Yeti crab grows its own food

Deep-sea species farms bacteria on its own claws.

Ed Yong

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In the deep ocean off the coast of Costa Rica, scientists have found a species of crab that cultivates gardens of bacteria on its claws, then eats them.

The yeti crab — so-called because of the hair-like bristles that cover its arms — is only the second of its family to be discovered. The first — an even hairier species called *Kiwa hirsuta* — was found in 2005 near Easter Island[1].

Andrew Thurber, a marine ecologist now at Oregon State University in Corvallis, identified the second species a year later. “It was a big surprise,” he says. “There’s a tonne of them, they’re not small, and they’re six hours off a major port in Costa Rica.”

Andrew Thurber

Yeti crabs living around deep-sea methane seeps cultivate the bacteria on which they feed.

Writing in *PLoS ONE*[2] this week, Thurber named the crab *Kiwa puravida*, after a common Costa Rican saying that means 'pure life'.

“Those of us who work in the deep sea expect to discover a strange new species every time we dive,” says Cindy Van Dover, a marine ecologist at Duke University Marine Laboratory in Beaufort, North Carolina. “*Kiwa puravida* doesn't disappoint. The original yeti crab was charismatic. This one is even more so.“

Ocean waves

Thurber had not set out to discover species. He was part of a geological research cruise off the coast of Costa Rica, which aimed to study methane seeps — sites on the ocean floor that belch out methane and hydrogen sulphide gas. While exploring the seep in a submersible, pilot Gavin Eppard noticed the 9-centimetre crabs waving their claws over active seeps, and collected one. “He came up and just handed me this new species,” says Thurber.

The bristles that cover the crab’s claws and body are coated in gardens of symbiotic bacteria, which derive energy from the inorganic gases of the seeps. The crab eats the bacteria, using comb-like mouthparts to harvest them from its bristles (see a video of this on our YouTube Channel).

The bacteria in *K. puravida* gardens are closely related to species that live in other cold seeps and hot hydrothermal vents all over the world. “It looks like the bacteria may use the seeps as stepping stones, to create this global connected population that consumes the energy coming out of seeps and vents,” says Thurber.

Thurber thinks that *K. puravida* waves its claws to actively farm its bacterial gardens: movements stir up the water around the bacteria, ensuring that fresh supplies of oxygen and sulphide wash over them and helping them to grow. “This 'dance' is extraordinary and comical,” says Van Dover. “We've never seen this strategy before.”

Strict diet

Thurber confirmed that the bacteria are the crab's main food source. Carbon isotopes and fatty acids in the crab's body match organisms that get their nourishment without the sun's energy, rather than those that rely on photosynthesis. This suggests that *K. puravida*'s diet consists mostly of seep bacteria, rather than surrounding photosynthesizing plankton. "We clearly showed that this species isn't using energy from the sun as its main food source. It's using chemical energy from the sea floor," says Thurber.

"They did the best job I've seen on nailing a nutritional role for the symbionts," says Charles Fisher, a marine ecologist at Pennsylvania State University in University Park.

K. puravida is not alone in snacking on the bacteria it hosts. Two other crustaceans that live on hydrothermal vents — a crab (*Shinkaia crosnieri*) and a shrimp (*Rimicaris exoculata*) — have similar bacteria growing on their bodies[3,4]. "This form of nourishment may be more common than was previously believed," says Bob Vrijenhoek, a marine biologist at the Monterey Bay Aquarium Research Institute in Moss Landing, California. The strategy could explain why crustaceans are so successful at deep-sea vents and seeps.

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References

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