



NOAA Undersea Research Center at the
University of North Carolina Wilmington

Request for Pre-Proposals for

Coral Reef and Reef-related Ocean Acidification Research
off the southeast U.S. and Gulf of Mexico in 2008 and 2009

The NOAA Undersea Research Center at the University of North Carolina Wilmington seeks proposals for undersea research projects to be conducted in 2008 and 2009 off the southeast U.S. from North Carolina to Texas. Projects are selected by peer review based on scientific merit, feasibility, and relevance to NOAA's mission and the topics outlined below. Proposals may be written for one year (opportunity 1) or two years (opportunity 2) of direct science support of \$75,000 per year and should contain an in situ field component. Undersea system and support vessel time is provided by the Center at no cost to the principal investigator.

This announcement is soliciting proposals for **TWO** specific funding opportunities. All proposals are strongly encouraged to involve industry, address how data will be disseminated to user communities (e.g., resource managers) and need to have broad scientific and societal impact.

OPPORTUNITY #1: Ocean Acidification Research at Aquarius Reef Base (Key Largo, FL)

Private foundation funds in the amount of \$75,000 for direct science support are available for a research mission focused on the impacts of ocean acidification on coral reefs at *Aquarius Reef Base* during **October 2008**. If additional funds are or become available projects may be extended to two years.

Systems Available: *Aquarius Reef Base assets (in October 2008)*

Proposal Focus: Coral reef ecosystems are among the most diverse and valuable ecosystems on Earth. Worldwide, coral reef ecosystems provide billions in annual goods and services. In the past few decades, competing demands on coral reef ecosystems and increasing threats from both natural and anthropogenic stressors (e.g., fishing, pollution, and climate change) have contributed to significant decline in coral reef ecosystem condition.

Climate change, in particular increases in temperature and carbon dioxide levels, threatens coral reef ecosystems through increased occurrence and severity of coral bleaching and disease events, sea level rise, and storm activity. Climate change may also reduce calcification rates in reef-building organisms by lowering the pH of seawater and reducing the availability of carbonate ions. Reduction in calcification rates directly affects the growth of individual corals and the reef's ability to maintain itself against forces that cause reef erosion, potentially compounding the 'drowning' of reefs caused by sea level rise.

Proposals are requested that specifically use *Aquarius Reef Base* assets to conduct a mission during October 2008 to address one or more of the following priorities for research on the impact of ocean acidification on coral reefs:

- Investigate how differing levels of atmospheric CO₂ will affect ocean pH, carbonate saturation state, and coral calcification and growth rates;
- Quantify the effects of temperature, pH, alkalinity, and aragonite saturation state on coral calcification, reproduction, and recruitment;
- Measure biogenic CaCO₃ production, seawater chemistry, CaCO₃ dissolution and accumulation, bioerosion, and export of CaCO₃ to improve the accounting of coral reef carbonate budgets, cycles, and predict how reef accretion may change in the future;

- Determine how variations in calcification rates affect associated organisms, food web dynamics, carbon and nutrient cycling, bioerosion, and ecosystem services;
- Determine the interactive effects of multiple variables that affect calcification and dissolution through experimental studies;
- Establish clear links between laboratory experiments and the natural environment, by combining laboratory experiments with field studies.

OPPORTUNITY #2: NOAA Coral Reef Conservation Program (CRCP) Coral Research

This funding opportunity is for one to two year targeted research projects that address one or more of the following threats facing U.S. coral reefs in Florida (includes the Florida Keys, Southeast Florida, and the Eastern Gulf of Mexico) and the Flower Garden Banks: fishing, pollution, coastal uses (including invasive species), climate change, and extreme events.

Systems available: *Scuba, Aquarius Reef Base assets (in 2009), Glider AUV*

Proposal Focus: Specific research needs for this funding opportunity are detailed in the *NOAA Coral Reef Ecosystem Research Plan for FY 2007 to FY 2011*. Proposals must identify the specific research need that their project is addressing from one of the following:

- Jurisdiction-wide Research Needs
 - www.coris.noaa.gov/activities/coral_research_plan/pdfs/jurisdiction_w_research.pdf
- Jurisdiction-specific Research Needs
 - Florida (includes the Florida Keys, Southeast Florida, and the Eastern Gulf of Mexico) www.coris.noaa.gov/activities/coral_research_plan/pdfs/florida.pdf
 - Flower Garden Banks www.coris.noaa.gov/activities/coral_research_plan/pdfs/flower_garden_banks.pdf

Proposals should be geared towards management-oriented research to: (1) develop a better understanding of the role of the threats listed above in coral reef ecosystem decline; (2) predict the impacts from and responses of reef communities to anthropogenic and natural stressors; and (3) design, test, and evaluate the effectiveness of specific reef management measures, including marine protected areas and habitat restoration techniques. Proposals should clearly demonstrate how the scientific information, tools, or other products from the project would enable resource managers to address threats to reefs and advance conservation of coral reef ecosystems.

Note: Proposals submitted under the CRCP funding opportunity require 100% non-federal match. Non-federal matching funds may be comprised of a variety of public and private sources and may include in-kind contributions and other non-cash support.

Description of Available Systems:

Aquarius Reef Base

The *Aquarius* undersea research station has evolved into *Aquarius Reef Base*, which is composed of the undersea lab, an ocean observing station with real-time access via the Internet, and a shore base. Together these assets provide a state-of-the-art saturation diving facility for coral reef science along with synchronous ocean observing, a test bed for technology development, and advanced communications that allow for telepresence research, education, and outreach.

Saturation diving is conducted from the *Aquarius* undersea laboratory, which is the only undersea laboratory specifically devoted to science operating in the world today. Four scientists and two staff technicians will live inside and work out of *Aquarius* for up to nine days. While saturation diving, a diver's tissues equilibrate with the surrounding depth with respect to inert gas (nitrogen) concentrations. The laboratory is located in 20 m of water, and aquanauts diving to a depth of 40 m achieve bottom times that are nearly 10 times longer than no-decompression scuba diving from the surface. *Aquarius* provides workspace, power, and data communications that support experimentation, observation, technology testing, and undersea access that could not be accomplished if supported solely from the surface.

During missions, the watch desk and support staff is based at the center's Key Largo facility, nine miles from the site. A life support buoy transmits real-time data from *Aquarius* and work sites to the shore-based watch desk, including:

- Status of generators and compressors;
- Life-support parameters inside *Aquarius*;
- Voice and video from *Aquarius* to shore;

- Science data from the seafloor and *Aquarius* to shore; and
- Ocean observations in real-time (salinity, temperature, oxygen, waves, currents, and various optical properties).

Dive tables and procedures developed in 1997 decrease decompression times for aquanaut rescues in the unlikely event that an emergency evacuation is necessary. Since surface support boats are not required to monitor aquanaut diving, staffing and weather conditions are less restrictive. Data from seafloor experiments can be transmitted in real-time, including voice and images, to anywhere in the world via the Internet. A cellular telephone also provides worldwide communication capability.

Staff-piloted, small boats are also available to enhance *Aquarius*-based research by providing the capability to conduct concurrent, independent, dive operations for a separate, surface-based research team. This is especially useful for projects requiring the assistance of scientific personnel beyond the four-scientist capacity of *Aquarius*, sampling from areas outside of the range of saturated aquanauts, and projects requiring outreach and education support from the surface.

Shore facilities, complete with sleeping, eating, and recreating areas, are available to house about 8 scientists and support personnel throughout the mission. A science laboratory and secure storage are also available on site.

Non-Saturation Diving: Personnel and equipment support for ambient air or nitrox scuba diving. Use of nitrox can increase the bottom time by as much as 200 percent over the course of a 12-hour dive day.

Technical Diving: Technical diving involves the use of techniques and equipment to enable divers to safely conduct scientific research to depths of 300 fsw. Technical diving supported by the center includes air and nitrox decompression diving and mixed gas decompression diving using alternative inert gas (AIG).

Glider AUV: Long-duration shelf deployments (<200m). The vehicle will be deployed from small vessels of opportunity to perform wide-area coastal ocean surveys lasting up to 30 days. The vehicle may survey in a yo-yo fashion through the water column or horizontally across programmed transects while recording CTD and limited oceanographic data (e.g., turbidity, oxygen, and fluorescence).

Pre-proposals. Pre-proposals are **required and must be submitted by email by January 14, 2008**. Pre-proposals should be <3 pages and give a summary of the proposed research, describe research goals and facilities/equipment requirements, outline time or logistic constraints, give area of operations including depths, and estimate the level of support required. This will ensure that appropriate research guidelines are addressed and permit operations staff to evaluate feasibility. Principal investigators will be notified within a week if they should submit a full proposal.

Address Pre-proposals to:

Thomas Potts, Associate Director
 NOAA Undersea Research Center
 University of North Carolina Wilmington
 5600 Marvin Moss Lane
 Wilmington, NC 28409
 email: pottst@uncw.edu

Full Proposals. Requests for full proposals will be issued on the basis of the pre-proposals. Invitation for submission of full proposals will be issued on or about January 21, 2008. Full Proposal guidelines and a description of Center facilities and systems, proposal conditions and format, and required forms are available online at <http://www.uncw.edu/nurc>. We expect full proposals will be due no later than March 1, 2008. Principal investigators will be notified of the peer review results by April 30, 2008 or sooner.

Inquiries related specifically to Opportunity #1 and *Aquarius Reef Base* should be directed to:

Ellen Prager, Chief Scientist of *Aquarius Reef Base*
 NOAA Undersea Research Center at UNCW
 PH: 305.451.0233, ext 206; FAX: 305.453.9719
 email: pragere@earthlink.net

Inquiries related specifically to Opportunity #2 and ALL preliminary proposals should be directed to:

Thomas Potts, Associate Director
 NOAA Undersea Research Center at UNCW
 PH: 910.962.2442; FAX: 910.962.2444
 email: pottst@uncw.edu