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# Ripple Marks

## The Story Behind the Story

BY CHERYL LYN DYBAS

### September Brings Crab Feasts—And Concerns for Chesapeake Blue Crabs

Infectious Diseases Play a Part in Crab Population Declines



It's September. Seafood restaurants from coast to coast are serving platter after platter of steaming crabs, ready for hammering and picking. The supply seems endless, but is it?

Not if we're talking about blue crabs from Chesapeake Bay.

The bay's iconic blue crab population has dropped to new lows—levels not seen since before restrictions were placed on the fishery more than five years ago.

In response, the Virginia Marine Resources Commission recently approved a reduction of the female blue crab harvest by 10 percent from July 5, 2014, to July 4, 2015. As of this writing, the Maryland Department of Natural Resources and the Potomac River Fisheries Commission are also expected to limit catches.

What's to blame for the decline?

A long and, by Mid-Atlantic standards, brutal winter of 2013–2014 has been fingered as a culprit. In one of the worst die-offs in recent history, more than a quarter of the Chesapeake's blue crabs perished in the frigid waters.

#### MORE THAN COLD WATER TO BLAME

But that's not the only factor, says disease ecologist Jeff Shields of the Virginia Institute of Marine Sciences in Gloucester Point, Virginia.

"Several commercially important crustacean populations, including blue crabs,

have had declines linked to diseases," says Shields. "In most cases, though, the underlying causes have been difficult to pinpoint because crustacean pathogens aren't very well known."

One Chesapeake Bay blue crab killer may be the single-celled parasitic dinoflagellate *Hematodinium perezii*, a scourge that infects blue crabs and is of concern in fisheries not only in the Chesapeake, but around the world.

#### OUTBREAK IN THE CRAB POT AND THE SHEDDING HOUSE

The parasite was first reported along the US East Coast in the 1970s and found in the Chesapeake's blue crabs in the 1990s.

In a *Hematodinium* outbreak, some 50 percent of crabs caught in fishing pots may die. That number jumps to 75 percent in "shedding houses" where crabs molt their shells, then are collected for the soft-shell industry.

"Infection is almost always fatal—for the crabs," says Shields, who adds that the disease isn't harmful to humans.

In a breakthrough for blue crabs, Shields and colleagues recently succeeded in their effort to uncover the life history of *Hematodinium*.

"Describing the entire life cycle of *Hematodinium* is an important step toward controlling the infection," says Shields. "With all the parasite's stages in culture in the lab, we can learn when *Hematodinium* is most infectious."

The biologists made their discovery by looking at many parasite generations over a year-long period.

#### ANSWERS UNDER A MICROSCOPE

Through the research, scientists now know that *Hematodinium* takes some 40 to 50 days to develop. "That matches what we see in the field," he says. "We think infection is linked with blue crabs' molting cycles."

*Hematodinium* usually infects young crabs. Some 50 to 70 percent of juvenile blue crabs along the Virginia coast carry the pathogen, "and it's prevalent in bays and inlets along the entire US East Coast," says Shields.

The high cost—to the crab population and to the humans that depend on it—comes in the deaths of young blue crabs before they can make their way from coastal spawning grounds to brackish tributaries, where they become large enough to legally catch.

"Imagine a harvest with 50 percent more crabs," says Shields. "The toll exacted by *Hematodinium* is very clear."

The parasite is after more than blue crabs, however.

"You can't fish out the blue crabs somewhere and hope this pathogen will be gone," says Shields. "It's also in many other crustaceans, including spider crabs, rock crabs, and other swimming crabs."

#### INSIGHTS FROM THE BAY'S SHAPE

Outbreaks of *Hematodinium* are linked with certain geographic features, such as shallow bays, lagoons, and fjords. "Such features are ideal for the growth and spread of pathogens, as they serve to focus transmissible stages or retain them within the system," writes Shields in a paper published in

the *Journal of Invertebrate Pathology*.

Four factors may facilitate epidemics of *Hematodinium* and other pathogens: relatively “closed” host (crab) populations, with little immigration and emigration of juveniles and adults; bays with restricted water exchange with the open ocean, which hold in pathogens; stressful environmental conditions, such as overfishing and seasonal hypoxia, or “dead zones”; and pathogens that can rapidly multiply.

“The Chesapeake,” says Shields, “has several of these features.”

#### MANAGING FOR PATHOGENS

Shields and colleagues are working to understand how *Hematodinium* is transmitted in wild crustacean populations—and at shrimp farms and other aquaculture operations. “We hope to develop ‘best practices’ for managing, in particular, the Chesapeake’s wild blue crabs.”

Diseases can have serious effects on commercial fisheries, Shields says. “But there’s a perception among resource managers and fishers that diseases aren’t important to the fishing industry, or that little can be done to manage them.”

Too few fishery models use information like disease prevalence and distribution, according to Shields, and fisheries management decisions often don’t consider disease.

“Estimates of disease-induced effects such as mortality or ‘negative marketability’ can be incorporated into existing models to improve stock assessment and management,” Shields writes in the *Journal of Invertebrate Pathology*.

Disease may be the sleeper in the decline of the Chesapeake Bay blue crab.

Hard hit by freezing temperatures, low-oxygen waters, and overfishing, unless disease is taken into account, believes Shields, the next blue crabs caught may be headed not to your dinner table, but to the crustacean equivalent of the ICU.

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