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**Project:**

***Development of Video Exploration and Mapping Capability, Tools and Methods.***

**Principal investigators:**

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The project began on January 1, 2006. To date we have completed about 50% of the project's scope of work.

**Building and Testing Gear**

Captains Lee and Williamson completed fabrication of the video equipment for the project. Five individual video array packages have been assembled and are available either as demonstration units or to be loaned to fishermen who wish to experiment with the gear. Each of these packages includes a self-contained kit with 12 volt battery, charger, video monitor, cords and connectors, 150 foot tether and video cable, dive lights, and camera mounted in a waterproof housing. Three units are equipped with digital VHS recorders.

In addition, John Williamson has experimented with various means to mount the cameras and lighting arrays. The intent is to offer potential researchers different ways to use the

cameras. In response to feedback that 150 foot umbilicals limit the use of the cameras, a 250 foot umbilical with tinned and shielded wire was fabricated and tested with lighting.

### **Outreach**

The project was introduced to the fishing public at the 2006 Maine Fishermen's Forum in March 2006 through a workshop entitled *Low Cost Video Designs for Fishermen*. The workshop was well received with more than 60 people attending in two sessions, one in the morning and a second in the afternoon. Bill Lee demonstrated a range of underwater video designs and explained various purposes. 30 people signed up to receive additional information and were subsequently contacted by phone.

Subsequently, we were invited to lead a similar workshop at the 2007 Maine Fishermen's Forum entitled *Underwater Video Systems for Fishermen*. In this workshop, Bill showed in detail how fishermen can build their own systems from available off-the-shelf materials and equipment. Project sample equipment available for loan to interested fishermen (complete video packages with monitor, umbilical and camera with housing) were on display for inspection.

Captains Lee and Williamson have offered on-site demonstrations to fishermen. John has met with Captains Bob Liston, Satch McMahon and Michael Perkins to demonstrate the gear, and make it available for loan. In these three cases, these charter boat operators are interested in viewing the habitats associated with favorite fishing locations. The 150 foot umbilical has proven to be a limitation for their purposes. John has also demonstrated video gear for Sea Grant researcher Peter Nelson.

Bill has accompanied Captain Bob Fisher on the F/V Marina Rose to observe his bait net and doors in operation (letter appended). Bill has also demonstrated the equipment to Captains Bob and Allen Smith who have subsequently used the design to fabricate their own underwater system; Bill will continue to work with these men to perfect their design.

In July 2008, at the invitation of Elizabeth Kubik, Bill Lee addressed a group of 65 at the Sandy Bay Yacht Club, Rockport, MA entitled *Ocean Odyssey ~ Cape Ann* showing underwater footage of marine habitats film specially for the presentation (using project equipment). Program notes: *"Bill Lee will offer a whole new video taken underwater exploring the ocean floor and everything else in Thatcher Bay, Sandy Bay and Ipswich Bay. He will offer insights on ecological changes he has observed over time and his activities with major marine research institutes and organizations. Don't miss this fascinating presentation of riveting images unavailable anywhere else and Bill's totally informative, perceptive and of course, fun information."*

In October 2008, Bill and John addressed a class in robotics at Manchester-Essex High School, Manchester-by-the-Sea, MA, taught by Physics teacher Mr. John Chiffer. These high school seniors are building submersible ROVs as a class assignment. Bill demonstrated various underwater camera designs and fabrication techniques. A project video system has been loaned to this class to observe their ROV prototypes in actual conditions.

### **Video Gear in Use**

The project currently has three camera units out on loan for field experimentation.

Appended is a note from Captain Phil Michaud of Provincetown, MA. Phil has had a camera unit for over a year and reports finding new uses. He has employed the camera to perfect a sampling trawl for a sand lance population study. He is also using the camera to more

efficiently target scallops with minimal dredge time, lessening habitat impacts. Phil has made the unit available to other fishermen in the Provincetown area.

Captain Rich Adams, a Cape Ann lobsterman, is using a camera to observe his lobster traps.

The Manchester-Essex High School robotics class will be using a submersible video to field-test class ROV designs. There are fourteen high school seniors in this class.

Additionally, appended is an email from Les Kaufman, PhD. Submersible video units from this project played a significant role in a study of sand lance presence and behavior in parts of the Stellwagen Bank National Marine Sanctuary. In this study the cameras were valuable in perfecting the sampling trawls used by Bill Lee and Phil Michaud. Additionally, the cameras were employed to assess physical features in sand lance environment. The study, and the camera use, has provided the context for research projects conducted by twelve Boston University undergraduates under the tutelage of Dr. Kaufman, as well as a masters thesis now in preparation.

### **Observations and Adaptation of the Work Plan**

The original hypothesis of this project, that *“development of a resident capability (i.e., a “pool” of fishermen knowledgeable in building and using video gear) will open up avenues of science endeavor not yet obvious”*, has not been clearly demonstrated. When the video gear has been made available to people, either through workshops or through on-the-pier demonstrations, curiosity is very evident. However, relatively few people have demonstrated enough inclination toward “tinkering” to take it to the next level and borrow a submersible video package simply for experimentation. Those people that have, have used the gear imaginatively and are enthusiastic.

The gear is more likely to be used if there is a context for it beyond just curious experimentation. In the future the project will place more emphasis on finding specific applications where affordable submersible video capability is a benefit, and seek to bring together a collaborative learning effort. The sand lance study and high school robotics class offer examples of this.

A criticism is that the gear we have made available for loan does not meet a need that would otherwise prompt some fishermen to borrow and experiment. Specifically, the camera units in this project were designed to be cheaply built from easily available materials. The electrical cord used was purchased from Home Depot at \$0.30/foot, however has the limitation of degraded signal quality if there is too much distance between the power source and the camera. Therefore, the umbilical for the five “loaner” units in this project are no longer than 150 feet. Fishermen wishing to observe a trawl or gillnet in actual use need something much longer. For fishermen wishing to observe fish habitat, the range of locations of most curiosity begin at 120 feet and go deeper. We have fabricated one umbilical capable of reaching 250 feet depth, but with special electrical cable priced at \$3.00/foot.

One evident finding is that video imagery of marine habitats is simply a great communication tool. The reaction of attendees to the presentation made at Sandy Bay Yacht Club of marine habitats in waters proximate to their boating activities elicited great discussion. Similar imagery at the two Maine Fishermen’s Forum workshops was equally simulating.