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Paleontology and stratigraphy of upper Coniacian–middle Santonian ammonite zones and application to erosion surfaces and marine transgressive strata in Montana and Alberta

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Abstract

Erosional surfaces are present in middle and upper Coniacian rocks in Montana and Alberta, and probably at the base of the middle Santonian in the Western Interior of Canada. These erosional surfaces are biostratigraphically constrained using inoceramid bivalves and ammonites, which are used to define lower, middle, and upper substages of both the Coniacian and Santonian stages of the Upper Cretaceous in this region. The most detailed biostratigraphy associated with these erosional surfaces concerns the MacGowan Concretionary Bed in the Kevin Member of the Marias River Shale in Montana, where the bed lies disconformably on middle or lowermost upper Coniacian strata, and is overlain by upper Coniacian beds. Surface and subsurface investigations in west-central Alberta reveal that the Bad Heart Formation, bounded by unconformities, is about the age of the MacGowan Concretionary Bed. Coniacian and Santonian strata are present elsewhere in Alberta and adjoining areas, but little has been published concerning the Santonian megafossils.

Keywords: Coniacian; Santonian; Cretaceous; MacGowan Concretionary Bed; Western Interior; Unconformities

1. Introduction

Two erosional surfaces in Coniacian–Santonian age marine sequences can be traced over much of west-central Montana and western Alberta (Fig. 1). In terms of the standard stages of the Upper Cretaceous, the older erosional surface is within upper Coniacian rocks, and the younger surface is at or near the base of middle Santonian strata. The surfaces are interpreted as having formed during relative sea-level lowstand events, and thus represent potential sequence boundaries within the marine section.

Although these erosion surfaces are present at least as distant as southwestern Utah (Peterson, 1969), the Black Hills (Tourtelot and Cobban, 1968), and northeastern Nebraska (Hattin, 1982), they are more conspicuous and dated better in Montana and Alberta, where many beds of concretions below and above the surfaces contain useful inoceramid and ammonoid guide fossils. In addition, the surfaces are marked by conglomerates easily recognized in sequences of shale in contrast to their presence in sandstone beds farther south.

In this report, we (1) discuss the paleontology and biostratigraphy of the Coniacian–Santonian interval in central Montana and Alberta using new faunal data and

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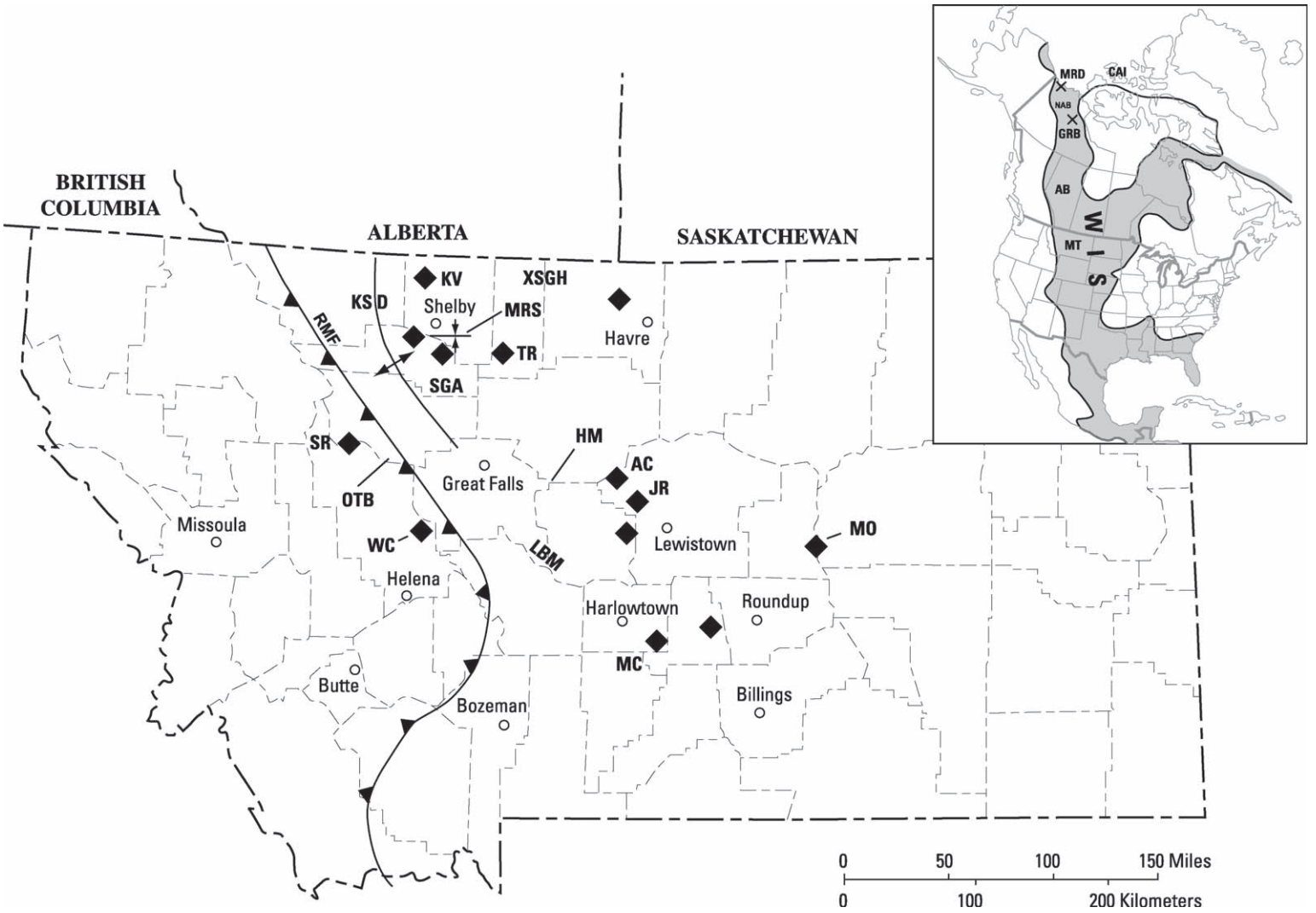

Fig. 1. Map of known localities of MacGowan Concretionary Bed in Montana (solid diamonds, labeled if referenced in this report). Abbreviations: KV, Kevin measured section; TR, Tiber Reservoir measured section; AC, Arrow Creek measured section; SR, Sun River measured section; JR, Judith River measured section; MO, Mosby measured section; MC, Mud Creek measured section; WC, Wolf Creek; LBM, Little Belt Mountains; HM, Highwood Mountains; SGH, Sweetgrass Hills; MRS, Marias River Shale; KSD, Kevin-Sunburst Dome; SGA, Sweetgrass Arch; OTB, Overthrust belt; MRD, Mackenzie River delta; GRB, Great Bear Lake; CAI, Canadian Arctic Islands; NAB, Northern Alberta Foothills; RMF, Rocky Mountain front; AB, Alberta; MT, Montana; WIS, Western Interior seaway.