

ARCHAIC AND MODERN SHELL BEDS IN A PERMIAN EPEIRIC SEA: IMPLICATIONS FOR THE LONG-TERM TRENDS IN NATURE AND GENESIS OF BIOCLASTIC CONCENTRATIONS

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The internal characteristics and stratigraphic distribution of Permian shell beds from the sedimentary sequences of the Paraná Basin were analyzed quantitatively. Taphonomic, sedimentologic, and stratigraphic data from 23 geological sections and 32 outcrops were amassed for the total of 34 fossil concentrations found in the stratigraphical column of the Passa Dois Group (Intervals 1-4 of Rohn's litho-biostratigraphic framework). The biostratinomic analysis of bioclastic concentrations (including clast composition, geometry, thickness/traceability, close-packing, internal complexity, and taphonomic signatures) reveals that the shell beds group into two distinct biostratinomic styles or shellbed modes (Kidwell's classification): Archaic and Modern. Archaic Shell Beds (29.5%) are thin (3 cm), two-dimensional, internally simple concentrations (distal tempestites), with disperse, high-organic nacreous aragonitic shells of anomalodesmatan bivalves. Modern Shell Beds (70.5%) are thick (30-50 cm), fully three-dimensional, internally complex, amalgamated concentrations (bioclastic sandstones or coquinas, proximal tempestites) with a mixture of densely-packed, low-organic calcitic shells of veneroid bivalves, and shells of anomalodesmatan bivalves. Archaic Shell Beds dominate (100%, n=8) the distal lithofacies of Passa Dois Group (Serra Alta Formation; Interval 1), whereas Modern Shell Beds are abundant in the more proximal lithofacies (Terezina/Corumbataí Formations) of intervals 2 (87.5%, n=10), 3A (100%, n=4), and 4 (100%, n=6). The increase in shellbed thickness/internal complexity in the Interval 2 and 4 (latest Late Permian) appears to be tied to lithologic changes (changes in tempestite proximality and rates of deposition), suggesting that their origin is primarily controlled by physical factors. Changes in the relative abundance of shell bed styles are tied to the sequence stratigraphy cycles. A biologic control is also suggested, however, because the thick coquinas of Modern Type are invariably composed (99%) of low organic (cross-lamellar A?), veneroid shells of *Pinzonella illusa* and *Pinzonella neotropica*. The high proportion of infaunal bivalves (anomalodesmatans, veneroids) indicates that the Permian benthic associations were post-Paleozoic rather than Paleozoic in their ecology. The overwhelming dominance of Modern shell beds among the proximal bioclastic concentrations may thus reflect an unusually early (pre-Mesozoic) onset of the modern style ecology among the benthos that dominated the Permian epeiric sea of the Paraná Basin.