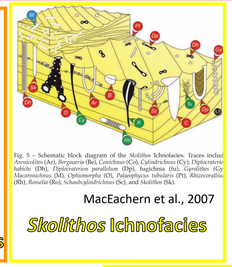
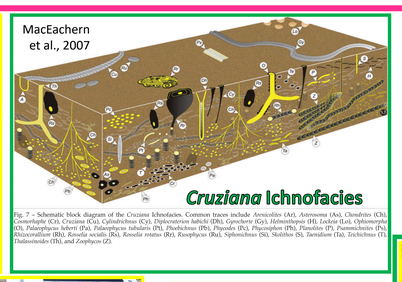
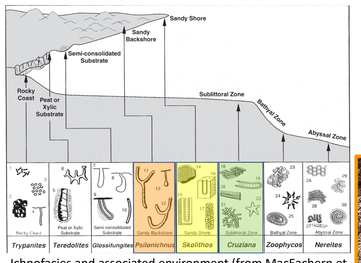
3b. Outcrop results: Ichnofacies

- Most ichnofossils in the upper Woodbine are associated with the *Skolithos* and *Cruziana* ichnofacies.
  - High-energy, intertidal to offshore marine environments
  - *Skolithos, Rosselia, Thalassinoides, Ophiomorpha, Arenicolites*, *Rusophycus,* and *Conichnus/Bergaueria*.
- Traces from the *Psilonichnus* ichnofacies are found in the vicinity of Lake Grapevine.
  - Sandy backshore, dunes, or supratidal flat environments.
  - *Psilonichnus* in crab sand-ball deposits, vertebrate tracks, and rhizoliths (root traces).

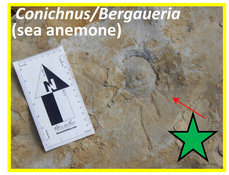
Hadrosaur **trackway on intertidal sand dune**







Ichnofacies and associated environment (from MacEachern et al., 2007 after Seilacher)



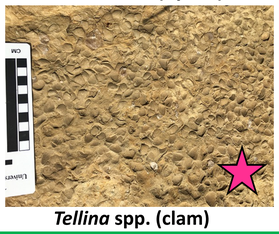
3c. Outcrop results: Biofacies

- Oysters, clams, and turritellid gastropods.
  - A ~0.5 m thick oyster bed is found near the top of the Woodbine.
- Ammonite impressions are occasionally found
  - Ammonites with preserved shell material, including the Middle Cenomanian marker *Conlinoceras tarrantense*, appear to be restricted to the uppermost Woodbine (Tarrant).
- Carbonized wood fragments and logs, some of which have been bored.
- Vertebrate fossils are restricted to only a few locations, and include dinosaurs, archosaurs (crocodiles), turtles, and shark teeth.
- Consistent with a marginal, brackish water to marine environment

Ostrea soleniscus **(oyster) bed**

Macrocerithium tramitense **(turritellid snail)**

Ammonite impressions



Tellina **spp. (clam)**

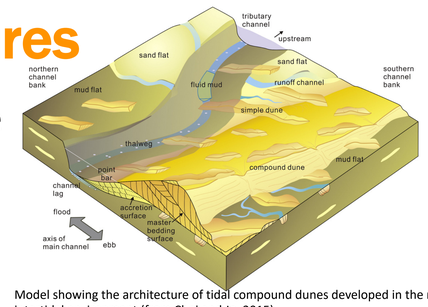
Wood

Shark tooth

Conlinoceras tarrantense

3d. Outcrop results: Sedimentary Structures

- Finer-grained and more quartzose than the lower Woodbine (Dexter) with a much higher percentage of mud.
- Many of the larger sand bodies are relatively clean.
  - Bidirectional cross-bedding, multi-directional troughs, and superimposed ripples.
- Heterolithic deposits, including flaser, wavy, and lenticular-bedded sandstones were identified at many of the locations.
- Bimodal distribution of current indicators (NW/SE)
- Sedimentary structures are suggestive of a tidally-influenced environment.



Model showing the architecture of tidal compound dunes developed in the macro-intertidal environment (from Choi and Jo, 2015)

Tidal bundles (point bars) with carbonaceous/organic drapes

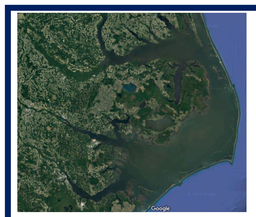
Coarsening upwards from wavy to lenticular bedding

Longitudinal wave ripples

Bidirectional Cross Bedding

Large concretions with flaser bedding

Interference ripples



4. Conclusions

- Upper Woodbine in the DFW area was predominantly deposited within a tidally-influenced estuary with shoreface barrier islands, inlets, and tidal flats.
- The transgression that preceded deposition of the Eagle Ford produced the oyster lag deposit and the overlying mud-dominated, gradually-deepening, offshore marine facies.

5. Abstract

Although there have been a number of previous studies of the Woodbine outcrops in and around the DFW Metroplex, most were conducted before the value of using ichnofacies for interpreting depositional environments was fully realized. In this study of upper Woodbine outcrops from Mansfield to Lake Grapevine, and the near-surface USGS GC-2 core, the ichnofacies, body fossils, and sedimentary structures found in the rocks are indicative a strong tidal influence. Our interpretation is that the upper Woodbine in this region was deposited within a tidally-influenced estuary with tidal flats, inlets, and shoreface barrier islands, which differs from previous interpretations of a fluvial-dominated delta plain or a shelf-strandplain setting.

In outcrop, the sandstones of the upper Woodbine are typically fine- to very fine-grained quartz arenites that are trough cross-bedded, or contain superimposed ripples or bidirectional cross-bedding. Mud-rich sandstones range from flaser, wavy, to lenticular-bedded. Most sandstones have indications of at least some bioturbation. The most common ichnofossils in the upper Woodbine are those associated with the *Skolithos* and *Cruziana* ichnofacies, which are usually found in high-energy, intertidal to offshore marine environments. Traces identified from these assemblages include *Skolithos, Rosselia, Thalassinoides, Arenicolites*, and more rarely *Rusophycus*. Trace fossils representative of the *Psilonichnus* ichnofacies, including *Psilonichnus* within crab sand-ball deposits, dinosaur tracks, and rhizoliths (root traces), are generally restricted to deposits found in the vicinity of Lake Grapevine. The *Psilonichnus* ichnofacies is indicative of sandy backshore, dunes, or supratidal flat environments.

Carbonized, bored wood fragments are common at some locations, as are oysters (*Ostrea soleniscus* and *Exogyra columbella*) and other bivalves. Gastropods, mostly turritellids, and ammonite were seen at only a few locations. The uppermost Woodbine contains a predominantly agglutinated benthic foraminiferal fauna, but specimens of planktic foraminifera and calcareous nannofossils were also identified. Vertebrate fossils, although well-publicized, are restricted to only a few locations, and include dinosaurs, archosaurs (crocodiles), turtles, and shark teeth.