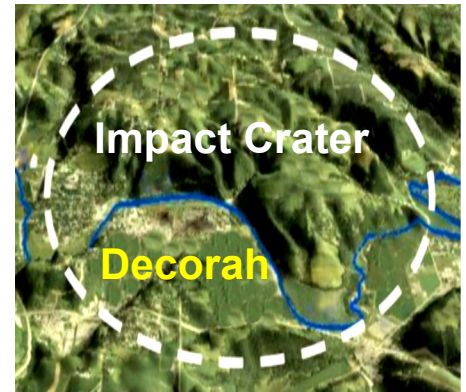




## Two Amazing Discoveries: The Decorah Impact Crater and The Giant Sea Scorpion

### The impact crater and its unique fossils

Nearly half a billion years ago, long before the dinosaurs, a meteorite the size of two football fields crashed into a shallow sea in the area that is now Decorah. The crater left by that impact was about three and a half miles wide and over 600 feet deep, creating a deep basin in the shallow sea. Over millions of years that basin collected the remains of unique sea creatures gently embedded in the soft mud that settled in the crater. Over many more millions of years that mud was compressed to form shale. This impact crater with its fossil-rich shale lay hidden beneath our feet until less than 20 years ago.



Only about 190 impact craters are known to exist on earth.

### The discovery of the crater and its fossils



Jean Young (1933-2007) was a long-time resident of Decorah noted as a local artist and one of the original founders of the Oneota Community Coop. She was also an independent geologist who worked with Luther College students and the Iowa Geological Survey to analyze well-drilling cores as a way of mapping the local geology. In 2004-2005 as part of a team including Robert McKay and H. Paul Liu from the Iowa Geological Survey, she helped discover Decorah's impact crater with its ancient layer of shale (called The Winneshiek Shale). Although the shale covers most of the impact crater, it is deep underground and only near the surface in one small outcropping beneath the Upper Iowa River near Decorah.

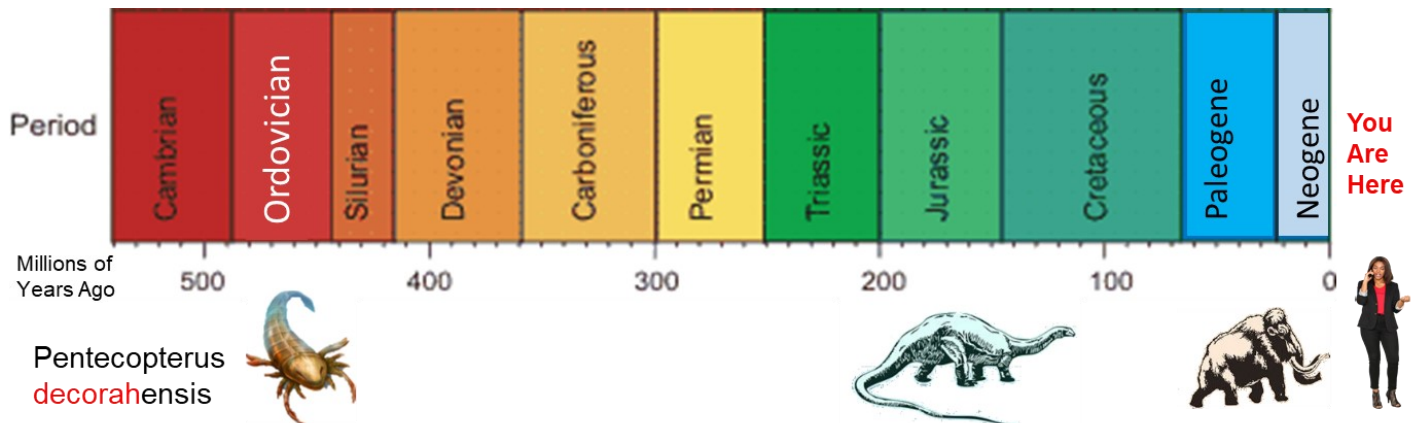
### The fossils are a scientific treasure trove

H. Paul Liu recognized the extraordinary state of preservation of the shale fossils and collaborated with a team from the University of Iowa and Yale University to document the initial findings. In 2010 the team secured a grant to construct a temporary dam to expose the shale in the riverbed. They were able to extract large samples of the shale which have been analyzed for several years to reveal thousands of exceptionally well-preserved fossils. Many of the fossils reveal sea creatures previously unknown to science, including the giant sea scorpion pictured at the top of the page.



## A unique window into the early history of life on earth

The sea creatures fossilized in the Winneshiek Shale were from the Ordovician period which started around 485 million years ago. This period was characterized by a dramatic increase in the diversity of sea life. The unusual conditions in the impact crater allowed for the fossilization of soft-bodied animals - a very rare occurrence. This adds to the scientific importance of these finds and helps account for the discovery of so many new species in the Winneshiek Shale, one of which was named *Winneshiekia youngae* to honor Jean Young, the Decorah woman whose curiosity and persistence was at the heart of these important scientific discoveries.



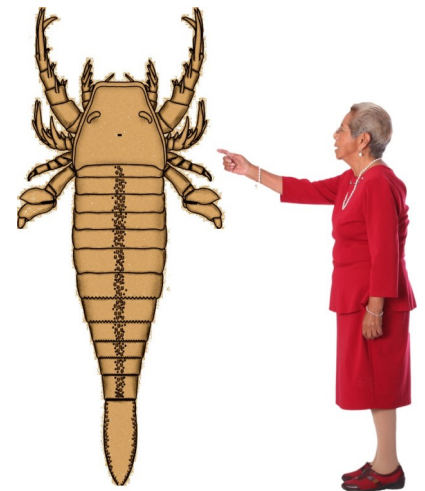
The most remarkable of these newly-discovered species was the seven-foot-long sea scorpion given the name *Pentecopterus decorahensis*. This discovery made news around the world when announced in 2015.

## The ancient sea scorpion

The term 'sea scorpion' is an informal name for a type of arthropod called a eurypterid (yew-RIP-ter-id). Like other arthropods (insects, shrimp, lobsters etc.), eurypterids had a segmented body and jointed limbs with a flexible organic exoskeleton. While it looked like a scorpion, it lived in water and used its tail for navigating rather than stinging. It also had paddle-like rear legs adapted for swimming.

The eurypterid found in Decorah, *Pentecopterus decorahensis*, is the oldest known and one of the largest. At about 7 feet long it was most likely an apex predator at the top of the food chain.

The illustration at the right gives a rough idea of the size of *Pentecopterus decorahensis* compared with a person.



## For more information



Article from BMC Evolutionary Biology Journal:

*The oldest described eurypterid: a giant Middle Ordovician (Darriwilian) megalograptid from the Winneshiek Lagerstätte of Iowa*

<https://bmcecolvol.biomedcentral.com/articles/10.1186/s12862-015-0443-9>