Are invasives bad? Not always, researchers say

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Marine ecologists led by Brown University have found why the Asian shore crab is so comfortable on East Coast beaches. The native cordgrass and ribbed mussels provide a moist, shady home. Credit: Andrew Altieri, Brown University

In 1988, a mysterious invader washed upon the New Jersey shore. The Asian shore crab likely arrived in ballast from commercial ships, and it found its new home to be quite agreeable. More than two decades later, the crab, *Hemigrapsus sanguineus*, has expanded its range along the Atlantic coast northward to Maine and southward to North Carolina. Its numbers continue to expand, and wildlife biologists have found them in greater densities along New England's cobbled shores.

Another tale of an invasive species conquering a native ecosystem? Not so fast, says Andrew Altieri, a marine ecologist at Brown University and

the author of a new paper in *Ecology* that scrutinizes the crabs' success. Altieri and colleagues have found that the Asian shore crab has found a hospitable niche in its new environs and in fact gets along just fine with native species. While the crab has exploited the conditions set up by the native cordgrass and ribbed mussels that dominate the cobbled beach ecosystem, it does not appear to do so at the expense of other species that call the shoreline home.

"Usually, when you think of invasions," Altieri said, "you think it will be bad. Yet we found here a situation where that doesn't occur. We've found a place where the natives and invasives get along quite well."

Altieri and team members Bregje van Wesenbeeck, a visiting scholar at Brown from the Dutch environmental research institute Deltares, and Mark Bertness, chair of the Department of Ecology and Evolutionary Biology at Brown and Altieri's adviser, counted crabs, which measure about 1 1/2 inches wide, at four sites on Narragansett and Mount Hope bays in Rhode Island in summer 2003-2004. They found crab density (an indicator of their numbers) to be highest where cordgrass and ribbed mussels proliferated. Crab density was more than 100 times higher in those areas compared to spots along the beaches where cordgrass or mussels were missing. The crabs have found their transplanted home so inviting that their populations are denser in North America than in their native range in Asia.

Cordgrass and ribbed mussels along East Coast cobbled beaches provide shade and protection for the invasive Asian shore crab. Credit: Andrew Altieri, Brown University

From the field observations, the team, which also included Brian Silliman from the University of Florida, determined the Asian shore crab took advantage of the moist, shady environment created by the cordgrass and the mussels. In ecological terms, the researchers found a "facilitation cascade." The cordgrass attracts ribbed mussels by giving the molluscs something to attach themselves to as well as a shady spot; the mussels, in turn, give the crabs crevices in which to avoid predators as well as the harsh sun. The cordgrass also provides valuable shade for the crabs.

"It's a moist, stable environment in an otherwise harsh environment," Altieri said. "It's the key to their success, the reason why they're so abundant."

The team found that the crabs' exploitation of their habitat did not crowd out native species, such as the common periwinkle, small crustaceans, blue mussels and barnacles. Indeed, the field studies showed the more invasive crabs, the greater the number of native species.

In other words, the cordgrass-ribbed mussel environment has enough room to accommodate another tenant. "They may be promoting co-existence," Altieri said, "allowing for this ecosystem to absorb a new species."

Previous research suggests the crabs do prey upon juvenile American lobsters, and the Brown scientists also want to study whether the crabs eat other crab species.

The research also seems to highlight the importance of cordgrass to provide shade, a service to species that may grow even more important with warming air and water temperatures forecast to accompany changes in the climate.

Provided by Brown University