PALEOCOMMUNITY INFORMATION RETRIEVAL VS. SHELL ACCUMULATION MODE IN PALEOZOIC CARBONATES: EXAMPLES FROM THE LEBANON LIMESTONE (MIDDLE ORDOVICIAN), TENNESSEE, U.S.A.

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Compared to their terrigenous counterparts, carbonate shell accumulations have until recently been relatively little studied to determine either descriptive or genetic classifications of shell bed types, the preservation potential of each type, or their relative ability to preserve community-level information. A partial classification of Paleozoic carbonate shell-rich soft sediment accumulations is proposed using sedimentation patterns in the Lebanon limestone of the Stones River Group. Paleoecological information preserved therein is then contrasted by shell bed type. The Lebanon represents typical Ordovician shallow to moderate subtidal carbonate shelf deposits in outcrops flanking the Nashville Dome and peritidal deposits in the Sequatchie Anticline of Eastern Tennessee; shell beds alternate with shell poor sediments (micrites, wackestones and diagenetically enhanced dolomites and clay-rich partings).

None of the analyzed shell beds was strictly biological in origin; most are sedimentological although >10% are combined sedimentological/diagenetic. While the majority are single simple shell beds, >20% are amalgamated. All are thin (1 shell to 15 cm) stringers that pinch and swell showing poor lateral continuity (outcrop scale, tens to hundreds of meters) likely enhanced by burial dissolution. These shell beds differ greatly in fabric (packing/sorting), clast composition, taphonomic signature, and intensity of time averaging; thus community information retrieval is biased in predictable patterns. Virtually no shell beds show common shell dissolution or encrustation from long-term sediment surface exposure or hardground formation. Five major categories of accumulation are herein proposed using a DESCRIPTIVE, non-genetic terminology modified from previous works of DJD, as well as a Genetic interpretation for each. These are easily distinguished in the field and are also discriminated by Q-mode cluster analysis.

Categories include, in decreasing frequency of occurrence: 1. SHELL GRAVELS; Storm/"event" beds: Sharp bases; poorly sorted coarse basal bioclasts and/or intraclasts, often with no preferred orientation; clasts fine upward to comminuted shell material and micrite. Horizontal platy brachiopods often cap the beds. High diversity and a wide range in shell alteration is represented, from whole unaltered brachiopods to minor abraded fragments, indicating extreme time averaging and poor resolution of short-term community dynamics. 2. COMMINUTED SHELLY LS; Current/ripple concentrations: Small tidal channel fill and discrete ripple trough accumulations are composed of cross-stratified bioclastic deposits with local concentrations of rip-ups. Beds are not graded; typically clasts are abraded, rounded and concordant with cross-beds. Intense time averaging and mixing of discrete communities is inferred due to continual reworking in these background deposits. 3. SHELL/CEMENT LS; Early cementation beds: Intense early diagenetic alteration is inferred due to red discoloration and rapid intergranular cementation; some beds show diagenetic micritic rinds. Beds may be brecciated and show deep burial stylolitization cutting bioclasts and cement. They may represent zones of preferred early cementation rather than a change in shell accumulation rate. Many shells from some beds show little postmortem alteration; these units may preserve much of the original community structure. 4. DENSE SHELL PAVEMENTS; Subtidal surficial pavements: Single layers of shells, commonly concave down, overlie mudstones/wackestones with no basal erosion. No obrution deposits were noted. Bioclasts are typically disarticulated and reoriented, but are not substantially abraded, broken, or dissolved. Diversity is low. Only minor temporal and lateral community mixing with small environmental fluctuation is indicated. 5. VERTICALLY IMBRICATE SHELLY LS; High energy beach zones: Platy whole and major fragments of brachiopods are deposited in low diversity, high angle imbricate beds. Less postmortem reworking and time averaging is evident compared to types 1 and 2.

Thus, the most common (physically reworked) shell bed types show the most intense loss of short-term paleocommunity information. There are surprisingly few in situ community pavements or obligate long-term accumulations. This pattern differs from some described Ordovician carbonates, which may contain common community beds or hardgrounds/hiatal accumulations. This implies a relatively low rate of net sediment accumulation on a shallow, periodically wave swept shelf, and no major flooding surfaces or other indications of significant sea level change. Delineation of the sequence stratigraphic position of these carbonates is enhanced from this type of integrated community/biostratinomic analysis.