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COURTESY OF SOEST / UH-MANOA
Lance Fujieki deploys a drifting sediment trap array at the HOT Station Aloha. Scientists from UH and other institutions have made spectacular discoveries about microorganisms since 1988 at Station Aloha, an ocean site about 60 miles north of Oahu.

Tiny ocean species hold big surprises

UH scientists join international studies of vital microbes

By Helen Altonn
haltonn@starbulletin.com

University of Hawaii oceanographers are part of an international group trying to unravel the secrets of microscopic life in the ocean.

"To get a census of this stuff, what they're doing and why they're doing it, is an enormous challenge," said David Karl, UH oceanographer and microbial biologist.

Karl chairs a committee on the open ocean for an International Census of Marine Microbes. Specialists from around the world began planning experiments during a recent ocean and coastal systems workshop here.

Microbes initially were left out of a bold, 10-year global program on the Census of Marine Life sponsored by the Alfred P. Sloan Foundation. They were later added as a separate part of the program.

Mitchell Sogin, leader of the marine microbe census, stressed its significance at the Honolulu workshop. "Microbes are what allow planetary habitability," said the evolutionary biologist and senior scientist at the Woods Hole Oceanographic Institution's Marine Biological Laboratory.

"They represent the only kind of life on Earth for at least 90 percent of evolutionary history. They can live without us but we cannot live without them."

"Microbes make things happen," Karl said, describing their wide-ranging role from producing and consuming organic matter and greenhouse gases to fixing nitrogen and taking up carbon.

Scientists from UH and other institutions have made spectacular discoveries about microorganisms since 1988 at Station Aloha, an ocean site about 60 miles north of Oahu.

Karl is one of the chief investigators in the Hawaii Ocean Time-series Program at Station Aloha and an affiliate faculty member at a similar ocean research station in Bermuda. The two have the longest records of ocean measurements in the world.

People were thinking of microbes in the sea 100 years ago, but the golden age of microbiology was "victory over disease" by Louis Pasteur, Karl said at the workshop.

But by the time he earned his doctorate degree in 1978, he said, so much work had been done in marine microbiology and microbial oceanography, "I thought we knew everything about microbial diversity, so much so I was going to law school because there was nothing else to discover."

Since then, however, "nothing short of a marine microbiological revolution has occurred," he said, noting the genetic makeup of organisms has revealed "very unusual, unexpected and fundamental groups of organisms. There are a lot of unknowables and yet to be known."

Observations and data from Station Aloha have changed fundamental ideas about how the ocean works, and scientists must react to the changes, Karl said.

Sogin said he is interested in seeing if the Atlantic and Pacific have the same microbial populations. "The only claim in microbiology is 'everything is everywhere.' We can directly ask that question."

Oceanographers can use microbial populations to monitor global changes, Sogin said, explaining microbes are probably "what buffers Earth from going over the edge in terms of global change. ...

"They control things in a way that you can buffer tremendous insults from change," he said, such as increased carbon levels in the atmosphere.

"If we have a better understanding of what microbial populations are doing, we could use microbes as sentinels to see if there really are changes."

The knowledge could have enormous impact on decisions that have economic consequences, Sogin said.

Karl's team is pursuing microbial research under a five-year, \$3.85 million award he received last year from the

Gordon and Betty Moore Foundation, which initiated a 10-year, \$145 million marine microbiology program.

He also has proposed a \$20 million UH Center for Microbial Oceanography to the National Science Foundation. It was one of six chosen in January by the NSF for funding out of 165 competitors, but budget cutbacks at the foundation have left funding for new centers in doubt.

International Census of Marine Microbes

icomm.mbl.edu/

Hawaii Ocean Time-series Program

hahana.soest.hawaii.edu/hot/hot_jgofs.html

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