From Mexico to Alaska, wasting disease kills off sea star populations

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In October 2013, diver Neil McDaniel saw something odd off the coast of Vancouver, Canada.

On his first dive, he found a huge bunch of sunflower sea stars on an underwater rock outcropping and took their picture. Two weeks later when he returned to the site, the rock was bare, and the remains of hundreds of dead sea stars littered the sea floor.

McDaniel’s photographs were among the first evidence of what would come to be called sea star wasting disease, a viral infection that has destroyed sea star populations from Mexico to Alaska in only a few years and driven one species, the sunflower sea star, to the brink of extinction.

“The scale and the magnitude of this event certainly has caught all of us, the public and all us scientists, by surprise,” Catherine Drew Harvell said during her talk on the sea star epidemic at the Romberg Tiburon Center for Environmental Studies on Nov. 4.

“[It] is the largest marine wildlife disease outbreak ever recorded,” she said.

Harvell, a professor of invertebrates in the Department of Ecology and Evolutionary Biology at Cornell University, spoke to a packed house at Romberg as part of the center’s ongoing Rosenberg Institute Seminar Series.

Harvell told audience members that at least two species of sea stars, including the ochre star common to local shorelines, have largely disappeared from the North American west, victims of a virus that is flourishing in warming seas.

The disaster could have huge impacts on the coastal environment, she said, because the sea star is a “keystone species” on which the balance of the intertidal environment depends.

Harvell and her team sampled ochre sea star populations in the San Juan Islands off the coast of Canada over a period of three years. In spring 2013, the area’s rocky coves were home to thousands of stars, but by summer 2014, 60-90 percent of the ochre stars had died of the wasting disease. Most of those remaining died off last summer, she said.

Ochre sea stars, which can also be purple, are the large five-armed variety once common on Marion shores. Now they are few and far between on the Pacific Coast, although a few isolated individuals can still be found.

But scientific sampling of another species, the huge, colorful sunflower star, has found something even more disturbing.

A recent sampling of sites from Sitka, Alaska, to Monterey found no sunflower sea stars at all, even at great depths where they used to live.

Harvell said a small population had been found in the Aleutian Islands, but it may not be enough to save the species.

“I have a lot of concern about this species’ recovery,” she said.

“It was a very magnificent star.”

The wasting disease causes a rapid and grisly death. First the stars begin to twist, as if in pain. Then white lesions appear on their outer skin that gradually eat away at the star. Within days, their arms drop off and they die.

At first, scientists were mystified by the die-off. They hypothesized that it might be ocean acidification, lack of ocean oxygen, even radiation from the Fukushima Daiichi nuclear disaster in Japan in 2011.

In 2004, a team of scientists headed by Cornell’s Ian Hewson first identified the virus behind the wasting disease, a type of densovirus similar to parvovirus in dogs.

Oddly, Hewson’s sampling of museum specimens found that the virus is not new to the species. Stars have been known to carry it, and there have been isolated outbreaks of disease in individual species in the past, Harvell said.

What is new, and what scientists can’t understand, is what caused the virus to become so virulent and widespread. It now affects at least 20 species from Mexico to Alaska.

Even sea stars in aquariums isolated from wild sea stars aren’t safe. All of the major West Coast aquariums, including those in Vancouver and Monterey, have reported outbreaks of the disease in captive sea stars within weeks of each other.

Harvell said, suggesting that the disease is waterborne and spread by the seawater that circulates in aquarium tanks.

The role of the environment in the outbreak is not well understood. Harvell said she is not sure if the unusually warm water sitting off the West Coast in the past two years caused the disease, but her lab experiments showed that sea stars developed the disease more quickly in warmer water and died faster.

“There is no indication that warming temperatures actually triggered the outbreak, because it also happened in very cold waters,” she said.

“But what I can say is the temperature made the mortality more rapid.”

Barbara Rosenberg, who with her husband, Richard, has endowed the Romberg Center with the funds for the lecture series, could not be on hand to open the event, but sent her good wishes.

“It’s obvious with programs of this high caliber we are going to have to find a bigger venue,” she said in a note read by the center’s director, Karina Nielsen, to a packed room.

Nielsen added that the subject matter was of vital importance to many members in the community as well as scientists.

“The death of our sea stars touches anyone who has ever explored a tide pool,” she told the crowd.

More than a colorful addition to the marine landscape, as a keystone species sea stars directly impact the marine tidal environment by keeping other invertebrates like sea urchins and mussels in check, Haskell said. Without them, urchin populations have already started to explode in California, upsetting the intertidal balance.

“Urchins are like cows. They eat down all the kelp beds,” Harvell said, adding that kelp forests are a vital habitat for fish and other sea creatures.

Harvell said people often ask what if anything can be done to save the remaining sea stars.

Vaccinating sea stars is probably not possible right now, she said, but captive breeding of disease-resistant individuals shows promise.

Harvell said a bright spot in the tragedy was that there is a lot of public interest.

“Monitoring by citizen scientists and divers, people being educated about this and paying attention is an enormous help,” she said.

She urged citizens to keep supporting environmental legislation, marine research and research stations like the Romberg Tiburon Center.

“Your involvement in this incredible marine lab … that’s right here in your community — I think that’s one of the most important things,” she said.

Contribution writer Gretchen Lang of Belvedere covers the environment. She spent 15 years abroad writing for newspapers including the Boston Globe and the International Herald Tribune.