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Spawning Dates of Subarea 5 Haddock

by

Robert R. Marak

and

Robert Livingstone, Jr.

Bureau of Commercial Fisheries, Biological Laboratory, Woods Hole, Mass.

Data which can be used to fix the time of spawning of haddock, *Melanogrammus aeglefinus* on Georges Bank has previously been collected by: Walford (1950) in 1931; Clarke, Pierce, and Bumpus (1943) in 1940 and 1941; Marak, Colton, Foster, and Miller (1961, 1962) in 1953, 1955, and 1956. Colton (1968) has demonstrated a relationship between spawning times of haddock and bottom temperatures in the Georges Bank area during the 1950's.

During 1968 we endeavored to find out what effect cold spring temperatures might have had on haddock spawning time. The gonads of 2,500 female haddock brought in by the fishing fleet were examined between January and July, and plankton samples were collected on seven biweekly cruises of the R/V Albatross IV from March through June.

Gonad Examination

Developmental stages of the ovaries were determined by visual means based on criteria set forth in the FAO handbook (1960). The eight stages used progress from resting (immature) to spent. Although only the actively spawning fish were used in the final analyses, plots of the ripening and spent fish validated the use of just these stages for showing peak production. The results of this part of the study show that very little spawning activity occurred during February and early March and was followed by a sharp increase, peaking about the third week in April (Fig. 1). Spawning activity fell off gradually to less than 5% in the middle of June.

Plankton Samples

Step oblique tows from 50 meters to the surface were made with Woods Hole Bongo nets in a 2,500 square mile area on the northeastern part of Georges Bank. Previous data has consistently shown this area to be a major haddock spawning ground. Since the haddock spawning season overlaps that of the cod, and cod and haddock eggs are unseparable in early stages, it was necessary to hatch a portion of the eggs collected. The ratio established was used to determine the numbers of haddock eggs. The stage of development (time from spawning) of the haddock eggs was determined by microscopic examination. The number of eggs per cubic meter of water filtered was also calculated in order to ascertain when the peak of spawning had occurred. Temperature observations were made at each of the fifty stations occupied on the seven cruises. The egg production curve constructed from this data shows that maximum spawning occurred in the third week of April.

Previous Data

Data collected on Georges Bank during two previous surveys in addition to the one in 1968 is presented in Figure 2. Clarke's (1943) data places the peak of spawning in 1940 and 1941 in late April. In contrast, Marak et al (1961, 1962) showed maximum egg production to be in March in 1953, 1955, and 1956. Walford (1950) felt that the spawning climax in 1931 preceded his March cruise.

Effect of temperature

The sharp rise in spawning activity in late March 1968 was accompanied by a sharp rise in bottom temperatures (Figure 1). Maximum spawning occurred between 3.3° and 5.6° C. A comparison of temperatures during spawning time from earlier surveys reveals similarities between 1940, 1941, and 1968, and 1931 and 1953, 1955, 1956 (Table 1). It was fortuitous that the four surveys had been carried out in years which Taylor, Graham and Bigelow (1957) and Welch (1967) show to include both "cold" and "warm" years. It is interesting to note that during the "warm" years (1931, 1950's) optimum spawning appeared to be prolonged whereas in "cold" years (1940, 1941, 1968) it was of shorter duration. It is also apparent that a 1.5° to 2.0° C temperature change can mean the difference of a month in spawning time.

Table 1. -- Mean Bottom Temperatures (°C) on Georges Bank for March and April 1931, 1940, 1941, 1953, 1955, 1956, and 1968.

Year	March	April	
1931	4.1	5.3	Walford
1940	2.5	3.7	Clarke, et al.
1941	2.7	3.9	" "
1953	5.1	6.5	Marak, et al.
1955	4.5	5.1	" "
1956	3.5	4.3	" "
1968	2.9	4.0	Marak

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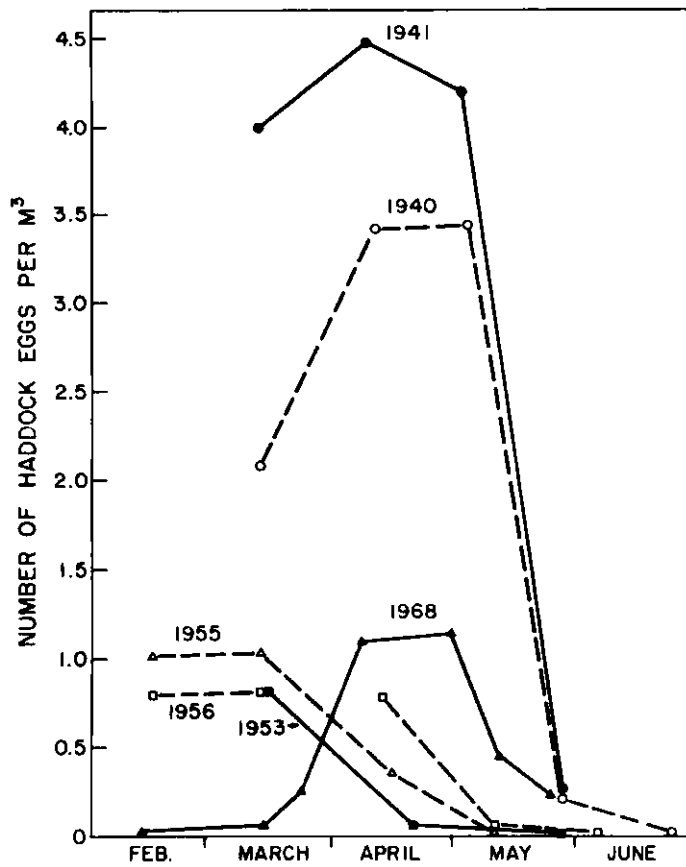
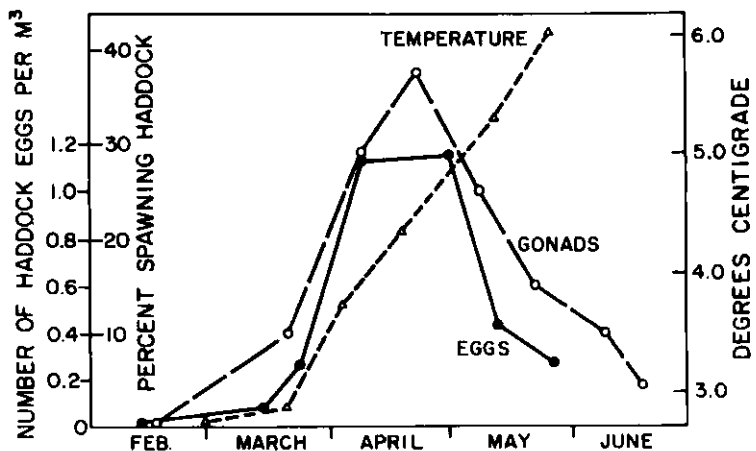


Fig. 1