PRESERVATIONAL CONSTRAINTS AND ECOLOGICAL OPPORTUNITIES: THE ROLE OF SHELL-INHABITING ORGANISMS IN THE FOSSIL RECORD

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Biological parameters, in addition to physical parameters, are important in determining past ecology, taphonomy and the effects of human intervention. Research conducted on a Recent community of gastropods and two late Pleistocene fossil assemblages from Puerto Penasco, Mexico, reveal a complex pattern of interrelationships among gastropod shell users. First, shell representation is biased in the intertidal of Puerto Penasco, Mexico, because of a complex mosaic of secondary shell occupants. Hermit crabs (five species) represent almost half (47%) of the intertidal gastropod shell resource available throughout the year. Living snails are represented by 17 out of the 32 gastropod taxa. Additionally, hermit amphipods (three species) occupy ten gastropod taxa. Hermit crabs and hermit amphipods retain the shells in anomalous habitats (that differ from the living snail). Second, physical factors act as a temporal component which affects shell use and availability during the seasons at Puerto Penasco. Late winter storms mix-up the intertidal distribution of living gastropods and hermit crabs. Subtidal to low intertidal shells appear in the high intertidal; living snails are buried under a thick bed of sand. Most importantly, empty shells become available, and the hermit amphipod population peaks. Thus, physical factors contribute to the demise of living snails (i.e, burial by sand) and the mixing of shells. However, the organisms (hermit crabs and amphipods) maintain this motif by retaining the shells in the anomalous habitats.

Third, all hermit crab species (Paguristes anahuacus, Pagurus lepidus, Paguristes roseus), except for one (the high intertidal, Clibanarius digueti), have epi-and endobionts associated with the gastropod shell. More than 20 species of invertebrates bore into or encrust the hermitted shells at Penasco. Of these, the encrusting bryozoans Hippothoa, Hippopodinella adpressa, ?Floridia antiqua, Lichenopora, Antropora tincta and the boring spionid polychaetes (Polydora commensalis, Polydora , Boccardia) and spirorbid polychaetes (Spirorbis; Serpula) are important bionts to use in recognizing hermit crab shell use in the fossil record of the northern Gulf of California. The encrusting bryozoans (H. adpressa and A. tincta) are present on Pleistocene gastropods at the unusual Pelican Point terrace deposit (large gastropod shells preserved among large bryozoan encrusted cobbles) indicating hermit crab inhabitation. These bryozoans appear to protect the gastropods from taphonomic alteration.

Finally, reworked fossil shells occur within the hermit crab guild and the beach drift assemblage. Hermit crabs retain fossil shells of the moon snail, Polinices, (n=two occurrences) and Turritella (n=3 occurrences). These species are common in the coquina beach rock which makes up the intertidal substrate of Puerto Penasco. However, reworking of fossil coquina is quite substantial in the beach drift assemblage. Three sampling periods (=150 samples) indicate the following: three species of fossil bivalves (Chione, Trachycardium and Glycimeris) and five species of fossil gastropods (Oliva, Polinices, Muricanthus, Nassarius, and Turritella) dominated the beach drift assemblage (over 16, 600 fossil whole shells/fragments). Fossil Chione represented the most shells (958 valves;>15,557 fragments). Recent bivalves were represented by 1115 shells/fragments (representing 12 species) and Recent gastropods contained mostly fragments (1069 pieces; 30 species). Additionally, the fossil gastropods were large, unlike the species that occur today, which have been picked over by humans. Thus, a large part of active beach deposition at Puerto Penasco contains late Pleistocene shells, taphonomically altered by secondary occupants and beachcombers.