

**Regional Proposal to Test Sensors for Detecting the Sea Squirt, *Didemnum* sp. A on  
Georges Bank**

Award No. NA07NMF4720360  
Period of Performance 11/21/08-6/30/10  
June 30, 2010

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### **Project Objectives and Scientific Hypotheses:**

This project focused on documenting impacts of *Didemnum vexillum*, a non-native tunicate on fisheries and the benthic community in nearshore habitats and Georges Bank ecosystem where it covers approximately 200 km<sup>2</sup> of the sea floor. Currently, only a small area of Georges Bank has been surveyed for *Didemnum*, which limits assessment of the risk to fisheries and understanding how quickly it can spread. We also are limited in our understanding of the extent of spatial coverage of the sea squirt in nearshore habitats. The first phase will explore how best to monitor the sea squirt presence throughout potential habitats (gravel beds and other hard surface areas). The next phase will focus on its impact to fisheries, identify options to prevent its spread and mitigate its impacts, and develop models to predict its potential spread throughout the region.

The funding from the Northeast Consortium (NEC) was intended to address the first phase of the project, namely to test different sensors for quickly and reliably identifying *Didemnum* colonies throughout nearshore Georges Bank cobble and hard surface habitats. Depending on the success of the sensor testing, targeted optimal habitats for *Didemnum* would be surveyed to expand our knowledge of its subtidal and offshore distribution. The fall-back option is to use cameras and videos to identify areas where *Didemnum* is present and where it is absent. This proposal would support regional research efforts of the Northeast Sea Grant College Programs and complement ongoing research and outreach projects. It addresses our MIT Sea Grant College Program's (MIT Sea Grant) strategic and implementation plan.

### **Changes from the original proposal:**

#### **Changes in Personnel and Fishing Collaborator:**

As noted in the June 24, 2009 report, there were changes in personnel and the Fishing Industry Collaborator. MIT Sea Grant engineers Seth Newburg and Ian Katz, along with Michael Soroka, have collaborated with the Fishing Industry Collaborator Captain Troy Dwyer (Dwyer Fisheries). Captain Dwyer's boat is a 90-foot fishing vessel with a large deck, crane, and other equipment necessary for safely deploying our AUV, Odyssey IV. We requested and were approved for the change in Fishing Industry Collaborator.

#### **Changes in Workplan:**

The change of Fishing Industry Collaborator was necessary to ensure the safety of the crew, autonomous under water vehicles (AUVs), and AUV lab to be consistent with the size of the fishing vessel. Thus, nearshore surveys for *Didemnum* are included in the workplan. The change in location identifies, among other areas, some sampling in Massachusetts and Cape Cod Bays and Stellwagen Bank. The change in location was reflected in our application to NEPA and we adhered to the restrictions in time to not interfere with the right whale. The response of the NOAA NMFS is provided below and

we will adhere to the requirements in the Categorical Exclusion from Requirements to Prepare and Environmental Assessment (EA) or and Environmental Impact Statement (EIS) for the University of New Hampshire, Regional Proposal to Test Sensors for Detecting the Sea Squirt, *Didemnum* sp. A (now called *D. vexillum*) on Georges Bank, Award No. NA07NMF4720360 (Appendix 1) for deploying the AUV and surveying for *Didemnum*.

### **Project Objectives, Method, Work Plan**

The overall goals of the project remain the same. We will test optical sensors for identifying *Didemnum vexillum* and use the information to identify spatial coverage in hard bottom/cobble habitats. Because we are testing sensors, and the efficacy of the AUV platform in these studies, our hypothesis that *Didemnum vexillum* impacts fisheries and/or subtidal communities is phase II of the project and not part of this initial study.

The NEPA Categorical exclusion letter was issued in September 30, 2008 and the grant was officially awarded on November 21, 2008. By this time of the year, the water temperatures have dropped and *Didemnum* colonies regress. Thus, we were not been able to resume field studies until the summer of 2009. The MIT Sea Grant AUV, Odyssey IV operated for a few days, but chronic engineering glitches arose forcing us to postpone the remaining surveys with the AUV. We have been able to conduct our surveys this summer (2010).

The goals of the Odyssey IV deployments included capturing high quality images of the ocean floor in surveys for the invasive species *Didemnum vexillum*, as well as operating the Odyssey IV at increased depths, and developing and demonstrating autonomous control behaviors using machine vision. We include deployment photographs that have allowed us to deploy safely (Figure 1).

We prepared the Odyssey IV and support equipment for operations in the open ocean. The vehicle was deployed from the 90 foot F/V Isabella & Ava for a total of five days. Operational trials and seabed imaging surveys were performed in Massachusetts Bay, 4 miles east of Scituate, MA, and on Stellwagen Bank, and Fifteen Bank. Our cruise dates were June

The imaging system of the Odyssey IV was extensively tested. The vehicle performed surveys cruising at an altitude of 1.4 m above the sea floor while at depths of up to 100 meters. Images were recorded at a 3 second interval with dual strobe illumination. The images were uniformly bright and had excellent color content. An example of the images that were collected is shown in Figure 2. Many species of starfish, sponge, tunicate, and fish were identified in the photographs. The improvements to the imaging system are crucial for successful imaging processing and automated identification tasks in deep water where there is no ambient light. During some of the cruises sediments in the water column prevented clear images, nonetheless macroinvertebrates were identifiable in most of the runs.

During the summer surveys, we continued to maximize the performance of our present imaging hardware, evaluated and implemented new camera systems that increase image resolution, illumination uniformity, and color fidelity. In addition, trials with the AUV indicated that it functioned and performed reliably and consistently. Odyssey IV continues untethered, autonomous operations and imaging tasks in the open ocean at depths of 100 m. Supervisory control has been demonstrated over a radio link on the

Odyssey IV. Integration of supervisory control using acoustic modem with Odyssey IV is in progress. The acoustic modem is not available for testing.



Figure 1: Photographic sequence of a routine deployment of the Odyssey IV from the F/V Isabella & Ava using the overhead boom crane. Field operations were conducted at Stellwagen Bank in October 2009.

We will be preparing a data report and sending data to NEC.

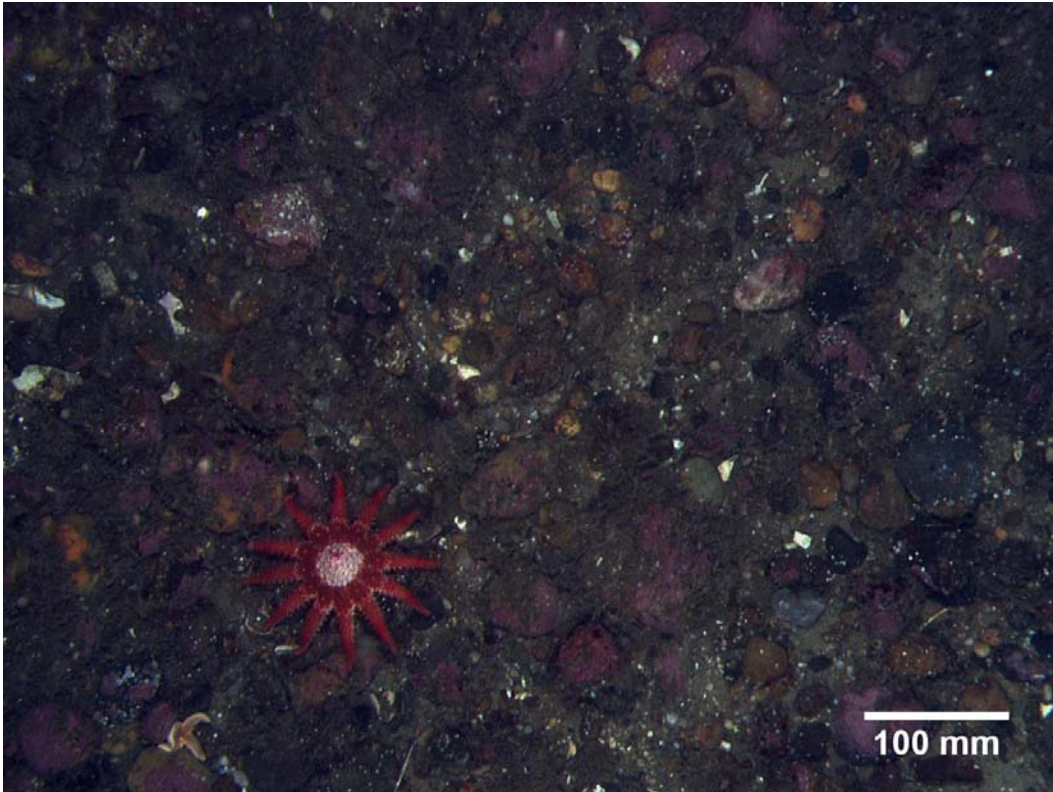


Figure 2: Photograph of the cobble substrate on Stellwagen Bank at a depth of 100 meters. Image was recorded at an altitude of 1.4 meters using the Balser A102f scientific video camera and dual strobe illumination. Species identified in this image include *Orossaster papposus* (spiny sunstar), *Asterias vulgaris* (northern seastar), *Lithophyllum* sp. (encrusting red coralline alga), *Modiolus modiolus* (mussel), and upright bryozoans. Scale bar is 100 mm.

### **Future Work**

We have used our vessel time with NEC funding. We have some loose ends to tie up, doing data analysis, and preparing a completion report.

### **Impacts and Applications:**

We anticipate that this work will be used by fisheries managers to assess the impact of *Didemnum* on groundfish and scallops and by coastal managers who are concerned about changes to diversity and function of nearshore coastal areas. It is relevant to the fishing industry and we hope that they will adopt best management practices to prevent *Didemnum* infestation from gear and ship hulls.

### **Related Projects:**

We had funding to conduct a survey of *Didemnum* on Georges Bank and this work will add to our initial pilot project study and preliminary data. The MIT Sea Grant

College Program's Advisory Program continues to advise the public about introduced species in general and *Didemnum* specifically.

**Partnerships:**

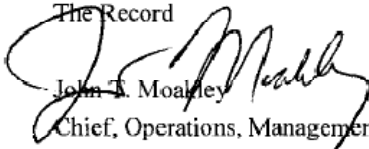
We have contacted the Captain of several fishing vessels, but have not collaborated directly with other fishermen. We plan to do so in the near future. A poster was presented at the Annual Meeting. There are no published reports or data at this time.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Northeast Fisheries Science Center  
166 Water Street  
Woods Hole, MA 02543-1026

September 30, 2008

MEMORANDUM FOR: The Record

FROM:   
John T. Moakley  
Chief, Operations, Management and Information

SUBJECT: **Categorical Exclusion from Requirements to Prepare an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), for the University of New Hampshire *Regional Proposal to test sensors for detecting sea squirt on Georges Bank Pederson, NA07NMF4720360***

I have reviewed the proposal for the above-referenced Federal financial assistance project NA07NMF4720360, submitted by the University of New Hampshire under the provisions for Unallied Science Projects, statute 16 U.S.C. 661. The environmental review of this proposal has been performed to address provisions of NOAA Administrative Order (NAO) 216-6, "Environmental Review Procedures for Implementing the National Environmental Policy Act" (NEPA) to determine whether the proposed action should be categorically excluded from requirements to prepare either an EIS or an EA under NEPA.

The goal of this project is to document presence or absence of the non-native, soft-bodied *Didemnum sp.* (sea squirts) in various habitats in waters off Massachusetts and Georges Bank. This project would progress in two phases. The first phase involves identifying the best method to monitor the presence of *Didemnum* in potential habitats (gravel beds and other hard surface areas). In the waters of Georges Bank, an autonomous underwater vehicle (AUV) would be deployed from F/V Lady Jane, with optical and acoustic sensors (i.e., color digital still camera and a high frequency imaging sonar). This data would be post-processed to produce seamless, geo-referenced image mosaics, which would be presented as GIS maps which may be hand-tagged to indicate the presence of *Didemnum* colonies. The second phase involves using location data collected from phase one in order for researchers to target optimal habitats. In order to verify the observations, 12 grab samples, 20 grams each will be collected by a ponar grab sampler and preserved for later work up in laboratory. A strict and specific protocol will be followed to ensure that researchers will not spread the organisms. Five cruises would be completed through mid-October of 2008, and approximately 10 additional cruises would take



place from spring 2009 through September of 2009. Study areas in the waters of Massachusetts include near shore waters off Sandwich in Cape Cod Bay, 5-15 meters (16'- 49') deep, and near the Nantucket Lightship Closed Area in approximately 30-50 meters (98'-164') of water. Offshore study areas include Georges Bank and the northern part of Closed Area II. Since researchers are not fishing, it was determined that they would not need any federal exemption permits. Researchers have necessary permits to collect in state waters.

Since all sonar devices would be pointed at the seafloor and attached to the bottom of the AUV which would be operating close to the seafloor, the high frequencies would not affect any nearby whales. In addition, researchers have agreed to mitigate any potential aggravation to whales by:

- 1) not to conducting the study in Cape Cod Bay from 2/15/2008 – 4/1/2008;
- 2) not using sonar in to Great South Channel area from 3/1/2009 – 6/30/2009; and,
- 3) visually inspecting waters for whales, prior to AUV deployment.

The minimal ponar grab sampling of the seafloor would result in impacts that are negligible and temporary. No other impacts associated with this project are expected.

This project would have only minimal effects to the human environment. As defined in Sections 5.05 and 6.03c.3 (a), of NAO 216-6, this is a research project of limited size and magnitude and for which any cumulative effects are negligible. As such, it is categorically excluded from the need to prepare an EA or an EIS.

Additionally, this project does not involve: (1) A geographic area with unique characteristics; (2) public controversy based on potential environmental consequences; (3) uncertain environmental impacts or unique or unknown risks; (4) establishment of a precedent or decision in principle about future proposals; (5) cumulatively significant impacts; or (6) adverse effects upon endangered or threatened species or their habitats. Therefore, the project does not trigger the exceptions for categorical exclusions listed in NAO 216-6, Section 5.05c.