Blue crabs found to attack at low tide

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Dr. David Johnson, an ecologist at William & Mary's Virginia Institute of Marine Science, has spent more than 20 years in salt marshes, at sites all along the U.S. East and Gulf coasts. But while doing research in a

Virginia salt marsh at low tide last September, he and colleagues saw something they'd never seen before—blue crabs ambushing fiddler crabs from shallow, water-filled pits.

"It was amazing because here was an aquatic predator—one that lives, eats, breathes, and breeds under water—feeding out of the water," says Johnson. "It was like crocodiles ambushing wildebeests in Africa." He reports their discovery in the September issue of *Ecology*.

Johnson and colleagues—VIMS Ph.D. student Serina Wittyngham; VIMS Laboratory and Research Associate Leah Scott; and Dr. Cora Baird of the University of Virginia—believe these ambush-style attacks from pits at low tide are the first ever recorded for the blue crab or any other swimming crab, save for an earlier anecdotal account from Dr. Richard Heard of the University of Southern Mississippi. The blue crab's genus name Callinectes, Greek for "beautiful swimmer," attests to its aquatic nature.

"It was really hot—95 degrees—and the tide wasn't going to return for another 3 hours," says Johnson. "But this aquatic crab had figured out a way to feed at low tide: dig shallow pits that fill with water and wait for prey to come to you. One crab was 70 meters away from the shoreline. That's 800 body lengths. It'd be like if I dove a mile underwater and hid behind a rock to ambush fish that swam by."

The researchers watched as the blue crabs emerged from the muddy camouflage of their pits, stalked and snatched a fiddler crab, then scampered back to the pit to devour their prey, leaving the large claws of the male fiddler crabs to litter the pits' edges. Johnson says it looked "like the discarded bones of villagers outside a dragon's lair."

Both crustacean scientists and fiddler crabs have long known that blue crabs feed within the salt marsh during high tide; fiddler crabs typically

respond by retreating to their burrows during tidal peaks to avoid being eaten by their aquatic cousins. But scientists had long thought that during low tide, the exposed marsh surface provided a fiddlers' refuge, where these semi-terrestrial crabs can feed on detritus and algae with only birds to worry about.

"Blue crabs have been known to dash a few feet onto land to snatch fiddler crabs before returning to the water to dismember and eat them," says Johnson, "But the behavior we saw was different. Blue crabs were not chasing their prey on land; they were waiting on land for their prey to come to them. It'd be like if you went to an Italian restaurant and were suddenly dragged under the table by a giant octopus."

The discovery raised a tide of questions. How common is this behavior among blue crabs, and how successful? Do they dig the pits or rely on existing depressions? How do blue crabs deal with the risks of hunting ashore, such as exposure to common fiddler-crab predators such as herons and egrets? Might other aquatic creatures use a similar hunting strategy?

To begin to address those questions, Johnson returned to the same marsh two weeks after the initial observations to record blue-crab densities, sizes, and attacks. This follow-up visit, plus subsequent video from trail cams, confirmed the behavior and revealed more details. For one, most of the crabs (83%) were juveniles. He also found that most of the pits were typically not much wider or deeper than the blue crabs, suggesting they dug the pits themselves. This was corroborated by video footage showing the crabs scooping mud out with their claws. But the blue crabs were not loyal to their pit and would move into an empty one—or a water-filled footprint—and evict another blue crab if necessary.

Out of 33 attacks captured on 37 hours of video, 11 (33%) were successful. That's three times as efficient as a polar bear and about the

same success rate as a domestic tabby. And the blue crabs' muddy camouflage and motionless waiting seem to reduce their own vulnerability. "A laughing gull, a known blue-crab predator, walked within centimeters of a blue crab in a pit, but didn't appear to notice it," says Johnson. He plans future tethering and video studies to test this hypothesis more rigorously.

The scientists also plan to explore another tantalizing observation from their initial fieldwork, which was actually focused on yet another crustacean, the purple marsh crab Sesarma reticulatum. "Sesarma creates denuded areas in the salt marsh by grazing on cordgrass," says Johnson. He thinks this more open landscape may in turn help the blue crabs by making it easier for them to dig pits and chase down their fiddler crab prey. Initial measurements support his hypothesis: the researchers found almost twice as many blue crabs in grazed areas than in areas with plants, and higher fiddler crab densities as well, the latter an observation strengthened by previous research.

The discovery that Callinectes feeds in salt marshes suggests these environments are more important to blue crabs than previously thought. "Our observations underscore how vital salt marshes are to blue crab production and the blue crab fishery," says Johnson.

He also thinks the blue crab's feeding strategy may act as a link between the salt marsh and adjoining waters. "Blue crabs feeding in salt marshes at low tide offer a fascinating opportunity to study how predator behavior can affect the movement of energy from one ecosystem to another," says Johnson. "Just like crocodiles link the river to the savanna, and grizzlies carry the energy of salmon into the forests of the Pacific Northwest, blue crabs connect the salt marsh to the estuary."

More information: David S. Johnson, Beautiful swimmers attack at low tide, *Ecology* (2022). DOI: 10.1002/ecy.3787