A Glimpse Into a Middle Devonian Ecosystem: Penn Dixie Fossil Beds, Erie County, New York

Carly Leventhal, Dr. Tamra Schiappa, Geography, Geology, and the Environment Department, cnl1004@sru.edu

Introduction

Penn Dixie Fossil Quarry and Nature Reserve is an educational center located in Erie County, NY. It provides an opportunity for individuals to explore the geology and paleontology of Western New York. The diverse fossil assemblage preserved in the rocks provide researchers with a unique opportunity to learn about life in the past. The purpose of this research was to reconstruct the Middle Devonian (393-382 million years ago) paleoenvironment using fossils and rocks collected from this locality.

Stratigraphy

- Middle Devonian Hamilton group
- Age: 377 to 384 million years old
- Formations: The Marcellus, Skaneateles, Ludlowville, and Moscow.
- Exposed units: West River Shale, Genundewa Limestone, North Evans Limestone, Windom Shale, Tichenor Limestone, and Wanakah Shale of the Moscow Formation (Figure 1).

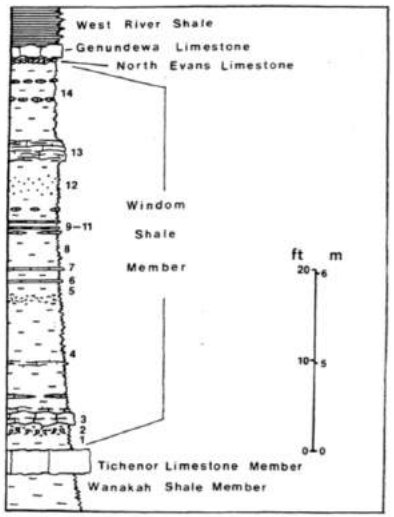


Figure 1: Stratigraphic units present at the Penn Dixie Site (Bastedo, 1999).

- Fossils collected from the Windom Shale.
- The Windom Shale is a soft, fissile, medium-grey shale with interbedded fossiliferous units.
- Thin calcareous beds contain abundant fossils near the base of the unit and a few feet from the top.
- These fossiliferous sections are separated by barren, grey shales containing no fossils (Brett, 1974).

Paleontology and Paleoecology

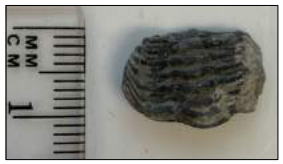
- Fossils collected include Brachiopods, Corals, Trilobites, Echinoderms, Bryozoans, Cephalopods, Gastropods, Bivalves and Conodonts.
- Shown below are some of the fossil species that were studied.

stereolasma rectum
Taxonomy:
Phylum: Cnidaria
Class: Anthoza
Family: Stereolasmatidae

Amplexiphyllum hamiltonae
Taxonomy:
Phylum: Cnidaria
Class: Anthoza
Family: Stereolasmatidae

Pseudoatrypa devonica
Taxonomy:
Phylum: Brachiopoda
Class: Rhynchonellata
Family: Atrypidae

Rhipidomella sp.
Taxonomy:
Phylum: Brachiopoda
Class: Rhynchonellata
Family: Rhipidomellidae



***Phacops rana* (thorax)**
Taxonomy:
Phylum: Arthropoda
Class: Trilobita
Family: Phacopidae

Figure 2: Ecological patterns within Hamilton Group (Modified from Bonuso et al., 2002.)

- Diverse community; > 8 species.
- Brachiopods/ corals abundant.
- Suspension feeding organisms dominant --Brachiopods, Corals, and Echinoderms (Figure 2).
- Scavengers - Trilobites,not as abundant.
- Characteristics of life and death assemblages.
- Trilobites and Brachiopods are disarticulated
- Scattered skeletal parts from bioturbation of scavengers, or energy that moved the fragments.

Paleoenvironment Reconstruction

- Penn Dixie Quarry sediments and fossil faunas indicate deposition on a shallow marine shelf within a Middle Devonian epeiric sea (Figure 4).
- During this time, NY close to equator; seas were tropical.
- Sediments deposited westward formed Catskill Delta (Figure 3).
- Low energy, warm, clear, shallow marine enviro nment in the photic zone.
- Light grey Windom Shale associated with aerobic zone. Species in faunal assemblage needed higher amounts of oxygen to survive (Stokes).
- Brachiopods and Corals are dominant sessile filter feeders. Trilobites are scavengers. Echinoderms are rare sessile filter feeders.

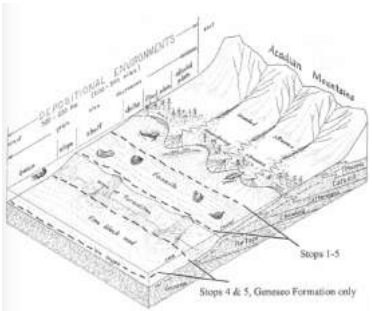


Figure 3: Characteristics of "Catskill Delta" depositional systems (Strokes)

Figure 4: Paleogeographic map of North America during the Middle Devonian; Fossil locality marked by star (Modified from Blakey)

References

Bastedo, J.C., 1999, Penn Dixie Paleontological and Outdoor Education Center: Visit to a Classic Geological and Outdoor Education Center. N.Y. State Geological Association 71 Annual Meeting Guidebook, Fredonia, N.Y., p. A1-A18.
Blakey, Ron. "Paleogeography and Geologic Evolution of North America", Global Plate Tectonics and paleogeography. Northern Arizona University.
Bonuso, N., Newton, C.R., Brower, J.C., Ivany, L.C., 2002, Does coordinated stasis yield taxonomic and ecologic stability: Middle Devonian Hamilton Group of central New York. Geological Society of America. Geology, Vol. 30; no. 12; p. 1055-1058.
Brett, C.E., 1974, Biostratigraphy and Paleoecology of the Windom Shale Member (Moscow Formation) in Erie County, NY: New York State Geological Association, 46th Annual Meeting Guidebook, p. G1-G15.
Brett, C.E., 1986, Dynamic Stratigraphy and Depositional Environments of the Hamilton Group (Middle Devonian) in New York State, Part 1. Cultural Education Center, Albany, New York. p. 166.
Brett, C.E., 1986, Dynamic Stratigraphy and Depositional Environments of the Hamilton Group (Middle Devonian) in New York State, Part 2. Cultural Education Center, Albany, New York. p. 166.
Maletz, J., 2008, Middle to Upper Devonian Stratigraphy and Faunas of Erie County, Western New York: Field Trip NE GSA, p. 1-14.
Stokes, J.P, Zambito, J.J., Using Marine Fossils to Unlock the Middle Devonian Paleoenvironments of Western New York: Middle Devonian Fossils for Teachers, p. 414-434.

Acknowledgements

I would like to thank Dr. Schiappa and the GGE Department for providing me with the knowledge, tools, facilities, and assistance in being able to do this research.