

Creation Care Ministry

When over 99 percent of California's sunflower sea stars mysteriously wasted away 10 years ago, an already stressed ecosystem unraveled.

Sunflower sea stars—*Pycnopodia helianthoides*—may look like a purely decorative feature of the ocean floor, but they're voracious predators. As adults, they can grow up to 24 arms, span three feet wide, and move three feet per minute. They are superlative, and alien—one of the largest and arguably most ravenous sea stars in the world.

But at the end of 2013, a colossal marine heatwave swept over the north east Pacific just as a mysterious underwater epidemic began causing sea stars to die off en masse.

Without a primary predator, an excess of purple sea urchins insatiably consumed their surrounding kelp forests. Over the past 100 years, these large ribbons of golden-brown seaweed had already dwindled in some stretches of the coast, due in large part to warming ocean conditions. By 2017, this sudden explosion of hungry sea urchins and an ongoing marine heat wave, strengthened by an El Niño weather pattern, wiped out more than 90 percent of kelp forests in some West Coast regions.

Kelp forests on the West Coast are critical habitats that support dozens of species, from drifting plankton to migrating gray whales. They're also a vital habitat to lucrative fish species like rockfish, abalone, and crabs. Kelp itself is a sustainable food and helps sequester atmospheric carbon. But without sunflower sea stars, kelp forests have been unable to grow back without being devoured by hungry purple sea urchins.

A decade into the devastation, weary coastal communities impacted by the loss of these ecosystems throughout the state and the scientists studying this environment wondered whether a population of urchin-devouring sunflower sea stars might have survived, tucked into a protected coastal inlet or nestled into a forgotten reef.

Sunflower sea stars, these crucial members of the ecosystem, became almost mythological, earning them the affectionate term “seasquatch” among many professional and amateur scientific sleuths. Finally, after years of faithful searching, a hidden “seasquatch” lair was discovered last June.

“The moment I saw my first sunflower star underwater, I was so excited that I literally screamed through my regulator,” Rachael Karm, a research technician at Sonoma State University’s Dr. Brent Hughes ecology and conservation lab, noted in an email. “I came up to the surface before remembering to even take a photo.”

A subsequent diving blitz revealed 18 total sunflower sea stars—the largest and southernmost population of sunflower sea stars documented since sea star wasting disease spread across the coast. Karm and her peers say this discovery offers a major sign of hope for restoring lost sunflower sea stars and potentially even reviving the coast’s lost kelp forests.

The world’s first *Pycnopalooza*

Karm began studying kelp forests in northern California in 2020, after most of the sunflower sea stars had already disappeared. She had never seen a sunflower sea star in the wild and said her search for these giant sea stars felt at times like a

cryptozoological hobby reminiscent of Big Foot chasers. For nearly a decade, she noted, these sea stars had been “virtually absent” from the coastline.

“For most of my career, seeing a sunflower star felt almost out of reach, something you hear about but don't get to see yourself because the chances are so slim,” she said.

But in June 2025, Karm’s colleagues found a single adult sunflower sea star at an underwater site they regularly monitored for kelp research projects. When Karm returned about a week later to relocate the star and collect genetic samples she was stunned to stumble across four more sunflower sea stars—juveniles this time, including two silver-dollar-sized individuals on the same rock.

“When we found those babies, I was filled with a profound sense of hope: Clearly there were adults that had successful reproduction, with huge implications for recolonization.”

Karm suspected there could be many more stars hiding out in this cove. Finding as many as possible and collecting genetic samples from them would help researchers determine whether this small, healthy population may have some resilience to the wasting disease. Such a trait could have major, positive benefits for the state’s kelp recovery efforts.

Just two months later, Karm convened an event dubbed *Pycnopalooza*.

Once *Pycnopalooza* was announced, it drew a dream team of 25 scientific divers from eight different institutions: The Nature Conservancy; Greater Farallones National Marine Sanctuary; Moss Landing Marine Labs; University of California, Berkeley;

Reef Check California; Sonoma State University; Sunflower Star Laboratory; and the Kashia Band of Pomo Indians, whose scientific dive team oversees kelp restoration on their ancestral lands.

Over two days, divers systematically surveyed the humble cove off the coast of Sea Ranch, California using an underwater grid system. Teams entered the frigid water with flashlights, measuring reels, and little red floats to be deployed should a wild “Pycno” be found. They also had access to a new technology that allowed them to find bits of sunflower sea star DNA in environmental samples, also known as eDNA.

By the end of the two-day effort, 18 adult sunflower sea stars had been found—each individual marked by its own exuberantly bobbing red buoy.

How the sea star colony could help fight disease

The discovery’s timing was fortuitous.

Just weeks before the August dive took place in California, scientists at the Hakai Institute in British Columbia published a paper that finally identified the culprit behind the sea star mass mortality—the bacterium *Vibrio pectenicida*.

With the ability to track the disease agent and its victim from a distance, scientists could now investigate how outbreaks of sea star wasting occur—and breed potentially genetically-resilient varieties of lab-grown sunflower sea stars.

All 18 of the *Pycnopalooza* stars' genetic samples are being analyzed in a lab at the University of California, Merced where scientists are trying to learn what genetic traits might have helped the stars to survive the wasting disease.

“I was thrilled to be told that 18 sunflower sea stars had been found and sampled—this is the largest and southernmost population we have seen in California post-wasting, and the first with enough large individuals to have meaningful reproductive potential,” said Lauren Schiebelhut, an evolutionary ecologist at the University of California, Merced, in an email.

Schiebelhut will be researching the genetic samples collected by pycnopalooza divers to look for clues that might bring them back.

“It's special to know these stars exist, and maybe they're special in a few more ways that can help us understand their hopeful return,” she said.

Scientists and tribal leaders are hopeful that this sea star population can recover, but they still face hurdles. At the same time scientists were finding healthy sunflower sea stars last August, one was also found wasting away, right next to its seemingly healthy neighbors.

A hopeful future for sea stars and kelp forests

In the months since the 18 stars were discovered, researchers have continued studying their DNA and methods for breeding disease resistance.

“Discovering a wild population of recovering Pycnos is an amazing opportunity to try and answer questions from the past we missed out on, and to map the next steps of sunflower star recovery,” said Andrew Kim, the lab manager at Sunflower Star Laboratory in Moss Landing, California.

Kim’s lab is one of several efforts, from Alaska to California working to release disease-resistant sunflower sea stars bred in a lab back into the wild.

“Understanding what—if anything—is special about the palooza ‘Pycno’s is crucial data for reintroduction programs like ours and the greater kelp community,” said Kim.

The observation of this Pycno population was also a source of hope for Kashia and other local Tribes. This stretch of northern California coastline—“Tule q^ha le yo” in the Kashia language (“many hummingbird plants”)—has long been a source of now-scarce foods like kelp and abalone.

“The discovery of sunflower sea stars in this sacred place is part of a healing process” said Dan Swezey, an ecologist and director for oceans and aquaculture with the Kashia Band of Pomo Indians. Knowing now that these Pycnos are afoot, Karm and her colleagues will be monitoring the health and movements of these individuals, while searching for more populations along the coast. “The first Pycnopalooza showed us how much we can accomplish when we all come together,” said Karm, “I’m looking forward to more paloozas up and down the coast of California to see where else sunflower stars may still be hiding.”

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