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CONODONTS OF THE MECCA QUARRY SHALE

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Abstract

Conodonts were found to be abundant in the Middle Pennsylvanian, Mecca Quarry Shale, Parke County, Indiana. Nine forms were identified in this black fissile shale from a locality along Montgomery Creek near the town of Mecca. These elements are: Hindeodella parva, Idiognathodus delacatus, Gondolella sp., Ozarkodina delacatula, Lonchodina clarki, Li gonodina typa, Lonchodus simplex, Metalonchodina bidentata, and Neoprioniodus conjunctus. Ratios of elements to each other were determined and used to arrive at an idea of what possible conodont assemblages were present. At least three assemblages are suspected; Scottognathus, Dubois ella, and Illinella. These assemblages compare well with what is known to be present in other Pennsylvanian shales described by Collinson et al. (1972). No natural intact assemblages were found in the shale.

Introduction

The Mecca Quarry Shale member is part of the Linton Formation in Indiana. It consists of evenly bedded, sheety, alternating gray and black, carbonaceous shale. The Mecca Quarry Shale lies upon a transgression shell breccia and the Indiana Coal IIIA. A marine limestone overlies the Mecca Quarry Shale. The Mecca Quarry Shale member is 1' 1/8" in thickness (Zangrel and Richardson, 1963).

Along Montgomery Creek the upper limestone layer has been partly removed by erosion. The Mecca Quarry Shale is exposed on

the ridges of the valley, in the floor of the creek bed, and on the talus of strip mining in the area. The shale is divided into six distinct layers which are the result of cyclic deposition of the shale due to changes in depth of the water in the Illinois Basin.

In addition to conodonts, an extensive fauna has been recorded in the Mecca Quarry Shale (Zangerl & Richardson, 1963). This includes some unidentified sponge and bryozoan remains; the corral Lophophyllidium proliferum; the brachiopods Lingula mytiloides, Desmoinesia nuricatina, Mesolobus mesolobus, Composita subtilita, and Neospirifer sp.; the molluscs Pseudorthoceras knoxense, Myalina meeki, Dunbarella sp., Nucula parva, Edmondia sp., and Allorisma subcuneata; the phyllocarid Concavicaris sinuata; some crinoid plates; and numerous bony fish and chondricthyeans.

Extraction Method

Mass extraction of conodonts from a matrix of black shale was, until recently, almost impossible. The black shales are much harder because of high concentrations of pyrite (FeS) than the calcium metaphosphate of the conodonts found in them. Extraction methods using acetic acid or petroleum products such as gasoline or Stoddard solvent (which dissolve limestone, dolomite calcareous shales, and soft shales adequately) have no effect on black shales (Collinson, 1963). As a result, black shales were considered poor sources of conodonts because an effective extraction method was not known.

The following extraction method was obtained from Mr. Rodney Norby of the Illinois State Geologic Survey, Urbana. Common chlorine bleach was found to dissolve black shale. Sections of shale were split along their bedding surfaces in thicknesses of approximately .5 cm. These sections were submerged in containers of bleach. There is no immediate effect on the shale because the shale surface has oxidized. It takes approximately four days for the shale to begin disintegration after which the disintegration process proceeds rapidly. The process can be accelerated with the addition of a few crystals of NaOH. As the shale dissolves, the residue is sieved daily. The bleach containing the disintegrated shale is poured through three sieves. The top sieve is a 16 mesh and is used to remove large shale fragments. The middle sieve is a 60 mesh which is used to remove shale fragments and other debris, conodonts are not usually trapped by this sieve. The bottom sieve is a 170 mesh. The conodonts are trapped here along with fine shale particles. The bleach is reused by collecting it in a container placed under the 170 sieve. The

material in the sieves is then washed with water several times to prevent the shale particles and conodonts from sticking together. This last operation is essential to complete the extraction. The sieved material is allowed to dry in the sieve for several hours at room temperature.

The final step of extraction involves separating the conodonts from the sieved shale by tetrabromoethane flotation (Collinson, 1963). The settling time is from 10 to 13 hours. The conodonts are drained out of the bottom of the separatory apparatus into a funnel of fine cotton cloth and washed with isopropyl alcohol to remove the tetrabromethane. This filtered and washed material is then picked of conodonts under a microscope. Approximately eight pounds of shale was processed in this manner.

Results

The conodonts obtained from the Mecca Quarry Shale are listed in table 1. Only elements large enough to be recognized were counted, although others of a very fragmentary nature were noted. Conodont assemblages in which these elements could have been associated are noted.

Species	Number	Assemblage
Hindeodella parva	101	S
Idiognathodus delacatus	63	S
Gondolella sp.	46	I
Ozarkodina delacatula	37	S
Lonchodina clarki	23	D, I
Ligonodina typa	16	D
Metalonchodina bidentata	5	D
Neoprioniodus conjunctus	6	D
Lonchodus simplex	(many fragments)	I
Hibbardella sp.	?	D
	267 +	

Table 1. Numbers of conodont elements collected from the Mecca Quarry Shale. The corresponding assemblages are indicated.
D = Duboisella
S = Scottognathus
I = Illinella

Natural conodont assemblages have been recognized for many years. An assemblage consists of several different kinds of

discrete conodont elements that are presumed to represent parts of one animal (Hass, 1962). Scott (1934) was the first to describe a convincing natural assemblage. Although most conodont elements have been named, it has now been generally accepted that the single elements described as species are in reality parts of assemblages (Jeppsson, 1971). Assemblages were originally named for the discoverer, or the location in which the assemblage was first discovered. The acceptable method of naming assemblages would be to use the name of the first named element. The other individual elements of the assemblage are numbered rather than receiving an individual name. This trend is due to the ever increasing importance of the assemblage over the individual element in conodont classification as more natural assemblages are found. This taxonomy based on the reconstruction of the skeleton of the conodont bearing animal is one of the most widely used methods at this time. Lindstrom (1970) has proposed a suprageneric taxonomy for naming single conodont element assemblages. There is thus a great deal of confusion in settling on an acceptable nomenclature for natural assemblages as assemblage names are converted to the new prominent element system. Klapper and Phillip (1971) observed that conodont taxonomy rested on unsure foundation and that nomenclature could only be provisional. In this paper, the original name given to the conodont assemblages is to be used.

Conclusions as to the assemblages present in the Mecca Quarry Shale are based on ratios of elements to each other as well as individual species of elements located in the shale (Table 1). In all cases, the ratios of elements to each other do not correspond exactly to expected ratios due to the fact that only elements were counted that were complete enough to be identified as one individual element. Certain species have high fragmentation rate and could not be counted accurately. Lonchodus simplex is an element that suffers a high amount of breakage in extraction. The individual element types, and in most cases the ratios of the elements to each other, correspond to information recorded by Rhodes (1952) and Collinson et al. (1972) for conodont assemblages from a Pennsylvanian black shale of La Salle County, Illinois.

Scottognathus as described by Scott (1934) and named by Rhodes (1952) is almost surely present (Table 1). Scottognathus contains one pair of Idiognathodus delacatus, one pair of Ozarkodina delacatula, four pairs of Hindeodella parva, and one pair of Synprioniodina sp., this last of which no positively identifiable elements were found in the Mecca Quarry Shale (ratio of 1:1:4:1). This assemblage has also been refered to as Idiognathodus for the prominent Idiognathodus element (Baesemann, 1973).

Duboisella was discovered by Du Bois (1943) and named by Rhodes (1952) is probably present in the shale (Table 1). Duboisella contains two pairs of Ligonodina typa, two pairs of Lonochodina clarki, a pair of Metalonchodina bidentata, a pair of Neoprioniodus conjunctus, and a pair of Hibbardella sp., this last of which no elements were positively identified although there were two possible Hibardella fragments (ratio of 2:2:1:1:1). This assemblage has also been called Idioprioniodus (Baesemann, 1973).

Illinella another Pennsylvanian assemblage described by Rhodes (1952) is also possibly present (Table 1). Illinella contains one pair of Gondolella sp. a, two pairs of Lonchodina clarki, and four pairs of Lonchodus simplex (ratio of 1:2:4). The single element Gondolella is most numerous due to its stoutness resulting in low breakage as compared to Lonchodina and Lonchodus which are very fragile and easily broken. The Illinella assemblage is often denoted as Gondolella for the prominent Gondolella element.

Although no actual natural assemblages were located in examining bedding surfaces of the shale, numbers and ratios of elements collected along with substantiating literature of other Pennsylvanian assemblages indicate probable assemblages present.

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