

# The first record of a trionychid turtle (Testudines: Trionychidae) from the Cretaceous of the Pacific Coast of North America

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**Abstract:** Trionychid turtles were widespread throughout much of the Western Interior Basin of North America during the Cretaceous, where they are represented by a wide variety of taxa. Despite their widespread abundance east of the Rocky Mountains, they have not previously been reported from Cretaceous deposits along the Pacific Coast of North America. We report here on an isolated trionychid costal from Vancouver Island, British Columbia. The fossil was recovered from the Upper Cretaceous (Turonian–Maastrichtian) Nanaimo Group, near the city of Courtenay. While the fossil is generically indeterminate, its presence adds an important datapoint in our understanding of the biogeographic distribution of Trionychidae.

**Keywords:** British Columbia; Nanaimo Group; Upper Cretaceous; Vancouver Island

## INTRODUCTION

Trionychid turtles are some of the most common fossils found in Upper Cretaceous deposits of North America (Hay 1908; Brinkman 2003; Joyce and Lyson 2010), and are known from Mexico (Reynoso 2006; Brinkman 2014) to the Canadian Arctic (Brinkman and Tarduno 2005). Despite their long history and wide geographic range in Cretaceous deposits of North America, they have not been reported from west of the Rocky Mountains. Here we describe an isolated costal plate of an indeterminate trionychid from the Upper Cretaceous Nanaimo Group of Vancouver Island, British Columbia. Although fragmentary, the specimen represents an important geographic record and provides new information about biogeographic dispersal for the group.

**Institutional Abbreviations:** RBCM, Royal British Columbia Museum, Victoria, British Columbia, Canada; TMP, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, Canada.

## SYSTEMATIC PALAEOLOGY

Order TESTUDINES Linnaeus, 1758  
Family TRIONYCHIDAE Fitzinger, 1826  
Trionychidae indet.  
Figure 1B

**Referred Material:** RBCM EH2004.012.1353, an isolated costal.

**Locality and Horizon:** Nanaimo Group; Turonian to Maastrichtian (Mustard 1994). The locality information associated with the fossil states that it was collected from “Shaft No. 6, Union Mines, (Nanaimo — Cumberland area)”. The No. 6 Shaft is likely the same shaft or mine associated with the Number Six Mine Park in Cumberland, located at approximately 49.618°N 125.032°W, south of Courtenay on Vancouver Island (Fig. 1A). As well, the fossil is listed as possibly coming from the Extension Formation. However, vertebrates have been recovered from nearby rocks of the Haslam and Pender formations as well (e.g., Nicholls and Meckert 2002). The three formations form a continuous succession, with the late Santonian Haslam Formation conformably grading into the early Campanian Extension Formation, which in turn is conformably overlain by the early Campanian Pender Formation (Mustard 1994). The matrix associated with the fossil is a silty sandstone, whereas deposits within the Extension Formation are generally conglomeratic, with some minor sandstone interbeds (Mustard 1994). The fossil

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seems more likely to have originated from the shallow marine deposits of the Pender Formation, although the complex depositional history of the area makes it difficult to assign it to any formation with complete certainty. While the depositional environment of each formation varies, the presence of abundant carbonaceous material in the matrix

associated with the specimen suggest a fluvial to near-shore marine deposition.

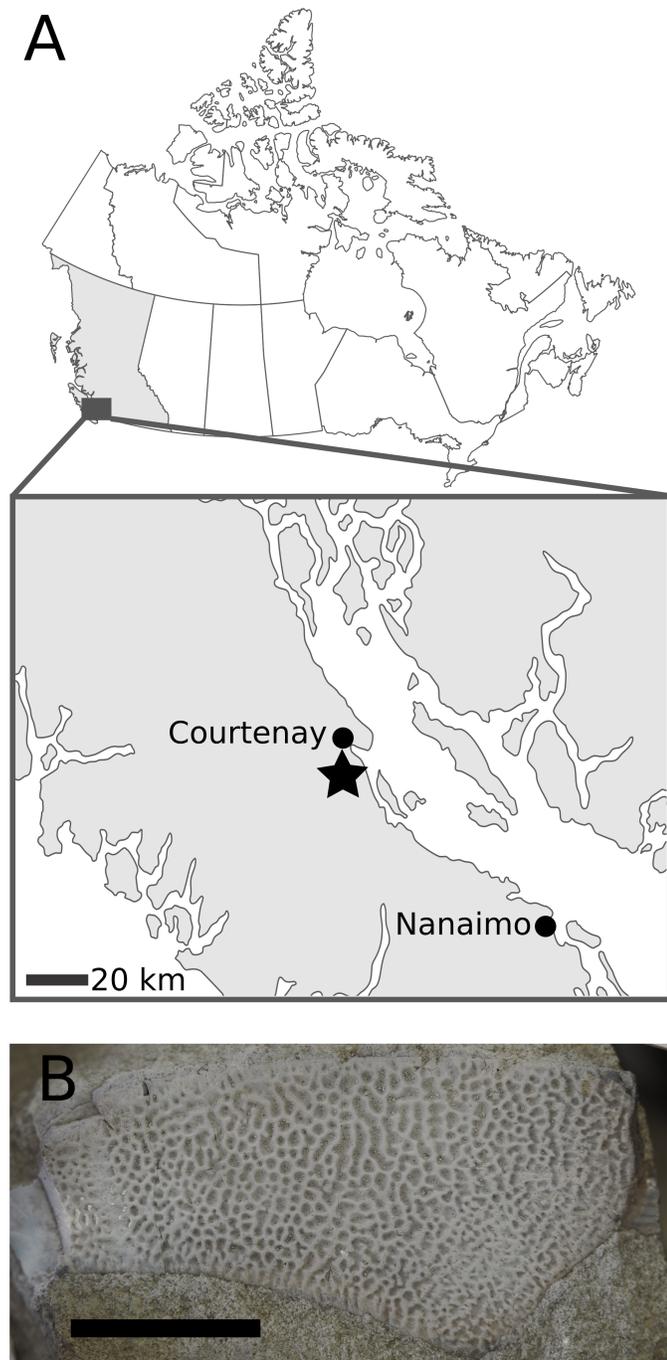
**Description:** RBCM EH2004.012.1353 is an isolated costal embedded in a portion of matrix, with the dorsal surface exposed and the ventral surface fully covered. The costal is almost completely intact, with only one of the medial corners absent (Fig. 1B). The specimen is 88 mm from the medial to lateral edge, and 44 mm from posterior to anterior edge. The sculpturing pattern of the shell is composed of small pits and longitudinal ridges. Along the lateral margin, there is a small portion of a costal rib still present on the specimen, and there is also an impression in the underlying matrix of the terminal end of the rib. The natural mould appears to preserve most of the rib, though there is a small portion not present. The free rib end is approximately 7 mm in width and was at least 4 mm long.

The costal displays a number of characters that are diagnostic of trionychids, namely the pitted sculpturing on the external surface of the shell, absence of scute sulci, and a lack of articular surfaces on the lateral edge, the latter indicating an absence ossified bridging peripherals (Meylan 1987). Based on comparisons to other trionychids, the curvature of the costal indicates it may have either come from the right posterior or the left anterior portion of the shell.

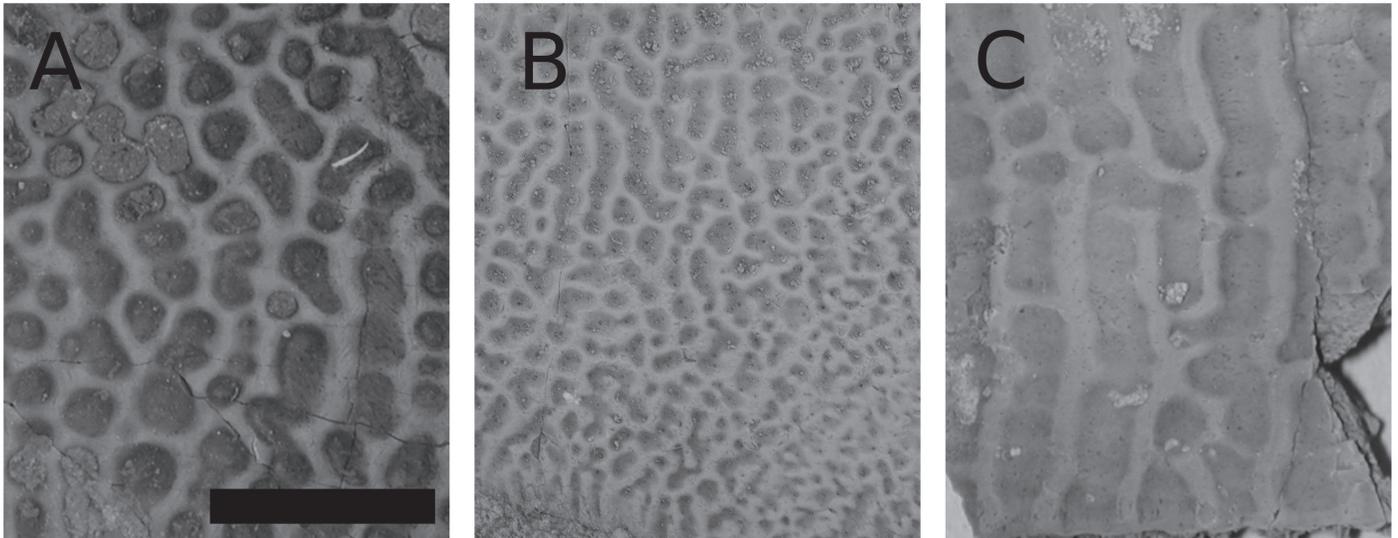
## DISCUSSION

Trionychid turtles first make their appearance in North America during the Cenomanian (Fiorillo 1999; Brinkman 2003), and by the Campanian are among the most common fossils found in Late Cretaceous deposits of the Western Interior Basin (e.g., Gardner et al. 1995; Brinkman 2003; Joyce and Lyson 2010). However, despite their abundance in the continental interior, they have not previously been reported from Cretaceous deposits west of the Rocky Mountains. Even today, living trionychids are not endemic to the Pacific region of North America (Ernst and Barbour 1989), although there is fossil evidence from the Paleogene of their presence in British Columbia (Wilson 1982; Cevallos-Ferriz and Stockey 1989; Cevallos-Ferriz et al. 1991), Washington (Mustoe and Girouard 2001) and California (Golz and Lillegraven 1977; McKenna et al. 1987).

Due to the lack of diagnostic characteristics, the specimen cannot be assigned to any specific taxon. However, the pattern of regular circular to subcircular pits in the Vancouver Island trionychid resembles that of *Axestemys splendida* Hay 1908 (Fig. 2A) from the Judith River Group of Montana and Alberta (Fig. 2; Gardner et al. 1995; Vitek 2012), but is unlike the longer, more con-



**Figure 1.** A, Maps, from upper to lower: the location of British Columbia (grey shading) within Canada, with the location of the regional map indicated by the grey rectangle; a regional map showing the location of the fossil site in Cumberland, Vancouver Island, British Columbia. Location of RBCM EH2004.012.1353 is denoted with a star. B, RBCM EH2004.012.1353, isolated costal of a trionychid. Scale bar equals 2 cm.



**Figure 2.** Costal sculpturing among Late Cretaceous trionychid turtles. Lateral edge of costal to the right for each image. A, TMP 1986.036.0302, an isolated costal from cf. *Axestemys splendida* from the Dinosaur Park Formation of Alberta. B, RBCM EH2004.012.1353. C, TMP 1986.009.0081, an isolated costal from *Aspideretoides foveatus* from the Dinosaur Park Formation of Alberta. All images at same magnification. Scale bar equals 1 cm.

tinuous pits as seen in taxa such as *Aspideretoides foveatus* (Leidy, 1856) (Fig. 2C). However, because of the difficulty in using shell sculpturing to determine species (Gardner and Russell 1994; Gardner et al. 1995), little more can be said at this time.

The discovery of this specimen from Vancouver Island establishes the presence of trionychid turtles on the Pacific Coast during the Late Cretaceous. While Cretaceous deposits along the west coast may not be nearly as abundant as those from the North American interior, further work in these areas may provide information on the distribution and relative abundance of trionychids along the Pacific coast, as well as information on the relationships between coastal and Western Interior taxa.

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