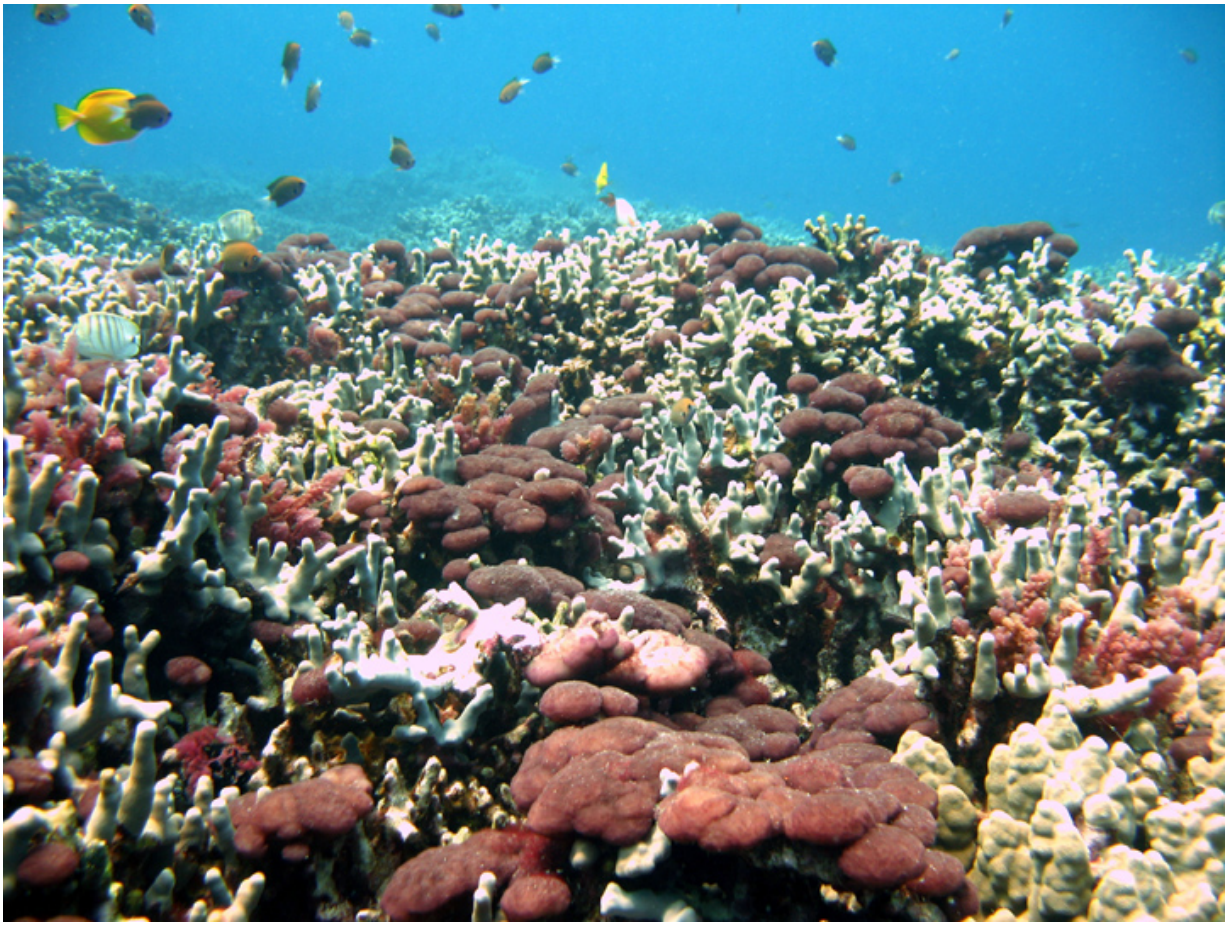
UC San Diego
UC San Diego News Center

May 24, 2012 | By Mario Aguilera

Nuisance Seaweed Found to Produce Compounds with Biomedical Potential

Scripps-led analysis of tiny marine organisms indicates early promise in areas ranging from inflammation to skin conditions



Darkly colored cyanobacteria overtake a Hawaiian coral reef. Photo credit: Jennifer Smith

A seaweed considered a threat to the healthy growth of coral reefs in Hawaii may possess the ability to produce substances that could one day treat human diseases, a new study led by scientists at Scripps Institution of Oceanography at UC San Diego has revealed.

An analysis led by Hyukjae Choi, a postdoctoral researcher in William Gerwick's laboratory at Scripps, has shown that the seaweed, a tiny photosynthetic organism known as a "cyanobacterium," produces chemical compounds that exhibit promise as anti-inflammatory agents and in combatting bacterial infections. The study is published in the May 25th issue of the journal *Chemistry & Biology.*

Hyukjae Choi

"In different arenas these compounds could be helpful, such as treating chronic inflammatory conditions for which we currently don't have really good medicines," said Gerwick, a professor of oceanography and pharmaceutical sciences at the Center for Marine Biotechnology and Biomedicine at Scripps and UC San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences.

Scientists identified the "nuisance" organism in 2008 on the reefs directly adjacent to the National Park Pu'uhonua o H'onaunau off the Kona coast of Hawaii. The cyanobacterium is believed to be native to Hawaii and is usually inconspicuous, said Jennifer Smith, a Scripps assistant professor in the Scripps Center for Marine Biodiversity and Conservation and a paper coauthor.

"When we first found the bloom during routine surveys with the University of Hawaii we were concerned as it was clearly smothering the corals at one of the most popular dive sites in Hawaii," said Smith. "Observations in the field even suggested that the cyanobacteria may have been releasing some chemical that was causing the coral to bleach."

When Smith and her colleagues found the seaweed blooming it was clear that it was overgrowing and negatively affecting the underlying corals. Samples were retrieved in 2009 and transferred to Scripps for analysis.

Cyanobacteria (dark shades) found in Hawaii produce che compounds with biomedical potential. Photo credit: Jenni

Choi, Gerwick and their colleagues conducted various laboratory experiments and discovered that the seaweed (the cyanobacterium *Leptolyngbya crossbyana*) generates natural products known as honaucins with potent anti-inflammation and bacteria-controlling properties.

Specifically, the substances hamper bacteria's ability to "swarm" over surfaces. For example, when overtaking a new area, bacteria secrete small amounts of a substance known as a quorum sensing factor, which tests to see if the new surface is safe for colonization. Halting a quorum sensing factor could one day translate to a treatment

for bacterial infections. For instance, this could be critical, Gerwick said, in the development of drugs to prevent infection in patients who require catheters to deliver vital nutrients to key areas such as arteries, as well the development of new treatments for acne and other skin conditions.

wick

“I think this finding is a nice illustration of how we need to look more deeply in our environment because even nuisance pests, as it turns out, are not just pests,” said Gerwick. “It’s a long road to go from this early-stage discovery to application in the clinic but it’s the *only* road if we want new and more efficacious medicines.”

“These organisms have been on the planet for millions of years and so it is not surprising that they have evolved numerous strategies for competing with neighboring species, including chemical warfare,” said Smith. “Several species of cyanobacteria and algae are known to produce novel compounds, many that have promising use in drug development for human and other uses.”

Other coauthors of the paper include Samantha Mascuch, Francisco Villa, Tara Byrum and Lena Gerwick of Scripps Institution of Oceanography; Margaret Teasdale and David Rowley of the University of Rhode Island; and Linda Preskitt of the University of Hawaii, Manoa.

UC San Diego and the National Institutes of Health supported the research.
