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News Release

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SCIENTISTS CONFIRM EXISTENCE OF VITAMIN “DESERTS” IN OCEAN

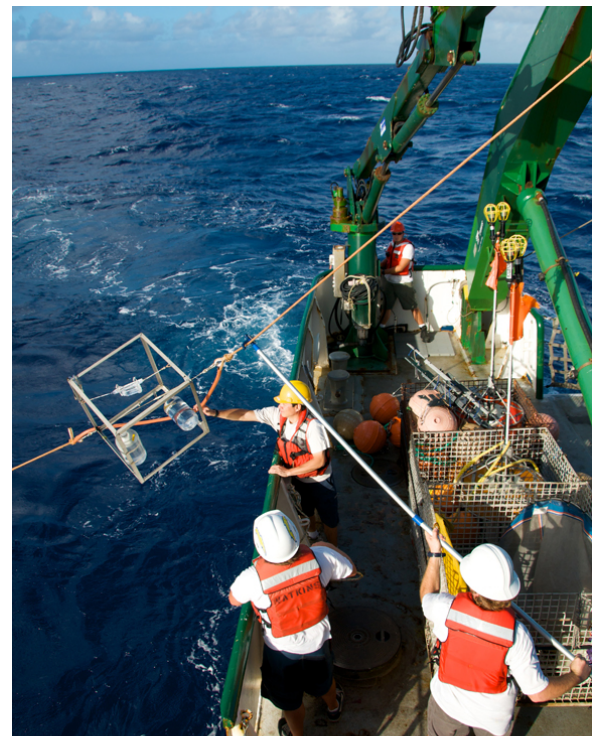
First hypothesized in the 1960s, marine zones where B-vitamins are undetectable may influence the growth of phytoplankton, the foundation of sea life

HONOLULU – Using a newly developed analytical technique, a scientist from the University of Hawaii – Manoa (UHM) and colleagues from the University of Southern California (USC) and Universidad Autonoma de Baja California were the first to identify long-hypothesized vitamin B deficient zones in the ocean.

“This is another twist to what limits life in the ocean,” said Sergio Sañudo-Wilhelmy, professor of biological and earth sciences at the USC Dornsife College of Letters, Arts and Sciences and lead author on a paper about the vitamin-depleted zones that will appear in *Proceedings of the National Academy of Sciences* on July 23, 2012.

B vitamins are organic compounds dissolved in the ocean and are important for living cells to function. Zones poor in B vitamins may inhibit the growth and proliferation of phytoplankton, which are tiny microorganisms at the base of the food chain in the ocean.

"An important result of our study is that the concentrations of the five major B vitamins vary independently and appear to have different sources and sink" says co-author David Karl, Professor of Oceanography and Director of the



C-MORE scientists and technicians recover an array on the UH research vessel *Ka'imikai-o-Kanaloa*.
Image credit: Paul Lethaby, SOEST/UHM

Center for Microbial Oceanography: Research and Education (C-MORE) at UHM. "This could lead to complex interactions among populations of microbes, from symbiosis to intense competition."

In addition to being food for the tiniest sea animals, phytoplankton also absorb carbon dioxide from the atmosphere, an important process when levels of atmospheric carbon dioxide from the burning of fossil fuels are the highest they have been in half a million years.

The team developed a new method of concentrating water samples and then analyzing them using a mass spectrometer, which identifies and measures the quantity of an unknown compound in a given sample by first ionizing and breaking-up the compound and then quantifying the fragmented ions or molecules produced.

In their PNAS article, the researchers are sharing their technique with their colleagues around the world to help advance related research.

"The most important thing is that everyone with the right equipment can do it," Sañudo-Wilhelmy said.

Next, Sañudo-Wilhelmy said he plans to investigate what causes varying amounts of B-vitamins in different regions of the ocean, and try to determine exactly how that affects phytoplankton blooms. This includes a comprehensive set of experiments in the North Pacific Ocean as part of C-MORE's ongoing Hawaii Ocean Experiment.

Periodically, phytoplankton experience population explosions known as "blooms." In the case of certain phytoplankton that produce toxins, these blooms become toxic, such as the so-called "red" tides. Temperature, sunlight and nutrients in the water all appear to influence these blooms, but the exact causes have yet to be pinned down. One hypothesis is that vitamins B₇ and B₁₂ may act as triggers.

"It's crazy that after 100 years of study, we still don't fully understand what controls different phytoplankton blooms in the ocean," Sañudo-Wilhelmy said.

Sañudo-Wilhelmy collaborated on this research with William M. Berelson, Lynda Cutter, Emily Smail, Laura Gomez-Consarnau, Eric A. Webb and Maria Prokopenko from USC Dornsife; as well as David M. Karl from the University of Hawaii, Honolulu; and Reginaldo Durazo of the Universidad Autonoma de Baja California en Ensenada, Mexico.

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The School of Ocean and Earth Science and Technology at the University of Hawaii at Manoa was established by the Board of Regents of the University of Hawai'i in 1988 in recognition of the need to realign and further strengthen the excellent education and research resources available within the University. SOEST brings together four academic departments, three research institutes, several federal cooperative programs, and support facilities of the highest quality in the nation to meet challenges in the ocean, earth and planetary sciences and technologies.

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