

**INTERPRETING THE EXISTENCE OF A PAIR OF CLOSELY RELATED SPECIES
OF CRETACEOUS HELL CREEK FORMATION FRESHWATER MUSSELS**

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INTRODUCTION

The Upper Cretaceous biota is replete with interesting fossils, not the least of which are the freshwater mussels (Unionoidea) living in the rivers and lakes between the Sevier and Laramide Mountains to the west and the Western Interior Seaway to the east. During the last 2 Ma of the Cretaceous, the species richness of these mussels reached new levels. The cause of this diversity and its subsequent demise is the main interest in ongoing investigations. This contribution addresses two surface-sculptured taxa, assigned provisionally to the modern genus *Plethobasus*, from the type area of the Hell Creek Formation in Garfield County, Montana.

PALEONTOLOGY

Plethobasus aesopiformis and *P. biesopoides* were both part of the inaugural description of the Hell Creek molluscan fauna in 1903 and 1907 (1, 2). As was true for any toothed mussel of the time, they were assigned to *Unio*. These taxa were subsequently reassigned to *Plethobasus* by Russell (2). We consider the assignment to *Plethobasus* provisional as these fossil taxa did not survive the K/T boundary. Thus there is only convergent superficial resemblance to extant taxa, which likely have their origins in the eastern United States. We consider *P. aesopiformis* and *P. biesopoides* to be sister species. They were initially thought to be only distinguishable by the number of rows of irregularly shaped nodes that curve posteroventrad from the umbo. *P. aesopiformis* was recognized as having one row of nodes, while *P. biesopoides* has two. Both species possess comparable beak placement, the number of umbonal corrugations that curve ventrad around the umbo, disc convexity, and node shape, node prominence, and number of nodes. However, further inspection permits discrimination based upon other character traits. *P. biesopoides* is slightly larger and appears more robust. It also possesses more robust and more prominent pseudocardinal teeth. The umbonal cavity is also deeper than found in *P. aesopiformis*. Another noticeable difference between these two species occurs in the disc outline shape. Traditionally, the genus *Plethobasus* is recognized as having an orbicular outline, and *P. aesopiformis* generally conforms to this ideal. However, *P. biesopoides* is more trigonal in marginal outline, with a more inflated umbo.

STRATIGRAPHY AND OCCURRENCE

Both *Plethobasus aesopiformis* and *P. biesopoides* are distinctive elements in the assemblage of species in the Hell Creek fauna and are not easily overlooked during collecting or subsequent taxon sorting. Thus their geographic and stratigraphic distribution within the collections made since 1903 can more easily be taken as valid than some other taxa. Both range through most of the Hell Creek Formation. Both are known from the lower but not lowest part of the formation (basal 27 m) and, likewise, neither are known from the uppermost part of the formation (top 10 m). Both are known from about the same number of localities and may co-occur. Typically, however, *P. aesopiformis* is much more abundant in number of specimens at a locality. In total, between 4 and 5 times as many specimens of *P. aesopiformis* have been collected. Although not widely reported, in contrast to Russell's (3) restricted distribution, *P. aesopiformis* is also known from the Lance Formation of the Powder River Basin, Wyoming, and the Hell Creek Formation in the North Dakota part of the Williston Basin. *P. biesopoides* is also known from the Hell Creek fauna of the eastern Crazy Mountains Basin, Montana.

DISCUSSION

Current studies indicate that *Plethobasus aesopiformis* and *P. biesopoides* are distinct and part of radiation of unionoids that we are only beginning to fully understand. They are found associated with other sculptured mussels, none of which survive past the K/T boundary. In fact, both *P. aesopiformis* and *P. biesopoides* were likely extinct before the end of the Cretaceous, and we suggest that this is due to the loss of diversified lotic habits with the eustatic rise of the Cannonball Sea, the last transgressive-regressive cycle of the Western Interior Seaway.

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1. Whitfield, R.P. (1903) American Museum of Natural History, Bulletin, v. 19, pp. 483–487, pls. XXXVIII–XL.
 2. Whitfield, R.P. (1907) American Museum of Natural History, Bulletin, v. 23, pp. 623–628, pls. XXXVIII–XLII.
 3. Russell, L. S. (1976) Canadian Journal of Earth Sciences, v. 13, no. 2, pp. 365–388, 7 pls.

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