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STUDY TITLE: Characterization of Algal-Invertebrate Mats at CMI Study Platforms: Developing Survey Design and Quality Assurance for Artificial Substrate Studies

REPORT TITLE: Characterization of Algal-Invertebrate Mats at Offshore Platforms and the Assessment of Methods for Artificial Substrate Studies

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KEY WORDS: Offshore platforms, artificial substrate studies, algal mats

BACKGROUND: The “oil patch” of the northwest Gulf of Mexico is a unique marine system in several regards; possibly the most ecologically important aspect is the extent of introduced structure. From the late 1940’s to the present, oil and gas production has resulted in the installation of thousands of hard substrate islands from Mobile Bay westward and from coastal embayment to beyond the edge of the continental shelf. While it is possible to view this construction as an extension of natural hard bottom, it may be ecologically accurate to consider it a whole new habitat, a steel archipelago. It extends from bottom through the euphotic, tidal, and wave splash zones. Unlike natural seafloor hardgrounds, which can accrete shells and tests into bioherms, the predominantly vertical surfaces of platforms shed these same building components due to waves, predation, and gravity. As a result, the dynamics of platform biota are unlike natural systems.

OBJECTIVES: The objectives of this effort include describing the invertebrate-algal communities at three oil platforms currently being investigated under other CMI studies and developing a more cost-effective and scientifically rigorous means of surveying

fouling communities that will be suitable for wider-area, longer-time studies, and be capable of supporting hypothesis testing.

DESCRIPTION: The composition of biofouling communities on three offshore platforms in the Gulf of Mexico was examined. A platform in South Timbalier block 94 lay in 22m of water 40km from shore. A platform in Grand Isle block 94 lay in 60m of water 86km offshore. A platform in Green Canyon lease block 18 lay in 219m at 150km offshore near the edge of the continental shelf. The three platforms had been the site of previous fisheries-related investigations and offered an offshore gradient. Research operations were carried out from the platforms with Exxon and Mobil corporations hosting and providing logistical support. Field sampling was initiated in November 1995, and completed September 1997. Video surveying, high-resolution photography, surface scraping, and settling plates were employed to describe the biota and to evaluate the effectiveness of the methods.

STUDY RESULTS: Combined, the methods showed that the inshore ST-54 platform biota conformed to a previously recognized inshore type dominated by barnacles with overgrowths of algae and hydroids. The more seaward platforms conformed to a previously recognized offshore type dominated by a mix of bivalves and larger barnacles overgrown by sponges, hydroids, and ectoprocts (bryozoans). No evidence could be found of a bluewater assemblage. Settling plates showed that new crust was forming at a slower rate at the most offshore platform, GC-18.

A scenario was developed which viewed the biofouling crust as a system in equilibrium between accretionary growth and crust shedding. Loss of crust is a direct consequence of the vertical orientation of platform benthos and is an important factor distinguishing platforms from natural systems. Accretion of the crust is dependent on the passing ocean water for food and new larval settlement. Biotic interactions such as predation, competition, and bioerosion all contribute to crust loss directly or in concert with wave surge. The ecological scenario of an equilibrium system helps identify high priority research questions.

Of the methods applied, all provided data and some degree of understanding. Video survey, however, proved a poor tool for obtaining quantitative data on species composition, but was very useful for planning and site characterization. The higher resolution of photography was better for quantitative data, the complexity of layered assemblages escaped documentation. Scrape samples were most informative but lacked consistent quantification. Settling plates produced important rate information, but the demands on dive time proved unrealistic given constraints of weather and conflicting platform operations.

STUDY PRODUCT(S): Carney, R.S.. 2005. Characterization of Algal-Invertebrate Mats at Offshore Platforms and the Assessment of Methods for Artificial Substrate Studies. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-0038. 93 pp.