D. Abstract

1. **Research Category**: ECOHAB; Funding Opportunity: EPA-G2006-STAR-B1
2. **Title**: ECOHAB: *Karenia* Nutrient Dynamics in the Eastern Gulf of Mexico
3. **Investigators**: PI-Cynthia A. Heil (FWC/FWRI: Cindy.Heil@myFWC.com); Co-PI-Deborah Bronk (VIMS); Co-PI-L. Kellie Dixon (Mote); Co-PI-Gary Hitchcock (Univ. Miami); Co-PI-Gary Kirkpatrick (Mote); Co-PI-Margaret Mulholland (ODU); Co-PI-Judith O'Neil (Univ. Md, Horn Pt Lab); Co-PI-John J. Walsh (USF); Co-PI-Robert Weisberg (USF);
4. **Institutions:** Florida Fish & Wildlife Cons. Comm.- Fish & Wildlife Research Inst, St. Petersburg FL; Virginia Inst. of Marine Science, Gloucester Point VA; Mote Marine Laboratory, Sarasota, FL; Univ. of Miami - RSMAS, Miami FL; ODU Research Foundation-Old Dominion Univ.,Norfolk VA; Univ. of Maryland -Center for Environmental Science, Cambridge MD; Univ. of South Florida-College of Marine Science, St. Petersburg FL
5. **Project Period**: 1 September 2006 – 30 August 2011
6. **Project Cost**: Total all years - $4,730,070: direct cost $4,512,384; indirect cost $217,686. YR 1 total-$813,998: direct-$772,745; indirect-$41,253. Y2 total-$977,656: direct-$935,107; indirect-$42,549. Y3 total -$989,773: direct-$945,906; indirect-$43,867. Y4 total-$992,348: direct-$947,728; indirect-$44,620. YR 5 total-$956,295, direct-$910,898; indirect-$45,396.
7. **Project Summary:**

a) *Objectives*: The nutrient sources that support and regulate environmentally and economically destructive *Karenia brevis* blooms in the eastern Gulf of Mexico remain enigmatic. *K. brevis* blooms in Florida (FL) are annually predictable, have severe economic and environmental impacts, and are closely monitored and so are an ideal system to examine the complexity of nutrient interactions with harmful algal blooms (HABs) throughout entire bloom cycles (initiation and development, maintenance, and decline). To examine how nutrients regulate *K. brevis* blooms, the following two hypotheses will be tested: 1) multiple nutrient sources and forms support *K. brevis* blooms, with the relative contribution of each source depending upon bloom physiological state, bloom environment (e.g., lagoonal, lower estuarine, coastal, offshore), and location along a latitudinal gradient and 2) *K. brevis* is a mixotroph with a flexible metabolism whose limiting growth factors and metabolic preferences vary with the environment. We propose a workplan that will combine biological, chemical and physical measurements with modeling efforts to examine how *K. brevis* is able to sustain high biomass blooms in oligotrophic environments for extended periods.

b) *Approach:* This proposal brings together a multidisciplinary team with extensive expertise on nutrients, HABs, *K. brevis*, and the southwest Florida (SWF) environment to identify, quantify and model nutrient inputs and cycling over the entire range of *K. brevis* bloom stages and environments. Efforts will combine a retrospective analysis of the 2001 bloom with targeted laboratory studies, comparative field studies across environments and bloom stages, identification and quantification of multiple nutrient sources, measurement of physical flows and three-dimensional coupled biophysical modeling of near and offshore *K. brevis* blooms and environments.

c) *Expected Results and Significance:* Effectual HAB management and regulatory interventions are stymied by the lack of an integrated understanding of how nutrients, particularly organic nutrients, regulate blooms temporally and spatially. The proposed effort, focused on environmentally and economically destructive *K. brevis* blooms, will provide data necessary to identify regulatory alternatives and will couple results with a public outreach approach individually targeting 1) resource managers and decision makers and 2) stakeholders and the general public via symposiums and workshops, newsletters, public seminars and websites.

8. **Key Words:** *Karenia brevis*, Florida, HABs, red tide, nutrients, sources, cycling, C, N, P, physical oceanography, models