

**Significant Scientific Research:** Human changes to marine ecosystems are increasingly prevalent. From climate change to coastal urbanization to overfishing, these changes affect the structure and function of coastal marine ecosystems. My graduate work sought to answer how human-driven changes to the biodiversity of our coasts affected ecosystem function. I found that most species going extinct in the ocean are at upper trophic levels<sup>5</sup>, forcing us to re-think what changes in diversity are most important in our oceans. I showed that the loss of diversity in upper trophic levels can lead to increased grazer biomass and herbivory<sup>2,8</sup>. While invasive species often replaced natives<sup>4-5</sup>, they often exacerbated ongoing changes to ecosystem function<sup>1,3,7</sup>.

In my postdoc at the Santa Barbara Coastal Long-Term Ecological Research site, I wanted to better understand the causes of shifts in biodiversity and food web structure. I examined how climate change can collapse food webs by altering giant kelp abundance<sup>11</sup> and developed a mechanistic understanding of the feedbacks between biodiversity and out-of-control herbivory<sup>6,15</sup>. I broadened my thinking while at NCEAS, becoming involved in larger efforts to synthesize the consequences of biodiversity loss for ecosystems functions and services<sup>13,16,18,20</sup>.

Since moving to UMass Boston, I have pushed to understand the whole cascade of interactions, from climate change through biodiversity on to multiple ecosystem functions. I have focused these efforts on kelp forests. This focus has driven me to lead an international working groups on kelp forests and climate change, build an international network of coordinated kelp forest climate change research, and create a local New England research program focused on teasing apart links between subtidal community structure and ecosystem function. New England is an ideal system for studying these questions. First, High-functioning subtidal ecosystems have an incredible economic value in New England. Second, many species have their northern range limit set around Cape Cod by water temperature. As the Gulf of Maine warms, we're seeing progressively more of these species move north leading to a wide variety of impacts.

As I followed these academic pursuits, I have also sought to find ways to connect them to the public. Towards that end, I have been a pioneer in science crowdfunding<sup>14,22</sup>, co-founding the #SciFund Challenge. It is an organization that trains scientists in crowdfunding and communication. I have also led workshops on fundamental change in scientific publishing practices<sup>21</sup>.

**Immediate Research Plans:** Over the next two years, I plan to study climate impacts on the biodiversity and ecosystem services provided by temperate rocky reefs both in New England and around the globe. Specifically, my lab will 1) build on data from the online citizen science project I have led, Floating Forests, to evaluate the importance of 30-year changes in temperature and waves for global kelp distribution and abundance, 2) compare global results to a series of kelp clearings across a thermal gradient to evaluate the effect of temperature on resilience of New England kelp beds and climate change, 3) compare these outcomes to results from a global network of similar experiments, 4) build detailed network food webs for the New England subtidal, 5) evaluate the direct and indirect links between food web structure, kelp abundance, temperature, and extremes of hurricanes and Nor'easters. This research addresses key questions in marine global change biology at both small plot-level and large global scales. My ultimate goal is to build an understanding of the cascading indirect and often interacting consequences of climate impacts within marine communities and ecosystems. Understanding these complex interactions will help us better prepare for and adapt to the coming changes to our ocean from climate change.

\*Superscripted numbers refer to the #s on the list of Peer-reviewed publications from my CV.