Reports

from Albert and Alice Weeks Postdoctoral Fellows

Gwen Daley

Natural variation within populations of organisms occurs both because of genetic and environmentally-induced differences. Determining which cause was more responsible for observed patterns of variation is not easy in fossil organisms. Morphological or paleoecological patterns of variability that consistently correlate with specific facies are likely environmentally-induced, while variation that does not correlate with observed paleoenvironmental patterns is likely not. Therefore, understanding the paleoenvironmental and paleoecological conditions under which an animal lived is very important in interpreting evolutionary and ecological patterns.

A straightforward way to obtain this understanding is to perform paleocommunity analyses using specimens from the same facies from which the study organism was collected. This sort of analysis can be augmented by such analyses as stable isotope work, taphonomic, and sedimentary analyses as well as interpretations from sequence stratigraphy and basin analysis. However, the remains of organisms that lived in the area when the sediments were deposited contain high-quality information about local syndepositional conditions.

Dr. Dana Geary and I examined a series of paleoecological samples taken from the Fort Thompson Formation (Pleistocene) of Florida in order to quantify paleoenvironmental trends (results presented at the last annual Geological Society of America meeting, and a manuscript with results provisionally accepted to *Palaios*). Our analysis indicates that the outcrop contained two well-defined and distinct facies. The data set consists of over 25,000 molluscan specimens, which offers a delightful opportunity to examine both paleoecologic and morphometric trends in multiple lineages within this temporally constrained geological interval.

My colleague Andrew Bush (formerly an undergraduate and graduate student at Virginia Tech, and now a PhD candidate at Harvard) examined shape changes in the Southern Quahog *Mercenaria campechiensis* within the Fort Thompson outcrop. We discovered that there were quantifiable differences between *M. campechiensis* collected from the different facies, and that these differences are comparable to the differences seen between geographically distinct populations in the modern oceans (results to be published in the next issue of *Paleobiology*).

Dr. Geary and I are also conducting several related studies, using the paleoecologic analysis as a conceptual framework. Currently, four undergraduates at UW-Madison have signed on to help out with additional research projects.

Summer Ostrowski, who just finished the first semester of her sophomore year, started working with us last year studying the interactions of *C. cancellata* with both its predators (as evidenced by predatory bore holes on the shells) and with the corals, kitten paws, and barnacles frequently found attached to its shell. We have found that both types of paleoecological interactions vary between the two facies. She presented the results of her research at the national Geological Society of America meeting in Boston, and we are preparing both a note for the *Journal of Paleontology* and a research manuscript for the journal *Paleobiology*.

Martha Kutter, who would like to be a vertebrate paleontologist, is examining both the sedimentology and geochemistry. She is combining trace element and stable isotopic analyses of clam shells to examine both climatic seasonality and salinity of the depositional environment at different times. It will be very interesting to compare and contrast these results with the results of my analysis of bivalve and gastropod paleoecology.

Christine Paglesdorf is analyzing shape changes in the shells of the small clam *Chione cancellata*. The purpose of this project is two-fold. Recent work on modern *C. cancellata* suggest that there are two rather cryptic species with overlapping geographic ranges that have been given the same name. We would like to determine whether or not both forms are also found in the Pleistocene, which would be a rather interesting result from an evolutionary standpoint. We are also examining whether the same type of facies-associated shape differences Andy found in his clams are also present in this clam.

The fourth student, Holly Schultz, signed on recently to analyze taphonomy (post-mortem alteration of fossil material). She will be looking for taphonomic differences between samples and defining taphofacies, which we will then compare to both my paleoecological analysis and Martha's geochemical and sedimentological analyses. We are also developing a novel approach to quantifying taphonomic grade based in part on image analysis.

I would like to express my gratitude once again to the Weeks Post-Doc committee for the opportunity to come to the University of Wisconsin and perform this very interesting research.