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Decomposing lithification bias: Preservation of local diversity structure in recently cemented storm-beach carbonate sands, San Salvador Island, Bahamas

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ABSTRACT

Lithification with related diagenetic phenomena is an important step in a complex transition from living communities to fossil assemblages and a major taphonomic filter distorting the record of past biodiversity. Apart from direct diagenetic culling of fossils, cementation of fossiliferous deposits induces changes in sampling procedures used to extract paleontological data. This study explores the effects of this methodological shift on recorded fine-scale paleoecological patterns by using subfossil mollusk assemblages occurring in the unlithified and recently cemented storm-beach carbonate sands at Sand Dollar Beach, San Salvador Island, Bahamas, which experienced limited diagenetic alteration. Results show that consistent differences in relative abundance patterns of particular taxa can be observed between unlithified and lithified samples due to collection failure. Magnitude of this distortion is controlled in a large part by a degree of transport-related size sorting, with well-sorted assemblages dominated by small gastropods being more affected. This bias, however, is of limited importance and can be mitigated by selective exclusion of the smallest size classes (<5 mm) from the analysis. Moreover, unlithified and poorly lithified deposits record very similar rarefied richness estimates and patterns of diversity partitioning. This contrasts strongly with earlier estimates of lithification-related diversity loss, suggesting greater importance of diagenetic over methodological filters in creating lithification bias observed in the older rock record. Poorly lithified carbonate rocks—present in many late Neogene successions—may yield biodiversity data directly comparable to those recorded by unlithified sediments if careful collecting methods based on bulk samples are employed.