DEVELOPMENT OF A MODULAR, AUTONOMOUS STEREO-CAMERA SYSTEM FOR MONITORING FISH ASSEMBLAGES

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EXTENDED ABSTRACT Monitoring fish populations directly, through fishery independent sampling, rather than through commercial catch data, provides an accurate, non-extractive alternative for assessing the health of fisheries to inform resource management decisions. To this end, NOAA's Pacific Islands Fisheries Science Center (PIFSC), in collaboration with the NOAA Office of Science and Technology, NOAA Hollings Scholarship Program, and the University of Hawaii, has developed a modular optical underwater survey system (MOUSS) that allows for *in-situ* visual sampling of fish species, including the commercially important Hawaii Deep 7 bottomfish assemblage. NOAA Hollings Scholar Grace C. Young developed the MOUSS prototype deployment platform. The development involved creating a three dimensional rendering of the system, designing mechanical support structures, overseeing fabrication, and assembling and testing the camera and data recording systems. MOUSS is rated to 500 m and uses highly light sensitive stereo-vision cameras that allow for the identification, enumeration, and sizing of individual fish at a range of 0-10 m from the system. In Hawaiian waters, the system can effectively identify individuals to a depth of 250 m using only ambient light. MOUSS is an evolution of the existing remote camera bait station (BotCam) developed in 2005 by PIFSC. MOUSS is an improvement over the older analogue because it is three times lighter (92 lbs versus 310 lbs), able to attach to different deployment platforms, and captures high-resolution digital footage. The size and weight reduction allows for hand deployment from cooperative research vessels and small boats while the use of high-resolution digital video allows for more accurate and precise fish identifications and measurements.

Three MOUSS units were used in summer 2014 as part of NOAA's strategic initiative to improve fish sampling in untrawlable habitats. Untrawlable habitats are places where traditional methods of fisheries independent sampling, including trawling behind research vessels, are infeasible due to rock or coral cover that could be damaged. Therefore, NOAA is seeking more advanced technologies to sample these areas, and toward that end tested MOUSS along with an autonomous underwater vehicle (SeaBED) and a towed camera system (C-BASS) in these areas. A comparison of results from these three systems is in the works, led by Dr. David Somerton of NOAA's Alaska Fisheries Science Center. Five other MOUSS units exist, for a total of nine, and are currently being tested at PIFSC before distribution to the other NOAA Fisheries Science Centers around the United States, and potentially to other fisheries programs worldwide. There is also an initiative, led by Dr. Dr. Ben Richards of PIFSC, to automate image analysis of the video footage from MOUSS and other platforms.

The new MOUSS systems are important because for the first time, NOAA and its international peer organizations have an effective, non-extractive, inexpensive, flexible, accurate, and independent means to monitor the health of fisheries to better inform management decisions.

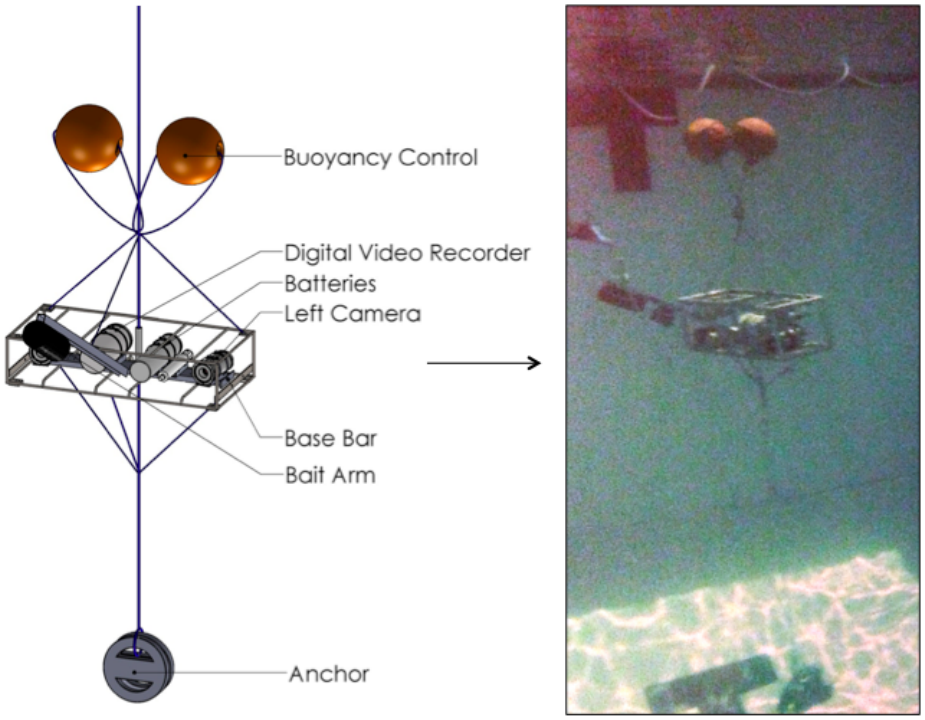

Figure 1: MOUSS model (left) and prototype during pool test (right). Nine MOUSS units now exist and are being deployed by NOAA Fisheries Science Centers around the United States.

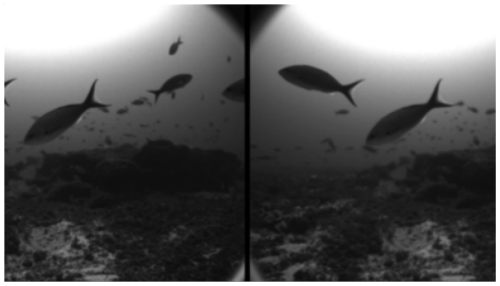

Figure 2: Example images from the stereo-vision cameras on MOUSS; these two images provide information on fish species, length, and abundance over time. The data aids the assessment of the health of fisheries to better inform resource management decisions.