

# Mutual benefits of inducible defenses to crab predators in the blue mussel *Mytilus edulis* in a multi-predator environment

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The blue mussel, *Mytilus edulis*, is a foundational species native to Maine's Rocky Intertidal ecosystem, meaning their presence or absence disproportionately impacts the ecosystem.<sup>1</sup> Blue mussels create substrate for other organisms to live on and provide an important source of food for many predators. Unfortunately, blue mussel populations have declined by sixty percent since the 1970s.<sup>1</sup> The green crab, *Carcinus maenas*, is an invasive crab species from the Atlantic coasts of Europe that now preys on blue mussels.<sup>2</sup> Thus, it is important to understand the ways in which an invasive species is impacting the critical and declining blue mussel population. In areas of high green crab abundance, blue mussels thicken their shells, a response known as an inducible defense.<sup>3</sup> Crabs must use greater crushing force or increased handling time to penetrate thicker shells, making these mussels less enticing prey.<sup>4</sup> But this defense comes at an energetic cost to the mussels, taking energy away from some form of growth or reproduction.<sup>5</sup> To understand these energy tradeoffs, I conducted a study on the shell thickness and adductor muscle size of blue mussels from sites with high or low green crab presence. Adductor muscles are used to hold the shells of blue mussels.

To conduct this study, I collected mussels from 2 sites with a high crab population and 2 sites with a low crab population. At each site, I conducted field surveys to assess the ecological make up. At low tide, 1 meter