



# Annual Progress Report

July 1, 2009 - March 31, 2010

Donald M. Anderson, Director

Submitted to:  
National Oceanic and Atmospheric Administration  
Ocean and Atmosphere Research (OAR)  
April 2010



**CINAR**  
**Annual Progress Report**

Reporting Period: July 01, 2009- March 31, 2010

Submitted by:

Donald M. Anderson, Director

Submitted to NOAA on 04/30/2010

The Cooperative Institute for the North Atlantic Region is funded by:  
National Oceanic and Atmospheric Administration Award # NA09OAR4320129

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b> .....	4
<b>CINAR ANNUAL RESEARCH HIGHLIGHTS</b> .....	6
<b>INTRODUCTION</b> .....	7
1.1 Institute and Core Activities.....	7
1.2 CINAR Vision, Mission, Goals and Organization.....	7
1.3 Distribution of NOAA Funding by Task, CINAR Themes and NOAA Line Office.....	12
1.4 Task I activities with Distribution of Funding .....	13
<b>CINAR RESEARCH SUMMARIES</b> .....	17
<i>Acquisition of a pressure housing and array of reaction chambers (pucks) for the Environmental Sampling Processor (ESP)</i> .....	19
Donald M. Anderson NOAA Program Manager: Dr. Zdenka S. Willis, NOAA / IOOS)	
<i>HabCam Data Processing (Leg 3 of the Scallop Survey)</i> .....	21
Scott M. Gallager NOAA Program Manager: Russell Brown, NOAA / NMFS / NEFSC)	
<i>Image Analyses Tools for Quantitative Mensuration and Classification of High Resolution Optical Imagery</i> .....	30
Hanumant Singh NOAA Program Manager: Scott Ferguson, NOAA /NMFS / PIFSC)	
<i>Development of Automated Tools for Underwater Photographic Analysis</i> .....	32
Hanumant Singh NOAA Program Manager: Elizabeth Clarke, NOAA /NMFS / NWFSC)	
<i>Commercial Fishing Vessel Electronic Trip Reporting Pilot Study</i> .....	34
Steve Eays NOAA Program Manager: Joan Palmer, NOAA / NMFS / NEFSC)	
<i>Understanding Determinants of Success of New England Groundfish Sectors</i> .....	38
Dan Holland NOAA Program Manager: Patricia Pinto da Silva, NOAA /NMFS / NEFSC)	
<i>Funding Dockside Monitoring for New England Groundfish Sectors in FY2010</i> .....	40
Jonathan Labaree NOAA Program Manager: Kevin Chu, NOAA /NMFS / NERO)	
<i>Social Science Performance Measure and Indicator Outreach</i> .....	43
Meredith Mendelson NOAA Program Manager: Patricia Pinto da Silva, NOAA /NMFS / NEFSC)	

<i>Health Implications of Entanglements of Large Whales</i> .....	46
Michael J. Moore	
NOAA Program Manager: Richard Merrick, NOAA / NMFS / NEFSC	
<i>MREP as a Catalyst for Cooperation</i> .....	49
Meredith Mendelson	
NOAA Program Manager: Earl Meredith, NOAA / NMFS / NERO)	
<i>Student Fellowship: Habitat Use and Dietary Patterns of Diadromous Fishes in the Northwest Atlantic: Making the Connections Between River Restoration and Sustainability of Federally Managed Fisheries</i> .....	52
Thomas J. Miller	
NOAA Program Manager: Jason Link, NOAA / NMFS / NEFSC	
<b>APPENDIX 1: Personnel Supported by CINAR Funding</b> .....	55
<b>APPENDIX 2: CINAR Publications for Reporting Period</b> .....	57

## **EXECUTIVE SUMMARY**

CINAR has been in existence since July 1, 2009, and during the past nine months we devoted considerable time to start-up issues as detailed below.

Immediately upon establishment, we began processing proposals for projects that had been on hold in NOAA awaiting the establishment of this new CI. We processed approximately \$3.3 million through CINAR during our first month of operation, requiring a rapid spin-up of the policies and procedures needed to move these funds from NOAA to the appropriate CINAR partners. We established guidelines for submitting proposals through CINAR, for WHOI PIs and our partners and for issuing the subsequent subawards once funding was received. We are continuing to make modifications to our procedures such as establishing an interactive cover sheet, enabling streamlined updating to the CINAR funding database. New procedures were needed at Woods Hole Oceanographic Institution (WHOI) due to the consortium nature of CINAR.

We developed a support team and administrative structure at WHOI. Ann Stone was hired as the Administrative Professional for CINAR and now deals with many of the day-to-day aspects of the operation of this Institute. Space in one of WHOI's buildings has been allocated to CINAR, and renovations are underway to create a conference room and office space. The CINAR office is located in the village of Woods Hole, in the Swift Building adjacent to Eel Pond and not far from the National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC). We developed a CINAR logo which can be viewed on the front page of this document. We drafted our Memorandum of Agreement (MOA) which is currently under review at NOAA headquarters.

We established multiple lines of communication with our investigators and PIs. Separate listserves were developed for all CINAR investigators, CINAR PIs and our CINAR theme leaders. These facilitate quick communication between all parties. We also instituted two types of "CINAR Announcements" - one which contains specific announcements for investigators concerning funding opportunities, internal deadlines, etc. These are circulated solely to our CINAR investigators. The second type includes a message from the CINAR Director and some summaries of funding to date, and research highlights. These are circulated to all CINAR investigators, our Council of Fellows, Executive Board and NOAA employees interested in CINAR. Our Web site is undergoing enhancement and we have been able to obtain our own domain name - [www.cinar.org](http://www.cinar.org). As projects develop, we will be adding research highlights to this site.

Throughout this time, we have had frequent conference calls with the CINAR PIs. As a result of these discussions, a number of different program development activities are underway, as detailed below.

### **Program Development**

We are working on different initiatives to expand CINAR funding and increase communications with NOAA researchers and program managers. The first involves one-page descriptions of NEFSC programs that might benefit from new technologies, instrumentation, models, or expertise available from CINAR partner institutions. These “one-pagers” were distributed to CINAR investigators, along with a form asking them to indicate contributions they might make to a particular program concept. We are currently working with NEFSC counterparts to begin a dialog to determine the possibility for collaboration.

Another initiative has the same objective – namely establishing communications and relationships between investigators and NOAA program managers. We have requested and obtained workshop ideas from the CINAR theme leaders. We envision a series of meetings between CINAR investigators and NOAA program managers and scientists in which NOAA’s needs in a particular area are outlined, as well as their plans for future programs. This would also be an opportunity for new approaches and technologies to be highlighted in a common effort to identify gaps or impediments as well as potential solutions. The CINAR Executive Board and Council of Fellows will review them and select those that are the most promising with respect to program development and future funding.

## **CINAR ANNUAL RESEARCH HIGHLIGHTS**

- The HabCam optical and acoustic imaging vehicle was integrated into the National Marine Fisheries Service Annual Sea Scallop Survey. A total of 787,832 images with a footprint of about 1 m<sup>2</sup> each representing, by region, 85,572 images collected in Closed Area I, 216,809 images in Closed Area II, 183,070 on the Canadian side of the Northeast Peak of Georges Bank, and 302,381 images between stations. Techniques were developed to process all images for lightfield and color correction, image distortion, and conversion to jpeg format for visualization as ground overlays in Google Earth. All image data for cruise HS\_20090623 and associated Google Earth kml files are available through the HabCam website: <http://habcam.whoi.edu>
- GMRI, has been working with the Northeast Seafood Coalition and their sector vessels in developing their electronic logbook software, Fishtrax. GMRI staff also developed a fishermen-friendly training manual for using Fishtrax. The use of electronic trip reports provides an opportunity for fishermen to transmit catch and effort data in a timely manner to the NMFS and their respective sector managers. This will substantially reduce the time between data receipt, evaluation, and response, thus providing both NMFS and sector managers an improved ability to manage and respond to fishing activity. To date, a total of 39 vessels representing 13 sectors have thus far expressed interest in participating in this project; currently 5 vessels representing 3 sectors are actively participating.
- GMRI has convened leading members of the groundfish industry and formed a consensus on how \$1.2 million for dockside monitoring will be divided among the 17 groundfish sectors. The sectors represent the full range of groundfishing activity, from small community-based groups operating from remote, island ports to large, offshore vessels that spend a week on Georges Bank.
- A database has been established containing all humpback whale entanglements over the past decade using the categories and definitions that the New England Aquarium and Provincetown Center for Coastal Studies have defined.
- The Marine Resource Education Program conducted one full session of the MREP 100 program (one Fisheries Science module and one Management Process module) and one MREP 200 workshop. MREP created an opportunity for fishing industry members to interact directly with the fishery survey scientists and crew, and engage in discussion about a process that has historically been the subject of concern and skepticism. This program increased the industry's understanding of survey methodology, leading to improved relationships between industry and NOAA Fisheries, and increased trust in the fisheries science contributing to management decisions.

## **INTRODUCTION**

The Cooperative Institute for the North Atlantic Region (CINAR) is a regional CI that focuses on the U.S. northeast continental shelf (NES) large marine ecosystem (LME) that encompasses the shelf from Cape Hatteras to Nova Scotia - one of the world's most highly productive marine ecosystems. The structure and dynamics of the NES ecosystem are strongly influenced by local, regional, and basin-scale environmental forcings and by a range of human activities including fishing, the discharge of nutrients and other pollutants, and development along the coast. There is also a growing recognition of ecological impacts from climate change and ocean acidification.

CINAR is a consortium of five partner institutions that together span the geographic range of the NES and provide the required breadth, depth and quality of scientific expertise, instrumentation, models, and facilities to address many of NOAA's needs in the region. Partners include the University of Maryland Center for Environmental Science (UMCES), Rutgers University (RU), the Woods Hole Oceanographic Institution (WHOI), the University of Maine (UME), and the Gulf of Maine Research Institute (GMRI). The CINAR Program Office is located at WHOI.

### **1.1 Institute and Core Activities**

### **1.2 CINAR Vision, Mission, Goals and Organization**

We envision that as CINAR develops and grows, it will become an essential component of the NOAA research and management capability in the northeast region, functioning as a mechanism that allows NOAA scientists to easily and rapidly obtain research assistance for ongoing projects, that contributes to the science planning process in NOAA, and that anticipates and responds to technical needs through the development of instruments, models, and approaches that contribute to management decisions.

CINAR's philosophy of operations, focuses on research, transition of research to applications specific to NOAA's mission and goals, and a range of education and outreach activities to train new NOAA scientists, enhance knowledge and expertise of existing scientists, and communicate research results. Our overarching goal is to dramatically improve the predictive science that enables sound management, while concurrently informing the general public and stakeholders of the complexities and importance of ecosystem-based management of NES LME resources.

**The mission of CINAR is engage NOAA and academic scientists in cutting-edge research that enables NOAA to make informed decisions about sustainable and beneficial management of the northwestern Atlantic shelf ecosystem.**

Working within the geographic framework of the NES LME, the goals of CINAR are:

- 1) To establish CINAR as a leader in promoting “rational ocean stewardship” and serving as a model for development of similar ecosystem approaches to management in other regions;
- 2) To coordinate research, education and outreach with NOAA scientists in support of responsible stewardship of coastal and marine resources in the region;
- 3) To conduct research that identifies and evaluates linkages among productivity, fish and fisheries, pollution, climate change and ecosystem health;
- 4) To conduct research and develop decision-support tools for sustainable fisheries management;
- 5) To conduct research and develop tools to restore degraded habitats and support restoration and rebuilding of protected species to healthy population levels;
- 6) To improve integration and availability of ocean observations from global to local scales;
- 7) To provide mechanisms for transition of predictive/forecasting and monitoring tools into operational use for management;
- 8) To improve ability to distinguish shifts in marine resource status caused by human impact from those due to climate and other natural forcing; and,
- 9) To develop robust indicators of ecological health and socioeconomic benefits that can be utilized by resource managers.

### ***CINAR Organization***

CINAR is managed and administered through WHOI, Woods Hole, Massachusetts.

Donald M. Anderson, the CINAR Director, has overall management responsibility for CINAR providing leadership with NOAA and with the CINAR Council of Fellows. He is responsible for scientific leadership of CINAR and for ensuring maintenance and development of scientific programs and priorities. The CINAR Director has budgetary authority over Task 1 (administrative) activities and accountability for Task 2 and 3 activities, subject to review and advice of the Executive Board. The administrative structure of CINAR is shown in Figure 1.

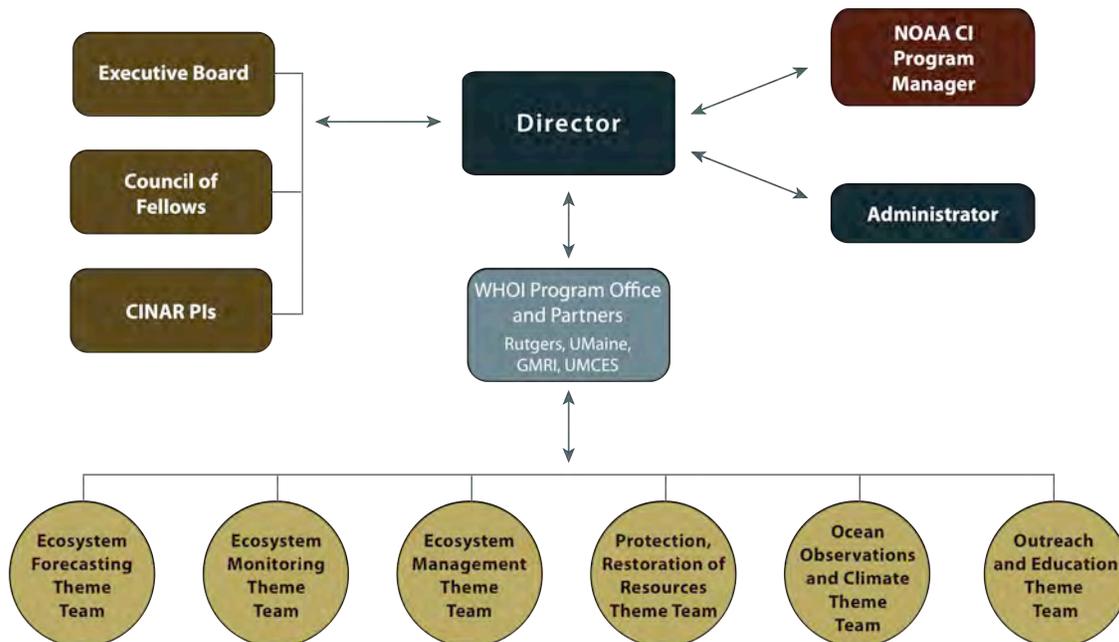


Figure 1. Organizational structure of CINAR

**CINAR PIs**

The CINAR PIs include Donald M. Anderson, *CINAR Director, Woods Hole Oceanographic Institution*; Francisco Werner, *Director, Institute of Marine and Coastal Sciences, Rutgers University*; Michael Roman, *Director, Horn Point Laboratory, University of Maryland Center for Environmental Science*; Peter Jumars, *Director, School of Marine Sciences, University of Maine*; and John Annala, *Chief Scientific Officer, Gulf of Maine Research Institute*. The CINAR PIs meet frequently in person or via conference call to discuss issues and to ensure that partner institutions are updated on CINAR activities.

### ***CINAR Executive Board***

The Executive Board consisting of senior employees from NOAA, WHOI, and at least one of the other CINAR consortium members, provides a senior management linkage to NOAA to guide the programmatic priorities and policy directions of CINAR. Members of the Executive Board participate in annual meetings, and represent the views of their program or branch within NOAA so as to facilitate beneficial interactions between NOAA scientists and CINAR. The Executive Board includes representatives from NOAA line offices and goal teams that have research interests in the North Atlantic region.

The CINAR Executive Board members are:

Nancy Thompson, Chair	NMFS NEFSC
Venkatachalam Ramaswamy	OAR Representative
Russell Callender	NOS Representative
Krisa Arzayus	Climate Goal Team Representative
Ned Cyr	NMFS/OST
Donald Anderson	CINAR Director
John Annala	CINAR PI, Gulf of Maine Research Institute
Leon Cammen	Director, National Sea Grant Program
Peyton Robertson	North Atlantic Regional Team Representative
Laurence Madin	WHOI Leadership
John Cortinas	OAR CI Program Director

### ***CINAR Council of Fellows***

Chaired by the CINAR Director, the Council of Fellows is the primary planning and consultative body of CINAR. Responsibilities include participating in conference calls and occasional in-person meetings and discussion of issues related to the administration and oversight of CINAR. NOAA Council members are expected to serve as a conduit for information in both directions between NOAA and CINAR, including the identification of research opportunities for the CINAR partners.

Membership includes: one senior representative from each CINAR partner institution (GMRI, RU, UMaine, and UMCES), the CINAR Director; a senior manager from the NEFSC; OAR Climate Program Manager (or designee); and OAR/NMFS liaison. The OAR CI Program Manager will be a special advisor to the Council in an *ex officio* status.

The CINAR Council of Fellows members are:

Donald Anderson, Chair	CINAR Director
Francisco Werner	CINAR PI, Rutgers
Michael Roman	CINAR PI, UMCES
Peter Jumars	CINAR PI, University of Maine
John Annala	CINAR PI, Gulf of Maine Research Institute
Paulinus Chigbu	MSI Representative / UMCES
Fred Serchuk	NMFS/NEFSC
Dave Goodrich	OAR/Climate Program Office
Ellen Mecray	OAR/NMFS Liaison
John Cortinas, <i>ex officio</i>	OAR CI Program Director

### **CINAR Theme Leaders**

Includes individuals from the partner institutions with long-term and significant interactions with NOAA who will serve as representatives for their respective CINAR research theme. Each leader is supported by Theme Coordinators at each partner institution, each of whom represents a large group of participating investigators, as identified on the CINAR web site ([www.cinar.org](http://www.cinar.org)).

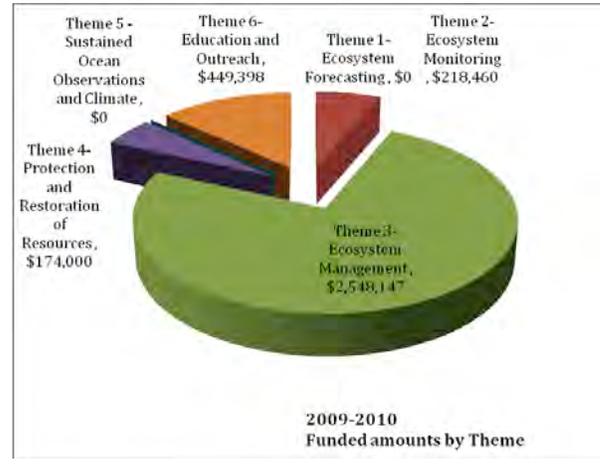
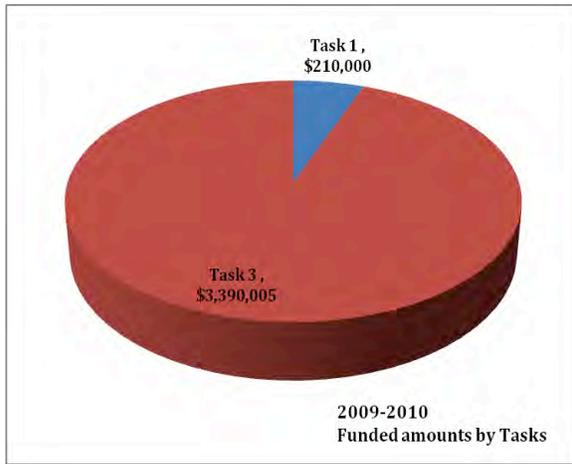
### **CINAR Research and Administrative staff**

WHOI and the partner institutions provide the administrative staff for grants and contracts management, human resource management, systems administration, procurement, and all necessary support staff roles for CINAR activities. CINAR uses the services of researchers through an appropriate combination of tenured or tenure-track faculty in academic departments, and non-tenure track faculty. Each institution is responsible for appropriate oversight of faculty research activities. CINAR actively promotes undergraduate and graduate education through internships, cooperative experiences, graduate assistantships, and fellowships.

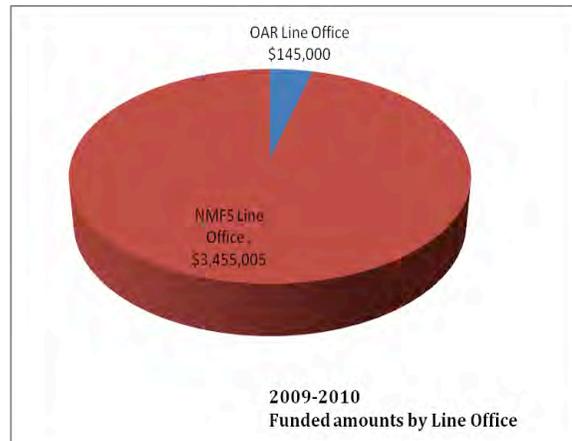
### **CINAR Program Office**

Donald Anderson	CINAR Director
Judy Kleindinst	CINAR Administrator
Ann Stone	CINAR Administrative Professional

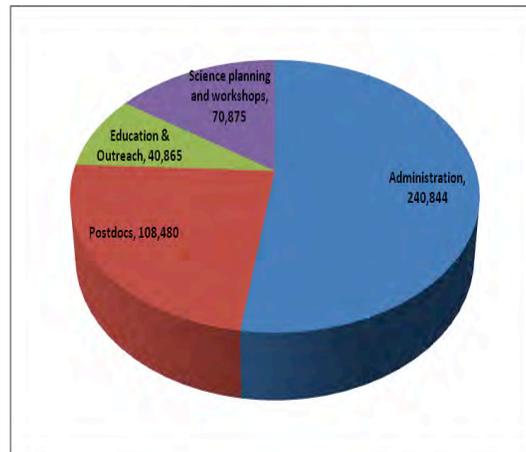
### 1.3 Distribution of NOAA Funding by Task, CINAR Themes and NOAA Line Office



Please note that as this report covers funding as of March 31, 2010, much of the support received was for projects supported by NMFS. We are now processing numerous projects supported by OAR and other line offices at NOAA; these will be reflected in the next progress report where we expect the line office pie chart will look quite different.



## 1.4 Task I activities with Distribution of Funding



Task I funding is provided by three sources. To date, we have received \$100,000 from NMFS and \$110,000 from OAR. \$251,064 is provided by WHOI as cost-sharing to cover salary and related costs for part of CINAR Director Anderson's time and for a CINAR Postdoctoral Scholar.

### **Data Management**

For many years, the NEFSC has been collecting hydrographic and biological data throughout the NES region. These data have, however, largely remained inaccessible to the broader scientific community other than through individual arrangements with NEFSC PIs. Recognizing the importance of making such a unique dataset available to a broad community of individuals within and outside of CINAR, we initiated discussion between NEFSC personnel and the NSF-funded Biological and Chemical Oceanography Data Management Office (BCO-DMO) office. As a result of these discussions, the NEFSC has made available their hydrography and EcoMon plankton datasets online via the BCO-DMO Office. The data collection began in 1997 and the data are processed through 2009 and 2007, respectively. The data can be accessed via the following URLs:

#### **Hydrography:**

<http://data.bco-dmo.org/jg/serv/BCO/NEFSC/hydrodata.brev0%7Bdir=data.bco-dmo.org/jg/dir/BCO/NEFSC,info=data.bco-dmo.org/jg/info/BCO/NEFSChydrodata%7D>

#### **EcoMon 10m<sup>2</sup>:**

<http://data.bco-dmo.org/jg/serv/BCO/NEFSC/plankton10m2.brev0%7Bdir=data.bco-dmo.org/jg/dir/BCO/NEFSC,info=data.bco-dmo.org/jg/info/BCO/NEFSCplankton10m2%7D>

### EcoMon 100m<sup>3</sup>:

<http://data.bco-dmo.org/jg/serv/BCO/NEFSC/plankton100m3.brev0%7Bdir=data.bco-dmo.org/jg/dir/BCO/NEFSC,info=data.bco-dmo.org/jg/info/BCO/NEFSCplankton100m3%7D>

Information about the NEFSC and these two projects are available at:

<http://osprey.bco-dmo.org/program.cfm?flag=view&id=22&sortby=program>

Once additional metadata are added, these datasets will be more readily available via the BCO-DMO web site:

<http://www.bco-dmo.org>.

### **Education and Outreach**

As part of the WHOI cost-sharing for CINAR, we will appoint an 18-month Postdoctoral Scholar during each year of the cooperative agreement. Postdocs will be selected from a national competition at WHOI of very strong applicants in all fields of oceanography. This year's Scholar will be Joel K. Llopiz from the Rosenstiel School of Marine and Atmospheric Science, University of Miami. This is an ideal CINAR Postdoc appointment, as Dr. Llopiz will work closely with Jonathan Hare and others at the NEFSC and will participate in an upcoming stock assessment survey cruise. We will include an update from him in the next CINAR progress report.

CINAR Education and Outreach Theme Leader, Mike DeLuca, met with the Directors of the NOAA Cooperative Science Centers (CSCs) and staff of NOAA's Educational Partnership Program to explore collaborative opportunities between the CSCs and CINAR. He gave a presentation on CINAR focused on education tasks, potential collaborative activities, and mechanisms to advance collaboration. CSC Directors expressed strong interest in developing collaborative research programs that engage faculty and students from both communities, creating a seminar series among the CSC and CINAR institutions, and fostering regular interaction of the CSC and CINAR communities through face-to-face meetings.

We note also that Dr. Paulinas Chigbu from the University of Maryland Eastern Shore has joined our Council of Fellows to represent Minority Serving Institutions (MSI) interests in CINAR education and outreach activities.

### **Executive Board meeting**

The first CINAR Executive Board meeting took place on March 31, 2010 in Silver Spring, MD. Director Anderson gave a presentation describing CINAR, its partners, themes and what capabilities and resources it brings to NOAA. Each member was given the opportunity to discuss potential opportunities for CINAR investigators with specific line offices. The

Board also discussed current CINAR funding, potential NOAA interactions, and mechanisms for enhancing interactions with CINAR such as a CINAR seminar series and a series of workshops. Positive feedback was received from the Executive Board about these efforts and we intend to work closely with this group as we establish these new programs.

### **Seminar Series**

In an effort to increase communications among CINAR and NOAA partners, we are initiating a CINAR seminar series. Initially, this has been through seminars in Woods Hole, sponsored by CINAR, but we are expanding this to include all our CINAR and NOAA partners. To date, we have sponsored the following seminars:

- Steve Cadrin, Northeast Fisheries Science Center, *“Ecosystem-Based Fishery Management: an emergent concept”*, December 10, 2009, Woods Hole, Massachusetts.
- Andrew Pershing, University of Maine and the Gulf of Maine Research Institute, *“Predicting copepod abundance and right whale distributions in Cape Cod Bay and the Gulf of Maine”*, April 8, 2010, Woods Hole, Massachusetts.

Our hope is to establish an Internet-based seminar series in which a CINAR or NOAA investigator can make a presentation that can be viewed at all partner institutions as well as in different NOAA offices.

### **Workshops**

Another way we are enhancing communications among the CINAR partners, and especially with our NOAA counterparts, is by organizing informal workshops designed around the CINAR themes. One of our hopes is that these workshops will help to build relationships between CINAR investigators and NOAA programs and scientists, as these relationships may then lead to project funding. A workshop might simply exchange information about new approaches to problems or tasks faced by NOAA programs (e.g., enhanced stock assessments, ecosystem based management, marine spatial planning), or it might seek to exchange ideas and new developments on a specific topic.

These workshops will involve CINAR investigators and our NOAA partners interested in the selected topic area and will be held at any one of the partner institutions, though they would be open to all CINAR members. We are currently reviewing the workshop ideas solicited from our CINAR Theme Leaders and, in consultation with our Executive Board and Council of Fellows, will choose a few to hold this year.

### **Presentations**

Director Anderson testified before the Interagency Ocean Policy Task Force at a public meeting held in Providence, Rhode Island on September 24, 2009. His testimony was on behalf of CINAR and discussed marine spatial planning.

**PI Conference calls**

Because of the consortium nature of CINAR, consisting of geographically separated partners, the CINAR PIs have periodic conference calls to discuss internal issues.

## **CINAR RESEARCH SUMMARIES**

The following pages provide research summaries of the 11 CINAR projects funded during the period July 1, 2009 through March 31, 2010. The projects are organized by theme. Note that there are a number of ongoing OAR sponsored projects that were funded through our predecessor, CICOR, which do not show up here as their renewal grants have not yet been processed.

### **Theme I. Ecosystem Forecasting**

None

### **Theme II. Ecosystem Monitoring**

1. Donald Anderson, WHOI- *Acquisition of a Pressure Housing and Array of Reaction Chambers (Pucks) for the Environmental Sample Processor (ESP)*
2. Scott Gallager, WHOI - *HabCam Data Processing for Leg 3 of the 2009 Scallop Survey*
3. Hanumant Singh, WHOI – *Image Analysis Tools for Quantitative Mensuration and Classification of High Resolution Optical Imagery.*
4. Hanumant Singh, WHOI – *Development of Automated Tools for Underwater Photographic Analysis*

### **Theme III. Ecosystem Management**

1. Steve Eayrs, GMRI- *Commercial Fishing Vessel Electronic Trip Reporting Pilot Study*
2. Daniel Holland, GMRI – *Understanding Determinants of Success of New England Fish Sectors*
3. Jonathan Labaree, GMRI – *Funding Dockside Monitoring for New England Ground Fish Sectors in FY 2010*
4. Meredith Mendelson, GMRI- *Social Science Performance Measure and Indicator Outreach*

### **Theme IV. Protection and Restoration of Resources**

1. Michael Moore, WHOI – *Health implications of entanglements of large whales*

### **Theme V. Sustained Ocean Observations and Climate**

None

### **Theme VI. Education and Outreach**

1. Meredith Mendelson, GMRI- *MREER as a Catalyst*

2. Thomas Miller, UMCES - *Student Fellowship: Habitat use and Dietary Patterns of Diadromous Fishes in the Northwest Atlantic Making Connections Between River Restoration and Sustainability of Federally Managed Fisheries*

## ***Acquisition of a pressure housing and array of reaction chambers (pucks) for the Environmental Sampling Processor (ESP)***

---

NOAA Cooperative Agreement No. NA09OAR4320129 – WHOI Sub point 01  
July 01, 2009-March 31, 2010

***Donald M. Anderson***

Woods Hole Oceanographic Institution

NOAA Program Manager

Dr. Zdenka S. Willis

NOAA Integrated Ocean Serving System (IOOS)

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore, and Manage the Use of Coastal and Ocean Resources through Ecosystem-Based Management

### **CINAR Theme:**

Theme II. Ecosystem Monitoring

### **PROJECT OVERVIEW:**

The ESP is an electromechanical/fluidic system that collects discrete water samples from the ocean subsurface, concentrates microorganisms (particulates), and automates application of ribosomal RNA (rRNA)-targeted DNA probe arrays that detect harmful algal bloom (HAB) species in near real-time. (See <http://www.mbari.org/esp/>). The ESP also archives samples for nucleic acid analyses, microscopy, and other procedures after the instrument is recovered from deployment. The ESP employs “pucks” for sample collection and processing protocols. Pucks are custom-designed reaction chambers that support a wide variety of filters or chemically adsorptive media depending on protocol requirements. Pucks are stored in a rotating carousel and are manipulated to processing station positions by elevator and shuttle mechanisms. The same mechanisms also move pucks to an imaging station where a CCD camera records results of DNA probe arrays.

Funding has been obtained from the EPA to purchase a base ESP unit for use in HAB-related activities through NERACOOS, the Northeastern Regional Association of Coastal Ocean Observing Systems. Supplemental funds were needed, however, for a pressure housing, and for sufficient pucks (100) to operate for a full duty cycle.

### **ACCOMPLISHMENTS:**

With OAR support through CINAR, we acquired a pressure housing for a core ESP. The housing is compatible with the EPA ESP and will be co-deployed in support of HAB monitoring and research in NERACOOS region. We have ordered, and are in the process of

acquiring 100 reaction pucks that are needed to operate the ESP for extended deployments, and that are also compatible with the EPA ESP.

**HIGHLIGHTS:**

The EPA funding is for a single instrument only. We are excited to report that we have been successful in obtaining NSF funding through their Major Research Instrumentation program to obtain 5 additional ESPs for deployment in the Gulf of Maine as part of a HAB monitoring and research program. This is a major step forward for our program and for biological sensors within the ocean observatory context.

**SOCIETAL BENEFITS:**

The ESP is truly a major advance in the science and management of HABs, which is a significant problem worldwide. The first ESP and its associated pressure housing and reaction pucks will allow us to learn how to operate and deploy this complex instrument in the dynamic coastal environment, paving the way to networks of deployed instruments that will send their data to shore where it will be assimilated into numerical models in an operational red tide forecasting system that we are in the process of transitioning to NOAA. Although the initial application will be for HABs, the ESP can be used to detect a variety of other organisms that affect society, including microbial pathogens. This development in ocean sensor technology is a major step in the ongoing revolution in the way we view and monitor the Earth's land, oceans, and atmosphere.

**PHOTOGRAPHS:**



Figure 1. ESP pressure housing designed by McLane Research, Inc. The coke can is deliberate to illustrate the size of the instrument.

## ***HabCam Data Processing (Leg 3 of the Scallop Survey)***

---

NOAA Cooperative Agreement No. NA09OAR4320129 – WHOI Sub point 04  
July 01, 2009-March 31, 2010

### ***Scott M. Gallager***

Woods Hole Oceanographic Institution

NOAA Program Manager

Russell Brown

National Marine Fisheries Service/Northeast Fisheries Science Center (NMFS/NEFSC)

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore, and Manage the Use of Coastal and Ocean Resources through Ecosystem-Based Management

### **CINAR Theme:**

Theme III. Ecosystem Management

### **PROJECT OVERVIEW:**

This project is designed to support image collection and processing, scallop and groundfish identification and enumeration, and comparison of HabCam data with that obtained by standard dredge tows during Leg 3 of the 2009 NMFS Scallop Survey. The HabCam imaging system was installed on the R/V Hugh R. Sharp for Leg 3 of the survey to conduct joint tows for the purpose of: 1) addressing dredge efficiency, 2) to assess the operation of HabCam as an optical survey tool under NMFS survey conditions, and 3) to evaluate the ability for HabCam to survey groundfish, particularly yellowtail flounder.

HabCam was towed at 23 stations in parallel with the Sharp and collected a total of 787,832 images with a footprint of about 1 m<sup>2</sup> each. By area, 85,572 images were collected in Closed Area I (CLAI), 216,809 images in Closed Area II (CLAI), 183,070 images on the Canadian side of the Northeast Peak of Georges Bank, and 302,381 images between stations. The objectives of this project are to: 1) process all images from the cruise HS\_20090623 for color correction, light field correction, and conversion to jpeg; 2) manually count and measure all scallops and fish in images along each track and characterize substrate; 3) plot vessel tracks, images, and data products in Google Earth for ease of visualization; 4) establish a training set of images manually processed for use with an automated target classifier and compare results with manual classification, and 5) compare HabCam data with dredge survey data to obtain a dredge efficiency for both scallops and yellowtail flounder, where applicable.

## ACCOMPLISHMENTS:

All objectives 1 through 5 have been completed. Objectives 1-3: The annual NMFS Scallop Survey was conducted in three Legs: Leg 1 (May 9-20), Leg 2 (June 8-19), and Leg 3 (June 23-July 3). Three members of the HabCam Group (Richard Taylor, Amber York, and Scott Gallager) participated in Leg 3. The HabCam vehicle, winch and separate power pack were installed on the R/V Hugh Sharp while it was docked in Woods Hole directly following Leg 2. The Sharp departed for Leg 3 on June 23 and headed into Nantucket Sound where trial tows were conducted to understand logistics of deployment and retrieval (Fig. 1). The vessel then headed to CLAI where HabCam was towed along the track of three previously conducted Sharp dredge tows from Leg 2. The vessel then headed to the Southeast Part of Georges Bank, into CLAI, and then onto the Canadian side. After proceeding eastward, the survey track returned to US waters along the Northern Edge. A serpentine camera tow was conducted that repeatedly crossed the ICJ border between the CLAI HAPC and the Canadian side. The Sharp then headed west towards CLAI and the Western Great South Channel. In Fig. 1, the orange line represents the Sharp's track as it conducted the NMFS stratified random survey stations, while the purple lines represent tracks where HabCam was towed and collected images from the Sharp. Red dots and stars represent single sightings of yellowtail flounder along track.

The following is a summary of data collection and processing efforts:

<u>Cruise HS 20090623</u>	<u>Number of Images</u>
CLAI	85,572
CLAI	216,809
Canadian side	183,070
<u>Non-area specific (between stations)</u>	<u>302,381</u>
Total	787,832

Since each image represents about 1 m<sup>2</sup> and there is approximately 50% overlap, an area of about 242,000 m<sup>2</sup> was imaged. In an area on the Canadian side called the 'seed box', the density of small (50-60 mm) scallops was extremely high, upwards of 50 to 90 scallops per image (e.g. Fig. 2).

Shell height measurements from HabCam showed a strongly skewed distribution to the left with a mode of 55 mm and a mean of 79 mm (Fig. 3), indicating that this area was dominated by two year old scallops with relatively few older individuals.

Along track abundance of scallops at Station 404 ranged from 0 to well over 60/m<sup>2</sup> (Fig. 4). A Neighbor -k analysis of scallop distributions along the track in Fig. 4 showed that patchiness was significant at several spatial scales from 600 to 1000m (Fig. 5).

Yellowtail flounder were sparse but most abundant in the Southeast Part of CLAI and on the Canadian side. Images show yellowtail to be found on mostly sandy bottom with shell hash and occasionally on gravel (Fig. 6.)

Objective 4: A training set of >10,000 images has been established through manual image classification of scallops, groundfish, and sea stars. These will be used in an automated classification scheme for processing all of the images collected on Leg 3 of the scallop survey.

Objective 5: Twenty three NMFS dredge and HabCam joint tows were analyzed for comparative assessments of scallop abundances. Comparisons between shell height distributions measured by hand from the dredge and from HabCam images show remarkable agreement in the mean (Fig. 7). Estimating measurement error from HabCam images is part of a separate, collaborative project with NOAA and will be reported in a separate document. The overall relationship between dredge and HabCam estimates of scallop abundances suggested that dredge efficiency for these tows ranged between 20 and 40% with a mean of 23%. These data have not been corrected for changes in length of tow using inclinometer data so the final efficiencies will be different.

### **HIGHLIGHTS:**

- The HabCam optical and acoustic imaging vehicle was integrated into Leg 3 of the National Marine Fisheries Service Annual Sea Scallop Survey on the R/V Hugh Sharp.
- Logistics of dredge and HabCam deployment were successfully characterized allowing for 23 joint tows to be conducted using both the dredge and HabCam.
- A total of 787,832 images with a footprint of about 1 m<sup>2</sup> each representing, by region, 85,572 images collected in Closed Area I, 216,809 images in Closed Area II, 183,070 on the Canadian side of the Northeast Peak of Georges Bank, and 302,381 images between stations.
- Techniques were developed to process all images for lightfield and color correction, image distortion, and conversion to jpeg format for visualization as ground overlays in Google Earth. All image data for cruise HS\_20090623 and associated Google Earth kml files are available through the HabCam website: <http://habcam.who.edu>
- Images were manually processed to count and measure scallops and groundfish (particularly yellow tail flounder) as well as define substrate composition.
- Scallops were extremely abundant in the 'seed box' area on the Canadian side of Georges Bank ranging in abundance up to 90 scallops/m<sup>2</sup>. The size frequency distribution had a mode of 55 mm indicating the population was dominated by 2 year-old scallops.
- The scallop population was extremely patchy with correlation scales at 600 and 1000m indicating some underlying process, such as bathymetry and substrate composition. may be influencing their distribution. The distribution of yellowtail flounder was sparse with greatest abundances in the Southeast Part of CLAI and on the Canadian side of the Bank.
- A training set of manually classified images was developed to allow further automated processing of additional HabCam data sets.
- Estimates of scallop abundances from 23 joint tows between the federal dredge and HabCam indicated that dredge efficiency ranged between 20 and 40% depending on substrate composition and depth.

**SOCIETAL BENEFITS:**

Data products produced from this project are being integrated directly into the National Marine Fisheries Sea Scallop Stock Assessment Program. These data will allow for more accurate assessments of existing stocks and the setting of Total Allowable Catch limits. HabCam data products are being used to help improve the accuracy of scallop stock assessment. Consequently, improved accuracy in stock assessments will facilitate better management practices ultimately benefitting the commercial scallop industry. Currently, the scallop industry is constrained by regulations that limit yellowtail bycatch. Providing real-time maps of yellowtail abundances and distributions from HabCam imagery will help scallop managers to set appropriate bycatch limits using valid in-season data.

**EDUCATION AND OUTREACH ACTIVITIES:**

Currently, the main venue for the HabCam Group's educational and outreach initiatives is the Ocean Explorium, located at 174 Union Street in New Bedford, Massachusetts. This venue provides us with a strategic location that is very close to the commercial fishing industry of New Bedford. The Ocean Explorium is open to the public year round. The main goal of the Explorium is to provide hands-on educational activities both on and off-site. The Ocean Explorium is also home to eleven different aquariums, including a 750 gallon reef tank. Each tank has an educational message and is designed to complement the Explorium's field trips.

There are four 22" monitors at the Explorium. One of these monitors has been displaying two continuously scrolling HabCam slideshows since the beginning of March 2010. The first slideshow is entitled "*The Sea Scallop Project*" and the second is "*The NorthEast Benthopelagic Observatory Project*". These slideshows will be running at the Ocean Explorium for the remainder of 2010. In addition to the slideshows, the HabCam Group has mounted two posters (each is 3"x5") on the wall at the Explorium. One poster introduces the HabCam Sea Scallop Project and optical imaging in general. The other poster introduces the NEBO Project and particularly focuses on an invasive tunicate species called *Didemnum sp.* The HabCam Group recently found this tunicate in large numbers on Georges Bank and other areas along the Northwest Atlantic continental shelf.

Future outreach goals for 2010 include the installation of an additional monitor which will display an interactive Google Fly-In program, designed to be a fun hands-on educational activity visualizing results of the Sharp cruise reported here. Members of the public and schoolchildren can sit at the monitor and "fly" into marine areas they are interested in. They can then zoom in to see what flora and fauna live there and what the ocean floor is made of. In addition, the HabCam Group has initiated collaborations with a Wareham, Massachusetts science teacher and her marine science class. Starting in fall 2010, this class will review the existing HabCam slideshows and give their opinions/suggestions on how it might be improved. These students will also be involved in the creation and development of two HabCam related educational activities. These activities, based upon HabCam outreach goals, can be integrated into the Ocean Explorium's field trips and the existing hands-on activity center. For example, students will be utilizing our highlighted images to enhance existing lesson plans for the Explorium. The Explorium teaches terms such as

predation, competition, mutualism and commensalism as part of the “Ecological Relationships” and the “Massachusetts Comprehensive Assessment System (MCAS)” field trips. The inclusion of HabCam images in these, as well as other, field trips will provide students with clear detailed pictures of animal behaviors and interactions. In addition, students will benefit from seeing images from local marine habitats which are located right in their own backyards. The HabCam Group also collects and distributes marine life caught offshore for the Ocean Explorium’s live exhibits and provides scallop shells for children’s painting activities.

Presentations of the data from Leg 3 of the Annual Sea Scallop Survey were made to the Scallop Assessment Working Group by Gallagher, York, Taylor in August 2009, February 2010, March 2010, and April 2010. Final presentations will be made in June 2010.

### **Other Presentations**

York and Gallagher. Applications of optical imaging of the sea floor in fisheries oceanography and assessment of biodiversity. Sendai University, Sendai, Japan, October 2010. Invited

York and Gallagher. Optical imaging of sea scallop populations and other applications of HabCam technology. Tongji University, Shanghai, China, November 2010. Invited

York et al. Distribution and abundance of the invasive tunicate and its impact on scallop populations on Georges Bank. Invasive Species Workshop 2010, Woods Hole Oceanographic Institution, April 26, 2010.

Gallagher et al. Development of automated image processing tools for assessing scallop populations and the invasive tunicate *Didemnum vexillum*. Invasive Species Workshop 2010, Woods Hole Oceanographic Institution, April 26, 2010.

### **PUBLICATIONS:**

Gallagher, SM, AD York, R Taylor, N Vine, D Hart, R Brown, K Bolles, P Keeton, and D Fallon. (in prep) Quantitative assessment of yellowtail flounder on Georges Bank using HabCam, a towed optical imaging system.

Gallagher, SM, AD York, D Hart, R Taylor, N Vine, K Bolles, P Keeton, and D Fallon. (in prep) Comparison between dredging and optical imaging for assessment of sea scallop populations on Georges Bank.

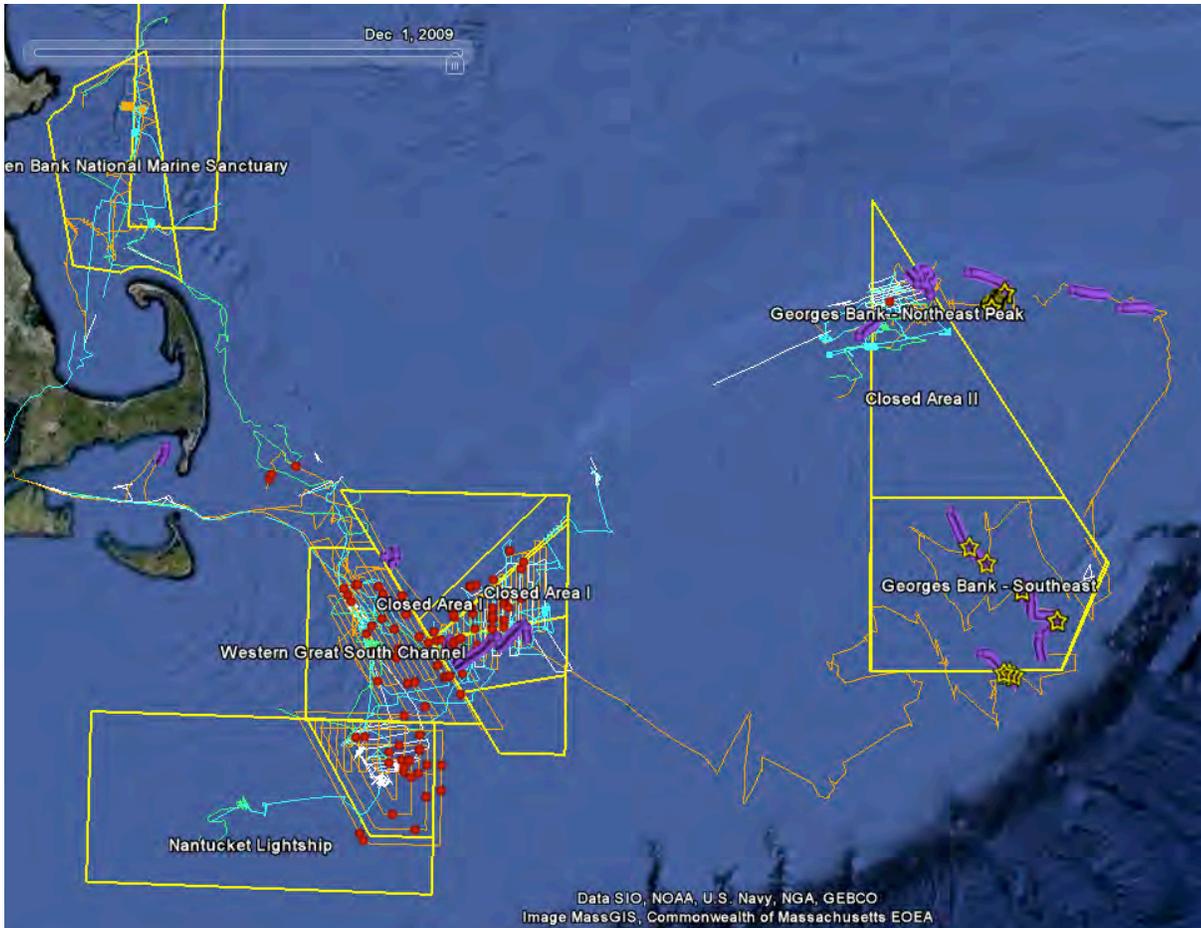


Figure 1. Georges Bank and tracklines of the R/V Hugh Sharp Leg 3 of the NMFS scallop survey (orange) and the regions where HabCam was deployed and collecting images (purple). Red dots and yellow stars are yellowtail flounder sightings.

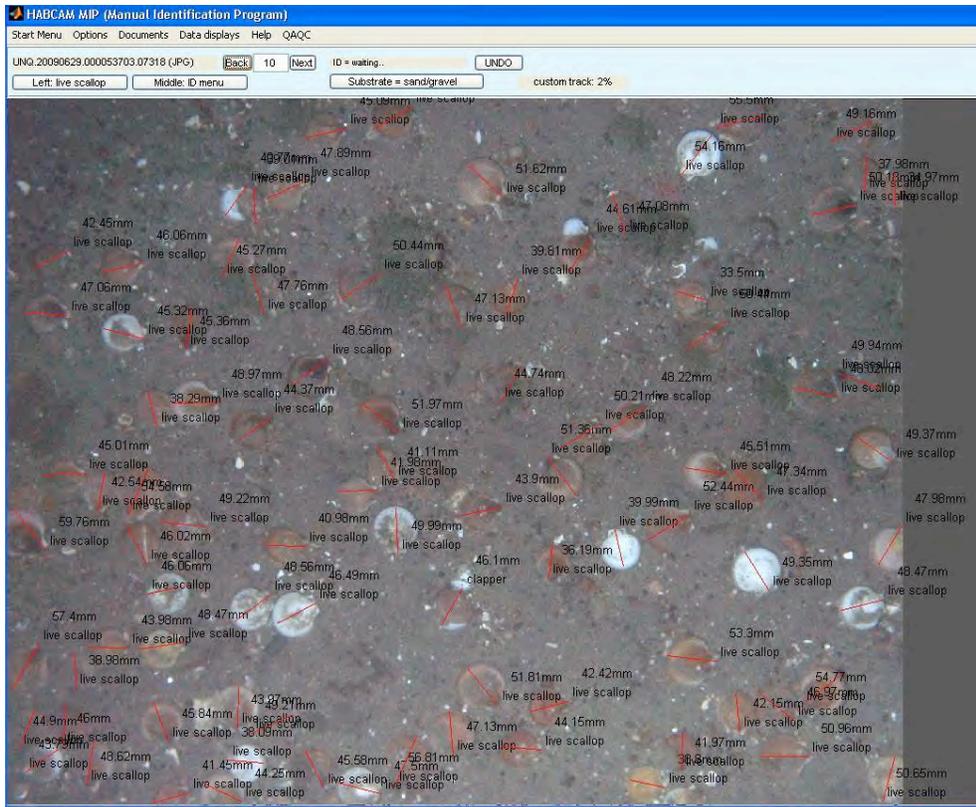


Figure 2. An image collected on the Canadian side near station 404 where 90 scallops were counted and measured in a single 1m<sup>2</sup> image.

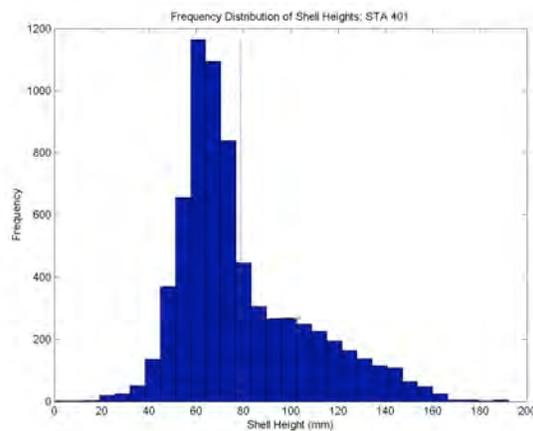


Figure 3. Frequency distribution of scallop shell heights from HabCam images at Station 401 in the seed box.

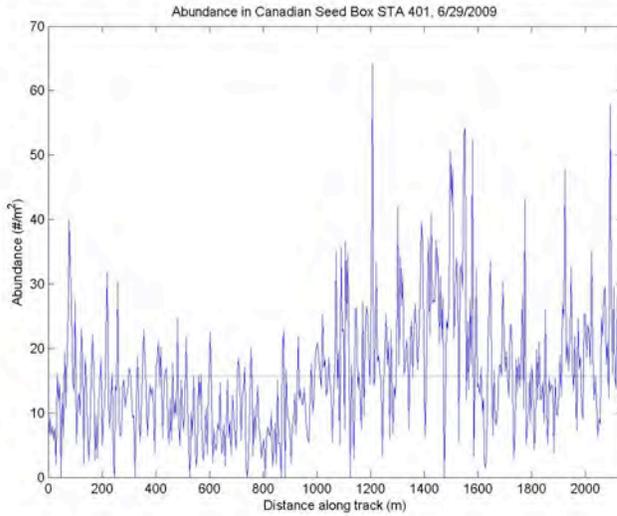


Figure 4. Along track abundance of scallops Station 401 in the 'seed box' on the Canadian side.

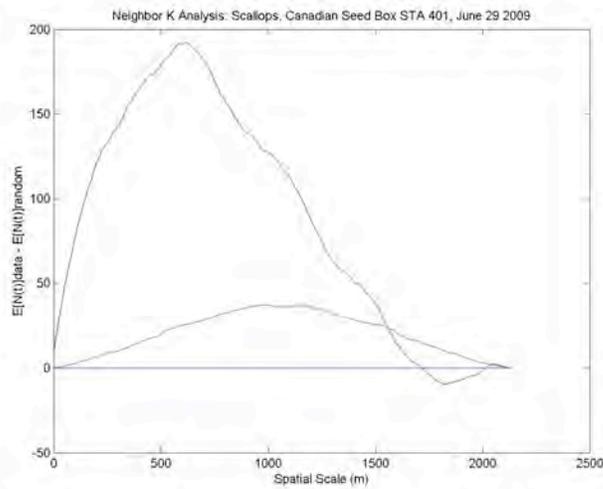


Figure 5. Neighbor-k analysis of the distribution of scallops at Station 404. Note significant modes at 600 and 1000m.

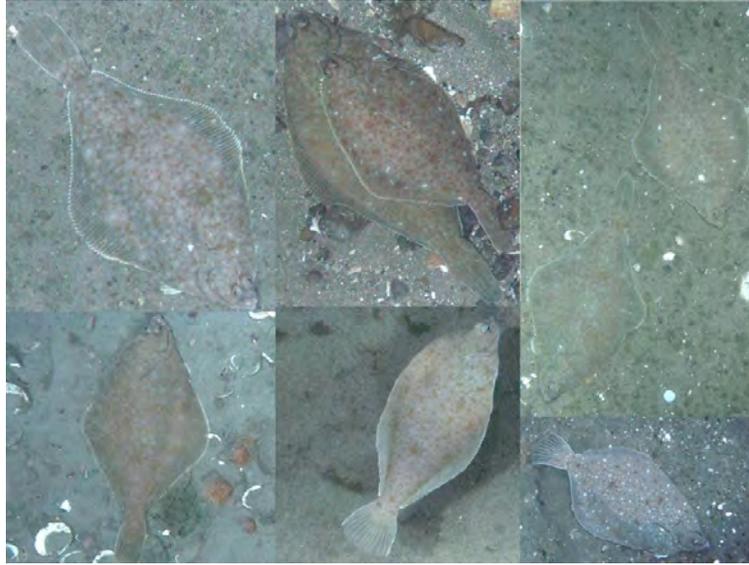


Figure 6. Composite of example images of yellowtail flounder from Georges Bank.

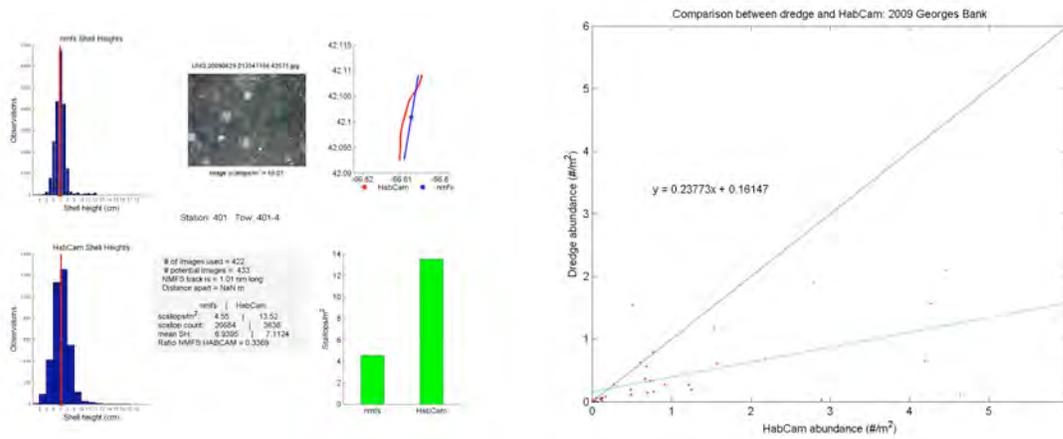


Figure 7. Data for one tow at Station 401 showing shell height and scallop abundance for the dredge and HabCam (left). Comparison between estimates of shell height and scallop abundance between dredge tows and Habcam (right).

## ***Image Analyses Tools for Quantitative Mensuration and Classification of High Resolution Optical Imagery***

---

NOAA Cooperative Agreement No. NA09OAR4320129 – WHOI Sub point 03  
July 01, 2009-March 31, 2010

### ***Hanumant Singh***

Woods Hole Oceanographic Institution

NOAA Program Manager  
Scott Ferguson  
Pacific Islands Fisheries Science Center

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore, and Manage the Use of Coastal and Ocean Resources through Ecosystem-Based Management

### **CINAR Theme:**

Theme II. Ecosystem Monitoring

### **PROJECT OVERVIEW:**

This effort is aimed at building new tools to aid in the quantitative mensuration and automated classification of underwater imagery. In this context it will form a package of tools that include:

- Web based tools for merging and examining the imagery in the context of all the metadata
- Methods for the fusion of multi-sensor (optical and acoustic) imagery
- Tools for making quantitative measurements of individual organisms from calibrated camera systems
- Tools for automatically classifying the background habitat associated with a particular image

In particular we have chosen to focus our efforts on the fusion of multibeam sonar and stereo based optical imagery.

### **ACCOMPLISHMENTS:**

This project is ongoing.

As part of this process we have built a prototype tool. This tool has been introduced to our NOAA community of users and through an iterative process we will continue to be refine this towards our eventual goal.

As part of this process, researchers from WHOI also participated in a highly successful NOAA led cruise off Guam.

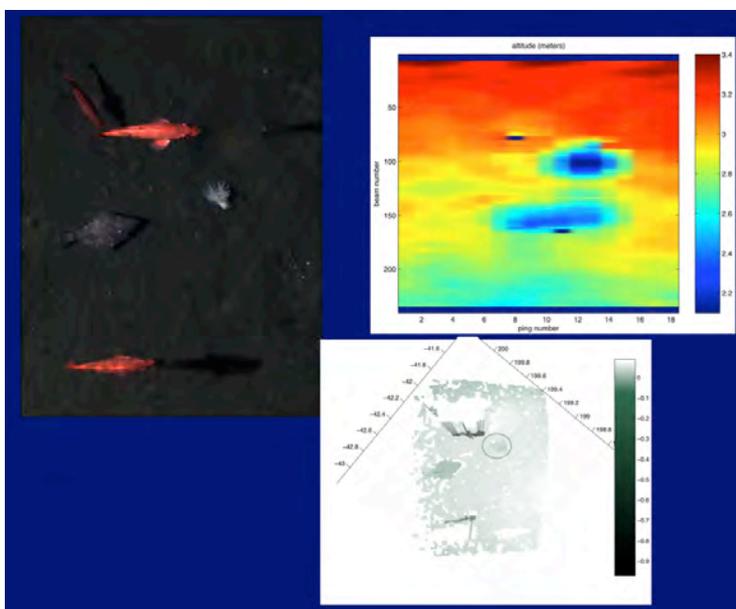
**HIGHLIGHTS:**

- Web based tools for the quantitative mensuration and classification of fish in underwater optical imagery are in the process of being developed.

**SOCIETAL BENEFITS:**

The ability to analyze the large amounts of optical data that are being generated by the imaging platforms is crucial for a better understanding and management of fisheries stock within a fisheries independent framework.

**PHOTOGRAPHS:**



Efforts in stereo reconstruction and multi-sensor fusion are ongoing. The accompanying figure shows (top left) one of the optical images that form part of a stereo pair, (top right) a section of multibeam data that shows the same area with the ship clearly highlighted in the multibeam and (bottom) the stereo reconstruction of the fish.

## **Development of Automated Tools for Underwater Photographic Analysis**

NOAA Cooperative Agreement No. NA09OAR4320129 – WHOI Sub point 02  
July 01, 2009-March 31, 2010

### ***Hanumant Singh***

Woods Hole Oceanographic Institution

NOAA Program Manager

Elizabeth Clarke

Northwest Fisheries Science Center

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore, and Manage the Use of Coastal and Ocean Resources through Ecosystem-Based Management

### **CINAR Theme:**

Theme II. Ecosystem Monitoring

### **PROJECT OVERVIEW:**

This effort is aimed at building new tools to aid in the automated analysis of underwater imagery. In this context it will form a package of tools that include:

- Web based tools for merging and examining the imagery in the context of all the metadata
- Methods for the fusion of multi-sensor (optical and acoustic) imagery
- Tools for making quantitative measurements of individual organisms from calibrated camera systems
- Tools for automatically classifying the background habitat associated with a particular image

This work will emphasize the use of standard freely available non-proprietary packages and on maintainability by the end user over the normal course of operations.

### **ACCOMPLISHMENTS:**

This project is ongoing.

We have built a prototype set of tools. This tool has been introduced to our NOAA community of users and through an iterative process we will continue to be refining this towards our eventual goal. As part of this process, researchers from WHOI also participated in a highly successful NOAA led cruise off Santa Barbara.

## HIGHLIGHTS:

- Web based tools for the automated analysis of underwater optical imagery are in the process of being developed that will allow end users to extract information from the large volume of imagery while maintaining the provenance of the data - that is the ability to drill down to the specific datasets, metadata, and images that went into the analysis.

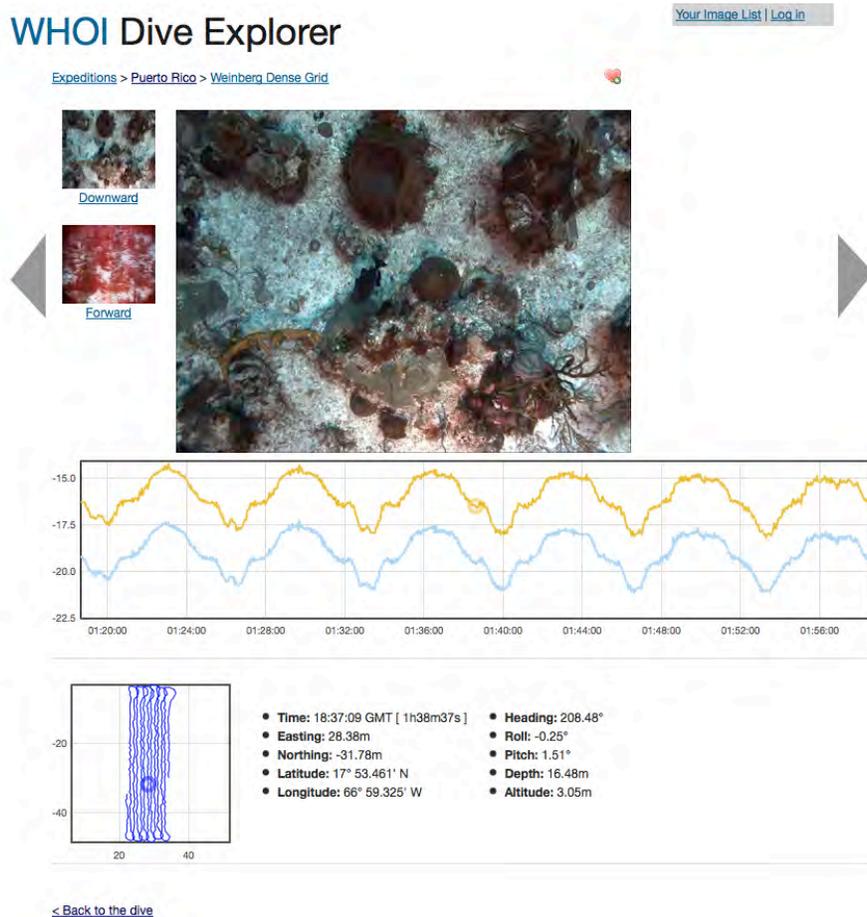
## SOCIETAL BENEFITS:

The ability to analyze the large amounts of optical data that are being generated by the imaging platforms is crucial for a better understanding and management of fisheries stock within a fisheries independent framework.

## EDUCATION AND OUTREACH ACTIVITIES:

The efforts of a Graduate Research Assistant were supported through this work.

## PHOTOGRAPHS:



A snapshot of the web based Data Explorer application that allows users to quickly examine the optical imagery and associated metadata

## ***Commercial Fishing Vessel Electronic Trip Reporting Pilot Study***

---

NOAA Cooperative Agreement No. NA09OAR4320129 GMRI Sub point - 01  
July 01, 2009-March 31, 2010

### ***Steve Eayrs***

Gulf of Maine Research Institute

NOAA Program Manager:  
Joan Palmer  
Northeast Fisheries Science Center

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-Based Management

**CINAR Theme:** Theme III. Ecosystem Management

### **PROJECT OVERVIEW:**

With the move to sector management in the Northeast Multispecies Fishery Management Plan (as reflected in Amendment 16 to the Plan), the need for catch data increases in both quality and timeliness. This will result in new requirements for the timeliness of data flowing to NMFS's Northeast Regional Office (NERO) and Northeast Fisheries Science Center (NEFSC). At the same time, groundfish sectors are developing technical capabilities to electronically monitor their vessels' fishing activity and to track progress toward their annual catch entitlements (ACE).

The convergence of these two factors makes this a crucial time to test the feasibility of providing vessels the option to submit their vessel trip reports (VTRs) electronically rather than on paper. In addition to NMFS's Fisheries Logbook Data Recording Software (FLDRS) and web-portal data entry system, there are several proprietary products available to vessel captains. As these systems develop, it is critical to ensure they are compatible with NMFS's regulatory reporting requirements. These are specific to the needs under sector development, but also to the general reporting system for vessels.

The primary goal of this pilot study is to collaborate with the fishing industry and the NMFS to test the feasibility of adopting electronic solutions for sector reporting requirements across a representative range of sector and common pool vessels in the northeast groundfish fleet. The pilot study will be designed to test the range of electronic logbook products and the NEFSC's web-based data entry to identify obstacles to their use by captains, and ensure their compatibility with NMFS's data collection systems.

The project is divided into two main components: development and implementation. Between October, 2009 to December, 2009, the development phase will focus on

establishing robust systems and procedures for such elements as: identifying vessels for participation (initial target is 20 - 25 vessels), identifying electronic logbook solutions (what software solutions are available or in development), determining terms of vessel participation, determining services and compensation provided by GMRI and NMFS, designing an effective training program, establishing data ownership and confidentiality standards and determining protocols for funding third-party software development. Vessels and captains will be selected to represent the six broad categories of the groundfish fishery: Georges Bank Fixed Gear, Georges Bank Trawl Gear, Gulf of Maine Fixed Gear, Gulf of Maine Trawl Gear, Southern New England/Mid-Atlantic Fixed Gear and Southern New England/Mid-Atlantic Trawl Gear.

The implementation phase, between September, 2009, to October, 2010, will focus on activities such as: signing contracts with participating vessels, purchasing and installing hardware, delivering training programs, providing technical and customer service support to vessels, tracking vessel participation, testing systems with vessels and sectors, interacting with third-party vendors to improve their systems, refining data format and transmission techniques and continual assessment of hardware and software solutions.

GMRI anticipates the need for several research and administrative staff to develop and implement this pilot study. The Principal Investigator will be a GMRI research scientist with experience in delivering hardware and software to active fishing vessels. Providing project and collaborative oversight, as well as direct technical assistance, will be a GMRI research associate with similar experience. In addition, GMRI foresees the need to hire a temporary, full-time research technician to provide continual support to participating vessels and coordinate with NMFS staffs who are involved on the ground. Overseeing contracts will also require direct project staffing.

Finally, GMRI intends to provide a detailed assessment of the lessons learned during the pilot project, including recommendations to NMFS for scaling the effort up to encompass more of the fleet. We envision a process of continual evaluation during the pilot study to ensure systems are working properly and captains are making the most of their logbook programs. Working closely with NMFS, GMRI will also ensure that NMFS is receiving the data it requires in a timely manner and in a format that meets NMFS reporting requirements.

#### **ACCOMPLISHMENTS:**

GMRI has hired a highly qualified research technician for the sole purpose of working on this project.

Five vessels/captains representing three sectors have been outfitted and trained on using FLDRS electronic logbook and the web-based portal system for data transfer. Two more vessels/captains are scheduled for training and outfitting with FLDRS and the web-based portal for the week of April 12.

An agreement has now been reached with the Sustainable Harvest and Tri-State Sectors regarding their participation in the eVTR project. Their primary concern is outfitting their

respective vessels with Olfish electronic logbook software, after it has been suitably adapted to sector reporting needs. A contract for software development is currently being reviewed by the parent company for Olfish and should be executed in the near future. This contract will provide monetary assistance for Olfish to upgrade their software to make Olfish eVTR compliant.

We have been working with the Northeast Seafood Coalition and their sector vessels in developing their electronic logbook software, Fishtrax. GMRI staff also developed a fishermen-friendly training manual for using Fishtrax. A contract for software development as related to the eVTR project is currently being reviewed by the parent company for Fishtrax.

GMRI staff has been communicating closely with NEFSC staff through biweekly conference calls, discussing project development, and solutions to data collection and transmission issues encountered thus far.

#### **HIGHLIGHTS:**

- The use of electronic trip reports provides an opportunity for fishermen to transmit catch and effort data in a timely manner to the NMFS and their respective sector managers. This will substantially reduce the time between data receipt, evaluation, and response, thus providing both NMFS and sector managers an improved ability to manage and respond to fishing activity. To date, a total of 39 vessels representing 13 sectors have thus far expressed interest in participating in this project.
- Currently, 5 vessels representing 3 sectors are actively participating in this project, and engagement with additional vessels will occur as resources permit.
- Following initial technical difficulties, FLDRS data has been successfully transmitted through the Skymate VMS system. Additional vessels using this software are expected in the near future.
- A fishermen friendly training manual and guideline have been developed for FLDRS, FishTrax, and the web-based portal system.
- Contracts with commercial software providers are expected to be signed in near future, allowing active use of these systems

#### **SOCIETAL BENEFITS:**

For the first time, fishermen will be provided an option to submit electronic vessel trip reports instead of paper reports. The successful application of related software and systems training will provide fishermen a simple reporting alternative, that is quick and effective, and enhance the ability of the NMFS and sector managers to monitor catch and effort in a timely manner. This will also allow fishermen to focus on other important fishing tasks, improve the timeliness and accuracy of reporting, and improve the management of fishing activity by the NMFS and sector managers, including monitoring of vessel catch with respect to their ACE.

#### **EDUCATION AND OUTREACH ACTIVITIES:**

Training of sector managers and fishermen in the use of FLDRS has occurred for the Cape Cod Hook sector on 23 February 2010. The Northeast Coastal Communities sector

manager and one eVTR participant received training on 8 April 2010. One fisherman from the Port Clyde sector was trained on the use of FLDRS on 8 April 2010. Furthermore, notification and training of several marine electronics personnel has occurred.

## ***Understanding Determinants of Success of New England Groundfish Sectors***

---

NOAA Cooperative Agreement No. NA09OAR4320129 GMRI- Sub point 00  
July 01, 2009-March 31, 2010

### ***Dan Holland***

Gulf of Maine Research Institute

NOAA Program Manager:  
Patricia Pinto da Silva  
Northeast Fisheries Science Center

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

### **CINAR Theme:**

Theme III. Ecosystem Management

### **PROJECT OVERVIEW:**

The New England groundfish fishery is undergoing a major transformation with the expansion of the “sector” allocations to 17 new sectors in addition to the two existing sectors. This new approach, which devolves substantial management responsibilities to groups of fishermen, represents a potential transformation in the relationship among fishermen as well as the relationship between fishermen and the management councils. The success of sectors is likely to depend largely on the attitudes and capabilities of the members that join them and skills and commitment of sector leaders. We hypothesize that their success will depend in part on the strength of the relationships between members including their degree of trust and collaboration. We expect that successful sectors will build norms and networks that enable collective action over time. Because sectors will be able to trade annual catch entitlement with other sectors to balance catches that exceed their initial allocation, we hypothesize that the connections and ability to cooperate with other sectors will also be important determinants of success. The value of these relationships is commonly referred to in social and economic literature as social capital.

There has been no evaluation of the social capital of existing Groundfish sectors or of the proposed sectors or other baseline information that may explain their future success or failure. We have designed and are now implementing a survey to collect the baseline information necessary to measure the social capital of existing sectors and of new sectors before they begin operation. We are also surveying a sample of permit holders that have not joined sectors. In addition to information relevant to measuring social capital, we are collecting baseline information that can be used to measure performance of groundfish

sectors in terms of socio-cultural and safety outcomes. We will utilize the data collected from the survey to derive assessments of social capital of the sectors. We plan to follow this with one or more additional surveys after the sectors have been operating to determine the role social capital played in their success (or lack thereof) and whether and how the social capital of the sectors has evolved over time.

**ACCOMPLISHMENTS:**

We completed development of the survey and contracted with Market Decisions (a market research company) to implement the survey as a phone survey. The survey is being implemented now. We have achieved a greater than 50% response rate from several of the sectors and the samples of common pool vessels. There have been relatively few hard refusals, but Market Decisions is having difficulty making phone contact with many permit holders. They will attempt contacting permit holders at least 9 times before counting that permit holder as a non-response. We hope to get at least a 50% response rate from all sectors before ending the survey. In order to reach some of the permit holders who are Portuguese speakers, we have had the survey translated into Portuguese and are now trying to identify a Portuguese speaker to interview those permit holders with the translated survey.

**SOCIETAL BENEFITS:**

Sector management has the potential to better ensure the sustainability and increase the profitability of the Northeast Multispecies fishery. This project will show the role that social capital plays in the success of sectors, what types of social capital are important, and how social capital is developed. Understanding the role of social capital in success of sectors will help sectors and regulators identify ways to invest in developing social capital to improve the success of sectors in the future in this fishery and others.

## ***Funding Dockside Monitoring for New England Groundfish Sectors in FY2010***

---

NOAA Cooperative Agreement No. NA09OAR4320129 GMRI- Sub point - 03  
July 01, 2009-March 31, 2010

### ***Jonathan Labaree***

Gulf of Maine Research Institute

NOAA Program Manager:

Kevin Chu

NMFS, Northeast Regional Office

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

### **CINAR Theme:**

Theme IV. Protection and Restoration of Resources

### **PROJECT OVERVIEW:**

The overall objective of the project is to assist New England's groundfish fleet during the transition to sector management. This new output-based approach replaces the effort controls for the vast majority of the fleet. The change, however, requires new organizations - sectors - and vastly increased levels of catch monitoring. The project establishes GMRI as a pass-through funding entity for federal support of the new management regime and assists the new sectors in start-up costs and dockside monitoring (third-party witnessing of the offload of fish from vessel to dealer).

The project's initial phase, which occurred over the winter, focused on convening the groundfish industry to agree on a method for equitably dividing up the dockside monitoring funds. The plan outlined in the grant proposal was to ask the sectors to submit proposals based on quotes they obtain from the third-party monitoring companies. Rather than taking that approach, GMRI worked with sector organizers to develop a formula based on pounds of fish landed, fishing trips monitored, and the use of roving monitors (when a vessel offloads its catch to a truck, which then goes to a dealer).

No sector has yet to seek any funding from GMRI either for the sector start-up costs or dockside monitoring. The new management system will become effective on May 1<sup>st</sup>, so GMRI expects sectors to begin requesting funds shortly thereafter.

Finally, GMRI will evaluate the effectiveness of dockside monitoring upon completion of the first fishing year (which ends in April, 2011). This analysis, to be conducted by GMRI's

Resource Economist, will examine the costs of monitoring landings and the benefits for sector management, data acquisition, and compliance.

**ACCOMPLISHMENTS:**

Thus far, GMRI has convened leading members of the groundfish industry and formed a consensus on how \$1.2 million for dockside monitoring will be divided among the 17 groundfish sectors. The sectors represent the full range of groundfishing activity, from small community-based groups operating from remote, island ports to large, off-shore vessels that spend a week on Georges Bank.

In addition, GMRI has drafted sub-award agreements with all 17 sectors, establishing the protocols for these new entities to account for federally reimbursable expenses.

**HIGHLIGHTS:**

- GMRI facilitated a consensus process for distribution of \$1.2 million of federal funds for dockside monitoring among 17 diverse groundfish sectors.
- GMRI undertook outreach to groundfish sectors to educate on the availability of funds and the process for accessing those funds.

**SOCIETAL BENEFITS:**

This is not strictly a research project, but the societal benefits include assisting fishing communities throughout the region in making the transition to sector management. Sector management, in turn, is expected to yield benefits to society that will include rebuilding the groundfish stocks while allowing fishing families more flexibility in running their businesses.

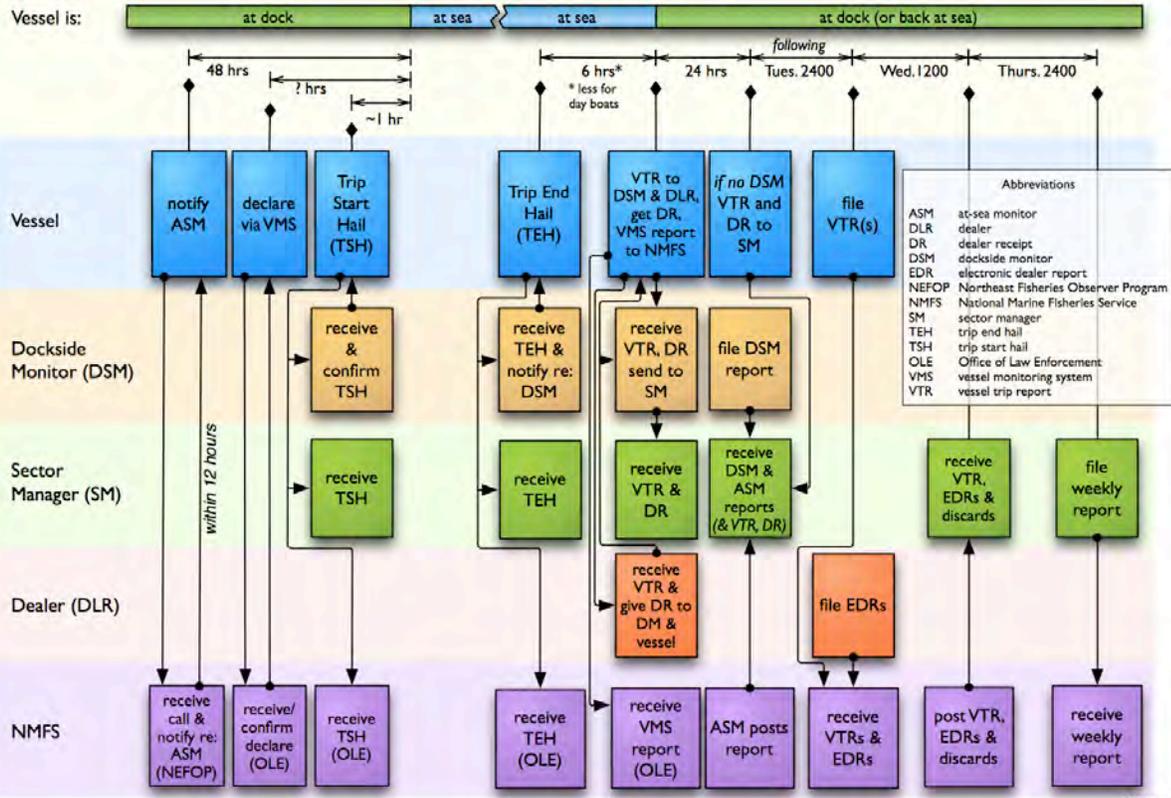
**EDUCATION AND OUTREACH ACTIVITIES:**

Education and outreach activities have been directed exclusively at the groundfish industry, sector organizers, and federal regulators. GMRI staff have presented at meetings, training sessions, and engaged in one-on-one training with the fishing industry.

**FIGURES/PHOTOGRAPHS/ILLUSTRATIONS:**

The below figure depicts the flow of data and communications between fishing vessels, sector managers, dockside monitors, fish dealers, and NMFS that are mandated in the new sector management regulations.

### Timeline of Sector Monitoring & Reporting



GMFRI 11/09

## ***Social Science Performance Measure and Indicator Outreach***

---

NOAA Cooperative Agreement No. NA09OAR4320129 GMRI Sub point 04  
July 01, 2009-March 31, 2010

### ***Meredith Mendelson***

Gulf of Maine Research Institute

NOAA Program Manager:  
Patricia Pinto da Silva  
Northeast Fisheries Science Center

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

### **CINAR Theme:**

Theme III. Ecosystem Management

### **PROJECT OVERVIEW:**

This project solicited input on draft indicators and mechanisms developed by the Social Science branch to measure social and economic change (resulting from catch share implementation). Feedback was obtained from a broad array of fishing industry and related industry stakeholders for use by the Northeast Fisheries Science Center (NEFSC). GMRI identified and met with a diverse range of relevant stakeholders not generally reached through listening sessions or management meetings. The target stakeholders included fishermen, dealers, auction houses, processors, vessel crew, other shoreside infrastructure employees, and other community groups. The resulting information is being compiled into an informal draft report documenting consistent themes around issues of concern, information needs, and measurements of change.

### **ACCOMPLISHMENTS:**

The outreach component of this project has been completed, and GMRI staff spoke with approximately 60 individuals about the suite of draft performance measures and indicators. All the data has been compiled into a spreadsheet able to be sorted by geography, category of individual, performance measure or indicator. A draft report summarizing data trends has been provided to the Social Science Branch and a final draft will be submitted by the end of April.

### **HIGHLIGHTS:**

- Captured insights of diverse stakeholders not normally reached in federal fisheries management process, including vessel crew, shore side businesses and related infrastructure.

- Identified potential new data sources to track social and economic change in fishery and related businesses.
- Identified critical business connectivity and linkages between shore side infrastructure and businesses.

**SOCIETAL BENEFITS:**

This research will contribute to fishery managers' understanding of the impacts of changing management regimes on various fishery stakeholders, fishing businesses and related industries, and support understanding of community impacts under National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act.

## ***Health Implications of Entanglements of Large Whales***

---

NOAA Cooperative Agreement No. NA09OAR4320129 WHOI Sub point 05  
July 01, 2009-March 31, 2010

### ***Michael J. Moore***

Woods Hole Oceanographic Institution

NOAA Program Manager:

Richard Merrick

Northeast Fisheries Science Center, Protected Species Branch

### **Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

### **CINAR Theme:**

Theme IV. Protection and Restoration of Resources

### **PROJECT OVERVIEW:**

The goal of this project is to evaluate photographic, necropsy and other data obtained from North Atlantic large whales observed entangled in fishing gear over the past two decades to determine the potential short- and long-term health effects of these entanglements. Entanglement in fishing gear is a source of injury and mortality to large whales, but the magnitude of lethal and sub-lethal events is not well-understood. The Provincetown Center for Coastal Studies (PCCS) is using mark-recapture statistical modeling and other approaches to estimate entanglement survival and fecundity impacts on Gulf of Maine humpback whales. It is also collaborating with New England Aquarium (NEAq) to produce comparable estimates for North Atlantic right whales. Entanglement survival and fecundity is being estimated relative to unexposed animals from the same population and will evaluate factors such as animal age class, sex and entanglement severity. In addition the Woods Hole Oceanographic Institution will undertake an analysis of necropsy reports of large whales that have been examined and shown to have died from entanglement in the past two decades. The product of the study will be three papers published in the peer reviewed literature, reflecting analyses of the right whale, and humpback whale mark-recapture and fecundity studies, and the necropsy analyses. The team consists of Michael Moore at WHOI, Jooke Robbins at Provincetown Center for Coastal Studies (PCCS) and Amy Knowlton at New England Aquarium (NEAq).

### **ACCOMPLISHMENTS:**

All humpback whale entanglements over the past decade using the categories and definitions that NEAq and PCCS have been agreed upon. PCCS is still working on the older cases (with more difficult documentation) and setting up the Mark Recapture models for

humpbacks. Data will be available for the April 12-16 2010 International Whaling Commission (IWC) whale entanglement meeting in Maui to the extent that it is reportable.

PCCS and NEAq have developed the database template for inputting cases and most of the NEAq slide collection of old events is scanned in and is being reviewed for accuracy. NEAq hopes to have at least a presentation of their initial findings ready for the Maui meeting.

The paper by Michael Moore summarizing 22 lethal entanglement cases has made serious progress, with introduction, methods and results complete and the discussion in progress. Images have been selected. The paper is being prepared for Endangered Species Research. It is hoped that a draft will be available as a FYI Not to be Cited working paper for the IWC meeting in Maui.

#### **HIGHLIGHTS:**

- A paper summarizing the pathobiology of 22 large whale entanglement cases in draft. A database has been designed and is being populated to analyze the history, fate and effects of humpback and right whale entanglement cases to enable a Mark Recapture analysis to tease out the significant parameters that affect outcome in terms of morbidity and mortality.

#### **SOCIETAL BENEFITS:**

Large whale entanglement is a major stressor to large whale populations wherever fixed fishing gear is in use. These entanglements impact the conservation and welfare status of these species. Better understanding of the factors that drive this impact will enable better mitigation management of the concerned fisheries.

#### **EDUCATION AND OUTREACH ACTIVITIES:**

A presentation was made at the Society for Marine Mammalogy Biennial Meeting in Quebec City, Canada October 12-16 2009 entitled "*At Sea Sedation of Entangled North Atlantic Right Whales*". A presentation was also made at the Woods Hole Oceanographic Institution Biology Department Seminar series entitled "*Right Whale Entanglements - Forensics on the Beach and Sedation at Sea*." A presentation was made to the Woods Hole Public Library on February 22 2010 entitled "*wanted: Dead or Alive - Lessons for Large Whale Conservation*".

#### **PUBLICATIONS:**

Moore M, Walsh M, Bailey J, Brunson D, Gulland F, Landry S, Mattila D, Mayo C, Slay C, Smith J, Rowles T (In Press) Sedation at sea of entangled North Atlantic right whales (*Eubalaena glacialis*) to enhance disentanglement. PLoS One

## FIGURES/PHOTOGRAPHS/ILLUSTRATIONS:



Photo credit - Peter Brown

This 1 year-old female North Atlantic right whale was first sighted entangled on July 6, 2002 near Brier Island, Nova Scotia. It had a single line, identified as lobster gear, wrapped around the distal peduncle. The line was deeply embedded in the ventral and lateral aspects of the peduncle and then trailed along the dorsal surface of the flukes. A disentanglement crew was able to remove the gear from the animal in the Bay of Fundy on September 1, 2002, 8 weeks after the initial sighting. During a final sighting, 12 days prior to stranding, the animal was found to be pale and cachexic. The major gross finding in this case, was a severe laceration around the peduncle at the site of entanglement. The laceration was 15-19 cm and 5 cm deep on the lateral and ventral aspects, respectively. It was also heavily infested with cyamids. In the ventral part of the laceration, the gear had severed a pair of large, superficial arteries (interior diameter= 8 mm). The gear was blocked from further tissue penetration ventrally by thick tendons. Scar tissue had formed in the severed arteries, caudal to the wound, completely occluding the vessels.

## ***MREP as a Catalyst for Cooperation***

---

NOAA Cooperative Agreement No. NA09OAR4320129 Sub point GMRI - 02  
July 01, 2009-March 31, 2010

### ***Meredith Mendelson***

GMRI

NOAA Program Manager:  
Earl Meredith  
NMFS, Northeast Regional Office

### **Related NOAA Strategic Plan Goal :**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

### **CINAR Theme:**

Theme VI. Education and Outreach

### **PROJECT OVERVIEW:**

The Marine Resource Education conducted one full session of the MREP 100 program (one Fisheries Science module and one Management Process module) and one MREP 200 workshop during the reporting period.

MREP 100 was held in Rhode Island at the Whispering Pines conference center and consisted of the two modules (Fisheries Science and Management Process). Three new moderators were trained during this time frame—Mary Kavanaugh for the Science module, and Stephen Welch and Rick Bellavance for the Management Module. A daylong training workshop was also held during this period, facilitated by Earl Meredith (a donation of his personal time on a federal holiday). All moderators, current and training, participated in this workshop. We also had two participants from the Gulf of Mexico region—one commercial fisherman, and one charter boat booking agent—who are interested in promoting and developing an MREP program in the South Atlantic/Gulf of Mexico regions.

The first MREP 200 workshop was held on February 3-4 in Falmouth, Massachusetts. Presentations included a refresher on fisheries biology, the stock assessment process, and what to expect aboard the RSV Henry B. Bigelow. Participants were transported to Newport, Rhode Island for an interactive tour of the Bigelow, and discussion on fishery dependent data sources. The workshop also included a visit to the Observer Program, the Woods Hole Oceanographic Institution's necropsy lab, the age and growth lab at the Northeast Fisheries Science Center, and the gear warehouse to see the new survey trawl net.

**ACCOMPLISHMENTS:**

The MREP 100 session held in January/February suffered from under-enrollment and also had significant attrition in the days prior to the workshop due to fishing schedules and illnesses. Over the last two years, we believe that fishing patterns have changed significantly enough that these months are no longer a successful time to hold these workshops—a modification we will make in future years. However, participation improved in February for the Management module, and these participants planned to attend the Science module in March. At the time of reporting, the second annual MREP session was beginning, and was over-subscribed.

The inaugural MREP 200 workshop was tremendously successful, drawing a great deal of interest from MREP alumni (including many who were unable to attend). Evaluations from this workshop were exceptionally positive and reflected great increases in support of and faith in the survey vessel/crew and process to produce quality fisheries science. The involvement of presenters familiar with MREP 100 was a tremendous asset, and the full participation of key NOAA Fisheries staff (Russ Brown and Amy Van Atten) provided a window into less familiar parts of the agency.

**HIGHLIGHTS:**

- MREP 200 created an opportunity for fishing industry members to interact directly with the fishery survey scientists and crew, and engage in discussion about a process that has historically been the subject of concern and skepticism. This program increased the industry's understanding of survey methodology, leading to improved relationships between industry and NOAA Fisheries, and increased trust in the fisheries science contributing to management decisions.

**SOCIETAL BENEFITS:**

MREP programs provide a continuum of professional development opportunities for the industry, cultivating a more informed, active stakeholder body. This develops leadership skills within the industry, increases effective participation in management and fosters collaborative relationships for research and management purposes. MREP also provides a forum for NOAA fisheries to have positive engagement with the industry outside of the regulatory arena.

**EDUCATION AND OUTREACH ACTIVITIES:**

Mendelson, Meredith. Presentation to Northeast Charterboat Captain's Association. December, 2009.

## FIGURES/PHOTOGRAPHS/ILLUSTRATIONS

Legend for photographs:

1. Fishermen examining a sea turtle at the Woods Hole Oceanographic Institution's necropsy lab.
2. Cape Cod fisherman Eric Hesse touring the RSV Bigelow's acoustic technology with Bigelow's officers.
3. Fishermen Mike Ball, John Barrett, Stephen Welch and Rodman Sykes examine the new four-seam trawl net used for the survey.



***Student Fellowship: Habitat Use and Dietary Patterns of Diadromous Fishes in the Northwest Atlantic: Making the Connections Between River Restoration and Sustainability of Federally Managed Fisheries***

---

NOAA Cooperative Agreement No. NA09OAR4320129 – UMCES - 00  
July 01, 2009-March 31, 2010

***Thomas J. Miller***

University of Maryland Center for Environmental Science

NOAA Program Manager:

Jason Link

Northeast Fisheries Science Center

**Related NOAA Strategic Plan Goal:**

Goal 1. Protect, Restore and Manage the Use of Coastal and Ocean Resources through Ecosystem-based Management

**CINAR Theme:**

Theme II. Ecosystem Monitoring

**PROJECT OVERVIEW:**

The project seeks to quantify the role of diadromous fishes in the north Atlantic coastal fishery ecosystem. We will address three specific tasks:

Task 1: Conduct a literature review with associated statistical analyses to identify the roles that diadromous fishes play in coastal marine ecosystems. The review will focus on the North Atlantic, but will take a global view.

Task 2: Using the Food Habits Data Base (FHDB) developed by the Northeast Fisheries Science Center, we will quantify the trophic demand of diadromous fishes in the Northwest Atlantic Coastal Shelf Ecosystem. These analyses will identify the species that individual diadromous fish consume during marine residency, and estimate the biomass and energy represented in the documented consumption patterns.

Task 3: Using the Food Habits Data Base (FHDB) developed by the Northeast Fisheries Science Center, we will quantify the patterns of consumption of diadromous fishes in the Northwest Atlantic Coastal Shelf Ecosystem by their predators. These analyses will identify the species that individual diadromous fish that are vulnerable to predation during marine residency, and estimate the biomass and energy represented in the documented consumption patterns.

## **ACCOMPLISHMENTS:**

A student, Nicole Mehaffie, has been recruited for this project. Nicole received her BS in Ecology, Behavior and Evolution from UCSD in 2009. During her degree she worked with Dave Checkley's group on the application of molecular techniques in quantifying diets of tuna. During her time at UMCES, it is anticipated that Nicole will take courses in the fisheries area of specialization with a particular focus on quantitative approaches including population dynamics, stock assessment and statistics.

Despite the late start to this research, we initiated the literature review on the role of diadromous fishes in marine food webs, and have received preliminary data from the NEFSC FHDB. The literature review will determine the global and local evidence for consumption of diadromous fishes as a component of marine ecosystems. Where possible, we will characterize the spatial and temporal patterns of the importance of diadromous fishes as prey items. We anticipate more significant progress will be made once the academic semester is finished and more attention can be given to the specific research tasks.

We have begun familiarizing ourselves with the FHDB structure and fields. It is anticipated that UMCES staff will visit the NEFSC for specific training on the FHDB early in the summer. In the meantime we have begun preliminary analyses. An initial request for data on the occurrence of diadromous fish in the diets of predators returned data on stomachs of 340 predators from 28 different species. Spiny dogfish (*Squalus acanthias*) accounted 144 (42.3%) of the observations. The most frequent 9 predators species (spiny dogfish, cod (*Gadus morhua*), goosefish (*Lophius americanus*), spotted hake (*Urophycis regia*), white hake (*Urophycis tenuis*), smooth dogfish (*Mustelus canis*), little skate (*Raja erinacea*), winter skate (*Leucoraja ocellata*) and striped bass (*Morone saxatilis*)) accounted for 80% of all observations. Focusing on spiny dogfish, although this species dominated records of consumption of diadromous fishes in the FHDB, these species accounted for only 12.4% of the occurrence of prey in spiny dogfish diets. Anguilliform species were the most common diadromous species reported in stomachs, accounting for 51.1% of all records. Alewife (*Alosa pseudoharengus*) was the second most abundant species accounting for an additional 29.4% of all records.

## **HIGHLIGHTS:**

- We have initiated progress on the first two tasks identified in the plan of work.
  - Literature review underway
  - Initial exploration of incidence of diadromous fish as prey in FHDB initiated.
- In collaboration with NOAA partners we are participating in new sampling in summer 2010 to specifically target potential predators of diadromous fishes in the Gulf of Maine.

## **SOCIETAL BENEFITS:**

Given the delayed project start, societal benefits have yet to accrue. It is anticipated that two principal benefits will result:

1. Training of an MS-level student

2. Research results will provide information on the consequences (benefits and costs) of efforts to restore passage of diadromous fishes in NE rivers on the marine ecosystem

**EDUCATION AND OUTREACH ACTIVITIES:**

The project will lead to the training of an MS level student in quantitative fisheries science - with the objective of producing a person who would be highly competitive for employment with NOAA/NMFS upon completion of the project

## **APPENDIX 1: PERSONNEL SUPPORTED BY CINAR FUNDING**

### ***Personnel summary:***

July 1, 2009 – March 31, 2010

Task I Support

#### **Employees**

#### **Appt. Dates**

Don Anderson, CINAR Director

7/1/09 - present

Judy Kleindinst, CINAR Administrator

7/1/09 - present

Ann Stone, CINAR Administrative Professional

9/26/09-present

<b>Postdoc</b>	<b>CINAR Theme</b>	<b>Appt. Dates</b>	<b>Advisors</b>
Dr. Joel Llopiz University of Miami Rosensteil School of Marine and Atmospheric Science		Fall 2010 (18 month appt.)	Carin Ashjian Cabell Davis Simon Thorrold

**PERSONNEL SUMMARY:**

Category	Number	B.S	M.S.	Ph. D.
<b>Employees that</b>	<b>receive <math>\geq</math> 50 %</b>	<b>NOAA Funding</b>	<b>( not including</b>	<b>Students )</b>
Research Scientist	0	0	0	0
Visiting Scientist	0	0	0	0
Post Doctoral Fellow	0	0	0	0
Research Support Staff	0	0	0	0
Administrative	1	0	0	0
<b>TOTAL</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Employees that</b>	<b>receive &lt; 50 %</b>	<b>NOAA Funding</b>	<b>( not including</b>	<b>Students )</b>
Research Scientist	6	0	1	5
Visiting Scientist	2	2	0	0
Post Doctoral Fellow	0	0	0	0
Research Support Staff	2	1	1	0
Administrative	1	1	0	0
<b>TOTAL</b>	<b>11</b>	<b>4</b>	<b>1</b>	<b>5</b>

<b>Students</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Undergraduate Students</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Graduate Students</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>TOTAL</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>

<b>Obtained NOAA employment within the last year</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
--	----------	----------	----------	----------

## **APPENDIX 2: CINAR PUBLICATIONS FOR REPORTING PERIOD**

	<b>Institute Lead Author</b>	<b>NOAA Lead Author</b>	<b>Other Lead Author</b>	<b>Total</b>
	<b>2009-2010</b>	<b>2009-2010</b>	<b>2009-2010</b>	<b>2009-2010</b>
<b>Peer Reviewed</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Non-Peer Reviewed</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>Total</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>