COMPARATIVE TAPHONOMY OF A NONMARINE-MARINE TRANSECT: SKELETAL SIGNATURES OF DISCONTINUITY SURFACES IN THE CAMPANIAN JUDITH RIVER-BEARPAW SEQUENCE, MONTANA

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An outcrop-based survey of the distribution of vertebrate and invertebrate (molluscan) fossils within landward-stepping high-frequency sequences of the Campanian Bearpaw transgression in north-central Montana permitted us to evaluate patterns of skeletal accumulation in both nonmarine and marginal marine parts of a single 3rd order stratigraphic sequence. How do taphonomic patterns vary laterally across the transgressive systems tract? To what extent are discontinuity surfaces consistently mantled by skeletal material, and do surfaces of different types have distinctive taphonomic signatures? What is the comparative utility of skeletal material for sequence stratigraphic analysis in the two settings?

In nonmarine coastal plain facies of the Judith River Formation, skeletal concentrations are associated only with aggrading facies and ~5th order surfaces and are all highly localized, regardless of taxonomic composition. Disarticulated and fragmentary vertebrate remains occur as 1) channel lags, but most commonly as 2) time-averaged assemblages in adjacent floodbasin ponds. Shelled invertebrates are represented by 3) in-situ colonies and 4) erosionally reworked channel lags of unionid bivalves, by 5) debris on lateral accretion surfaces, and by 6) freshwater mollusks in carbonaceous floodbasin ponds. There is no distinctive skeletal lag or accumulation marking the 3rd order regressive-transgressive turnaround, but there is a change in fossil abundance, with the transgressive record being much richer. 4th order surfaces bounding high-frequency sequences in the eastern, seaward portion of the study area cannot be distinguished inland of the shoreface: they pass landward into heterolithic paralic facies that show no clear evidence of lithologic or taphonomic cyclicity and no through-going erosional or flooding surfaces.

The marginal marine and shoreface part of the facies tract (Judith River to Bearpaw transition) also includes many localized concentrations, for example 1) in-situ colonies of brackish mollusks and 2) laterally amalgamated channel fills of taphonomically culled, tide-shingled oyster shells, together composing 5th order, probably autocylic progradational units. However, in contrast to the contemporaneous nonmarine record, this marine part of the transgressive record does include laterally persistent skeletal concentrations useful for correlation. These include 3) thin pavements of in situ open marine or brackish oysters developed on lignites, representing 4th and 5th order omissional flooding surfaces, and 4) extensive bioclastic "lags" with various mixtures of fresh or reworked brackish bivalves, marine vertebrate elements, and exhumed burrows. These latter concentrations mantle low-relief (1 m) erosional surfaces that are each a composite 4th order sequence boundary and transgressive surface. Taphonomic features indicate that most skeletal material was exhumed rather than newly produced during each hiatus, in contrast to the substantial hiatal concentrations we have found on analogous surfaces in other shallow-marine records. In absolute terms these Campanian marine skeletal concentrations are minor -- skeletal material is dense in local pockets, but generally is strewn across 4th order surfaces -- but they nonetheless constitute distinct spikes in skeletal abundance and thus provide good cues to the location of flooding surfaces. Skeletal concentrations of the marine record are thus well-suited for high-resolution stratigraphic analysis (e.g. correlation of surfaces, information on erosion), whereas the taphonomy of the nonmarine record is such that only larger scale phenomena (like the onset of the 3rd order Bearpaw cycle) can be diagnosed using skeletal material.