Actualistic taphonomy: putting the Holocene shells to work

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Death assemblages are ubiquitous features of many modern marine, transitional, and continental depositional settings. These shell-rich accumulations can be made-up of countless remains of marine mollusks and other invertebrates (e.g., brachiopods, echinoderms, etc.), as well as shell/tests/carapaces of brackish, freshwater and terrestrial species. In many cases, these shells can be easily sampled or sieved from the top few cm of the bottom sediments and/or from sedimentary cores that encompasses the last few centuries to millennia of accumulation. These bioskeletal remains offer us a great diversity of research opportunities, addressed via distinct methods within the field of Actualistic Taphonomy (AT). In the early days of this approach, modern depositional environments and laboratory experiments offered clues to understand the fossilization processes and the nature of fossil record, especially in the deep time. Classical research fields here encompassed the study of necrolysis and biostratinomy, early fossil diagenesis, time-averaging, taphofacies, and flume and settling experiments, among many others. However, only in recent years, the practitioners of AT noted that those bioskeletal remains can be employed as historical data recorders, offering us quantifiable baseline information on ecosystems, especially before the onset of anthropogenic activities. Thanks to taphonomy (time-averaging), geochronology / sclerochronolgy, and geochemistry "it is now possible to use the dead to help the living" (paraphrasing M. Kowalewski). In other words, the shells can be used as biorecorders to evaluate natural and/or human driven environmental changes, at local, regional and global scales, and also to assess the restoration efforts. Hence, a new research field (or approach) evolved from the conventional AT, called "Conservation Paleobiology", which is tied to Historical Ecology. Fidelity (e.g., live-dead study or LD-mismatch), taphonomy (e.g., taphonomic grades, temporal and spatial mixing, preservational biases), geochronology/sclerochronology, and geochemistry (e.g., stable isotope, trace element signatures) are the main research fields of this modern branch of AT.

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