

New England Lobster Settlement Index: Update 2002

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In 2002 the New England lobster settlement index welcomed its first Canadian collaborator – perhaps suggesting the program has outgrown its name. This sampling program, independently supported by Rhode Island, Massachusetts, Maine, and New Brunswick, Canada, aims to evaluate the strength of lobster year classes when they first arrive as post-larvae in shallow near-shore nurseries where they spend their first few years of life. The data are being used to gain a better understanding of the role of environmental factors in determining regional population trends, a potentially valuable tool in lobster fishery stock assessment and forecasting.

Surveys are conducted by divers suction sampling shallow cobble-boulder nurseries. Because earlier studies demonstrated that patterns in the density of benthic young-of-year lobsters sampled at the end of the settlement season reflect the planktonic post-larval supply, it has become a proxy for settlement strength (Wahle & Incze 1997, Incze et al. 1997). The benthic suction sampling method is more time- and cost-effective than planktonic sampling because it only requires a single survey (late August in southern New England, mid-October in the north) as opposed to weekly sampling required for planktonic larvae and post-larvae.

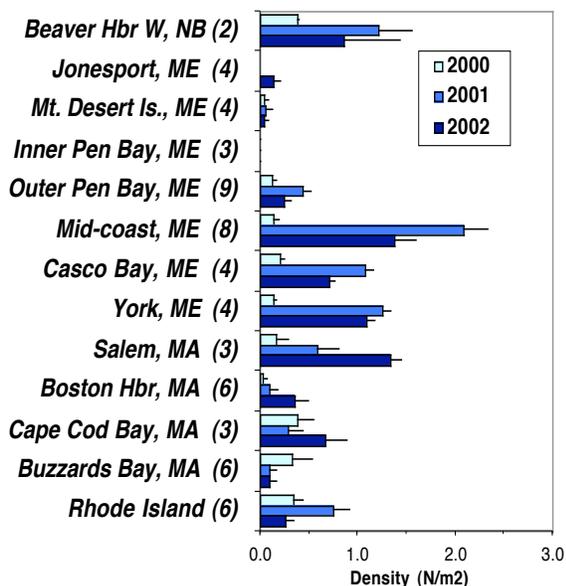


Fig. 2. Regional average lobster settlement throughout New England in 2000, 2001, 2002. In parentheses, the number of sites included in the regional mean.

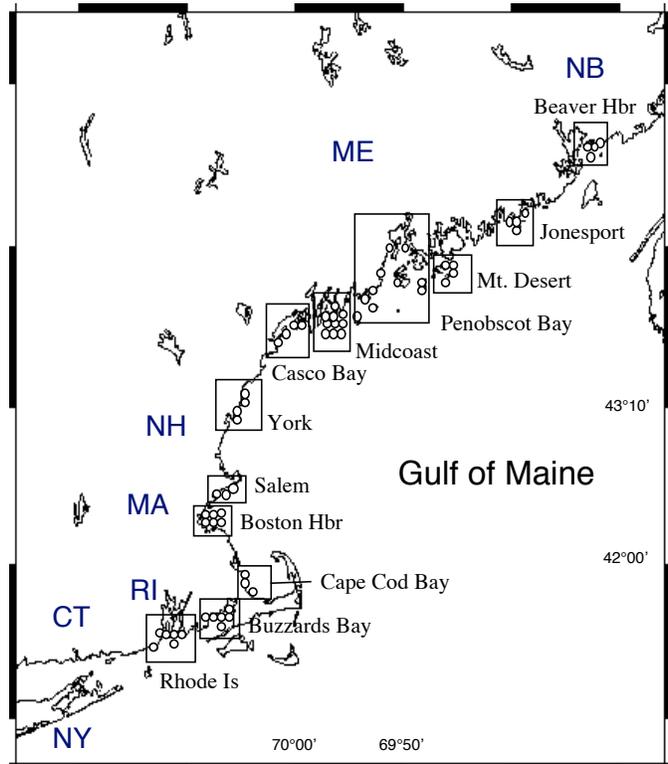


Fig. 1. Sampling sites for the New England lobster settlement index. Boxes surround sites used for regional averages shown in Fig. 2.

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The time series began on Maine's mid-coast in 1989. In the 1990's it expanded to Rhode Island, Massachusetts and Maine's Mt. Desert region; then most recently, to the remainder of Maine's seven lobster fishing zones. Although, the Canadian effort began as early as 1991, this is the first time the Canadian data have been pooled with New England's. With sampling now conducted at some 65 sites from Beaver Harbour, New Brunswick to Point Judith, Rhode Island (Fig. 1), the past three years represent the most comprehensive sampling effort to date.

Over the years the survey in US waters has been variously supported by Sea Grant, the National Science Foundation, the lobster industry, and the respective state marine resource agencies. Year-2001 was the first year the program became mostly state and industry supported in the US. New York and Connecticut still plan to begin sampling Long Island Sound in the near future. New Hampshire has yet to join ranks.

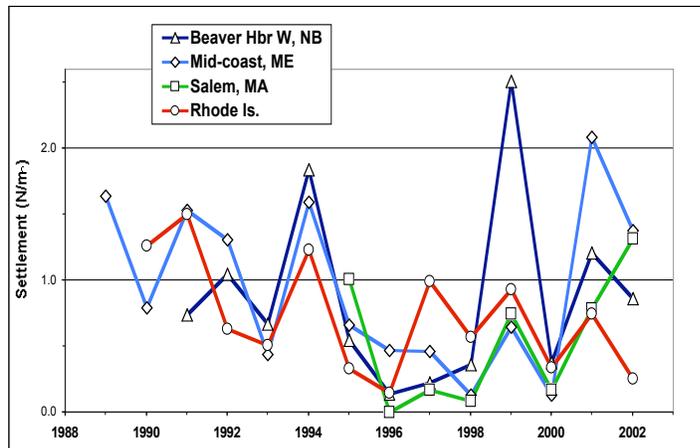


Fig. 3. Lobster settlement index time series for four selected regions spanning the full length of coastline surveyed.

The expanded sampling gives unprecedented detail on the pattern of settlement along the coast (Fig. 2). Over the years we have observed that eastern Maine consistently has lower settlement than regions to the west or further east – a pattern generally reflected in the lower commercial landings per-area in eastern Maine (Steneck and Wilson 2001). Over the past three years with the full complement of sites, we have observed dramatic fluctuations in settlement in some regions. For example, 2001 was a banner year for many areas especially those just west of Penobscot Bay (Fig. 2).

The time series is beginning to suggest a coherence in annual fluctuations among some areas. Coherence is most evident where we have the longest time series. Among four widely separated regions from Canada to Rhode Island, annual fluctuations are in synch more often than not (Fig. 3). For example, for seven of the past ten years during which at least three of the four regions were monitored, annual change has been in the same direction, if not always of the same magnitude. Coherence like this might be expected among neighboring regions, but it becomes more surprising when geographically more isolated areas are also in synch. The intermittence of these coherent periods suggests there might be times when larger scale oceanic/atmospheric processes dominate annual settlement trends, whereas at other times more local processes dominate. A more formal analysis of this regional coherence is a priority.

From these longer time series we have also been able to demonstrate that settlement strength translates to the abundance of older juveniles (Incze et al. 1997, 2000), but will the settlement index foretell recruitment to the fishery? The extent to which fluctuations in settlement determine subsequent harvests, some 5-9 years later, will depend on whether ecological factors operating in the intervening years disrupt the linkage. Because lobsters of different ages overlap in size, annual fluctuation in settlement are smoothed by the time lobsters become harvestable. Other factors like disease-related mortality could also decouple the settlement-to-harvest linkage. It remains to be seen whether harvest might slump along Maine's mid-coast where settlement and other indicators of juvenile abundance declined significantly for several years in the late 1990s. Our power to test the predictive value of the settlement index will also depend on having accurate estimates of recruitment to the fishery. The best test of the predictive value of the index will be to compare our projections not only to landings trends, but to fishery-independent indices of mature lobster abundance in coming years.

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