Human-Occupied Submersibles

Presenter: Yoklavich

The Southwest Fisheries Science Center Fisheries Ecology Division Habitat Ecology Team (http://swfsc.noaa.gov/HabitatEcology/) carries out research on deep-water California demersal communities in untrawlable habitats. For over twenty years, we have used a human-occupied submersible (HOV; Figure 21) to conduct hundreds of visual surveys of juvenile and adult demersal fish species and their habitats on the continental shelf and slope in 20-440 m water depths off southern and central California. Results of these surveys in conjunction with seafloor habitat maps have been used to (1) implement and initiate long-term monitoring of spatial management strategies, such as marine protected areas (MPAs), in federal and state waters; (2) improve stock assessments for overfished species that occur in complex rock areas; (3) characterize fish and habitat associations; and (4) determine distribution and abundance of marine debris, corals, sponges, and other invertebrates in deep water.

Figure 21. The yellow Delta (right) and red Dual Deepworker (left) research submersibles accommodate one scientific observer and one pilot, and were operated to a maximum depth of 365 m (Delta) and 440 m (Dual Deepworker) at a survey speed of 0.5-1.0 kts.

Human-Occupied Submersibles (cont'd)

Collaborators in our program are from University of California, Santa Barbara and Moss Landing Marine Laboratories, among others.

Our HOV surveys follow protocols that have been vetted and peer-reviewed in the scientific literature. A pilot operates the HOV while an experienced scientist identifies and counts all fish species along a quantitative transect and estimates fish length using paired lasers as a guide. Each transect is annotated in real-time by the scientific observer and documented with multiple video cameras inside and outside the HOV. The HOV is equipped with a Doppler velocity log and ring-laser gyrocompass to accurately locate and measure each transect, a manipulator arm for specimen collections, and CTD sensors to record temperature, conductivity (salinity), pressure (depth), and oxygen concentration during the dives. The primary advantage to using an HOV is that in situ scientific observations enhance the detection and identification of a diverse group of similar-looking, often cryptic species in high-relief rock habitats. The ability to reliably identify and count target species is a key requirement of accurate stock and habitat assessments. Other advantages in using an HOV include: portable platform used on a variety of support vessels and in a variety of ocean conditions; highly maneuverable and tractable particularly in high-relief topography; and a relatively small environmental impact in terms of artificial light, sound, and motion produced by the HOV. In addition, the reaction of fishes to an HOV has been found to be far less than reaction to a Phantom remotely operated vehicle (ROV) while in survey mode. Presently the main disadvantage in using a small HOV is that these vehicles are no longer available. The obvious solution to this challenge is for the underwater research community to commit to HOVs as a valuable survey tool and to secure funding to build and maintain a new HOV for underwater research on the west coast.

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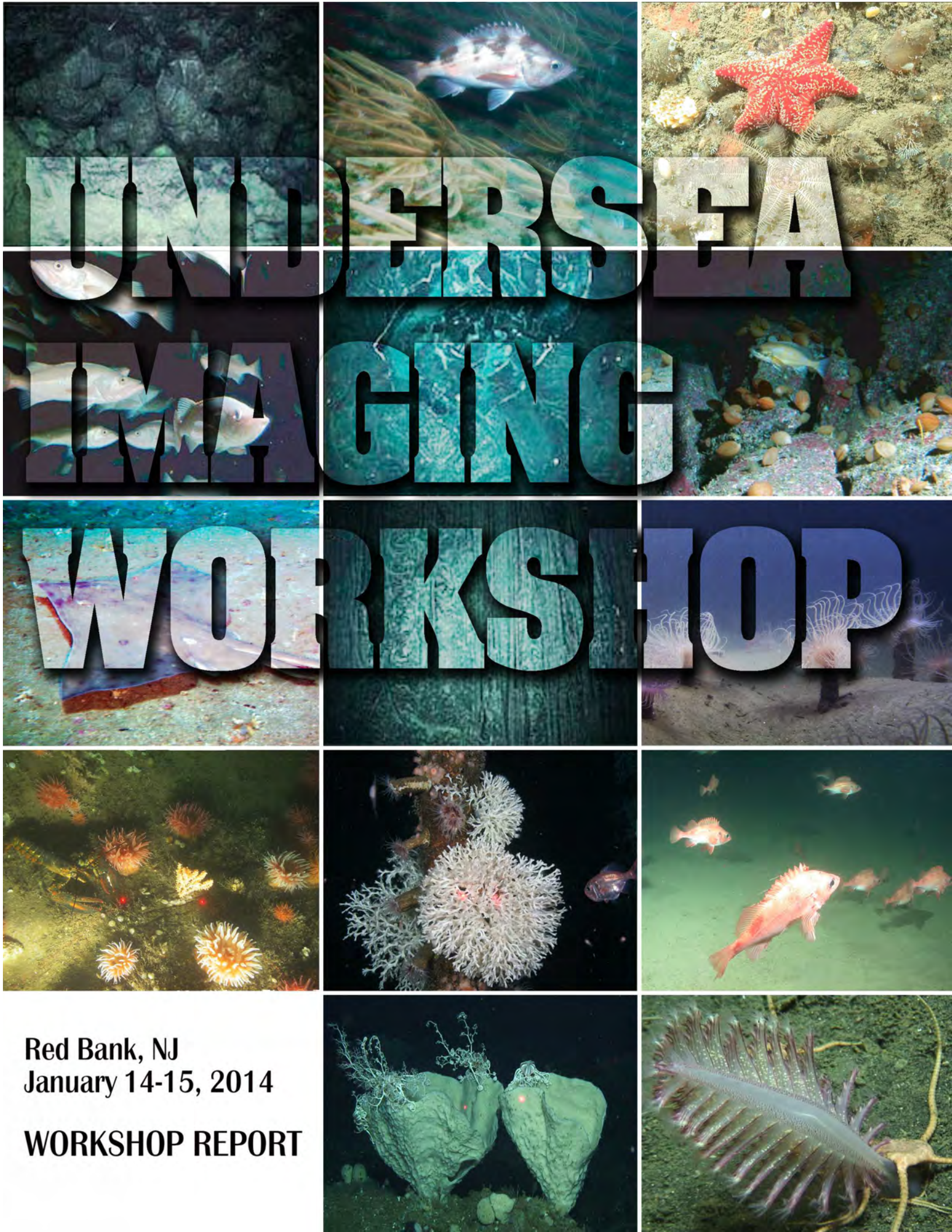

UNDERSEA IMAGING WORKSHOP

Red Bank, NJ
January 14-15, 2014

WORKSHOP REPORT

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Cover Photos - Peter Auster, Mary Yoklavich, Dan Fornari and Tim Shank

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