UC SANTA BARBARA

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Gail Gallesich Brown

NATIONAL SCIENCE FOUNDATION TO FUND STUDY OF PARASITES

The University of California, Santa Barbara has just received notice that the National Science Foundation will award $2.2 million over five years to the Marine Science Institute to study the role of parasites in natural ecosystems. The money will largely fund student research under the direction of three co-principal investigators.

In their proposal, the researchers explain how the ecology of parasites has long had implications for human health and that human alterations to the environment have affected the success of parasites: "Humans have altered the globe in ways that favor diseases. For example, deforestation, damming, fish farming and rice farming have increased malaria transmission by creating mosquito breeding habitats."

The researchers will work in salt marshes because these have proven to be a model system for understanding the ecology of parasites with complex life cycles.

In addition to work at two UCSB Natural Reserves, Carpinteria Salt Marsh and Coal Oil Point, the researchers will travel to estuaries in Morro Bay, Mugu Lagoon, Japan and along the Pacific Coast of Baja California, Mexico.

"We seek to reveal how anthropogenic or human-induced changes, particularly those related to biodiversity loss and habit transformation, influence communities of parasites with complex life cycles," said Armand Kuris, co-principal investigator and professor of zoology.

"The types of changes most likely to affect parasite communities are alterations in host communities resulting from climate change and environmental degradation," said Kevin Lafferty, a co-principal investigator and adjunct professor of biology at UCSB, who also works for the U.S. Geological Survey. He noted that, counter to most expectations about disease, healthier, less degraded ecosystems tend to have more parasites with complex life cycles because these parasites depend on functioning ecosystems.

Lafferty explained that environmental degradation can include introduced species, habitat fragmentation, pollution and overharvesting. In turn, because parasites, particularly those transmitted through predation (when an organism eats an infected host), have the potential to organize their host communities, changes to parasite communities can profoundly alter natural systems. "We are especially interested in the potential for complex feedback dynamics initiated by anthropogenic change," he said. The new research ties in with current research by Lafferty and colleagues at UCSB funded by the EPA to develop parasites as indicators of estuary health and function.

Kuris, Lafferty and a third investigator, Andrew P. Dobson, professor of zoology at Princeton, are specialists in parasite ecology. They will use mathematical models, molecular tools, laboratory experiments, field experiments and large scale comparative field studies for the investigation.

The researchers will study parasites of the abundant horn snail, Cerithidea californica, which acts as a hub in the life cycle of 17 parasitic trematode (worm) species. Each worm moves through several hosts.

A worm castrates the snail it infects and each day produces scores of free-swimming stages that leave infected snails to search out a second intermediate host such as a fish, clam, crab or snail. In the second intermediate host, the trematode can greatly alter host behavior to increase the chance of transmission to a final host.

Wading birds, shorebirds and seabirds prey selectively on second intermediate hosts and become parasitized by adult worms. In the final host, the small worms live in the gastrointestinal tract, mate and produce eggs that pass into the marsh with the host's feces where they encounter snails and complete the life cycle. Each of the 17 trematode species that use C. californica has a different life cycle.

The reviewers of the NSF proposal praised the researchers and their work: "This is an intellectually strong team of scientists with a proven track record of fruitful collaboration," said one reviewer. "They are among the international leaders in their respective fields. The research environment is outstanding and unique for addressing the questions being raised."

The reviewer went on to say, "This is an outstanding proposal to study trematode parasites in estuaries and to test ideas about the general role that parasites play in structuring animal communities. The ideas are novel and the experiments are logical and well articulated. The simulation models, once tested, could help to change the way we think about parasites and the way that their impact may be changed by anthropogenic environmental changes."

Note: Kevin Lafferty can be reached by phone at (805) 893-8778, or by e-mail at (lafferty@lifesci.ucsb.edu). Armand Kuris can be reached by phone at (805) 893-3998 or by e-mail at (kuris@lifesci.ucsb.edu). Andrew Dobson can be reached by phone at (609) 258-2913 or by e-mail at (andy@eno.princeton.edu).

About UC Santa Barbara

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