**Why Green Crabs Are Invading the East Coast**

**The gophers of the sea, they dig and dig, destroying eelgrass habitats.**

For a long time, I was almost excited at the prospect of a warming climate in the Gulf of Maine, where I grew up and live today. The [gulf is warming faster](http://nefsc.noaa.gov/press_release/pr2016/scispot/ss1601/%22%20%5Ct%20%22_blank) than 99 percent of the global ocean: More of the warmer water contained in the Gulf Stream is depositing into the Gulf of Maine as the stream shifts northward, and less of the colder water from the Arctic and Labrador streams.

"Over the last 30 years we have warmed at four times the global average rate," [Andrew Pershing](http://www.gmri.org/about-us/who-we-are/staff/andrew-pershing-phd%22%20%5Ct%20%22_blank), chief science officer at the non-profit Gulf of Maine Research Institute, told me.

In the Gulf of Maine, as elsewhere in the world, many [species are feeling the pressure](http://motherboard.vice.com/en_ca/read/pablo-escobars-hippos-keep-having-sex-and-no-one-is-sure-how-to-stop-them) brought on by climate change. A changing environment makes them more susceptible to one existential threat: invasive species. This, in turn, is having a huge impact on the local fishing industry that employs [tens of thousands of people](http://www.gulfofmaine.org/2/wp-content/uploads/2014/03/commercial-fisheries-theme-paper-webversion.pdf%22%20%5Ct%20%22_blank) in the area, and provides seafood to the local restaurants that Maine is famous for.

In short, the health of the Maine economy largely depends on the health of the Gulf of Maine, and the marine species that have made it their home. But invasive species [like green crabs](http://www.maine.gov/dmr/science-research/species/invasives/greencrabs/index.html%22%20%5Ct%20%22_blank) are coming in and wreaking havoc.

Foreign species are [defined as invasive](http://motherboard.vice.com/en_ca/read/rising-sea-temperatures-lure-lionfish-into-the-mediterranean) when they cause the displacement of a native one. In the Gulf of Maine, that includes eelgrass, blue mussels, oysters, and many other types of shellfish. Invaders disrupt the trophic hierarchy (or the organization of species according to their ecological niche) of an ecosystem by interrupting the ecological roles of those that live within it. This effect is being seen more and more with warming in the Gulf of Maine waters.

"Invasive species are increasing," [Susan Shaw](http://www.meriresearch.org/about/founder-executive-director-dr-susan-shaw%22%20%5Ct%20%22_blank), director of the nonprofit Marine & Environmental Research Institute, told me, pointing to the example of Asian and European crabs, which are thriving under changing conditions, although they aren't local to the area.

"There are certain species that do very well in warmer waters, and reproduce prolifically, that are displacing species like mussels and other shellfish," she continued. "They're consuming them, they're over-reproducing, out-competing and consuming the species that are lower in the food chain," such as oysters, mussels, and other marine invertebrates that rely on filter feeding.

The green crab, an [invasive species native to Europe](https://www.invasivespeciesinfo.gov/aquatics/greencrab.shtml%22%20%5Ct%20%22_blank), is very well-suited to the warming waters of the Gulf of Maine. "Green crabs eat a lot of stuff. They tend to just dig, it's a little like having gophers in your lawn. When they're sort of digging around in the mud, they actually uproot the eelgrass, so there has been a big loss of eelgrass in Casco Bay [an inlet on the southern coast of Maine], following the couple of green crab outbreak years," Pershing told me.

In Maquoit Bay, about 30 miles up the coast from Portland, eelgrass coverage fell by 83 percent from 2012 to 2013 as green crabs took over, according to a [report](http://www.pressherald.com/2015/10/28/invasive-species-exploit-warming-gulf-maine-sometimes-destructive-results/%22%20%5Ct%20%22_blank) in the *Portland Press Herald*. It irreversibly changed the ecosystem there.

"Eelgrass is one of these nice, structuring habitats that is used by small fish, especially by a lot of juvenile fish," he continued. "And there are ecosystem services too, like pulling nitrogen out of the water."

It's having an impact throughout the ecosystem. "The food supply is on the move, and I'm talking about all the way up from mussels, oysters, all of the molluscs, up to the crustaceans, shrimp, lobsters, all the way up to the fish species, and at the top the dolphins, and seals and whales," said Shaw.

Migration means a huge loss in biodiversity, and fewer species available to commercial fisheries.

The Atlantic States Marine Fisheries Commission has imposed [regulations](http://www.centralmaine.com/2014/11/10/regulators-to-place-strict-limits-on-cod-catch-in-gulf-of-maine-2/%22%20%5Ct%20%22_blank) on the catching of many nationally unique species. "[Northern shrimp](http://bangordailynews.com/2014/11/06/business/officials-cancel-2015-gulf-of-maine-shrimp-season-citing-weak-shrimp-stock/%22%20%5Ct%20%22_blank) was an important commercial fishery, and that fishery has been closed now for several years in a row, because the population is just too low to sustain a fishery," said Pershing.

The once familiar image of Mainers clad with rubber boots and gloves, digging up molluscs in Casco Bay, has been replaced by a lunar landscape at low tide. Although there is no scientific proof of a correlation between the outbreak of green crabs in 2012 and the possible decline of the blue mussel populations that people love to harvest and cook, the public has begun to notice.

"Every time I go and give a public talk, someone will come up and ask, 'Where are the mussels?' " said Pershing.

I have lived here for my entire life, and I have absolutely no doubt that the [climate is changing](http://motherboard.vice.com/read/2016-is-set-to-break-all-kinds-of-climate-records-and-its-only-half-over). Although I have the benefit of living in a region of the world where the effects of climate change are gradual and likely manageable, many do not.