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Preliminary report on the distribution, catches, and sizes of age I herring in the Gulf of Maine, Georges Bank, and Nantucket Shoals during the spring of 1976

by

Clarence W. Davis and Thomas L. Morris
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, Massachusetts 02543 USA

Introduction

Information on young herring just prior to and during metamorphosis from larvae to fry is of particular interest as a possible stage at which to estimate their recruitment potential. Two cruises, R/V *WIECZNO* 76-01 and *ALBATROSS IV* 76-03, in the spring of 1976 provided data from which a preliminary summary of the distribution, catches, and sizes of age I herring is presented. Results from a 1975 May cruise (Davis, 1975) allow some comparisons between years. Catches of age I herring in 1975 at night with a Neuston net led to the choice of this gear as a primary sampling device in 1976.

Methods

Only Neuston tows are considered in this preliminary report. All tows were made during hours of darkness except for one haul at dusk on *WIECZNO* and 4 hauls on *ALBATROSS IV* during dawn or dusk (Tables 1 and 2). A 1 x 2 m rectangular net of .505 mm mesh was used and all tows were of approximately 10-minute duration with the net frame half submerged in the surface waters whenever possible.

R/V *WIECZNO* coverage included primarily Georges Bank and Nantucket Shoals from 9 April to 4 May (Figure 1); R/V *ALBATROSS IV* sampling was mostly over depths greater than 200 m in the Gulf of Maine and adjacent to the northern edge of Georges Bank (Figure 2).

Length measurements were made after preservation in 4% formalin as standard length to the nearest mm. Since larval herring shrink about 10% when preserved in this formula (Blaxter, 1971; Davis, unpublished MS), the L-F distributions reported by Davis (1975) have been recalculated from preserved fish for comparison with the 1976 data.

Results

WIECZNO Cruise 76-01 (9 April - 4 May)

Nineteen out of 70 night tows captured herring; the largest single catch of 557 fish was made slightly southeast of the central part of Georges Bank (Figure 1). Most of the other large catches were in the central and eastern parts of the Bank. Only one tow west of the Great South Channel produced any larvae. Another isolated catch of 23 larvae occurred northeast of Cape Cod in the open Gulf of Maine.

Standard length in April ranged from 31 to 49 mm with a single mode at 40 mm (Figure 4). The majority of individual L-F distributions conformed to the pattern for that of the total cruise. Notable exceptions occurred at Station 30 off Cape Cod where the mode was 37 mm and Station 381 on east central Georges Bank had two modes at 37 and 40 mm.

ALBATROSS IV Cruise 76-03 (11-21 May)

Thirty-one out of 41 stations had herring catches of from 1-107 individuals per tow (Figure 2). Catches were most consistent in the central Gulf of Maine but at least one station produced positive results during each of the 10 nights of sampling. The stations near Cape Cod and those adjacent to Georges Bank generally had few or no herring.

Sizes of preserved herring ranged from 30 to 50 mm standard length with a slight mode at 33 mm and larger modes at 40 and 43 mm (Figure 3). The recalculated 1975 L-F distribution also obtained during May had a lower range (24-46 mm) with modes at 36 and 40 mm.

A single visual observation, quite confidently identified as age I herring, was made during daylight at 43^{0} 32' N Latitude and 67^{0} 06' W Longitude about 30 miles Southwest of Lurcher Shoal on 16 May. The herring were 1-2 meters below the water surface and continually swimming in a loose school for perhaps 10 minutes past the stationary vessel. They appeared to be swimming at a steady speed in a northerly direction.

Discussion

Although the occurrence of late-stage larval herring and fry (age I) has been well documented in the coastal waters of the Gulf of Maine (Davis and Graham, 1970; Das, 1968), there are little data on their distribution and abundance in the open waters of this region. Colton and St. Onge (1974) and Boyar, et al. (1973) show a limited distribution of age I herring in the open Gulf during April and May but mostly in waters less than about 100 meters. Their several years of fragmentary data are insufficient to draw any firm conclusions about the comparable abundance of these fish between the open Gulf and Georges Bank.

Because *ALBATROSS IV* was primarily doing hydrographic investigations during this past May cruise, biological sampling was limited to the night stations shown in Figure 2. However, the consistent nightly catches indicate a fairly wide distribution of age I herring in the open Gulf of Maine this year. This broad distribution along with their larger size in 1976 (Figure 3) may indicate good overwinter survival. During the 1975 May cruise,which covered Georges Bank and Nantucket Shoals, herring catches were limited to the northwest quadrant of the Bank over depths of 35-186 meters (Davis, 1975).

After completing the standard transects of ICNAF stations (west to east) on the April 1976 cruise, *WIECZNO* re-occupied certain transects on the return to Woods Hole, sampling at night those stations which had been sampled during the day on the original cruise track.

The failure to capture but a few herring by *WIECZNO* on her westward return transects adjacent to those stations that produced large catches on the eastward transects, suggests a possible migration off the Bank. The subsequent small or negative tows adjacent to northern Georges in May by *ALBATROSS IV* along with larger, more consistent catches in the middle of the Gulf, also supports this possibility. Since there is no evidence of spawning in the open Gulf, this suggests the possibility that the larvae and fry found there in May 1976 are to some degree, of Georges Bank origin.

Conclusions

Sampling of age I herring in late spring for estimating their recruitment potential appears feasible since their catchability has been demonstrated both on Georges Bank and in the open Gulf of Maine. Their distribution during this season was widespread in the Gulf, at least over the deep basins, but catches tended to be more localized on Georges Bank.

A time series of late spring cruises in the Gulf of Maine and on Georges Bank is clearly necessary, including concurrent surveys in the coastal regions, if we are to improve our understanding of this stage in the life history of herring.

References

Blaxter, J. H. S., 1971. Feeding and condition of Clyde herring larvae. Rapports et Procés-Verbaux, Vol. 160: 128-136.

Boyar, H. C., R. R. Marak, F. E. Perkins, and R. A. Clifford. 1973. Seasonal distribution and growth of larval herring (*Clupea harengus* L.) in the Georges Bank-Gulf of Maine area from 1962 to 1970. J. Cons.int. Explor. Mer, 35(1): 36-51.

Colton, J. B., and J. M. St. Onge. 1974. Distribution of fish eggs and larvae in continental shelf waters, Nova Scotia to Long Island. Serial Atlas of the Marine Environment, Folio 23. American Geographical Society, New York, N.Y.

Das, Naresh. 1968. Spawning, distribution, survival, and growth of larval herring (*Clupea harengus* L.) in relation to hydrographic conditions in the Bay of Fundy. Fish. Res. Bd. Can., Tech. Rep. 88: 129 p.

Davis, C. W. 1975. Preliminary results of juvenile fish survey on Georges Bank and Nantucket Shoals by *ALBATROSS IV*, 13-22 May 1975. ICNAF Res. Doc. 75/118: 6 p.

Davis, C. W. (unpublished MS). Shrinkage of Atlantic herring larvae preserved in formalin.

Davis, C. W., and J. J. Graham. 1970. Brit herring along Maine's coast. Commercial Fisheries Review 32(5): 32-35. (Also USFWS Reprint No. 872).

Table 1. Catches of age I herring, *WIECZNO* cruise 76-01.

Station no.	Position Latitude N	Position Longitude W	April Date	GMT Time	Number of herring	Standard length (mm) Range	Standard length (mm) Mode
30	41° 30'	69° 25'	16	0010	16	34-39	35
34	42 15	69 30	17	0112	23	31-44	39
50	41 45	68 30	28	0031	20	37-45	41
62	41 26	68 06	19	0439	95	34-47	41
63	41 50	68 00	19	0707	1	36	36
64	42 00	68 00	19	0912	5	41-44	41
73	41 30	67 30	19	2340	1	42	42
373	41 22	67 15	20	0225	39	37-45	41
74	41 15	67 30	20	0515	152	35-46	40
374	41 08	67 15	20	0800	4	33-42	35
81	41 15	67 00	21	0539	557	35-43	39
381	41 22	66 45	21	0809	78	35-46	37 & 40
85	42 15	67 00	25	0045	1	47	47
89	42 00	66 30	22	0219	102	34-49	41
90	41 45	66 30	22	0445	15	36-47	39
91	41 30	66 30	22	0745	19	38-43	40
92	41 15	66 30	22	0031	3	38-40	39
99	42 15	66 00	24	0247	13	38-43	41
701	42 20	65 49	24	0057	4	39-42	42
Total					710	31-49	40

Table 2. Catches of age I herring *ALBATROSS IV* cruise 76-03.

Station no.	Position Latitude N	Longitude W	April Date	GMT Time	Number of herring	Standard length (mm) Range	Mode
1	42° 13'	69° 43'	11	0156	5	[1]37-43	40
3	42 36	69 43	12	0637	1	[2] 45	
5	42 04	69 39	13	0420	1	[2] 45	
6	42 00	69 28	13	0610	3	[1]36-49	42
8	42 25	68 55	14	0011	17	[1]35-50	38
9	42 11	68 44	14	0353	4	[2]40-52	
10	42 24	68 39	14	0503	15	[2]35-53	
11	42 24	68 22	14	0701	3	[2]42-45	
12	42 37	68 24	14	0903	5	[2]42-50	
13	43 00	68 23	15	0122	107	[1]30-48	32,43
14	43 00	68 07	15	0431	2	[2] 45	
15	43 09	68 13	15	0645	6	[2]35-45	
16	43 19	68 05	15	0923	1	[2] 40	
18	43 48	67 51	16	0255	5	[1]34-40	35
19	43 48	67 36	16	0436	4	[2]40-45	
20	44 00	67 56	16	0624	1	[2] 38	
21	44 09	67 25	16	0842	1	[2] 56	
22	43 12	67 05	17	0048	13	[1]38-45	39
23	43 15	67 20	17	0311	2	[2]54-55	
25	42 50	67 18	17	0753	10	[2]41-48	
26	42 36	67 22	17	2349	4	[2]39-41	
28	42 36	66 51	18	0629	15	[1]38-49	41
29	42 32	66 30	18	0923	16	[1]39-46	41
33	42 24	66 33	19	0621	30	[2]38-52	
35	42 11	67 20	20	0218	29	[1]35-50	37
37	42 24	67 35	20	0804	8	[2]36-48	
38	42 11	68 08	21	0100	7	[1]34-46	38
39	42 12	68 19	21	0256	7	[2]38-48	
40	41 55	68 23	21	0545	1	[2] 40	
42	41 47	68 31	21	0821	5	[2]40-50	

[1]Preserved fish - used in L-F distribution, Figure 3.
[2]Unpreserved fish.

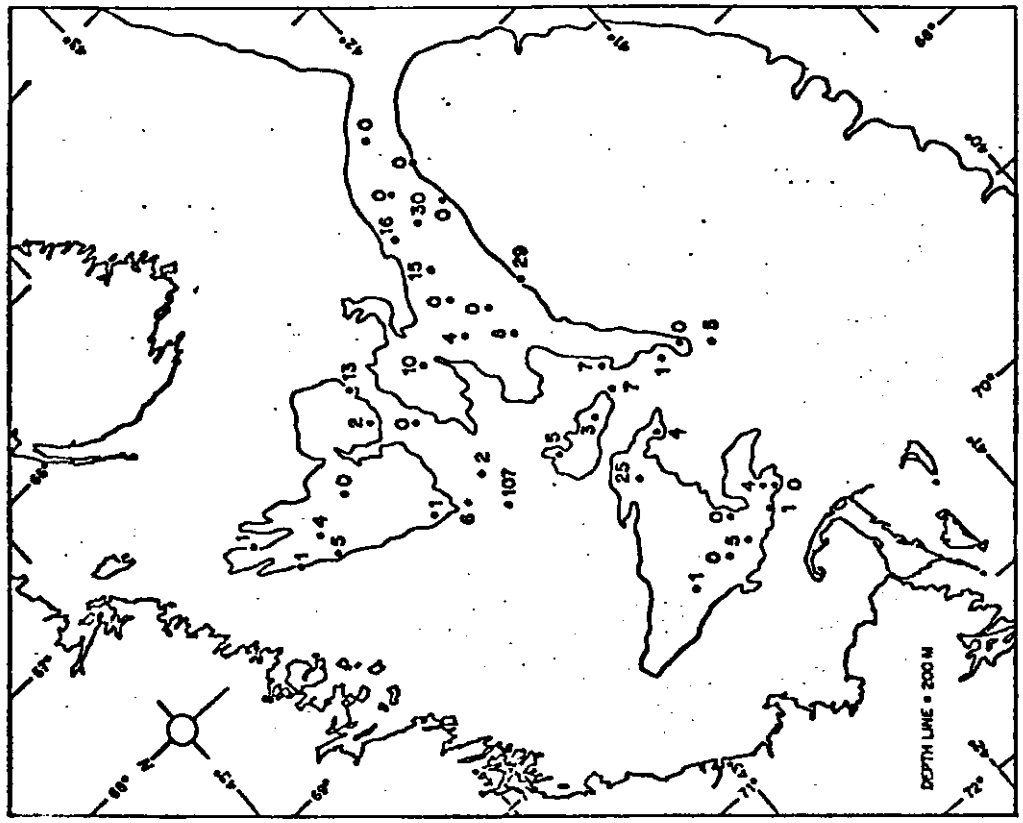

Figure 2. Distribution of sampling and catches of age I herring during May 1976 (*ALBATROSS IV* cruise 76-03).

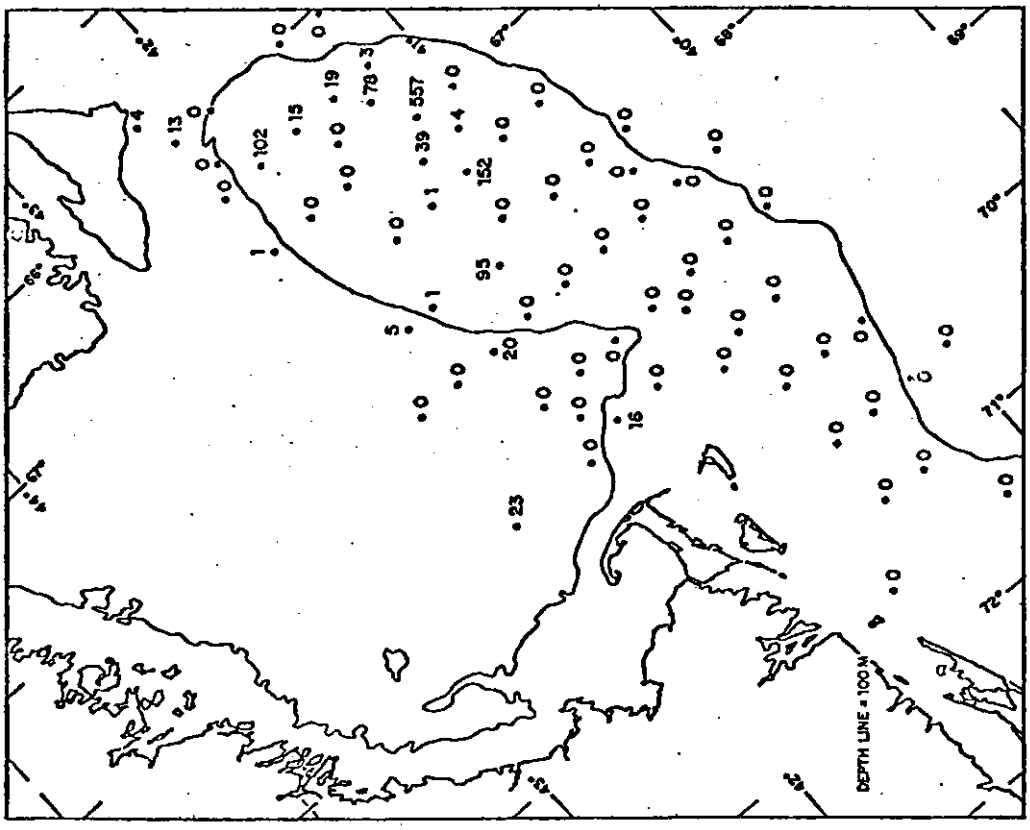

Figure 1. Distribution of sampling and catches of age I herring during April 1976 (*WIECZNO* cruise 76-01).

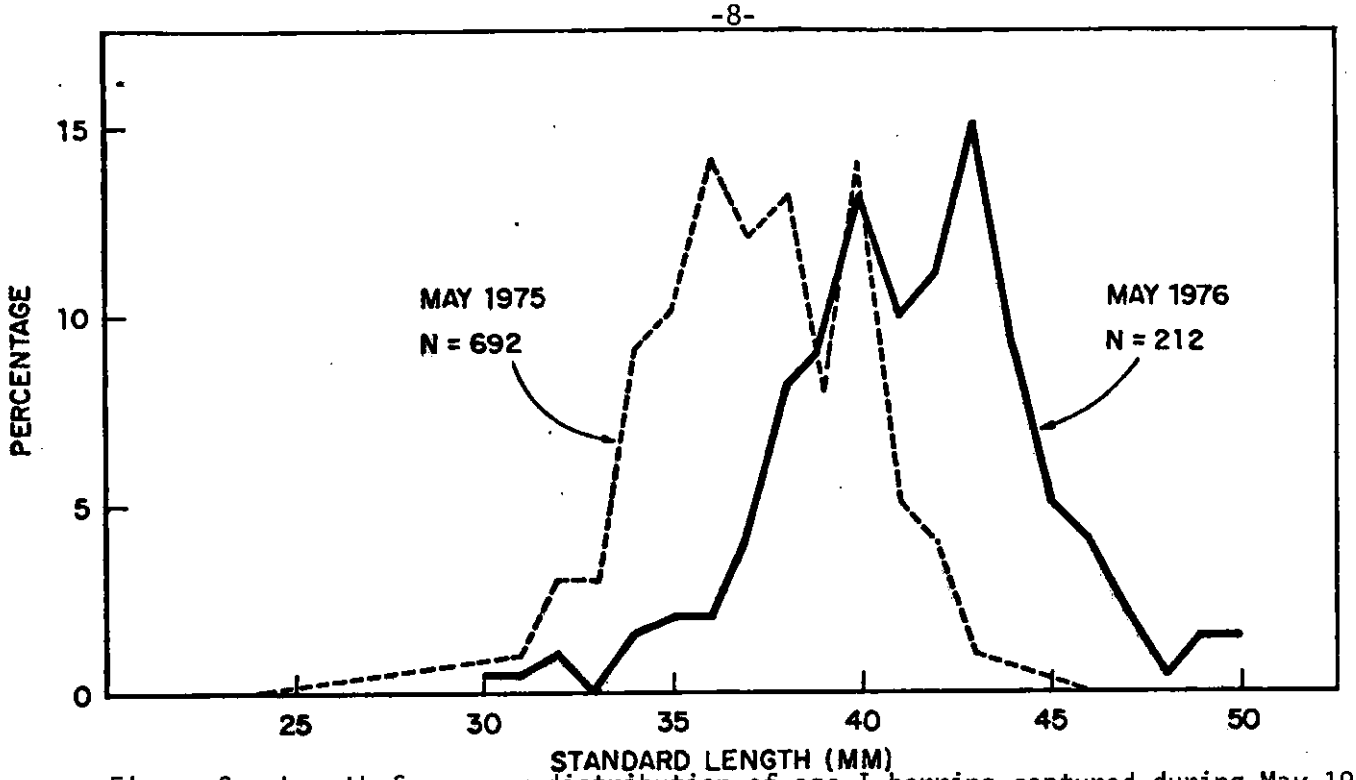

Figure 3. Length frequency distribution of age I herring captured during May 1975 and 1976 (*ALBATROSS IV* cruises 75-05, and 75-03).

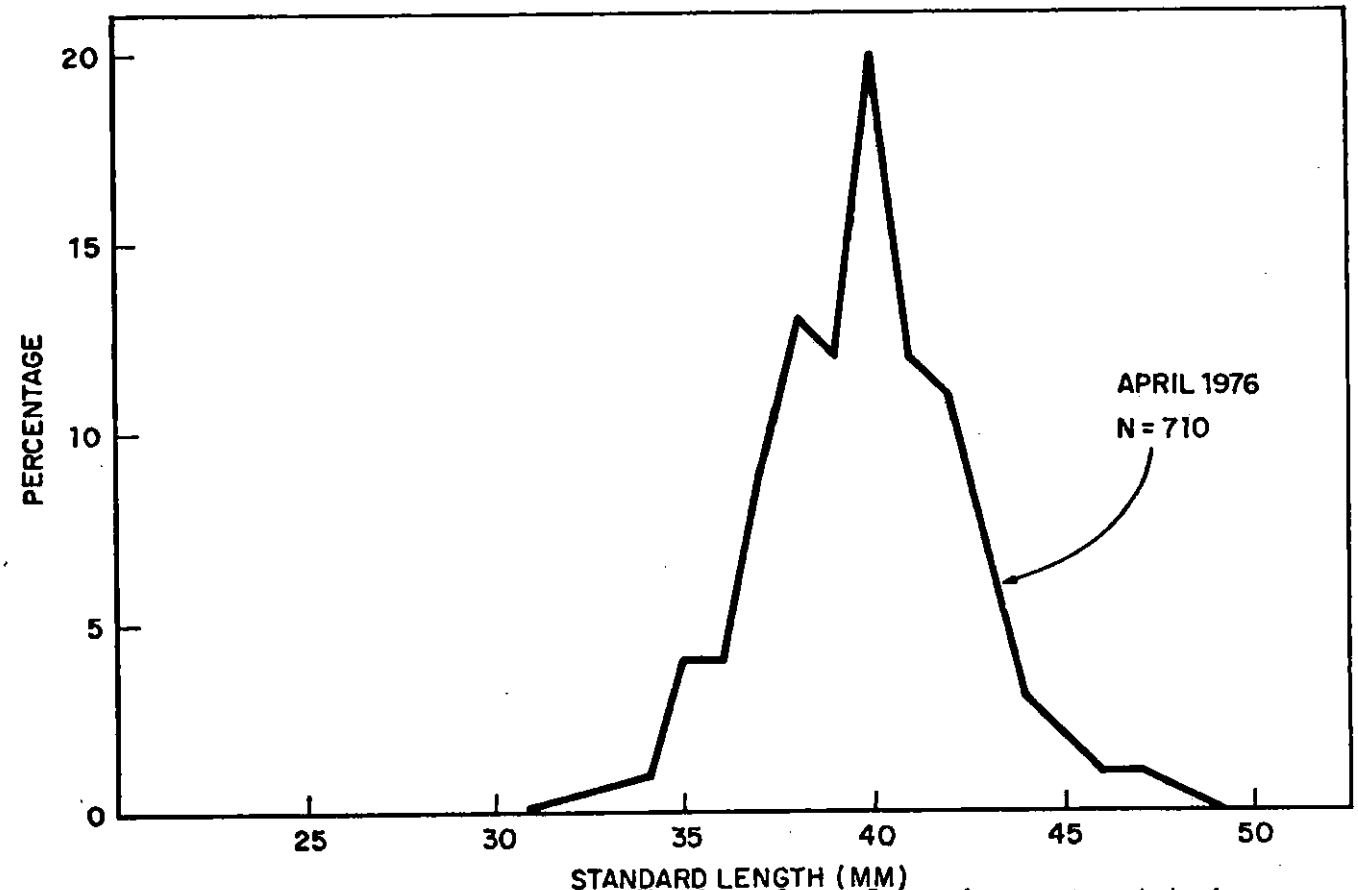

Figure 4. Length frequency distribution of age I herring captured during April 1976 (*WIECZNO* cruise 76-01).