As the American Lobster Settlement Index passed its quarter century mark in 2014, it has continued to chronicle dramatic shifts in lobster nursery populations that may have important consequences for the fishery. The Gulf of Maine's widespread lobster settlement downturn in 2013 continued a recent spate of poor years that had many wondering whether a decline in lobster landings may be in its future. With another mediocre showing in 2014, that question will continue to trouble stakeholders in the region's premiere fishery. In the meantime, the per-pound value of lobster has rebounded nicely from the 50-year lows (in real dollars) of the past few years to provide much of the region its most valuable catch ever. For example, Maine reported an impressive 23% increase from the year before, even with a 3% drop in volume. Massachusetts produced 11% greater value while volume stayed on par with 2013. Preliminary reports from Atlantic Canada indicate double digit increases in volume and value. The question is, why are we seeing such modest levels of settlement in the Gulf of Maine at a time when the lobster stocks, and presumably egg production, seem to be at record highs? Oceanography and weather likely play a role. Coupling these environmental indicators with the ALSI time series will help us understand and predict trends in the fishery.

In this issue of the **Update** we give results of the 2014 nursery survey in New England and Atlantic Canada and a new visualization of the regional settlement patterns from the long-standing suction sampling effort and the lengthening time series of passive collector deployments.

Settlement 2014: We've designed new maps to better depict spatial patterns: one for newly settled young-of year (YoY) lobsters (Fig. 1), and another for older juveniles (Fig. 2). Now we show all 107 current sampling sites on the map, and a color scale for population density. We've also combined the results of diver-based and collector-based sampling on a single map (circles for dive sites, diamonds for collector sites). Plus, as in the past, we still include time series of average densities for groupings of sites arranged and numbered from north to south. Previous research has demonstrated that the
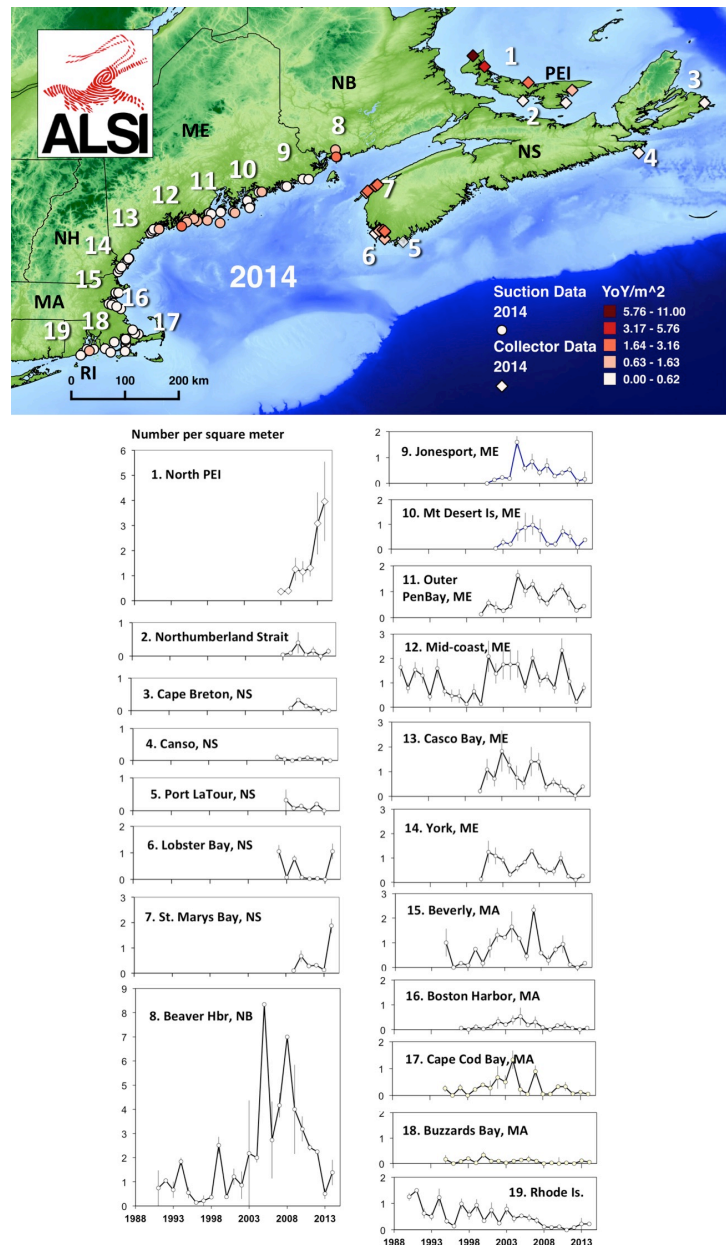

Figure 1. Settlement 2014: Map of young-of-year (YoY) densities at the 107 ALSI sampling sites 2014. Circles = sites sampled by divers with an airlift suction samplers. Diamonds = sites sampled with cobble-filled passive collectors deployed by boat. Time series given below for numbered groupings of sites.

collectors and suction samplers produce comparable results.

Settlement in 2014 was generally a modest improvement over the mostly poor showing of the previous year (Fig. 1). Densities of newly settled YoY lobsters were highest in the central and eastern Gulf of Maine, lower Fundy, and north shore of Prince Edward Is. (PEI), and lowest in southern New England, eastern Nova Scotia and Northumberland Straight between PEI and Nova Scotia. In the context of long-term trends, 2014 produced higher settlement than the year before at 14 of the 19 site groupings. PEI boasted some of the highest densities on record for the year. Meanwhile, settlement in the southernmost areas remained near record lows despite a slight uptick in RI.

Older juvenile lobsters (Fig. 2) range in age from 1 to 3-4 years, and so their population densities in nurseries reflect the accumulated settlement and post-settlement attrition over the first few years of life on the sea bed. Indeed, our previous research demonstrates that the initial settlement is an excellent predictor of year class strength in the next year or two. Not surprisingly, then, the highest densities of older juveniles tend to be where we've seen the highest levels of settlement in the recent past. Numbers of older juveniles have been declining at most locations in the Gulf of Maine and Fundy regions in recent years despite historically high levels of brood stock. On the other hand, nursery populations in the Gulf of St. Lawrence, and especially the north shore of PEI, seem to be steadily growing.

Looking ahead: What are the implications of ALSI time trends for the future of the fishery? In *Update 2013* we featured some of our first forecasts. That outlook has not changed. We have begun to validate model predictions against observed landings where time series are long enough (in excess of about 12

Figure 2. Older juveniles 2014: Map and time series of older juvenile densities at the 107 ALSI sampling sites. Symbols as in Fig. 1.

years). ALSI models predicted the boom in the eastern Gulf of Maine and suggest that, generally, fishery recruitment will begin to fall back to long-term averages in the next several years. Southern New England is predicted to persist at only a fraction of its historic levels of recruitment. Settlement time series in much of Atlantic Canada are still too short to forecast since there's a lag of about 7-10 years between settlement and recruitment to the fishery. Nonetheless, the dramatic settlement increases in the southern Gulf of Saint Lawrence are consistent with the upward trends in the fishery there, and bode well for the future there. Still, our forecasting models are not a crystal ball. Even where we can test forecasts against observed landings, modeling the settler-to-fishery recruitment relationship has its uncertainties, in part because we need to account for regional differences in growth and mortality, variables that are difficult to estimate. The maps above also reveal significant gaps in the coverage of settlement monitoring in deep water and along the coast. We hope to fill those gaps in the future to give us more a complete 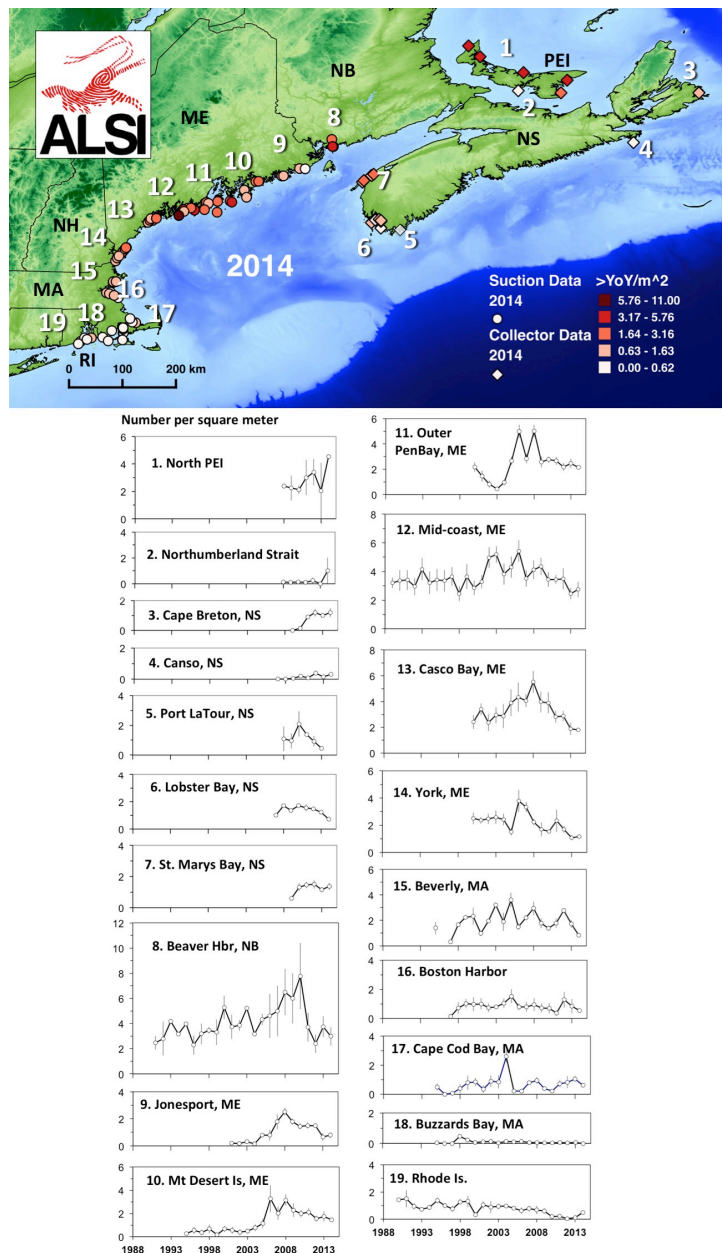picture of the lobster recruitment process. θ