# Where do Maryland crabs come from? Researchers use a virus, ocean current maps and more to find out

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A common joke between politicians from Maryland and Virginia holds that all Maryland blue crabs actually come from Virginia, where saltier waters are hospitable to egg-bearing females. The retort: As soon as they can, they move to Maryland.

But what if some Chesapeake Bay crabs actually come from Delaware or North Carolina?

Scientists are using a crab virus—akin to the common cold—as well as computer models of ocean currents and genetic analysis of crustaceans from Massachusetts to Argentina to figure out just how much different populations of swimming crabs have in common.

They're even using acoustic monitoring to track crab movements within and between estuaries in Florida, along the Mid-Atlantic coast and around Mexico.

Aside from settling interstate rivalries, the data the researchers collect could help guide efforts to conserve the crustaceans.

It's difficult to understand how harvesting pressures, disease or climate change could affect numbers of crabs, or any other creature, without knowing how migration patterns might allow a population to replenish itself, said Andy Kough, a research biologist at Shedd Aquarium in

Chicago.

"You have to understand where animals are going in order to protect them," he said.

Scientists' general understanding of the life cycle of Chesapeake Bay crabs is this: They are spawned in salty Virginia waters near the mouth of the bay, spend their earliest days floating in the Atlantic Ocean, and then begin migrating up the bay toward Maryland. It's during that larval stage that researchers can lose track of where crabs are going and where they are coming from, because their movement is dependent on weather, currents and tides.

That makes it difficult for scientists to predict how robust populations of juvenile crabs in the Chesapeake might be in any given year, a critical forecast in setting annual rules for crab harvests in Maryland and Virginia. Researchers survey how many adult crabs hibernate burrowed in mud around the bay each winter to calculate estimates of how many spawning-age females might be present, but it's harder to guess how many of their offspring will end up in the estuary.

The ongoing research by Kough, along with collaborators at the University of Maryland Center for Environmental Science and the University of Florida, could make that process easier or more precise—not to mention shed light on crab population movements across thousands of miles. The work is funded by about $960,000 in National Science Foundation grants.

Kough is revealing just how far crabs could float using a variety of oceanographic models that cover the entire planet, and plugging in the potential paths of larval crabs up and down the Atlantic.

It's "like video games with little baby larvae," he joked.

Data from the acoustic sensors will be factored into the models to better calculate adult crabs' range. Another researcher, University of Florida associate professor Donald Behringer, is bringing expertise on crab behavior into the analysis.

Other researchers are using genetic analysis to trace crabs' steps backward. The thought is that the greater genetic similarity far-flung groups of crabs share, the more likely it is that their populations are mixing with one another.

"We know they have the potential to move large distances, but we don't know necessarily how connected the populations are," said Eric Schott, an associate research professor at UMCES and the study's primary investigator. "They are important fisheries where millions of crabs are harvested, but we don't always know where those crabs are coming from."

Schott, UMCES assistant professor Louis Plough and colleagues have been pulling DNA samples from the legs of crabs up and down the Atlantic coast. They've received samples from off of Massachusetts, Cuba, Mexico's Yucatan Peninsula, Venezuela and Uruguay.

They've also been searching the crabs for the presence of a virus known as CsRV1, an even more precise tool for measuring similarities or differences. Because the virus mutates more quickly than the crabs evolve themselves, it provides an even more detailed fingerprint of crab geography, Schott explained.

The virus is not thought to be a threat to the crabs' survival—while it has been shown to kill crustaceans that are infected with it in a lab setting, it doesn't appear to kill many crabs in the wild. It does not infect humans.

"The data suggests it's been part of the crab life history for millennia,"

Schott said.

So far, the results have been mixed. Researchers have noticed a lot of diversity in the genetics of viruses in crabs collected from around various Caribbean islands, for example. They expected such results to be a sign that strains of the virus are distinct because populations aren't interacting.

But in Anne Arundel County's Rhode River, their findings were more surprising. The researchers found unexpectedly wide genetic diversity among samples all collected from that waterway—even crab samples collected over multiple years.

It could be a sign that in any given year, crabs are migrating in from many different locations, Schott said.

But it's too early to tell for sure. The research and analysis are expected to continue at least through next year.