To: The Office of Governor Janet Mills

From: Eve Fischer, Maine Policy Scholar, University of Maine at Farmington

Subject: Policy Solutions for Establishing a Green Crab Market in Maine

The Issue

European green crabs (*Carcinus maenas*) are one of the most insidious invasive species in Maine. The crabs pose a stark threat to Maine's soft shell clam and lobster industries and their population has grown rapidly in the wake of climate change. The species first arrived in the United States in the mid 1800s via ballast water in ships from Europe and made their way to Maine by the early 1900s. Green crabs feed on soft shell clams and have been determined to be the principal cause of the dramatic decline in clam landings in the state[1]. Green crabs cause habitat destruction by burrowing into eelgrass beds, which many marine species rely on for shelter and raising young. Green crabs are incredibly fecund, with female crabs laying as many as 185,000 eggs per year[2].

Between habitat destruction, high rates of predation, and rapid reproduction, green crabs outcompete native crab species and pose a threat to lobster and clam populations. Clamming and lobstering are two of Maine's most valuable marine industries, and the serious threat green crabs pose to them must be addressed through policy interventions. As the Gulf of Maine warms, marine resource management will require adjustment, both to preserve existing values and to manage environmental change. Creating markets for underutilized and invasive species such as green crabs is an important part of this policy-based adaptation.

Previous Efforts

Attempts to control green crabs have focused on eradication and physical removal of the species with the aim of protecting threatened native species and habitats above all else. One proactive example is the Maine Clammers Association's project in Freeport, which involved setting up fence barriers against green crabs in clam flats. While this is an effective method of reducing predation, it is labor-intensive, limited in geographic scope, and does not reduce the further encroachment of green crabs into soft shell clam habitats. To date, the most notable action Maine has taken against green crabs is the Green Crab Task Force, which concluded its report in

[1] Downeast Institute (2020)
[2] USGS (2011)

2015[3]. Maine has been slow to implement the Task Force's solutions, with state policy continuing to mostly focus on physical removal strategies which are labor intensive and generally ineffective.

Potential Actions

The green crab invasion is a complex issue with implications for fisheries, markets, communities, and the environment. Solutions aren't straightforward, but the problem is severe and impactful enough that we must do more to seek them. If Maine takes no additional actions against green crabs, their population will continue to explode, putting greater pressure on soft shell clam, lobster, and native crab populations. The reality is that green crabs are ingrained in the ecosystem now, and responsible policy solutions must incorporate them into our management of marine resources, markets, and food systems. Adaptation is not optional.

Because green crabs cannot be eradicated, efforts that rely on removing them from the water without establishing a system to perpetuate their removal will always be unsuccessful. Therefore, Maine should pursue strategies that contain mechanisms to incentivize continuous green crab harvest and removal. The clear option for implementing such a mechanism is to establish markets for green crabs.

There are several potential markets for green crabs. These include uses as bait in existing and emerging fisheries. Green crabs can be composted for use as a soil amendment, and crabs can be processed into value-added products such as pet food or novel materials such as bioplastics. Finally, green crabs can be used for human consumption in culinary markets, either by processing for lump crab meat or sold as soft-shelled crabs. Of these market possibilities, the culinary market has the greatest potential value, because processing for lump meat is fairly simple and because soft shell crabs are extremely expensive without requiring processing. Culinary processing creates waste streams that can be directed into compost and pet food, adding additional value to the harvested crabs and building new ancillary business opportunities. For these reasons, establishing a culinary market is the best solution to the invasive green crab problem.

Solution Outline

A culinary market for green crabs will make the best use of a harmful invasive species as a resource, while simultaneously being the most effective long term way to reduce its population

[3] Maine Department of Marine Resources

and environmental impacts. Multiple policy actions are required to support the growth of a green crab fishery.

First, Maine must encourage green crab trapping via a regulated fishery. Maine has already made obtaining a green crab license fairly easy, and there are no restrictions for recreational green crab fishing. From here, the most useful step is support for publicity and education about green crab licenses and green crab fishing techniques. The culinary market for green crabs in Italy, which has existed for hundreds of years, relies on harvesting softshell green crabs[4]. This avoids the problem of processing meat from such small crabs, as it allows the entire body to be eaten. Teaching these techniques to people entering the fishery, which could be done through a series of workshops and expanded web-based information, will be crucial to expanding the green crab fishery.

Further support should go towards the many innovations that incorporate green crabs into novel products. Research on processing machinery for extracting hard shell green crab meat will grow the lump-meat industry and is essential to expanding culinary use of an invasive and underutilized marine species. Investment into existing research into biodegradable plastics made with green crab shells will yield new environmentally-friendly business opportunities. The most important effort is garnering public awareness of green crabs as a food source, and making the knowledge of how to fish for, process, and cook with them widely available. Once green crabs enter public consciousness as a culinary item, we can finally take advantage of this highly abundant resource and grow Maine's economy in the process.

Massachusetts has taken multiple steps to combat the green crab invasion that Maine can look to for inspiration. Massachusetts state policy focuses on easy access to green crab fishing and removal above all else. State law allows anyone to trap green crabs, either commercially or recreationally, as long as they give notice to the Department of Marine Fisheries, which grants a Letter of Authorization[5]. The process is free and easily available. Massachusetts also removed green crabs from its classification list of "edible crabs." Paradoxically, this switch keeps green crabs from being subject to the more intensive permitting associated with lobstering and crabbing, while expanding the market possibilities for an invasive but edible crab. Massachusetts is closely tied to the bait market in southern New England and New York. Although geographic distance presents a barrier for Mainers to significantly engage with that bait market and our

[4] Miles, Kathryn (2021)
[5] Division of Marine Fisheries

licensing system is not necessarily in need of further loosening, Massachusetts provides a good example of how another state has altered policy to cope with green crabs.

As climate change progresses in the Gulf of Maine, it is increasingly necessary to adapt and prepare for the future. As soft shell clams decline from predation and lobsters shift eastward into Canadian waters, Maine must diversify its fisheries by incentivizing harvest of underutilized invasive species. This will in turn remove pressure from clam, lobster, and native crab populations while growing new markets and businesses. Maine is well known for its seafood and restaurants, which will be extremely beneficial when marketing green crabs and expanding their culinary use. By incorporating green crabs into Maine's vibrant culinary scene, we can support shellfish harvesters who have been affected by the clam decline while introducing exciting new products that will draw tourism. If Maine can properly incentivize using this resource that has been greatly overlooked, our state will be more resilient and show how inventive we can be in facing the challenges of climate change.

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