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Seasonal Distribution of Larval Herring in the Bay of Fundy and Gulf of Maine

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Introduction

In February 1967 we initiated a series of plankton cruises to relate the distribution of herring larvae in the Bay of Fundy and Gulf of Maine to the physical and biological environment. Since then, similar cruises have been carried out quarterly and are being continued. Data analyses are incomplete but some tentative conclusions may be reached and are presented here.

Materials and Methods

Cruises were usually carried out in January, April, July, and November, although there were some deviations from this timing. The cruise track covered approximately 1,200 miles and there were 51 plankton stations along the track.

Plankton tows were made with 1-metre nets (#0 mesh) and Isaacs-Kidd trawls (1.6-mm mesh codend). They were made either vertically from 30 metres or obliquely at 20-10-0 metres for 1-metre nets and 30-15 metres for Isaacs-Kidd trawls. The 1-metre nets were towed for 15 minutes and the Isaacs-Kidd trawls for 30 minutes. The number of plankton collections during each cruise ranged from 57 to 100 and there were

782 collections altogether in the 10 cruises included in this report (results of the summer and autumn cruises in 1969 are not yet available).

Drift bottles and seabed drifters were released along the cruise track and temperature and salinity observations were made at each station. This report is concerned only with surface circulation and includes results from 12 seasonal cruises with additional information from monitor stations.

Most of the sorting and identification of larvae was done at the Canadian Oceanographic Identification Centre in Ottawa.

Results and Discussion

The accompanying figure shows the seasonal distribution and abundance of herring larvae and the seasonal pattern of non-tidal drift of surface waters. Although there were differences between years, the overall pattern of larval distribution was similar each year and the diagrams represent total collections for 10 cruises. Similarly for surface circulation the diagrams represent average conditions during the 1967 to 1969 period (12 cruises).

Herring larvae

Numbers of herring larvae in individual tows or even for whole cruises were small. The largest number (239) in a single tow was taken during the spring cruise of 1967 at a station about 20 miles offshore from Yarmouth, N. S. In only 6 tows during the entire series were there more than 100 larvae. In contrast to this, Tibbo *et al.* (1958) with identical nets, towing times, and depths, collected nearly 50,000 larvae in a shorter series of cruises and on several occasions had more than 1,000 larvae in a single tow.

The most productive cruises in the current series were in the autumn — 218 larvae in the November 1967 cruise and 413 larvae in the November 1968 cruise. Total collections during winter cruises were somewhat smaller (509 larvae for

3 cruises) but most of them (384) were taken in January 1969. For 3 spring cruises the total number of larvae was 641 of which 383 were taken during the April-May cruise in 1967 and only 46 in the April-May cruise in 1969. The summer collections totalled 7 larvae – 4 in 1967 and 3 in 1968.

There were significant seasonal differences in larval lengths. Most of the larvae taken in autumn cruises were 13 to 21 mm long. In the winter collections, most of them were 18 to 35 mm and in the spring they were 30 to 45 mm. The 7 larvae from summer cruises were 5 to 7 mm long.

The distribution of larvae during the autumn suggests that there are two important recruitment areas in the region – the northern edge of Georges Bank and the southwest coast of Nova Scotia. This is, of course, not an unexpected result since massive spawnings are known to occur in both areas. It is of importance, however, to observe from these results that there are apparently no other major sources of larvae within the region.

The winter collections suggest that larvae have drifted away from the main spawning grounds and are concentrated at the entrance to the Bay of Fundy – particularly on the west side. During the spring cruises, larvae were taken at fewer stations than in the winter yet there appears to have been either a dispersal of the winter concentrations or an invasion of larvae from other areas.

The summer collections show some spawning during the summer months (5-7 mm larvae are newly hatched and presumably not far from the spawning beds). However, in comparison with autumn spawnings, summer spawnings are insignificant.

Surface circulation

The year-to-year differences in seasonal patterns of surface circulation were generally small with one exception – the winter season of 1969. Basically, these patterns were the same as those previously described by Bumpus and Lauzier (1965). The main features are variations in the southwest drift along

the coast of Maine and in the exchange of surface waters between the Bay of Fundy and the Gulf of Maine. Both of these are associated with the northerly drift along the west coast of Nova Scotia and with the formation and disappearance of the Gulf of Maine eddy.

During the autumn, the relatively weak circulation, the convergence towards the southern entrance to the Bay of Fundy, and the inflow along the south side of the Bay of Fundy may have been instrumental in holding larvae near the spawning grounds off the southwest coast of Nova Scotia as well as dispersing some downstream.

During the winter the circulation should have brought about a greater concentration of larvae along the south side of the Bay of Fundy. However, in the winter of 1969, when large numbers of larvae were collected on the west side of the entrance to the Bay of Fundy, a southwest drift stronger and earlier than usual was being developed by persistent easterly winds.

The development of the Gulf of Maine eddy during the spring may have been responsible for the dispersal of larvae from the northern segment of the study area towards the western part of the Gulf of Maine and also for the increased concentrations in the southern segment of the study area. The latter concentrations (just north of Georges Bank) presumably consist of larvae that spent the winter in the western half of the Gulf of Maine. In 1969 early strengthening of the southwest drift may have prematurely dispersed a very large proportion of the larvae with the result that abundance was lower in the spring of 1969 than in previous years.

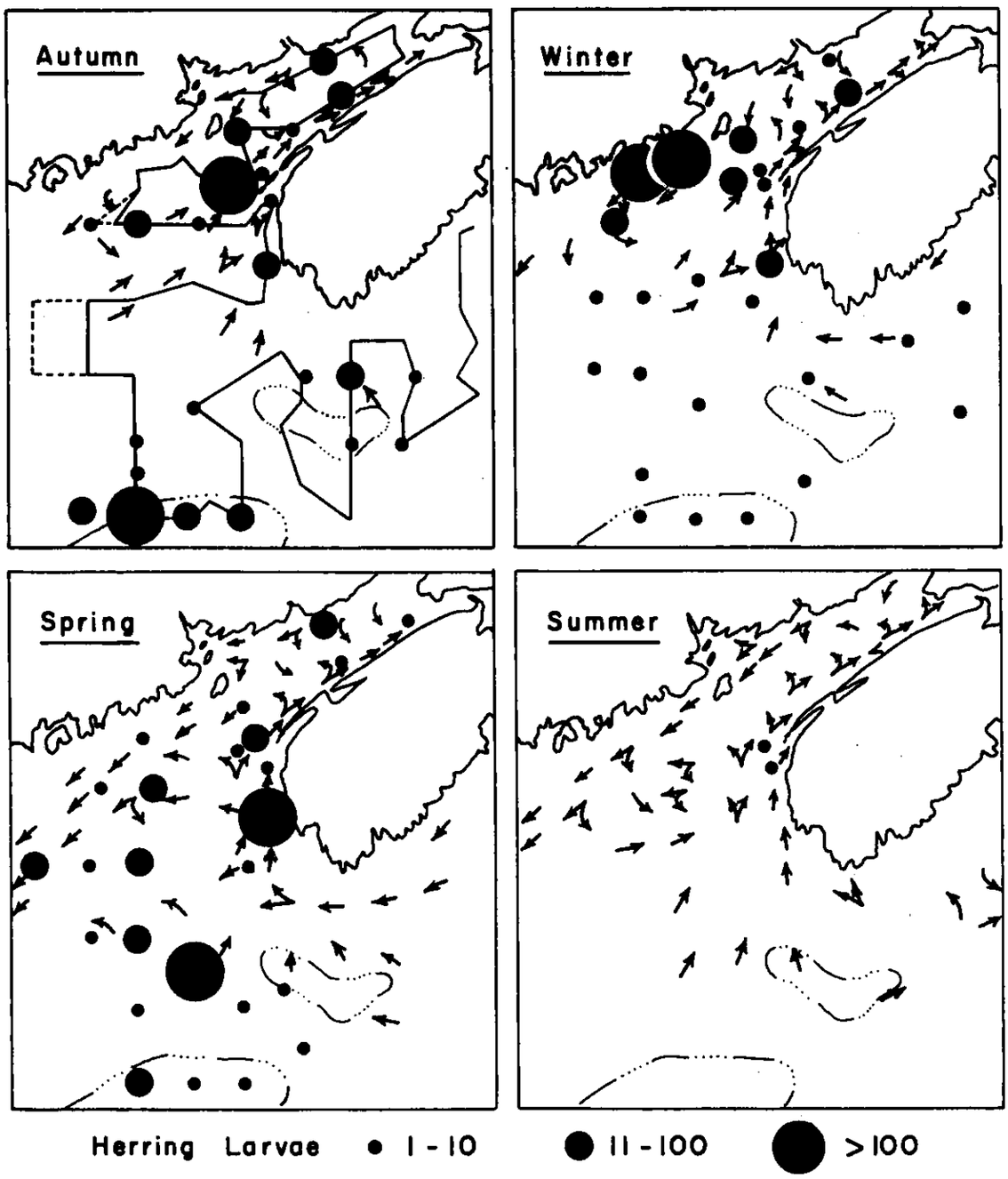
Surface circulation undoubtedly influences the distribution of herring larvae within the study area but the picture is far from being complete. There were no recoveries of drift bottles released in the southern part of the area and hence nothing can be said about the effect of water movements on the eventual fate of larvae produced on Georges Bank. With growing concern about adult herring stocks in the region, it is of prime importance to examine

the possibility of a relationship between the Georges Bank and the inshore spawning populations.

References

Bumpus, D. F., and L. M. Lauzier. 1965. Surface circulation on the Continental Shelf. Folio 7. Serial Atlas of the Marine Environment. American Geographical Society (New York).

Tibbo, S. N., J. E. H. Legaré, L. W. Scattergood, and R. F. Temple. 1958. On the occurrence and distribution of larval herring (*Clupea harengus* L.) in the Bay of Fundy and the Gulf of Maine. J. Fish. Res. Bd. Canada 15(6): 1451-1469.



Surface circulation and seasonal distribution and abundance of herring larvae – cruise track is included.