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Defining and Differentiating Marine Coastal Facies and Subenvironments: A Foraminiferal Approach

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Two new undergraduates commenced work on the third year of this project in September 2017. These students resampled Onslow Bay, North Carolina vibracores that were studied during the previous two years of the research to fill in gaps in the foraminiferal data. One student worked on cores from the shoreface and inner shelf off Bogue Banks and the other on cores from the Bogue Inlet complex (inlet channel and ebb tide delta). Students learned to log cores under the tutelage of Dr. Kathleen Farrell, NC Geological Survey, and Holocene sediment was resampled for grain-size and foraminifera.

The two undergraduate students successfully completed Honors theses in May 2018. As in the previous years, shoreface, inner shelf, inlet channel and ebb tide delta subenvironments, although similar in sediment characteristics, could be distinguished based on foraminiferal assemblages. The students presented the results of their work in posters at the South East Geological Society of America Conference, Knoxville, Tennessee in April 2018.

A particularly interesting laminated mud and sand unit in two cores proved to be barren of foraminifera. It closely resembles intertidal deposits from the northern Outer Banks that accumulated during Marine Isotope Stage 3 based on OSL dating. This has implications for late Pleistocene sea levels. This unit was radiocarbon dated during this year of the project. Two samples were radiocarbon dead and their ages were considered to be >45,000 radiocarbon years before present.

The Master's student who joined the project in January 2016, and whose task was to characterize modern coastal barrier island-related subenvironments with foraminiferal assemblages, completed her thesis research and successfully defended her thesis in August 2018. Her research provides a modern model whereby Holocene samples from cores worked on by undergraduate students can be classified via multiple discriminant analysis into known subenvironments of deposition based on foraminiferal assemblages. The modern model was the subject of an abstract for a poster that was presented at the annual GSA meeting in Seattle in October 2017.

In addition to conducting research, an equally important role of the graduate student has been to act as mentor to undergraduates involved in this project. Much time has been spent on this activity and, as a result, the production of competent Honors project reports was an efficient process in year 3 of this project. A research paper is under preparation that includes as authors all six undergraduate students and their graduate student mentor, in addition to their faculty advisors.

A one-year no-cost extension to this grant was approved in April 2017. The project has investigated foraminiferal assemblages in a retrogradational temperate, coastal setting. During the extension year the project will be extended to a progradational tropical, coastal setting on the east coast of peninsular Malaysia. We will collect samples in December 2018 and preliminary data will be compiled in spring/summer 2019.

Six undergraduate students and one Master's student have been involved in this project. The Master's student defended her thesis in August 2018 and is in the job market. Five of the undergraduates decided they wanted to undertake a Master's degree based upon the research experience provided by this project. One of the undergraduates from the first year of this project has already completed his Master's degree and has just acepted a position at an environmental/archeology consulting company. Three of the undergraduates are currently Master's students and one undergraduate is now in her senior year and intends to apply to Master's programs in fall 2018. The sixth undergraduate student left ECU after receiving her BS degree and her educational/employment status is unknown.

This project has been instrumental in increasing the number of undergraduates undertaking research in our department, thus addressing one of our strategic goals concerning increased involvement of undergraduates in research. The mentoring aspect of this project has proven to be very successful and of considerable value to both the undergraduate students and their Master's student mentor. The project has been enriching to my career in that it breaks from my usual mold of advising Master's students and has formalized true undergraduate research rather than having undergraduates providing technical support in the laboratory.