Meso-Tidal Interpretation of Hartselle Sandstone (Lower Carboniferous, Alabama) by Analogy with Bay of Fundy Macro-Tidal Ichnocoenoses

Louis G. Zachos and Brian F. Platt
Department of Geology & Geological Engineering
University of Mississippi
Study Area

Lubec, Maine

Tidal flat in protected bay
- Fetch limited
- Tidal range 6-7 meters
- Heterogeneous ichnofacies
Upper Shoreface Facies

Chiridotea Facies

Mud Facies

Mya Facies

Gravel Facies

Corophium Facies

Gravel Facies

Mytilus Facies

Littorina Facies

Sand Wave Facies

Ichnocoenoses
*Chiridotea coeca*

*Corophium volutator*

*Mathiilus edulis*

*Littorina littorea*

*Mya arenaria*

*Arenicola marina*

*Clymenella torquata*

*Nereis spp.*

Identification keys from Pollock (1998)
Mean Grain Size

Sediment grain size ranges from silt to fine gravel

Tidal Exposure

Up to 12 hours of exposure each tidal cycle (high tide to high tide)
Ichnocoenoses: A function of tidal exposure and substrate grain size

The tidal flat environment is characterized by surface traces (Epichnia)

Faunal Facies

- Upper Shoreface
- Chiridotea Facies
- Corophium Facies
- Mud Facies
- Mya Facies
- Littorina Facies
- Mytilus Facies
- Sand Wave Facies
- Gravel

Numbers indicate hours of exposure per tidal cycle
Lower Shoreface
*Chiridotea* facies
>8 hrs Exposure
Chiridotea facies
6-8 hrs Exposure
Corophium facies
6-8 hrs Exposure
Mud facies
6-8 hrs Exposure
Mya facies
4-6 hrs Exposure
*Littorina* facies
4-6 hrs Exposure
*Mytilus* facies
4-6 hrs Exposure
Sand wave facies
1-4 hrs Exposure
Late MississippianPaleogeography of the Southeast
a reconstruction of changes in the landscape from about 340 to 320 million years ago

Fielder Ridge

Yucatan Microplate?

South American portion of Gondwana

African portion of Gondwana

Lacefield, 2013
Hartselle Sandstone

Location of Fielder Ridge Trace Fossil Site

Hartselle SS Isopach 25’ CI

Hartselle SS Outcrop

After Wilson, 1987
Stratigraphic Column

Upper Section
Fielder Ridge

Meso-Tidal Zone
*Chiridotea coeca*

Ichnotaxa after Rindsberg (1994)

*Haplotichnus* isp.

UM5291

*Chiridotea* ichnocoenosis
Corophium volutator

Hartsellea sursumramosa

Corophium ichnocoenosis
Corophium ichnocoenosis

Nereis sp.

Corophium volutator

Hartsellea sursumramosa
Nereis sp.

Nereites missouriensis

Corophium ichnocoenosis
Corophium and Mya ichnocoenoses

Arenicola marina

Uchirites implexus?
Diplichnites gouldi
**Mya ichnocoenosis**

*Lockeia silquaria*

*Mya arenaria*
Diplichnites gouldi

Trails in wet to dry sand

UM5136

Dry tracks

Wet tracks
Distressed-context traces
Sand wave facies

Drag marks
Diplichnites gouldi

Apex predator?

Larus argentatus
Feeding frenzy

Diplichnites gouldi
Crossing trails

*Diplichnites gouldi*

UM5314
Slippery slopes

*Diplichnites gouldi*

UM5316
Conclusions

Abundance of tracks attributable to crustaceans (isopods and amphipods) evidence for extensive tidal flats.

Variety of littoral traces evidence for extended exposure and meso to macro tidal environment

Tracks of myriapods evidence for nearby terrestrial habitat, possibly connection to mainland.
References


