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The Late Cretaceous inoceramid bivalves of the Canadian portion of the Western Interior Seaway; palaeontological record, biogeographic pattern and evolutionary inferences

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Summary

Late Cretaceous inoceramid bivalves of the Euramerican Biogeographic Region can be subdivided into temperate and boreal faunas, with a fluctuating boundary between these two informal biochores. While temperate faunas are well represented across vast areas of the region, boreal faunas remain poorly documented. Scattered occurrences are known from northern Europe, and composite sections exist in Greenland; however, the most comprehensive record is found in the Canadian sector of the Western Interior Seaway, extending southward into Montana and northern Wyoming in the United States. In formal paleobiogeographic classification, this distribution corresponds to the Northern Interior Subprovince and the northern part of the Central Interior Subprovince, as defined by Kauffman (1973, 1984). The extensive exposures in western Alberta and eastern British Columbia provide an exceptional record spanning from the Cenomanian to the basal Campanian, positioning this area as a potential type locality for the boreal inoceramid faunas of the Euramerican region.

The Canadian record begins with an endemic Early to early Middle Cenomanian inoceramid fauna that characterizes a significant portion of the Western Interior Seaway, isolated to the south and northeast from the rest of the Euramerican Biogeographic Region. By the latest Middle Cenomanian, the area became physically connected to the eastern and southern parts of the region, leading to the establishment of a continuous boreal inoceramid record from the Cenomanian through the earliest Campanian. The higher Campanian and lower Maastrichtian deposits in eastern Alberta and western Saskatchewan remain understudied but likely preserve critical insights into the final evolutionary stages of the Inoceramidae clade.

The 1,000-km-long north-south transect allows for the reconstruction of the geographical structure of inoceramid assemblages during their migrations, recorded by intervals of pan-regional faunal unification. During the late Cenomanian to early Turonian migration event, the *Mytiloides-Inoceramus* assemblage exhibits a pattern of "filtered migration," with *Mytiloides* transgressing northward; *Inoceramus*, almost completely removed in the south, survived in the boreal region, its refugium. The early Coniacian migration event represents a major southward biogeographic expansion of inoceramid assemblages, resulting in a unified fauna across the Euramerican Biogeographic Region. Minor southward migration pulses are noted in the Santonian. Following the Cenomanian-Turonian boundary *Mytiloides* migration, throughout the Late Cretaceous, no northward invasion of temperate (southern) species has been recorded.

Instead, biogeographic exchanges with other boreal sectors of the Euramerican Biogeographic Region were facilitated via northern or Hudsonian migration routes.

The Early Cenomanian *Posidonioceramus-Gnesioceramus* fauna appears to be a direct evolutionary successor to the Late Albian *Gnesioceramus* fauna endemic to the Western Interior Seaway (Walaszczyk and Cobban, 2016); however, the detailed evolutionary history of this clade remains poorly understood. At the Early/Middle Cenomanian boundary, this lineage became extinct. The Late Cenomanian to Early Campanian faunas appear to have evolved primarily in situ, with little to no external immigration. Thus, the boreal sector of the Euramerican Biogeographic Region functioned as an evolutionary "pump," driving faunal innovation for the entire region.

References

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