A Late Mississippian conodont faunule from area of proposed Pennsylvanian System stratotype, eastern Appalachians

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FOSSILS AND STRATA

A late Chesterian (Late Mississippian) conodont faunule assigned to the Adetognathus unicornis or lower Rhachistognathus muricatus Conodont Assemblage Zone was recovered from the Bramwell Member of the Bluestone Formation in southern West Virginia, thereby extending the geographic range of these assemblage zones into the eastern Appalachians. The Bramwell Member thus correlates with, or may even be younger than, the Grove Church Shale, the highest unit traditionally placed in the type Chesterian sequence, and it correlates with the uppermost Namurian A strata in western and central Europe.

Upper Mississippian and Lower Pennsylvanian rocks form a thick sequence in the eastern part of the Appalachian basin. The succession near Bluefield, Virginia—West Virginia, is one of the few in eastern North America in which deposition was virtually continuous across the Mississippian—Pennsylvanian boundary. The U.S. Geological Survey is proposing that stratotypes for the Mississippian—Pennsylvanian boundary and the Lower Pennsylvanian Series be established in this area.

The Bramwell Member of the Bluestone Formation is the youngest unit included in the Mississippian (Fig. 1). About 30 m thick at its type locality, it consists primarily of a sequence of fine-grained terrigenous clastic rocks, which coarsens upward. It was deposited as a set of nearshore marine beds during a transgression over coastal-plain and near-coastal nonmarine deposits of the red member of the Bluestone Formation. The Bramwell Member generally is overlain conformably either by the upper member (near-coastal nonmarine beds) of the Bluestone or by the lower sandstone member of the Pocahontas Formation. The lower sandstone member was formed by a series of distributaries prograding over the upper member and Bramwell Member of the Bluestone. As shown by Englund (1979) and by Englund et al. (1981), the lower sandstone member of the Pocahontas interfingers and intertongues with the upper member of the Bluestone in interdistributary areas; however, near distributary axes, the lower sandstone member of the Pocahontas truncates subjacent beds and rests directly on the upper part of the red member of the Bluestone.

Studies of the macrofloras by Gillespie & Pfefferkorn (1979) and Pfefferkorn & Gillespie (1981) have indicated that the Mississippian—Pennsylvanian boundary, defined in this sequence at the top of the Bramwell Member of the Bluestone Formation, corresponds exactly with the Namurian A—Namurian B boundary of western Europe.

The Bramwell Member contains a locally diverse marine invertebrate fauna. Preliminary studies by Gordon & Henry (1981) have suggested that this molluscan-dominated fauna consists of at least 45 macroinvertebrate taxa and that it is closely similar to the faunas of the upper Chesterian of the Ozark Plateaus region of north-central Arkansas.

A 5 kg sample of fossiliferous silty limestone from the upper part of the Bramwell Member at Freeman, Mercer County, West Virginia (U.S. Geological Survey collection 26789-PC), yielded a small collection of conodonts, including Pa elements of Adetognathus unicornis (Rexroad & Burton 1961), Cavusgnathus convexus Rexroad 1957, C. naviculus (Hinde 1900), and Gnathodus bilineatus (Roundy 1926) morphotype φ (Fig. 2). This co-occurrence establishes a late Chesterian age, limited to the A. unicornis through at least the lower Rhachistognathus muricatus Zones sensu Lane & Straka (1974).

Although further sampling may or may not allow ultimate assignment of these strata more precisely to either the A. unicornis or the R. muricatus Zone, some important points can be made from this discovery:

1. If the upper part of the Bramwell Member represents the A. unicornis Zone, then the Mississippian—Pennsylvanian boundary as used in this area at present is somewhat different from that used elsewhere in North America by most conodont workers, i.e. at the R. muricatus – R. primus Zone boundary (Lane & Straka 1974; Lane 1977; Lane & Baesemann 1982).

2. If these strata can be shown to represent the R. muricatus Zone, then the Bramwell Member would be slightly younger.
Fig. 1. Sketch of stratigraphic relationships of Mississippian–Pennsylvanian boundary sequence in area of proposed Pennsylvanian System stratotype near Bluefield, Virginia—West Virginia.

References


Fig. 2. SEM photomicrographs of conodont Pa elements from upper part of Bramwell Member of the Bluestone Formation at Freeman, West Virginia (USGS collection 26789-PC). Specimens, photographed coated lightly with carbon (later removed), repositioned in collections of Department of Paleobiology, U.S. National Museum of Natural History, Washington, D.C., U.S.A. (A) Cavusgnathus concexus Rexroad. Inner lateral view, ×50, USNM 347251. (B) Cavusgnathus navicularis (Hinde). Inner lateral view, ×50, USNM 347252. (C) D. E. Gnathodus bilineatus (Roundy) morphotype δ. Lower, ×50; outer lateral, ×50; and upper stereo-pair, ×45 views, respectively, USNM 347253. (D) F. G. Adeno gnathus unicorns (Rexroad & Burton). Lateral, ×100, and upper (stereo-pair, ×105) views, respectively, of specimen having most of free blade missing, USNM 347254.