

2008 Annual Report: Biology

In 2008, members of the Biology Department traveled to the poles, the tropics, shallow lagoons and the deep sea. At WHOI, research in biology covers a broad range of life forms from microscopic to some of the largest marine mammals on the planet. Equally broad is the range of sub-disciplines in biology, from the genomic level to large-scale processes and modeling.

An overall goal of research in the Biology Department is to gain a better understanding of the ecology and evolutionary biology of living organisms in the sea. To accomplish this, scientists use a variety of tools to observe, experiment and model interactions among species and between species and their environments.

Among the expeditions undertaken by Biology staff in 2008 were studies of the corals of the Red Sea through collaboration with the King Abdul University of Science and Technology (KAUST); a multi-disciplinary voyage to the Bering Sea aboard the U.S. Coast Guard Cutter *Healy* to examine the effects of climate change on the Arctic ecosystem; and coastal cruises to examine the distribution of harmful algal blooms in the North Atlantic.

Biological research benefits from the development of new tools that facilitate observations, analyses and interpretation of phenomena. In 2008, several new tools and approaches in the Biology Department yielded research advances.

Using the Imaging FlowCytobot, biologists Rob Olson, Heidi Sosik, and Lisa Campbell of Texas A & M University were able to detect a bloom of *Dinophysis acuminata* in the Gulf of Mexico, posing a serious health hazard to shellfish harvests. This toxic alga was never before detected in local waters, but its presence alerted Texas health officials to take action before any health hazards occurred.

Mark Baumgartner and colleagues in the Applied Ocean Physics and Engineering Department developed a Realtime Acoustic Tracking system (RATS) to examine the foraging behavior of baleen whales in three dimensions. The system consists of a free-floating array of GPS-linked hydrophone buoys that determine the position of a whale equipped with an acoustic transmitter. The time-of-arrival data are relayed from the buoys to a ship immediately upon receipt of each acoustic pulse from the transmitter.

Using these techniques, predator behavior can be monitored in relation to its prey availability.

The Marine Mammal Center for the study and conservation of marine mammals was also formed during 2008. The center combines scientific expertise, state-of-the-art facilities, and technological innovations to address basic questions about marine mammal behavior, physiology and health, as well as potential effects of human activities on marine mammals and the ecosystems on which they depend. The MMC combines scientific expertise with novel applications of technologies and tools such as gliders, sound propagation models, and biomedical and habitat visualizations.

—[Judy Mcdowell](#), Department Chair



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Reef-building corals create habitats for many other organisms. The corals reefs of the Red Sea are highly diverse and unique in the world, providing shelter and sustenance for abundant fishes and other marine life. A research partnership with KAUST (King Abdullah University of Science and Technology) in Saudi Arabia is providing WHOI scientists a rare opportunity to study the Red Sea, including an assessment of pristine coral reef ecosystems near the Saudi Arabia coast. (Photo by Jessie Kneeland, Woods Hole Oceanographic Institution)

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Invasion of the "Alien Vomit"?

WHOI researcher Mary Carman narrates a short video on her work mapping the spread of sea squirts that can have come from Europe and Asia and are crowding out native species of plants and animals.

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