 to 4 inches average standard length were easily caught. No catches of larger herring were made. This smaller trawl was, however, as effective as the larger one in taking samples of the smaller fish and was easier to operate. Results of tows with this smaller trawl are listed in the midwater trawl fishing log under Cruise 8.

A depth indicator was devised to show continuously the depth at which the midwater trawl was being towed. An accurate knowledge of the depth of the trawl is necessary when fishing on subsurface schools located by echo-sounding.

Water pressure at the depth of the trawl was used as the indicator of the depth. (Water pressure in standard sea water is 0.44 pounds per square inch per foot of depth.) In order to transmit the water pressure information from the position of the trawl to the deck of the vessel, an air-filled hose of $\frac{3}{16}$-inch inside diameter

was employed and a standard air-pressure gauge used to give the pressure reading. A very small volume of compressed air was added continuously at the top end of the hose and bubbled out the open bottom end into the water to keep the hose clear of water. A series of vertical lowerings on a measured line and towing tests have shown that the depth indicator does give true and accurate readings. A separate report has been written on this device (Smith 1957).

Prior to and during the ninth cruise of the Metacomet, trial sets were made with a purse seine. This was done to obtain information as to whether or not a New England dragger-type vessel could be adapted to purse-seining operations. If this were possible, a vessel of such seaworthy design and of the type which is available in this area might possibly be used in offshore waters of the Gulf of Maine and the North Atlantic Ocean for purse seining herring. The net was set over the port gunwale of the Metacomet from a seine bin constructed alongside the hatch (fig. 7). The purse lines were pulled through blocks on a seine davit to winch heads on the trawl winch, and the seine was hauled aboard with a power block. Although only a short period of time could be spent investigating this method, results were quite encouraging. The seine was set smoothly over the port gunwale in all trials. Due to the turning of the vessel, the seine pulled out away from the stern while setting and there was no tendency of the seine to be drawn into the propellor. Some difficulty was experienced while pursing. The bow of the vessel sometimes drifted into the seine and the purse line fouled in the web of the net. However, after several trial sets, these problems were largely overcome, and one smooth set was made without any trouble with fouling of lines.

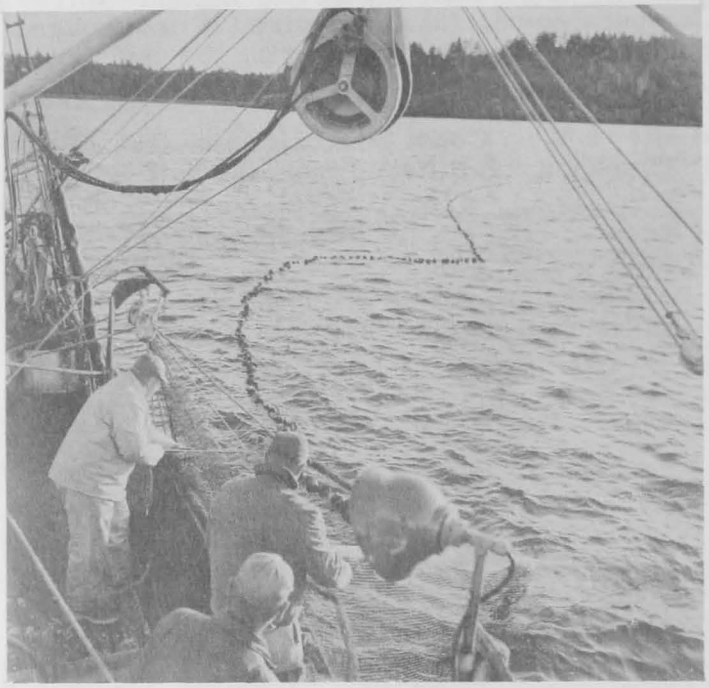

FIG. 8 - CLOSING PURSE SEINE ABOARD THE METACOMET.

The method of purse seining was not worked out early enough in the 1956 season to be of great value to the project during that particular season; however, it is expected that the techniques devised may be of considerable value to the project in future work. Indications are that this method can be used successfully on a properly-equipped dragger if sufficient trial sets are made to work out the problems encountered.

See pages 9-12 for table 2; pages 13-14 for table 3.

Table 2 - Fishing Log--M/V Metacomet Midwater-Trawl Tows, 1956

Cruise No.	Date	Gear	Tow No.	Position at Start			Time Started	Time Finished	Time Towed (Hrs.)	Soundings		Herring Catch	Avg. Std Length	Tide Stage Start	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference				Min. Depth of Fish (Ft.)	Max. Depth of Fish (Ft.)				
1	5-9-56	1/ 32' Trawl	1	43°-45.2'	70°-2.8'	Middle Bay - Casco Bay	1520	1540	00:20	18	80	1/3 bu. herring 2/3/	1.4"	.8E	-
	5-10-56	32' Trawl	2	43°-40.8'	70°-7.9'	Lukse Sound, Casco Bay	1325	1340	00:15	20	40	0	-	.7E	-
	5-12-56	32' Trawl	3	44°-19.2'	68°-56.7'	½ mi. SE Gt. Spruce Hd. Pnbst. Bay	1625	1705	00:40	20	50	0	-	.8E	-
	5-17-56	32' Trawl	4	420-3.7'	70°-16.0'	Race Pt., Cape Cod	1345	1420	00:45	15	45	0	-	.8F	-
2	5-31-56	32' Trawl	1	43°-50.5'	68°-48.0'	Wooden Ball Island	1610	1645	00:35	20	35	0	-	Hi	7.8°
	6-1-56	32' Trawl	2	44°-15.5'	68°-53.2'	N.E. Penobscot Bay	1400	1515	01:15	25	35	29 herring	5.6"	.6F	11.2°
	6-3-56	32' Trawl	3	44°-13.5'	68°-24.0'	Entrance Bluehill Bay	1015	1045	00:30	100	120	0	-	.7E	8.5°
	6-4-56	32' Trawl	4	44°-12.5'	68°-23.0'	Entrance Bluehill Bay	1815	1840	00:25	25	50	0	-	.9F	8.3°
	6-5-56	32' Trawl	5	43°-43.0'	69°-10.0'	5 mi. SE Monhegan Island	2210	2215	00:05	15	65	0	-	.3E	9.1°
	6-5-56	32' Trawl	6	43°-43.0'	69°-10.0'	5 mi. SE Monhegan Island	2300	2400	01:00	15	65	0	-	.5E	9.2°
	6-6-56	32' Trawl	7	43°-43.0'	69°-10.0'	5 mi. SE Monhegan Island	0045	0055	00:10	15	65	0	-	.7E	9.2°
	6-6-56	32' Trawl	8	43°-47.2'	69°-38.5'	Cuckolds Light	1055	1115	00:20	10	55	0	-	.4E	11.3°
3	6-16-56	32' Trawl	1	45°-4.1'	66°-57.9'	St. Andrews Bay	0945	1045	01:00	10	40	0	-	.7E	11.5°
	6-17-56	32' Trawl	2	45°-5.2'	66°-58.5'	St. Andrews Bay	0900	1000	01:00	0	75	1/5 bu. herring	4.0"	.4E	11.0°
	6-18-56	32' Trawl	3	44°-59.0'	66°-53.1'	E. Quoddy Head	1045	1120	00:35	15	45	¼ bu. herring	2-2.5"	.6E	8.0°
	6-19-56	32' Trawl	4	44°-38.1'	66°-50.3'	Seal Cove, Grand Manan	0900	0915	00:15	10	35	¼ bu. herring	2-2-5"	.1E	7.2°
	6-20-56	32' Trawl	5	44°-36'	67°-21'	Center Machias Bay	0515	0545	00:30	15	40	10 herring	2.1"	.7F	7.0°
	6-25-56	32' Trawl	6	44°-7.2'	69°-2.5'	2.8 mi. E. Rockland	1800	1822	00:22	15	35	30 herring	2.0"	.9E	15.0°
	6-27-56	32' Trawl	7	44°-29'	67°-38.5'	Western Bay, Ram Island	1213	1237	00:24	0	60	200 herring	2.2"	.8F	10.3°
	6-29-56	32' Trawl	8	43°-57.7'	68°-35.6'	3 mi. S. Isle Au Haute	0925	0950	00:25	15	55	0	-	.1F	10.3°

NOTE: FOR EXPLANATION OF FOOTNOTES SEE P. 12.

Table 2 - Fishing Log--M/V Metacomet Midwater-Trawl Tows, 1956 (Contd.)

Cruise No.	Date	Gear	Tow No.	Position at Start			Time Started	Time Finished	Time Towed (Hrs.)	Soundings		Herring Catch	Avg. Std. Length	Tide Stage Start	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference				Min. Depth of Fish (Ft.)	Max. Depth of Fish (Ft.)				
4	7-12-56	32' Trawl	1	43°-40.3'	70°-2.5'	1 mi. N. Halfway Rk., Casco Bay	0405	0445	00:40	15	28	0	-	.4E	14.0°
	7-18-56	32' Trawl	2	44°-22.9'	66°-9.8'	2 mi. E. Petit Psg. St. Mary Bay	1255	1337	00:42	15	100	2 herring	2.5"	.9E	14.8°
	7-18-56	32' Trawl	3	44°-21.7'	66°-12.5'	So. End Petit Psg., St. Mary Bay	2215	2255	00:40	25	50	2 bu. herring	4.6"	.4E	13.5°
	7-18-56	32' Trawl	4	44°-21.7'	66°-12.5'	So. End Petit Psg., St. Mary Bay	2330	2400	00:30	15	60	1 bu. herring	2.6"	.6E	14.1°
	7-19-56	32' Trawl	5	44°-21.7'	66°-12.5'	So. End Petit Psg., St. Mary Bay	0030	0100	00:30	0	65	12 herring	4.7"	.6E	13.4°
	7-19-56	32' Trawl	6	44°-21.7'	66°-12.5'	So. End Petit Psg., St. Mary Bay	0135	0245	01:10	0	65	100 herring	4.7"	.8E	13.2°
	7-20-56	32' Trawl	7	43°-48.4'	69°-30.9'	1½ mi. S. Pemaquid Point	2130	2140	00:10	0	40	0	-	Low	-
5	8-7-56	32' Trawl	1	44°-01'	68°-30.5'	5 mi. S. Marshall Island	0855	0945	00:50	15	35	0	-	.7F	12.0°
	8-8-56	32' Trawl	2	44°-16.9'	68°-28.2'	Tinker Is. Bluehill Bay	1040	1143	01:03	5	60	½ bu. herring	3.2"	.2F	12.5°
	8-8-56	32' Trawl	3	44°-18.1'	68°-47.1'	Spectacle Is. Penobscot Bay	1830	1900	00:30	0	50	½ bu. herring	2.6"	Low	14.1°
	8-9-56	32' Trawl	4	44°-22.7'	68°-55.9'	NE End Long Is. Penobscot Bay	1100	1130	00:30	0	120	¼ bu. herring	3.0"	.3F	13.7°
6	8-21-56	32' Trawl	1	45°-8.2'	67°-8.2'	1½ mi. upstream St. Croix Is.	1317	1323	00:06	0	45	146 herring	4.7"	.4E	14.0°
	8-21-56	32' Trawl	2	45°-3.8'	66°-55.8'	Off Letite Psg. Passamaquoddy Bay	1509	1523	00:14	0	80	⅔ bu. herring	2.18"	.7E	14.0°
	8-21-56	32' Trawl	3	44°-53.6'	67°-1.1'	Channel between Shackelford Hd. and Sewards Neck	1737	1815	00:38	0	50	⅔ bu. herring	2.8"	.1F	12.0°
	8-22-56	32' Trawl	4	45°-1.8'	66°-52.5'	Off Mascabin Pt. Light, Deer Is.	1230	1250	00:20	0	20	⅔ bu. herring	2.7"	.2E	11.0°
	8-22-56	32' Trawl	5	44°-55.9'	66°-42.8'	¼ mi. South of Wolves Is.	1545	1550	00:05	0	50	⅔ bu. herring	2.3"	.7E	12.0°
	8-22-56	32' Trawl	6	44°-52.7'	66°-30.2'	10 mi. SE of Wolves Is.	1715	1730	00:15	0	30	0	-	.9E	12.5°
	8-23-56	32' Trawl	7	44°-43.7'	65°-47'	2 mi. NW Digby Gut Bay of Fundy	0915	0930	00:15	0	80	⅔ bu. herring	2.4"	.5F	11.0°
	8-24-56	32' Trawl	8	44°-47.5'	66°-45'	North Head Bay Grand Manan Is.	1000	1015	00:15	0	100	2 bu. herring	2.9"	.6F	12.0°
	8-24-56	32' Trawl	9	44°-38'	66°-54.5'	Bradfords Cove Grand Manan Is.	1250	1310	00:20	0	50	2.5 bu. herring	3.0"	Low	10.0°
	8-25-56	32' Trawl	10	44°-38.8'	67°-10.4'	Mouth Cutler Bay	0632	0645	00:13	0	50	61 herring	2.7"	.9E	10.0°
	8-25-56	32' Trawl	11	44°-37'	67°-20.8'	Machias Bay	0833	0915	00:42	0	75	⅓ bu. herring	3.0"	.2F	11.5°
	8-25-56	32' Trawl	12	44°-31'	67°-30'	1 mi. off Black Hd., Head Hbr. Is.	1150	1205	00:15	0	65	1 bu. herring	3.1"	.8F	12.0°

NOTE: FOR EXPLANATION OF FOOTNOTES SEE P. 12.

Table 2 - Fishing Log--M/V Metacomet Midwater-Trawl Tows, 1956 (Contd.).

Cruise No.	Date	Gear	Tow No.	Position at Start			Time Started	Time Finished	Time Towed (Hrs.)	Soundings		Herring Catch	Avg. Std. Length	Tide Stage Start	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference				Min. Depth of Fish (Ft.)	Max. Depth of Fish (Ft.)				
6 (cont.)	8-26-56	32' Trawl	13	44°-26.5'	68°-15'	Sunken Ledge Buoy Eastern Bay	0942	0953	00:11	0	30	⅔ bu. herring	2.9"	.3F	13.9°
	8-26-56	32' Trawl	14	44°-23'	68°-7.5'	SE Shore Iron Bound Is. Fr'man Bay	1300	1321	00:21	0	60	1 bu. herring	3.2"	.9F	13.0°
	8-26-56	32' Trawl	15	44°-23'	68°-27.1'	Highhead Union River	1908	1916	00:08	25	80	2 bu. herring	2.8"	.8F	16.0°
	8-27-56	32' Trawl	16	44°-8.1'	68°-32.0'	Halibut Rocks, Jerico Bay	0940	0952	00:12	0	40	0	-	.2F	14.5°
	8-27-56	32' Trawl	17	44°-22.5'	68°-50.0'	Off Castine, Penobscot Bay	1400	1420	00:20	80	125	0	-	.9F	12.0°
	8-29-56	32' Trawl	18	43°-48.5'	69°-34.8'	Mouth Damariscotta River	0813	0830	00:17	40	90	0	-	.7E	14.5°
	8-29-56	32' Trawl	19	43°-54.2'	69°-34.5'	Plummer Pt. Damariscotta River	0945	1005	00:20	25	65	3 herring	4.5"	.9E	16.0°
	8-29-56	32' Trawl	20	43°-50.2'	69°-41.6'	Off Ebenecook Hbr. Sheepscot River	1155	1205	00:10	0	50	3 bu. herring	3.1"	.3F	12.0°
	8-29-56	32' Trawl	21	43°-52.5'	69°-41.6'	Lower Tip Barters Is.	1258	1308	00:10	15	90	⅔ bu. herring	2.6"	.6F	12.2°
	8-29-56	32' Trawl	22	43°-46.4'	69°-53.5'	Mouth New Meadows R. Casco Bay	1540	1600	00:20	0	40	2⅓ bu. herring	5.3"	.9F	16.3°
	8-29-56	32' Trawl	23	43°-42.9'	70°-1.0'	Western Shore Bailey Is. Casco Bay	1758	1822	00:24	0	50	0	-	.2E	16.5°
	8-30-56	32' Trawl	24	43°-39.8'	70°-10'	Ent. Hussey Sound, Casco Bay	0640	0655	00:15	15	50	1½ bu. herring	3.6"	.3E	13.5°
7	9-5-56	32' Trawl	1	43°-07.6'	70°-25.6'	½ mi. W. Boon Is. Ledge	2100	2115	00:15	25	85	(⅓ bu. bluebacks)[1]	(9.0")	.7F	19.5°
	9-5-56	32' Trawl	2	42°-58.5'	70°-38.5'	0.6 mi. W. Lunging Is.	0030	0045	00:15	25	45	(⅓ bu. bluebacks)	(9.0")	.2E	18.2°
	9-10-56	32' Trawl	3	40°-20'	70°-56'	4.4 mi. W. Gay Hd. Marthas Vnyd.	2000	2010	00:10	20	40	(30 round herring)	(6.5")	.9E	19.0°
	9-11-56	32' Trawl	4	41°-38'	71°-18.7'	Narraganset Bay	0030	0045	00:15	20	55	2 herring	6.0"	.7F	19.7°
	9-12-56	32' Trawl	5	41°-42.1'	69°-50.0'	Chatham Buoy, Cape Cod	0115	0125	00:10	25	85	3 herring	8.4"	.5F	16.3°
	9-13-56	32' Trawl	6	42°-42.1'	70°-39.3'	½ mi. E. Eastern Pt. Gloucester Hbr.	0540	0630	00:50	30	80	0	-	Hi	15.8°
	9-13-56	32' Trawl	7	42°-49.8'	70°-46.7'	1½ mi. E. Merrimac R. Ipswich Bay	1940	2040	01:00	25	85	(2½ bu. bluebacks)	(9-9½")	Low	16.9°
	9-13-56	32' Trawl	8	42°-49.2'	70°-45.5'	2½ mi. E. Merrimac R. Ipswich Bay	2130	2150	00:20	20	90	0	-	.5E	16.9°

NOTE: FOR EXPLANATION OF FOOTNOTES ON P. 12.

Table 2 - Fishing Log--M/V Metacomet Midwater-Trawl Tows, 1956 (Contd.)

Cruise No.	Date	Gear	Tow No.	Position at Start			Time Started	Time Finished	Time Towed (Hrs.)	Soundings		Herring Catch	Avg. Std. Length	Tide Stage Start	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference				Min. Depth of Fish (Ft.)	Max. Depth of Fish (Ft.)				
8	9-27-56	32' Trawl	1	43°-42.4'	70°-9.9'	Off Little Chebeague Is. Casco B.	1030	1041	00:11	25	50	43 herring	3.6"	.5F	11.8°
	9-27-56	32' Trawl	2	43°-39.5'	70°-9.7'	Mouth Hussey Sound, Casco Bay	1115	1125	00:10	25	75	23 herring	3.6"	.6F	11.8°
	10-4-56	16' Trawl	3	43°-42.4'	70°-9.9'	Little Chebeague Is. Casco Bay	0645	0705	00:20	20	60	½ bu. herring	3.4"	.4F	-
	10-4-56	16' Trawl	4	43°-42.4'	70°-9.9'	Little Chebeague Is. Casco Bay	0735	0755	00:20	15	50	1 bu. herring	3.4"	.5F	-
	10-4-56	16' Trawl	5	43°-44.9'	70°-4.0'	Little Whale Boat Ledge Broad Bay	1105	1120	00:15	25	75	¼ bu. herring	3.8"	Low	-
	10-4-56	16' Trawl	6	43°-42.9'	70°-1.3'	Haskell Island, Casco Bay	1205	1208	00:03	25	60	0	-	.3E	-
	10-4-56	16' Trawl	7	43°-39.5'	70°-9.7'	Mouth Hussey Sound Casco Bay	1400	1416	00:16	25	80	¾ bu. herring	4.0"	.5E	-
	10-11-56	16' Trawl	8	44°-19.4'	68°-57.1'	Gt. Spruce Hd. Penobscot Bay	1030	1130	01:00	50	125	150 herring	3.5"	Hi	-
	10-11-56	16' Trawl	9	44°-19.4'	68°-57.1'	Gt. Spruce Hd. Penobscot Bay	1230	1350	01:20	50	125	¾ bu. herring	3.2"	.4F	-
	10-11-56	16' Trawl	10	44°-20.2'	68°-50.7'	E. Long Island Penobscot Bay	1510	1550	00:40	50	90	1 bu. herring	2.7"	.8F	10.6°
	10-11-56	16' Trawl	11	44°-7.6'	68°-59.5'	Between Rockland & No. Haven Is.	1725	1745	00:20	20	110	3 bu. herring	3.3"	.2E	-
	10-12-56	16' Trawl	12	44°-7.6'	68°-59.5'	Between Rockland & No. Haven Is.	0830	0845	00:15	25	50	8½ lbs. herring	3.4"	.6E	-
9	10-25-56	16' Trawl	1	45°-5.9'	66°-57.9'	Center Passamaquoddy Bay	1055	1115	00:20	0	210	½ bu. herring	2.7"	.5F	9.7°

1/ THE 32' TRAWL HAS A 32' SQUARE OPENING AT ITS MOUTH. THE 16' TRAWL HAS A 16' SQUARE OPENING.
2/ MIDWATER TRAWL CATCHES OF BRIT WERE SMALL AND CAN BE CONSIDERED ONLY AS A SAMPLE OF THE FISH SOUNDED SINCE THESE FISH WERE SO SMALL AS TO PASS THROUGH THE MESHES EXCEPT AT THE REAR OF THE COD END WHERE THE NET WAS GATHERED AND KNOTTED. AFTER CRUISE 2 A SMALL MESH LINER WAS PUT IN PART OF THE COD END TO HOLD MORE FISH. THIS, HOWEVER, WAS DESIGNED TO RETAIN ONLY A SMALL SAMPLE OF BRIT.
3/ 1 BUSHEL OF HERRING WEIGHS APPROXIMATELY 70 POUNDS.
4/ CATCHES OF FISH CLOSELY RELATED TO HERRING ARE ALSO LISTED FOR CRUISE 7 SINCE IT WAS THE PURPOSE OF THIS CRUISE TO TRY THE TRAWL ON HERRING AND "HERRINGLIKE" FISH. THE CATCHES OF CLOSELY-RELATED SPECIES ARE ENCLOSED IN PARENTHESIS.

Table 3 - Fishing Log--M/V Metacomet Gill-Net Sets, 1956

Cruise No.	Date	Gear Length	Set No.	Set Location			Time Started	Time Fished (Hrs.)	Tide Stage Start	Herring Catch	Avg. Std. Length	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference						
3	6-16-56	50 fathoms surface set	1	45°-4.8'	66°-58'	St. Andrews Bay	2235	11:40	.8E	3 herring 1/	6.4"	10°
		50 fathoms bottom	2	45°-4.9'	66°-55.5'	St. Andrews Bay	2235	11:40	.8E	20 herring	6.4"	10°
	6-18-56	50 fathoms surface set	3	44°-38.6'	66°-48.6'	Red Head, Grand Manan Is.	2030	9:30	.1E	0	-	7.5°
		50 fathoms bottom	4	44°-38.6'	66°-48.6'	Red Head, Grand Manan Is.	2030	9:30	.1E	0	-	7.5°
	6-19-56	50 fathoms surface set	5	44°-39.2'	67°-20'	Upper Machias Bay	2330	6:00	.5E	0	-	8.0°
		50 fathoms bottom	6	44°-39.2'	67°-20'	Upper Machias Bay	2330	10:00	.5E	19 herring	7.5"	8.0°
	6-20-56	100 fathoms surface set	7	44°-34.5'	67°-31.7'	Shorey Cove, Roque Is.	1800	14:00	.5F	0	-	10.0°
	6-21-56	50 fathoms surface set	8	44°-11.7'	67°-27.2'	Black Island	2000	8:35	.7F	0	-	10.0°
		50 fathoms surface set	9	44°-15.3'	68°-31.0'	W. Side Flye Is.	2000	8:35	.7F	0	-	10.0°
	6-25-56	37 fathoms bottom	10	44°-7.5'	68°-56.2'	Wooster Cove, N. Haven Is.	1950	12:15	.2F	0	-	11.5°
		50 fathoms bottom	11	44°-8.3'	68°-55.9'	Bartlett Harbor	2007	10:53	.3F	0	-	11.0°
		50 fathoms bottom	12	44°-9.1'	68°-55.7'	1 mi. NNE Bartlett Hbr.	2022	11:23	.3F	0	-	11.0°
	6-26-56	43 fathoms bottom	13	44°-29.1'	67°-34.4'	Mud Hole Pt. Gt. Wass Is.	1818	05:15	.9E	0	-	9.0°
		50 fathoms bottom	14	44°-31.9'	67°-32.4'	Mark Is., Chandler Bay	1909	10:21	Hi	1 herring	8.7"	8.3°
		50 fathoms bottom	15	44°-34.6'	67°-28.1'	Halifax Is., Englishmans Bay	1940	09:35	.1F	0	-	8.0°
	6-27-56	50 fathoms bottom	16	44°-26.2'	67°-51.2'	E. Shore Bois Bubert Is.	1834	17:59	.8E	0	-	10.3°
		50 fathoms bottom	17	44°-28.0'	67°-44.8'	Northern Pt. Nash Is.	1918	16:06	.9E	2 herring	8.3"	9.0°
		50 fathoms bottom	18	44°-29.1'	67°-47.5'	Flint Is. Narrows	1945	14:57	Hi	-	-	10.5°
	6-28-56	50 fathoms bottom	19	44°-20.2'	68°-1.7'	Schoodic Island	1433	15:12	Lo	6 herring	9.1"	9.8°
		50 fathoms bottom	20	44°-21.9'	68°-6.3'	Turtle Is., Frenchmans Bay	1535	13:08	.2E	1 herring	7.9"	11.0°
		50 fathoms bottom	21	44°-24.4'	68°-8.2'	Iron Bound Is., Frenchmans Bay	1600	11:45	.3E	-	-	11.0°
4	7-10-56	50 fathoms bottom	1	43°-48.1'	69°-35.6'	New Point, Fishermans Is.	1900	12:50	Hi	2 herring	8.7"	14.0°
		50 fathoms bottom	2	43°-49.2'	69°-34.9'	Ocean Point Buoy	1915	13:05	.1F	0	-	14.0°
		25 fathoms bottom	3	43°-49.6'	69°-35.9'	NW Shore Linekin Neck	1935	11:45	.2F	0	-	14.5°

NOTE: FOR EXPLANATION OF FOOTNOTE SEE P. 14.

Table 3 - Fishing Log--M/V Metacomet Gill-Net Sets, 1956 (Contd.)

Cruise No.	Date	Gear Length	Set No.	Set Location			Time Started	Time Fished (Hrs.)	Tide Stage Start	Herring Catch	Avg. Std. Length	Surface Temp. (Centigrade)
				Lat. N.	Long. W.	Geographical Reference						
4 (cont.)	7-13-56	50 fathoms bottom	4	43°-58.1'	68°-7.9'	W. Shore, Mt. Desert Rock	1915	13:00	.7E	2 herring	9.4"	10.0°
		50 fathoms bottom	5	43°-57.7'	68°-7.8'	Shoal SE Mt. Desert Rock	1930	10:20	.7E	3 herring	13.4"	11.0°
		50 fathoms bottom	6	43°-57.4'	68°-7.7'	0.7 mi. S Mt. Desert Rock	1954	11:56	.8E	1 herring	12.2"	10.7°
		50 fathoms surface set	7	44°-0.2'	68°-7.6'	2½ mi. NNE Mt. Desert Rock	Lost in storm					
		50 fathoms surface set	8	43°-56.8'	68°-8.8'	1½ mi. SSW Mt. Desert Rock	Lost in storm					
	7-15-56	50 fathoms bottom set	9	44°-37.2'	67°-22'	Howard Cove, Machias Bay	2133	08:27	.7E	10 herring	8.9"	11.0°
		50 fathoms bottom	10	44°-37.7'	67°-21.8'	Jasper Head, Machias Bay	2150	07:30	.8E	0	-	9.8°
		50 fathoms bottom	11	44°-38.5'	67°-21.5'	Yellow Head Is., Machias Bay	2210	05:50	.8E	6 herring	9.1"	11.0°
	7-16-56	150 fathoms surface drift	12	44°-7'	67°-1'	Grand Manan Bank	2300	09:00	.8E	0	-	10.5°
	7-17-56	250 fathoms surface drift	13	44°-32'	66°-36'	Proprietor Buoy Grand Manan Is.	2000	11:30	.2E	8 herring	8.7"	9.0°
	7-19-56	250 fathoms surface drift	14	43°-51'	66°-36'	8 mi. NW Lurcher Shoal	2040	08:20	Lo	0	-	10.0°
5	8-1-56	150 fathoms bottom	1	43°-54.8'	68°-56.8'	3½ mi. NW Matinicus Is.	1730	10:00	.9F	0	-	14.0°
		2/100 fathoms surface-2 fm.-drift	2	43°-54.8'	68°-56.8'	3½ mi. NW Matinicus Is.	1830	10:45	.9F	22 herring	8.3"	14.0°
	8-2-56	100 fathoms surface-2 fm.-set	3	44°-18'	66°-55'	5¼ mi. SW Schoodic Is.	1935	11:25	.1E	3 herring	10.0"	11.5°
		150 fathoms bottom	4	44°-18'	66°-55'	5¼ mi. SW Schoodic Is.	2000	12:15	.2E	0	-	11.5°
	8-3-56	250 fathoms surface-2 fm.-drift	5	44°-23.1'	67°-14'	8⅜ mi. SW Machias Seal Is.	1940	11:05	.8F	0	-	10.0°
	8-4-56	250 fathoms surface-2 fm.-drift	6	44°-10.8'	67°-5.2'	Grand Manan Bank	1910	10:40	.7F	6 herring	9.5"	10.0°
	8-5-56	250 fathoms surface-2 fm.-drift	7	44°-1.8'	67°-37.2'	25.5 mi. SE Schoodic Is.	1910	11:27	.7F	11 herring	10.2"	17.0°
	8-6-56	100 fathoms surface set	8	44°-4.4'	68°-26.2'	2⅜ mi. S Swan Is.	1935	16:40	.5F	0	-	12.0°
		150 fathoms bottom	9	44°-4.4'	68°-26.2'	2⅜ mi. S Swan Is.	1935	16:40	.5F	0	-	12.0°
	8-9-56	250 fathoms surface-2 fm.-drift	10	43°-33.6'	69°-27.2'	13 mi. SSW Monhegan Is.	1930	10:45	Hi	11	9.9"	16.3°

1/ CATCHES OF FISH OTHER THAN HERRING ARE OMITTED EXCEPT WHERE NOTED.
2/ GILL-NET SETS MARKED "SURFACE-2 FM." WERE SUSPENDED FROM BUOYS TWO FATHOMS BELOW THE SURFACE.

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PROMOTIONAL IDEAS URGED

American housewives are ready to accept fish for added uses in home menu-planning if the product is packaged and merchandized to increase their interest, an Arkansas leader in the industry said in a statement to the National Fisheries Institute at its 12th Annual Convention.

"The opportunities are there, but it's all too easy to say, 'Well, it won't work' or 'maybe they can do it in your city but o u r s is different market,'" he stated.

He urged more original promotions, such as a Lenten one in Little Rock in which frozen fish sticks, breaded shrimp, and other fish products were displayed in a supermarket in a 12-foot row boat also containing macaroni and spaghetti items related to Lent.

Other successful ideas, he said, have included Thursday and Friday "saturation" spot announcements on local radio, $2\frac{1}{2}$-pound family-size layer-packed boxes of breaded shrimp, coupon or straight nickel-discount promotions in stores, local participation in National Fish Week, cooperation with various food-freezer plans, furnishing products to home demonstration programs on local TV, providing menu clip-ons and back-bar material for restaurants, and selling breaded fish fillets and similar items to frozen-dessert stands and roadside restaurants for use in fish sandwiches.