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Loss of Eelgrass (*Zostera marina* L.) Associated With European Green Crabs in Casco Bay, Maine

The Challenge: Eelgrass provides essential functions to the ecology and economy of Maine's coastal zone. In the summer of 2012, sudden and dramatic disappearance of eelgrass was noted throughout upper Casco Bay. For example in Maquoit Bay, which forms the northwestern arm of Casco Bay in southern Maine, nearly total loss of a 570-ha eelgrass meadow was documented. Loss of eelgrass coincided with a population explosion of the invasive European green crab (*Carcinus maenas*) in many regions of the coast. Green crabs are the leading cause of eelgrass loss in Nova Scotia, leading to hypotheses that green crabs may now also be contributing to devastation of this habitat in Maine.

The Science: Although it is too late to test the hypothesis that green crabs caused loss of vegetation in Maquoit Bay directly, indirect evidence can be gathered by testing whether environmental conditions in the bay are conducive to eelgrass growth in the absence of green crabs. In August 2013, I established six experimental eelgrass transplant-plots in a formerly vegetated cove in Maquoit Bay. Three plots were protected from green crabs with fenced exclosures and three were in adjacent unprotected areas. During a 26-day growth period, the average eelgrass survival was significantly higher inside the exclosures (82%) than outside (24%), and the average rate of new leaf formation on undamaged shoots was comparable to rates measured in healthy eelgrass beds in New England.

The Future: Green crabs appear to be a primary cause of eelgrass loss in Maquoit Bay, although effects of other interacting stressors cannot be ruled out. This short experiment suggests that habitat restoration will depend on limiting green crab disturbance and that other eelgrass beds in areas of high green crab densities are at risk. However, not all eelgrass beds in Maine with seemingly high densities of green crabs have disappeared, so identifying the factors affecting resiliency of eelgrass beds relative to green crab damage will be an important next step.

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