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Mystery of the Missing Horseshoe Crabs

By MIKE SECCOMBE

By the miracle of instinct and enormous exertion, a little bird, the red knot, migrates from the Canadian low arctic to the tip of South America and back each year.

But a decade or so ago, their number dropped dramatically. And the reason for it makes for one of those scientific detective stories that illustrates the interrelatedness of things to each other, and to us.

It turns out one of the main food sources for the red knots, which are a species of sandpiper, is the eggs of horseshoe crabs — which have been laid on the beaches of the United States in bogglingly large numbers for untold millions of years.

As the red knots scurry along the tideline, parsing the sand for morsels of food, striving to put on weight fast for the next leg of their long migration, the sandpipers are eating something which is infinitely older than they are in evolutionary terms.

Horseshoe crabs have existed, barely changed, for longer than almost any other living thing. Some sources say they have existed, essentially unchanged for some 230 million years, some fossil forebears have been dated at 455 million years.

They are remarkable things in many ways. In fact they are not even crabs. To the extent they have living relatives, the nearest things are arachnids, like spiders and ticks.

They have multiple, primitive eyes, they have long stiff tails, the only purpose of which appears to be to turn their flattish, helmet-like bodies right way up if they get tipped over. And in the spring, when the pull of the moon is at its strongest, they are inspired to mate.

The male grabs the female with special pincers, and is dragged behind her to a beach, at the highest of high tides (that is, at the new and full moons), where she makes a nest and



Threatened by medical research, menus and beach renourishment

lays eggs. She then moves forward so he can fertilize them. Then they move on and make another nest.

Horseshoe crabs are remarkable in a couple of other ways, too. They are the best known as bait for conch and eels. And their blood contains a copper-based protein, quite unlike the iron-based protein in ours, which yields a product of huge importance to human medicine.

“Anything that’s injected or implanted into a human body,” said the resident horseshoe crab expert at the state department of Marine Fisheries, marine biologist Alison Leschen, “is tested with this extract of horseshoe crab blood. It detects endotoxins.



Citizen scientists are finding few specimens.

“There’s nothing that is as good a detector of bacteria.”

As a result, each year in America, hundreds of thousands of horseshoe crabs are harvested and bled so medical patients don’t sicken or die.

So you can see why the red knot’s problem also is our problem.

In Delaware Bay, which is the area with the highest concentration of crabs, by some estimates numbers have fallen maybe by two-thirds.

Catch quotas in the Delaware Bay states have been cut drastically as a result. Delaware, for example, has progressively cut its harvest from 482,000 to 100,000 crabs (all of which must be male) and imposed moratoriums at various times over recent years. New Jersey has a moratorium on all fishing in place.

The good news is, after declining until about 2002, crab populations appear to be increasing again.

But Massachusetts, including Martha’s Vineyard, also has a significant horseshoe crab fishery, and this state has been far slower off the mark studying the population of crabs in tightening regulations.

“The current regulations are, starting last year, no new entry to the fishery. There is a limit of 400 crabs per day per person,” said Alison Leschen.

“It was 1,000 until last year. The total annual quota for all the catch is 165,000 for Massachusetts. It was 330,000 until last year.”

And further controls are being contemplated, moves motivated as much by an abundance of caution and anecdotal evidence as by hard data.

Ms. Leschen said the first counts of laying crabs in Massachusetts was conducted only last year. The first survey of the breeding population on the Vineyard is now almost complete, and the results have not been encouraging.

The person who organized the volunteers to go out on the nights of full and new moons this May and June to count crabs was Susie Bowman, naturalist at Mass Audubon's Felix Neck wildlife sanctuary.

"We aren't finding nearly as many as I had hoped," she said this week. "We have done three cycles, and we begin the fourth this weekend. Typically, the volunteers might find five crabs on the whole length of Tashmoo. There are nights when they see none."

The largest number she saw, she said, was one night she was out surveying Tashmoo with her husband. They spotted two fishermen with boats.

"One guy had like 280. Between them, the two of them had every crab we counted that night, I think.

"I want to stress these guys were acting completely legally," she said. "I don't want to create an adversarial relationship with the local fishermen.

"It's not my place to say these fishermen can't do it. But I am concerned that we don't lose these creatures. I'm just hoping the data we collect will give a bigger picture so the industry can be sustained."

And she stresses the data gleaned to date is far from conclusive of anything. Their work was limited to Tashmoo and Felix Neck.

"On the other hand, some folks have told me they've never seen so many in the harbor in Vineyard Haven, and never seen bigger females. And we would like to do Katama, which I hear is a hot spot for them.

"We can't really estimate what's happening to the population without surveying several years in a row, but the anecdotal evidence from everybody who has been on the Island a long time is that there are not nearly as many crabs as there used to be."

Alison Leschen, who coordinated the surveys last year and this year across the state, tells a similar story.

"Last year we did 25 beaches from Duxbury south," she said.

"The reason for that is the crabs north of Cape Cod are much smaller than those south of Cape Cod, so there's almost no market for them.

“We had probably 200, 250 volunteers and we surveyed around the full and new moons in May and June, on the high tides, and we found very, very low numbers,” she said.

It’s too soon to read anything much into these breeding surveys, but Ms. Leschen has amassed other evidence, too.

“The Department of Marine Fisheries does a fall and spring trawl survey, in which they identify, measure and weigh everything they catch.

“They’ve been doing this for 30 years and the last eight showed a definite downward trend. That was another worrisome trend. In the fall survey last year they caught no crabs at all. And that’s the first time that’s ever happened.”

So, where are all the horseshoe crabs going?

Mostly into traps to catch conch and eels, but particularly conch.

Several million pounds of conch was caught annually in the 1990s. The bulk of it (about 80 per cent) was exported to southeast Asia and most of the rest to the Caribbean for food.

In Massachusetts, conch is a now \$3 million a year industry.

Said Ms. Bowman: “More effort has been put into the conch fishery as other fisheries have declined. And I don’t know who first discovered it, but somebody found out if you bait the trap for conch with horseshoe crab, well, they love it. It’s like a magnet for them.”

(Elsewhere in the country, there is currently research underway to try to replicate the substance which makes dead crabs so attractive, in the hope of synthesizing it as bait.)

Other crabs are harvested for the biomedical industry. These days, they are caught, bled and then returned to the ocean. But some still die. Several companies are involved in the production process, including one in this state. Ms. Leschen said the exact number they used was proprietary information, but there was a study now underway to more accurately determine mortality rates.

But you need not kill the breeding female horseshoe crabs to seriously disrupt their population, she pointed out.

“Females in evening will lay a nest for half an hour and move few feet and lay another nest, and so on. On any evening they will make three or four nests. Then they’ll come back the next night and maybe the next moon cycle, two weeks later.

“So if a fisherman happens to get here just as she’s settling in with her first nest, he’s basically truncating that entire series of layings,” she said.

There is one other probable factor in the horseshoe crab's decline, too. Habitat destruction.

The construction of wharves, piers and walls to armor property against the sea all reduce the available nesting space. Not to mention beach nourishment programs.

"Beach nourishment, can create great spawning spots, but not when it happens in May and June, when towns often want to do it before the summer," she said.

Then you can wind up dumping hundreds of tons of sand on eggs and larvae, burying and killing them.

"We've been trying to work with towns but it's a losing battle, frankly. They just did Lake Tashmoo. Cape Pogue is another place it's been happening. But this is the time of year, just before the tourist season, when the towns want to do it."

So, what is to be done, to better protect this living fossil from the pressures of the modern world?

Well, in other states, there is a ban on taking females. But the Massachusetts, Division of Marine Fisheries is taking another approach.

"What we're proposing this year," Ms. Leschen said, "is putting size harvest limits, so anything smaller or bigger than the designated size would have to be left.

"That way fishermen could not completely wipe out an area in a single night, but would leave between a quarter and a third of the crabs.

"The second advantage to that approach, too, is that it's enforceable anywhere — at dealers, in the guy's truck, at the beach. Right now a big problem is there's very little enforcement, because it's mostly a nighttime fishery."

"Nobody's saying there shouldn't be a fishery. But it should be sustainable, so there's still a fishery in 5, 10, 50, 100 years."

"Otherwise the fishermen are out of business and the biomedical companies are out of business, and everyone who has medical needs is out of luck," she said.

Not to mention the red knots.