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Formation of Marine Biological Thin Layers: Recruitment of Zooplankton

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LONG-TERM GOALS

Localized accumulations of planktonic organisms are well known as a result of physical and chemical oceanographic conditions. Since zooplankton are commonly endowed with effective sensory and locomotor apparatus, they also may aggregate or disperse on the basis of biological drives of many types. For example, mating aggregations or swarms may be guided by pheromones or bioluminescent signaling. Grazing and predation are also major influences on local distribution of organisms. It is likely that accumulations of organisms induced by physical or chemical states, for example, phytoplankton thin layers, might serve to influence accumulation or dispersal of zooplankton equipped to sense and orient to them.

Our goal in this work is to train an ASSERT Fellow in the techniques of our several research units and apply them to this question of higher order orientation of zooplankton.

The AASERT Fellow is Ms. Christy Herren. She is scheduled to complete her PhD dissertation during this academic year.

OBJECTIVES

Originally, the intent was to conduct laboratory experiments with model systems. A useful zooplankton model did not emerge from the organisms locally available. The objective then shifted to field investigations using bioluminescence measurements as indicators of distributions.

APPROACH

Over the last two years we have been involved in several field studies involving bioluminescence measurements embedded in parallel investigations providing extensive sampling of the biota and relevant environmental measurements. It was decided that Ms. Herren should take advantage of these opportunities and have a significant role in these studies as the major part of her thesis research.

WORK COMPLETED

East Puget Sound Thin Layers Study

In this investigation Ms. Herren operated our BP, designed and operated a LLLVideo “Splatcam” and collaborated with the Holiday group in making acoustic measurements of plankton distributions in this study. She also did plankton collections, organized their identification and measured total stimutable light on representative specimens using our integrating sphere photometer. Publications are in preparation at this time on the bioluminescence component of this work.

San Diego Bay REMUS test

Herren collaborated in the groundtruth measurements to accompany the several REMUS runs testing its BP. For details see report in this volume, Case, JF:A Bioluminescence Bathypotometer for an Autonomous Underwater Vehicle , N00014-98-1-0202.

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Our participation in this study involved development and installation of the BP on the profiling mooring and operation of several BPs to obtain good spatial coverage around the mooring. Herren was heavily involved in both BP operations and plankton workup. Publications are in preparation at this time. Details are reported in this volume, Moline, M and JF Case: High Resolution Temporal studies of Near Shore Vertical Structure of Bioluminescence, N00014-00-1-0008.

MUSE Experiment

Herren operated one of the profiling BPs and supervised zooplankton collections for this operation. Data analysis is scheduled to begin after recalibration of the BPs. For a general summary of the project see the report in this volume - Haddock, SHD: Zooplankton and Phytoplankton Contributors to Bioluminescence in Monterey Bay. N00014-00-1-0842.