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Original article

Taxonomy, biostratigraphy and paleoecology of Cenomanian and Turonian ostracodes from the Western Interior Basin, Southwest Utah, USA

Taxonomie, biostratigraphie et paléoécologie des ostracodes du Cénomanien et du Turonien du Bassin de Western Interior, sud-ouest de l'Utah, États-Unis

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Abstract

Cenomanian–Turonian ostracodes are reported from the western Colorado Plateau (Western Interior Basin) in the United States. Fifteen genera and twenty species are illustrated, six of which are new: *Cytheromorpha perornata* nov. sp., *Looneyella leckiei* nov. sp., *Asciocythere posterangulata* nov. sp., *Asciocythere arizonensis* nov. sp., *Cytheropteron clavifragilis* nov. sp. and *Hourcqia dakotaensis* nov. sp. Three ostracode interval zones are proposed that broadly correspond to the existing late Cenomanian through to Middle Turonian Ammonite-zones of Kauffman et al. (1993). Paleoenvironments range from estuarine to coastal plain.

Résumé

Des ostracodes sont identifiés dans le Cénomanien–Turonien du Plateau du Colorado occidental, Bassin de Western Interior, sud-ouest de l'Utah, aux États-Unis. Quinze genres et vingt espèces sont illustrées, six d'entre elles étant nouvelles : *Cytheromorpha perornata* nov. sp., *Looneyella leckiei* nov. sp., *Asciocythere posterangulata* nov. sp., *Asciocythere arizonensis* nov. sp., *Cytheropteron clavifragilis* nov. sp. et *Hourcqia dakotaensis* nov. sp. Trois zones d'intervalle basées sur les ostracodes sont proposées ; elles se corrèlent approximativement avec les zones d'ammonites du Cénomanien supérieur–Turonien moyen de Kauffman et al. (1993). Les paléoenvironnements sont représentés par des biofaciès d'estuaire et de plaine côtière.

Keywords: Ostracodes; Taxonomy; Biostratigraphy; Paleoecology; Upper Cretaceous; Cenomanian; Turonian; Western Interior; United States

Mots clés : Ostracodes ; Taxonomie ; Biostratigraphie ; Paléoécologie ; Crétacé Supérieur ; Cénomanien ; Turonien ; Western Interior ; États-Unis

1. Introduction

The Colorado Plateau contains an exceptionally well-preserved suite of sedimentary rocks that were deposited during the highest sea level of the Mesozoic (Hancock and Kauffmann, 1979; Haq et al., 1988). In the central United States, the Cenomanian–Turonian Greenhorn Marine Cycle records this widespread sea level highstand. The bathyal and neritic macro- and microfossil assemblages of the Cenomanian–Turonian Western Interior Basin (WIB) have been studied in detail (Eicher and Worstell, 1970; McNeil and Caldwell, 1981; Elder, 1991; Caldwell et al., 1993; Kauffman et al., 1993; Kirkland, 1996; Kennedy et al., 2000). Furthermore, chemical and physical stratigraphic studies on the distal facies are well known (Pratt et al., 1993; Leithold, 1994; Sageman et al., 1997, 1998). The siliciclastic sedimentary rocks that comprise the land–sea coastal deposits yield few, normal marine, mollusk taxa. Therefore, correlation to the offshore framework is problematic and

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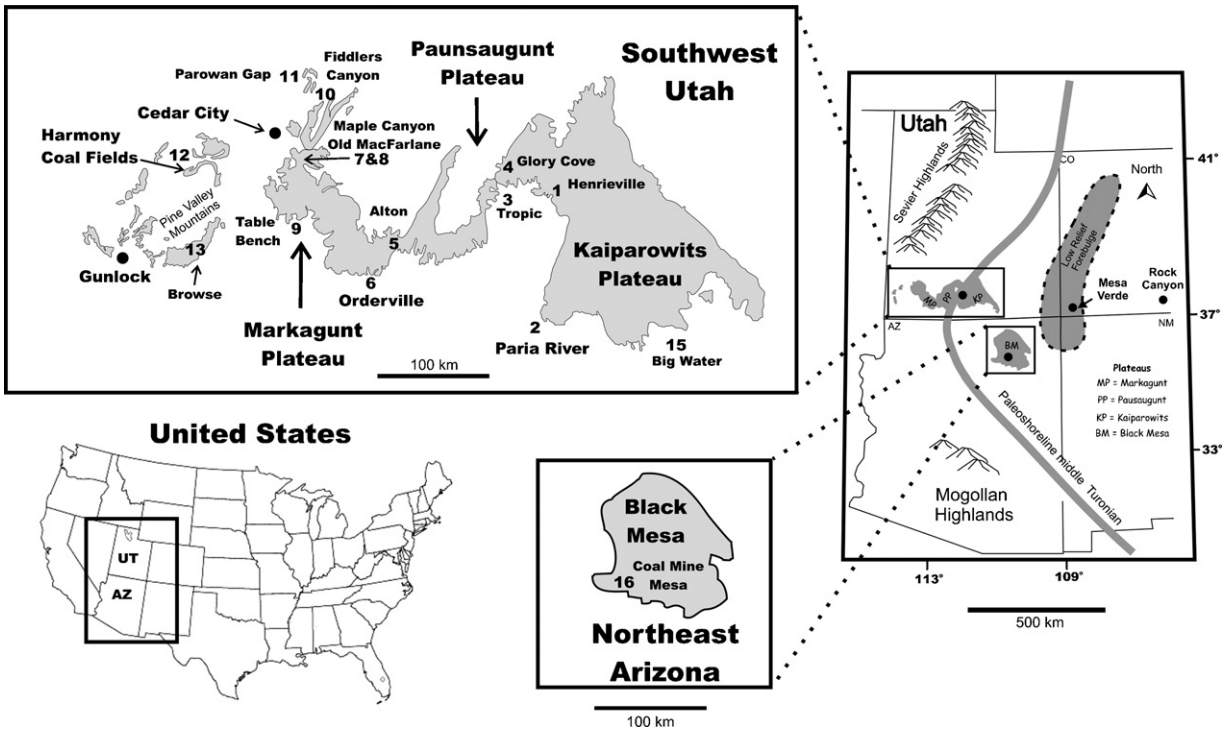

Fig. 1. Map presenting the fossil localities from southwest Utah. Positions are superimposed on the generalized geologic map where the grey shaded areas denote Cretaceous exposures (modified from Hintze, 1980). Details are provided in Table 1.

Fig. 1. Carte des localités fossilifères du sud-ouest de l'Utah. Les positions sont superposées à une carte géologique dans laquelle les zones en grisé représentent les affleurements du Crétacé (modifié d'après Hintze, 1982). Les détails se trouvent sur le Tableau 1.

microfossils provide a practical medium to correlate to the Cenomanian–Turonian deposits worldwide. The primary objective of this manuscript is to formally document and summarize the spatial and temporal distribution of the little studied marginal marine ostracode taxa that were collected across a greater transect from Mesa Verde, Colorado to the Pine Valley Mountains, Utah (Fig. 1). This Cenomanian–Turonian microfossil synthesis from Utah is a pioneering attempt to provide the biostratigraphic framework to correlate the coal-bearing strata to existing stratigraphic systems recognized in North America (Fig. 2).

2. Samples localities and stratigraphic overview

A subsiding fore-deep basin developed in southwestern Utah during the late Cretaceous (Molenaar, 1983; Ryer, 1984; Eaton and Nations, 1991; Elder and Kirkland, 1993). Deposition occurred in a series of structurally parallel topographic lows that form a V-shaped embayment known as the Grand Canyon Bight (Stokes and Heylmun, 1963). During late Cenomanian–Middle Turonian time (~94.5–90.5 Ma), brackish water facies were deposited around the perimeter of this embayment extending from Black Mesa, Arizona, to southwestern Utah where today, a series of plateaus record a nearly continuous stratal succession (Fig. 1). The marginal marine facies comprise the Dakota Formation, Tropic Shale (and correlative units of the lower Mancos Shale), the lower part of the Straight Cliffs Formation (Tibbet Canyon and Smoky Hollow Members), and the westernmost correlative Iron Springs Formation (Figs. 1–3) (Eaton et al., 1997, 1999, 2001; Tibert et al., 2003a, 2003b; Tibert and Leckie, 2004).

Approximately 350 samples from 20 individual stratigraphic sections were collected during four field seasons on the Colorado Plateau. Twenty formal localities and sub-localities are listed in Table 1. Figs. 4–7 illustrate the 4 primary reference sections for the new species provided within modified from Tibert (2002). Locality 1, Henrieville (Fig. 4) encompasses marginal marine strata assigned to the Middle-to-late Cenomanian. Locality 15 at Bigwater, Utah (Fig. 5) is the stratigraphic section that encompasses the shallow marine facies of the Greenhorn Cycle and its subsequent biozones. Locality 7 at Maple Canyon, Utah (Fig. 6) comprises the latest Cenomanian and earliest Turonian marginal marine facies marking the Cenomanian–Turonian boundary interval. Finally, Localities 8a–b at Cedar Canton (Fig. 7) comprises a stratigraphic sequence best representing the marginal facies deposited during the Turonian.

Kennedy et al. (2000) have formally proposed that the Cenomanian–Turonian boundary interval at Pueblo Colorado be elected as the global boundary stratotype. This is an exciting aspect for global comparisons; yet, some changes to the ammonite and bivalve zones of the WIB have also been proposed (Kennedy et al., 2000). To maintain consistency with the most recent paleontologic studies in the immediate southwestern region (Elder, 1991; Kirkland, 1991; Elder and Kirkland, 1993; Elder et al., 1994; Kirkland, 1996), we have chosen to retain the scheme of Kauffman et al. (1993). Widespread dated