Determination of larval dispersal and population connectivity in the blue mussel ***Mytilus edulis*** along the northern Gulf of Maine using trace element fingerprinting

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Elemental fingerprinting represents a powerful, unique approach to determine larval dispersal and improve our understanding of connectivity among populations with planktonic larvae. In this study, elemental fingerprinting was used to quantify connectivity among blue mussel populations in the Gulf of Maine and test predictions from biophysical larval transport models about the direction, scale and intensity of dispersal. During growth, $CaCO_3$ is deposited atop shell proteins, passively recording water chemistry. Concentrations of trace elements (Mg, Mn, Co, Sr, Ba, La, Pb) relative to Ca were quantified in larval mussels outplanted at 15 sites in the Gulf of Maine using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). Discriminant function analyses were performed to create a geospatial reference map. Larval shells of collected settlers were analyzed to determine natal origin. Larvae were correctly assigned to sites with over 50% accuracy. Settler analysis revealed high regional self-recruitment among northern sites and significant dispersal from northern spawning sites to mid-coast and southern settlement sites. Estimated patterns of connectivity likely reflect larval transport with the dominant Eastern Maine Coastal Current, and local retention through strong tidal flux.