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The main goal of this study was to provide a mechanistic understanding of the various spatial-temporal patterns produced by benthic community assemblages. The sample study covered a complex hydrodynamic physical environment spanning estuaries, bays, islands, and the open Gulf. We considered the spatial and temporal distributions of marine invertebrates in the Gulf and estuary across the St. Lawrence (Quebec, Canada). Overall 200 floating buoys per year were deployed as artificial settlement substrate between the months of May and December on an inter-annual time basis for the years corresponding to 2005 and 2007. We quantified colonization dynamics on collector surfaces using 50 cm x 50 cm quadrats for detecting the presence and/or absence of species and 10 x 10 cm quadrats for species identification and enumeration of individuals, motile and sessile species respectively. Multidimensional scaling (MDS) was used to explore the relative distance between species assemblages and overall to our expectation we identified significant differences existing between estuarine and gulf samples at large regional spatial scales, confirming bioregional classification for these areas. Interestingly, within these same regions, changes in diversity indices also occur at smaller local scales, demonstrated by the cluster analysis of species abundance at these smaller spatial scales between 2005 and 2007, within the Madeleine islands, the upper north shore and south gulf areas precisely. We believe this information to be significant for resource managers in the future selection of conservation sites. Furthermore, our analyses suggest these novel regions could be important sources of biological productivity for other neighboring regions, and as such, they warrant protection for their role as sources of larvae and prey for higher trophic levels.

Key words: scaling, marine reserves, benthic, colonization, geographical distribution, temporal variations, Canada