The Coniacian stratigraphy in the Western Interior of North America: A Canadian perspective

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The Coniacian in the foredeep of the Western Canada Foreland Basin (western Alberta, including northern Montana), is dominated by mudstone and subordinate sandstone, deposited on a very low-gradient, storm-dominated marine ramp. The rocks are characterized by upward-shoaling successions, ~3–10 m thick, bounded by marine flooding surfaces. Flooding surfaces that were particularly widely-traceable in wireline logs were chosen as the boundaries of 24 informal allomembers. Most allomembers could be mapped along the foredeep for > 750 km and traced to outcrop in the Rocky Mountain fold and thrust belt. Certain allomembers and flooding surfaces have distinctive characteristics that allow confident correlation between subsurface and outcrop. Consequently, fossils collected at outcrop could be placed precisely in a regional (~ 200,000 km^2) spatial and temporal context.

Molluscan fossils are dominated by inoceramid bivalves and scaphitid ammonites. In the upper Lower Coniacian - basal Santonian, six successive inoceramid zones are recognised. In ascending order, these are: *Cremnoceramus crassus / deformis*; *Inoceramus gibbosus*, *Volviceramus koeneni*, *Volviceramus involutus*, *Sphenoceramus subcardissoides*, and *Sphenoceramus* ex gr. *pachti*. Four standard scaphitid zones of the North American Western Interior (*Scaphites preventricosus*, *S. ventricosus*, *S. depressus* and *Clioscaphites saxitonianus*) are precisely correlated with the inoceramid succession.

The studied succession provides a good record of the *Inoceramus gibbosus* Zone of the uppermost Lower Coniacian. Due to stratigraphic gaps resulting from eustatic changes, the *I. gibbosus* zone is commonly absent. The base of the Middle Coniacian is marked by a distinct lag-strewn flooding surface, above which appear *Volviceramus* fauna (*V. koeneni, V. exogyroides*, *V. cardinalensis*), associated with *Inoceramus undabundus* Meek and Hayden. *Scaphites ventricosus*, taken to mark the base of the Middle Coniacian, appears with *I. gibbosus* in the late Early Coniacian. The base of the Upper Coniacian is placed at a distinct flooding surface and is marked by the first appearance of *Sph. subcardissoides*, which co-appears with *Scaphites depressus*, the traditional marker for this boundary. The base of the Santonian is marked by facies change to more offshore sediment, accompanied by the abrupt appearance of *Sphenoceramus* ex gr. *pachti* (Arkhangelsky), accompanied by *Clioscaphites saxitonianus*, the scaphitid marker of this boundary.

The high-resolution, regional allostratigraphic framework makes it clear that the appearance of new inoceramid faunas takes place immediately above major flooding surfaces, most of which succeed significant regressions suggestive of eustatic sea-level fall and exposure of inner shelf areas. This observation suggests that there is a causal link between evolutionary and/or migration events and episodes of sea-level change. Repeated sea-level excursions therefore appear to explain the rapid turnover rate among Coniacian inoceramid faunas.

Preliminary carbon-isotope data from one section, supported by biostratigraphic tie-points, allow a preliminary and tentative correlation to the English Chalk reference curve.