Three-fourths of a Century of Cretaceous Marine Invertebrate Zonation in the Western Interior, North America: a Sequence Biostratigraphy Perspective

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Upper Cretaceous molluscan biostratigraphy in Canada and the United States has evolved from a simplistic, inconsistently-applied zonation to one of the most refined ammonite zonation schemes available. However, the stratigraphic position of biozone and stage boundaries in marine strata of the Western Canada Sedimentary Basin (WCSB) hasn't risen to the level of precision of the European Cretaceous. Application of sequence stratigraphy concepts in the Western Interior of North America has resulted in a more broadly applied series of disconformity-bounded sequences -- but generally without corroborating fossil age data. Rises and falls of relative sea level have recently become documented for the Turonian to Campanian of the WCSB *within* a biostratigraphic context. An unexpected finding of this research was the repeated coincidence of biozone boundaries (interval zones based on first occurrences of index taxa) and third-order sequence boundaries (capping progradational siliciclastic wedges) or maximum flooding / condensed intervals (separating transgressive and regressive system tracts). This pattern is consistent for the three eustatic sequences in the Cardium Formation and four consecutive sequences of the Wapiabi Formation in the Alberta Foothills. High-resolution correlation has successfully recognized these facies sequences and coeval biozones as far south as the Denver-Julesburg and San Juan basins. The reason for the concurrence of fossil taxa turnover and relative maximum sea level lowstand or highstand is the closely-linked association between marine fauna and paleoceanographic parameters (*e.g.,* paleobathymetry, niche availability, food supply, sediment influx, and turbidity). Thus, it isn't surprising that ammonites and inoceramid bivalves evolved new species in concert with sea level oscillations. The key to recognition of subtle sequence stratigraphic surfaces is utilization of available biostratigraphic data -- this practice forms the basis of "sequence biostratigraphy."