

# COASTAL RESEARCH

A newsletter from the Coastal Ocean Institute

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## A message from

## Director Chris Reddy



As the Director of the Coastal Ocean Institute (COI), I am asked a wide range of questions about WHOI research in the coastal

oceans by Trustees and Corporation members, friends and guests. This newsletter addresses two frequently asked questions: (1) Does COI support research around the world? and (2) Are jellyfish becoming more prevalent in the coastal ocean? The first question focuses on COI's global reach, and

the second touches on the marine environment that is perhaps right outside your window.

On the global front, you will read how Bernhard Peucker-Ehrenbrink utilizes his COI funds to study some of the largest rivers in the world. Graduate student Andrew McDonnell highlights how COI funds have helped him to study the coastal ecosystem in Antarctica. Andrew Ashton reviews his new efforts to collaborate with the University of Ghana off the coast of East Africa. Clearly, the COI has a worldwide presence with exciting and novel

work. Underscoring WHOI's scientific breadth, we are fortunate to have in our midst one of the world's experts on jellyfish, Executive Vice President and Director of Research Larry Madin. I spoke with Larry one afternoon and received an impressive lesson on coastal biology. His thoughts on the presence of jellyfish in coastal waters are printed on the last page.

I hope this newsletter reveals the outstanding work done at WHOI and the talented group of scientists we have. I hope you enjoy it and encourage you to keep asking questions. 🌊

## Investigator Spotlight

## Connecticut River Observatory



*Bernhard Peucker-Ehrenbrink and student Britta Voss sampling the Fraser River as part of the global river initiative.*

*Bernhard Peucker-Ehrenbrink, Senior Scientist, Marine Chemistry & Geochemistry*

Rivers—the arteries that connect land and ocean—are of vital importance to the health of coastal ecosystems. Owing to its location at the tip of Cape Cod, WHOI does not have a natural “home river” to study and use for developing and testing instrumentation. A group of WHOI scientists met in 2008 to discuss concerted science and engineering activities at one of

New England's rivers. We decided to focus on the Connecticut River, a mid-sized river draining portions of five New England states and a fraction of southern Canada into Long Island Sound. This river system has a storied history of alteration by European settlers that affected the composition and flux of material into Long Island Sound.

Aleck Wang, Assistant Scientist, Department of Marine Chemistry & Geochemistry, and I received funding from WHOI's Coastal Ocean Institute to establish a river observatory on

the lower Connecticut River. This observatory will be the local test bed for our global river initiative that brings together researchers from WHOI, the Woods Hole Research Center, the University of New Hampshire and many international collaborators to investigate the Lena and Kolyma rivers in Russia, the Yangtze in China, the Ganges and Brahmaputra in India and Bangladesh, the Congo in central Africa and the Fraser in western Canada. We are gearing up for intense time-series sampling in collaboration with the Connecticut River Museum in Essex, CT, in order to chemically characterize this river system for one

year. We are particularly interested in nutrients, different types of carbon species, and other geochemically interesting parameters. Measuring these parameters at least biweekly will enable us to better understand the seasonal dynamics of this river system, the sources of excess nutrients and pollutants, and the delivery of sediment to Long Island Sound. In collaboration with our colleagues in the Applied Ocean Physics & Engineering Department who are studying the physical dynamics of the estuary and how it interacts with Long Island Sound, as well as with colleagues at Yale University and other institutions along

the Connecticut River, we are trying to build an integrated network to study and ultimately model this river system. In the fall of 2008, as a step towards a more integrated study, we organized the first Connecticut River Science Conference at the Connecticut River Museum, a meeting that attracted over 60 representatives from universities and colleges, state agencies and non-profit organizations.

Having the Connecticut River nearby is an invaluable resource that will help us understand river-influenced coastal dynamics in New England but also those of the major rivers of the world. ❁

## COI Funded Graduate Student A project of his own

While attending a lunchtime seminar in 2007, I realized an unusual research opportunity. I could leverage the oceanographic tools at WHOI to study how carbon compounds produced and recycled by algae, zooplankton, and bacteria, interact and move along the west Antarctic Peninsula—a region so far that has been understudied. With support from a COI Student Research Fund grant, I purchased supplies for a research cruise to Antarctica, shipped scientific gear, and purchased a computer needed to do shipboard analysis and guide decision making on where to collect samples. I have learned a lot about the behavior of carbon along the west Antarctic Peninsula. The data collected during this cruise forms a core component of my PhD

dissertation and was crucial in demonstrating the feasibility of my initial idea. I have presented the data from this cruise at two scientific conferences and am currently submitting a manuscript on these results.

Additionally, COI's seed funding led the way for the successful funding of a \$600,000 National Science Foundation grant that I helped write with my advisor, Ken Buesseler, Senior Scientist, Department of Marine Chemistry & Geochemistry, and James Valdes, Senior Engineer, Physical Oceanography Department. With this Federal support, we are returning back to Antarctica this year for an even more comprehensive study.



*Joint Program Student Andrew McDonnell (right) with his advisor, senior scientist Ken Buesseler on board the ARSV Laurence M. Gould in January 2009.*

COI's support of student research makes WHOI a unique and wonderful place for a graduate student. The COI has allowed me to pursue an exciting project of my own, providing useful data about the Antarctic coastal region.

—Andrew McDonnell, MIT/WHOI  
Joint Program Student, Department of  
Marine Chemistry & Geochemistry



## Investigator Spotlight

# Developing Coastal Research in Ghana

*Andrew Ashton, Assistant Scientist,  
Geology and Geophysics*

The coastal zone, and those who try to manage it, face similar challenges worldwide. These challenges, however, tend to be amplified in developing nations where resources and expertise in coastal sciences are often limited. Over the last year, I have been collaborating with other U.S. researchers and colleagues in the Department of Oceanography and Fisheries of the University of Ghana (UG) to help develop the capabilities of the Ghanaian research community to monitor and manage the coastal environment, with an emphasis on measuring, understanding, and eventually predicting the widespread coastal erosion affecting the Ghana coast.

These efforts are part of a larger program to enhance maritime safety and security on the African continent as part of The African Partnership Station, an international initiative supported by Naval Forces Africa, with U.S., European, and African partners. Limited access to adequate scientific tools poses a significant challenge in Africa. The Coastal Geosciences Program within the Office of Naval Research has provided funding for researchers at UG to obtain state-of-the-art technology to measure and monitor the coast, including surveying equipment and a wave buoy. To help guide the development of their research program, the Office of Naval Research has also funded international experts to interact with Ghanaian researchers.



Andrew Ashton, WHOI

In February 2009, a Coastal Processes Workshop was conducted at the University of Ghana, in the capital city of Accra. In addition to myself and Cheryl Hapke of the United States Geological Survey's Woods Hole Field Center on the Quissett Campus, the conference included UG researchers, students, and government regulators from Ghana. During the workshop, we shared information gathered with funding from a 2008 COI research grant to study barrier response to sea-level rise and visited locations of coastal erosion. We visited the Volta Delta, on the eastern coast, a densely populated region experiencing significant erosion from a poorly understood combination of natural and human influences (particularly the damming of the Volta River). We deployed WHOI's ground-penetrating radar system to investigate how the evolution of the delta is

recorded in the sedimentary record.

The collaboration continues. Another workshop will be held in Ghana this June and, last summer, WHOI hosted UG researcher Selorm Ababio as part of the Mary Sears Visitor Program. Honoring the late Mary Sears, WHOI biologist, this program gives awards to provide an exchange of "information about oceanography to nations where it is not otherwise available." Although the research to date has focused on coastal erosion, Ghana and its neighbors face significant challenges monitoring its offshore resources, particularly fisheries that are increasingly threatened by international fishing fleets. As the Ghanaian research capabilities develop, the department plans to serve as a center of research excellence along the sub-Saharan coast, providing tools and expertise to its neighboring countries. 🌊

## Question and Answer

# Jellyfish in Coastal Waters

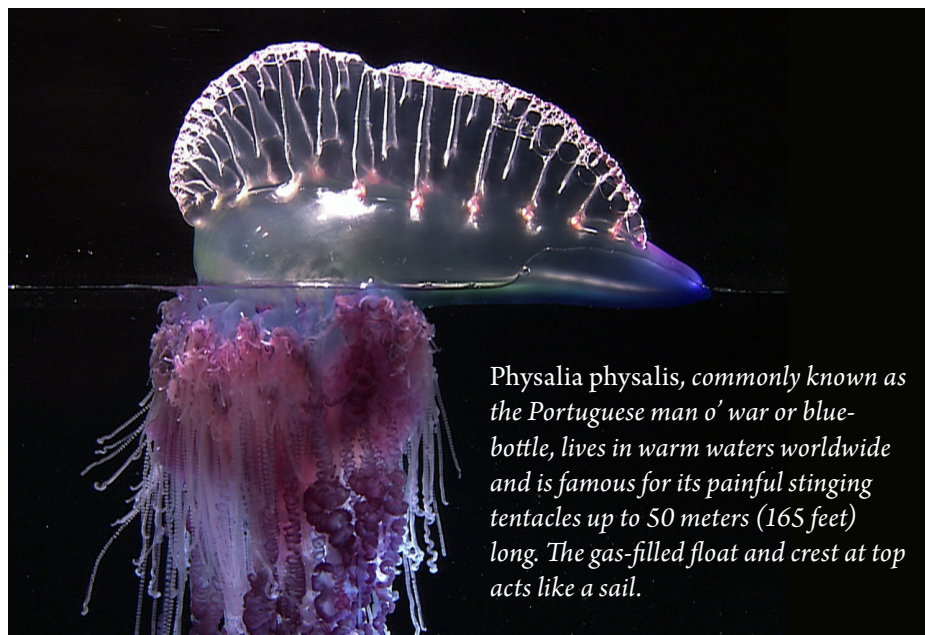
### Q. Are jellyfish populations increasing in coastal waters?

A. According to Dr. Larry Madin, biologist and Director of Research at WHOI, though there is uncertainty, it does appear that some jellyfish species' population ranges are expanding in some coastal areas, due to climate change, human activities, and cycles of abundance.

Warmer waters encourage jellyfish reproduction, and changes in ocean current patterns can contribute to expanding ranges. For example, moon jellies, *Aurelia aurita*, which, in the past, were never seen north of Cape Cod, are now found in Boston Harbor. The range of the Portuguese man o' war, *Physalia physalis*, may also be increasing; people have seen this warm-water species off the coast of England and in the Irish Sea.

One reason for population increases of these fast-growing creatures is over-fishing of some fish species, leaving the oceans open to jellyfish that consume fish larvae and tolerate ranges in salinity and temperature.

One species, Nomura's jellyfish, (*Nemopilema nomurai*, Japanese name, echizen kurage) is being found in large numbers in Japan's waters. The bottom-living phase of



*Physalia physalis*, commonly known as the Portuguese man o' war or blue-bottle, lives in warm waters worldwide and is famous for its painful stinging tentacles up to 50 meters (165 feet) long. The gas-filled float and crest at top acts like a sail.

Larry Madin, WHOI

its life cycle, called polyps, likely live and reproduce in waters off China, where overfishing removes the fish that eat it. The second phase of the lifecycle, the jellyfish, are carried by currents to Japan, feeding and growing along the way. The huge jellyfish can reach 6 feet in diameter and 450 pounds and severely disrupt fishing.

Furthermore, "jellyfish do not have many predators," said Dr. Madin. "Sea turtles, ocean sunfish, and only a few other ocean predators eat them."

Some jellyfish populations increase,

or are spotty in some years, due to cyclic abundances. The mauve stinger, *Pelagia noctiluca*, has a short lifespan but a 12-year cycle of fluctuating abundance, and has impacted tourism during years when great numbers of them wash ashore on Mediterranean beaches.

There is still a lot to be learned about jellyfish abundance. There are only limited records of occurrences of jellyfish; the reports that do exist are based solely on human sightings. Despite probable increases in ranges or populations in coastal areas, "there are no really dangerous species of jellyfish around here (Cape Cod)," according to Dr. Madin. This is not the case in Australia, where the range of deadly Irukandji jellyfish, *Carukua barnesi*, appears to be expanding, based on sightings and reports of stings.

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