

Abstract

The objective of my thesis research was to identify processes affecting recruitment in the northern Gulf of St. Lawrence shrimp *Pandalus borealis* stocks. Sampling surveys in 1986 and 1987 revealed homogeneity of larval developmental stages among sectors that suggested brief and synchronous larval emergence among stocks. Spatial patterns of larval distribution were not correlated with the hydrographic structure within the sectors and it is suggested that biological processes of differential survival and development rates could explain the observed patterns of distribution. Analysis of the vertical distribution of shrimp larvae in 1987 and 1988, in relation to the water column physical structure and planktonic community, revealed that developmental stages I and II were concentrated in the upper layers (> 30 m) above the permanent pycnocline region and coincident with the subsurface chlorophyll *a* and suspended particle maxima. Vertical variation in the direction and magnitude of the local currents had limited consequences for larval transport given the relatively uniform flow field that characterized the upper 50 m of the water column. The vertical distribution of the larvae appears to be a means to maximize speed of development and the quality of the feeding environment. An objective measure of shrimp larvae nutritional condition, which reflected larval survival potential in response to variability in the feeding regime, was developed from laboratory experiments. The condition index was based on the standardized triacylglycerol (TAG · wet-weight⁻¹) content of shrimp larvae. The proportion of larvae below a critical TAG · ww⁻¹ level of 0.2 was quantitatively linked to the cumulative survival recorded at moult in the cohorts. In the field, shrimp larvae were bigger at a given stage relative to the laboratory experiments and had higher survival chances in areas with enhanced productivity and diversified planktonic communities, which resulted from intensified mixing within the surface layer. Environmental factors affecting the density structure of the surface layer are suggested to influence shrimp larvae survival in the Gulf, and to determine recruitment levels to local stocks. As a preliminary test of the hypothesis, I showed that the buoyancy fluxes into the northern Gulf (i.e. spring runoff and late winter ice volume) seem related with shrimp recruitment for 1979 to 1988.