Long-Term Monitoring of the Gulf of Maine’s Intertidal Zone
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Introduction
Since 1976, students at Shoals Marine Lab have surveyed permanent vertical transects in the rocky intertidal of Appledore Island. Since 2011, we have focused on 5 sites representing the exposed and sheltered sides of the island. Our goal is to continue the legacy of our long-term monitoring program and to provide an archived baseline information on the composition, abundance and vertical distribution of key intertidal organisms. Our data reveal short-term dynamics and long-term trends, both of which are important to provide context for understanding the effects of environmental change, including sea level rise, changing sea and air temperatures and the arrival of new non-native species.

Methods

Transect
We surveyed 5 transects marked by permanent pins set into the bedrock precisely 13.5 feet (4.1 m) above the mean lowest low water (MLLW). A census of the organisms was taken at 1 foot (0.3 m) increments from the pin down to 0.5 m above MLLW by estimating percent cover, counts, and frequency of organisms. Size classes of selected organisms were also recorded.

Modified National Park Service (NPS)
Five permanent 70x50 cm photoplots in 3 conspicuous biotic zones (Ascophyllum, Fucus, and Chondrus crispus/Mastocarpus stellatus zone, with the addition of five barnacle zone plots in Transect 15) were photographed each year in August. Percent cover of organisms was calculated by the point-intersect method using a grid superimposed on the image. Mobile invertebrates present in each plot were also recorded in the field.

Annual Barnacle Recruitment
We monitor five 20x20 barnacle recruitment plots each year in August. The previous year’s recruitment was photographed, and plots were scraped clean to assess future recruitment. Photographs were analyzed by counting every live barnacle using ImageJ software.

Conclusions
- Our 3 methods (transects, NPS, barnacle clearings) provide congruent patterns and complement one another.
- Trends are difficult to discern due to high inter-annual variability in the recruitment and persistence of dominant species (e.g., barnacles, mussels, Fucus, and cyanobacteria).
- Sea surface temperature also vary markedly across years, but extreme intertidal air-water temperature fluctuations at organismal scales may be a driver of the patterns that we have observed.
- To detect community related responses to climate change in the face of large inter-annual variability, a long-term baseline is essential.