Geomorphological relief on mesophotic banks of the northern Gulf of Mexico, including geographic patterns and relationship to benthic species diversity

Paul W Sammarco, Lance Horn, Glenn Taylor, Daniel Beltz, Marissa F Nuttall, Emma L. Hickerson and G P Schmahl
Louisiana Universities Marine Consortium (LUMCON), USA

Hard-bottom relief is common in marine environments and can be correlated with species diversity. The degree of relief in the mesophotic zone on oceanic banks is not known. Neither are geographic patterns in relief, forces which might influence these patterns, nor the relationship between relief and species diversity. We investigated this relief using high-resolution bathymetry via ROV with a multi-beam sensor standardized by depth of the unit at a resolution of ~0.5 m, on 14 shelf-edge banks in the northern Gulf of Mexico. Relief was defined as “the difference between the highest and lowest elevations in an area”. The average and standard deviation of relief in m were calculated for each transect (n=5) within a drop-site (sample site; n=10), and each drop-site within a bank (n=14). Relief varied significantly both between and within banks. Sidner (max. relief = 11 m) and McGrail Banks had the highest relief, and 29-fathom (range = 1.2-2.2m) and Sonnier Banks the lowest. Bright Bank exemplified intermediate and variable relief at the transect and drop-site levels. Relief is most predictable on low and high relief banks, but is not predictable on medium relief banks due to high variances. Geographic analyses revealed that relief decreased significantly as one moved northward/shoreward across the continental shelf. Relief exhibited a significant sinusoidal pattern from west to east. We hypothesize that differential, authigenic carbonate production and exposure to loop currents through geological time may be responsible for these observed geographic patterns. Benthic species diversity was positively correlated with bank relief.

Biography

Paul W Sammarco is a Professor at Louisiana Universities Marine Consortium (LUMCON), Chauvin, Louisiana, USA. He has conducted research on coral reef ecology for 45 years in the Caribbean and Great Barrier Reef, Australia. He has >300 publications and has served as an Asst. Professor, Clarkson University (NY); Senior Research Scientist, Australian Institute of Marine Science; Executive Director, LUMCON; Director, Envtl. Research, Resource Assessment Commission, Dept. Prime Minister and Cabinet (Australia); Executive Director, Asstn. Marine Laboratories Caribbean; Chairman, State Commission, South Louisiana Wetlands Discovery Center; Assoc. Editor, Marine Biology, Marine Ecology Progress Series, and Aquatic Biology. His PhD is in Ecology and Evolution.

psammarco@lumcon.edu

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