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Jeb Byers, Associate Professor of Zoology, travels to Australia

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International Perspectives

Center for International Education

JEB BYERS, ASSOCIATE PROFESSOR OF ZOOLOGY

Professor James (Jeb) Byers spent the 2007-08 academic year in Australia conducting research on a highly invasive alga species.



Jeb Byers (foreground) with Dr. Paul Gribben, University of Technology Sydney – and kangaroo companions in background.

With the help of the Faculty Development Grant from the UNH Center for International Education, National Geographic, and the UNH Class of 1937 Professorship in Marine Biology Award, I spent my sabbatical in 2007-2008 conducting research and guest lecturing in Australia. I was hosted by two excellent colleagues—Dr. Jeff Wright at the University of Wollongong and Dr. Paul Gribben at the University of Technology Sydney.

Our research project focused on identifying the community impacts of the invasive alga, *Caulerpa taxifolia*, that forms dense mats and is spreading throughout estuaries in southeastern Australia. This alga is considered one of the dozen worst invasive species throughout the world, including the Mediterranean Sea where it forms a dense

monoculture over expansive reaches and has displaced many native species. *Caulerpa taxifolia* is considered an ecosystem engineer because it typically invades bare substrata and creates a massive canopy of algal biomass. Invasive species such as these that create or modify structure and habitat often have profound community effects. In soft-sediment marine systems these so-called ecosystem engineers can affect such properties as habitat complexity, sediment structure, sediment chemistry, and water flow. These alterations of abiotic properties may in turn alter the abundance and diversity of native species, as well as their many context-dependent interactions like competition and predation.

Caulerpa taxifolia had been suggested to affect the vulnerability of the common native clam species, the Sydney cockle (*Anadara trapezia*), to native predators and parasites by creating biogenic structure and altering flow in previously unvegetated areas. We hypothesized that the biogenic structure decreases predation rates by limiting access to roving benthic predators like octopus and rays, but may increase predation rates by mesopredators like drilling snails which themselves may have refuge from predators inside *Caulerpa* beds. By decreasing flow, *Caulerpa* may make it easier for parasites, like boring sponges, anemones, and blister worms that foul the shells of the clams, to find and settle onto their host. Furthermore, dense *Caulerpa* stands may also create high sediment anoxia which is detrimental for the clams. Our study aimed to experimentally tease apart the mechanisms by which *Caulerpa* affects *Anadara* and discern the ultimate net impact on this important native species.

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In preparing for my work in Australia I received some very important pilot data for this project that was made possible through the UNH International Research Opportunities Program (IROP). Dr. Wright and I initiated a project in the summer of 2006 by jointly advising Lena Collins, a UNH junior and fellowship recipient. Ms. Collins' project gathered key preliminary data on *Caulerpa taxifolia*, including rates of water flow inside and outside of *Caluerpa* beds, and predator usage of algal beds. Ms. Collins' summer IROP project (which was worked up into her Honor's thesis and was an award winner at the 2007 Undergraduate Research Conference) provided excellent information upon which to expand our studies to examine multiple community-wide impacts of *Caluerpa*. Her work was so successful that I already have plans to involve another UNH IROP undergraduate student in summer 2009. This will allow me to engage more students in active research and continue to strengthen my international collaboration even after my sabbatical term is over.

Given my interest and research focus on marine invasive species, Australia was an ideal location for pursuing my project. Notably the Australian government agency CSIRO (Commonwealth Scientific and Industrial Research Organisation) is essentially the only governmental agency of its kind anywhere in the world that collects superb, detailed data on marine invaders. I visited and guest lectured at CSIRO in Canberra hosted by a top invasion biologist, Dr. Mark Lonsdale. I also was invited to lecture at the University of New South Wales and at my host institutions (University of Wollongong and University of Technology Sydney). I was thrilled by the interactions with new colleagues in these places and I am pleased with the strength of my international connections, which have already begun to catalyze stimulating, new collaborative projects on marine invasions.

In sum, this project was the perfect next step for my own professional development. It was my first major independent research project in subtropical marine systems. It allowed me to mentor students and collaborate with Australian scientists on a project that will ultimately provide results with direct conservation applications. My sabbatical was an invaluable experience that will allow me to infuse new ideas and collaborations into my research program.

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