Researchers uncover world's oldest fossil impression of a flying insect

October 14 2008

While paleontologists may scour remote, exotic places in search of prehistoric specimens, Tufts researchers have found what they believe to be the world's oldest whole-body fossil impression of a flying insect in a wooded field behind a strip mall in North Attleboro, Mass.

During a recent exploration as part of his senior project, Richard J. Knecht, a Tufts geology major, and Jake Benner, a paleontologist and senior lecturer in the Geology Department, set out to hunt for fossils at a location they learned of while reading a master's thesis that had been written in 1929. With chisels and hammers, the team reached the shale and sandstone outcropping described in the paper. There they delicately picked away pieces of rock before reaching a section that yielded fossils. Just below the surface, they uncovered a fossilized impression of a flying insect.

Not just any fossil

It was not just any fossil. Knecht says it is the world's oldest known full-body impression of a primitive flying insect, a 300 million-year-old specimen from the Carboniferous Period. It is a rare find in the specialized world of ichnology, which is the study of fossilized animal tracks, impressions and trails to investigate behavior. Knecht says a preserved full-body impression of a flying insect from this or any previous period has never been discovered.

The fossil, Benner says, "captures a moment in time over 300 million years ago when a flying insect just happened to land on a damp, muddy surface leaving almost a perfect impression of its body behind."

Knecht and Benner presented the fossil at the Second International Congress on Ichnology, in Krakow, Poland last month. The pair will present other trace fossils from the site, including tracks of amphibians and precursors to reptiles, at the Annual Meeting of the Geological Society of America meeting in Houston later this month.

Paleontologists use fossilized remains of insect bodies to study anatomy and develop hypotheses about evolutionary processes. Typically the only evidence available for this type of work is remains of insect wings. Bodies of primitive flying insects are rarely preserved and therefore little is known about them. The North Attleboro fossil will provide researchers with evidence of how it moved once it landed on a surface, as well as its stance, position of its legs and details about its abdomen and thorax.

The impression is about three inches long and is imprinted on the flat side of a rock. The impression does not contain direct evidence of the insect having wings but Knecht and Benner say evidence suggests that it was a winged insect. According to Benner, the insect's anatomy and body plan are consistent with those of primitive flying insects. He also points out that "there are no walking tracks leading up to the body impression, indicating that it came from above."

Michael S. Engel, a leading entomologist at the University of Kansas, is working with Knecht and Benner to study the insect. He says that a preliminary inspection of the anatomy indicates that it may be related to the common mayfly. "We can tell from the imprint that it has a very squat position when it lands," Engel says. "Its legs are sprawled and its belly is pressed down. The only group that does that today is the

mayfly."

Identifying the insect will also help the researchers to gain knowledge about the ecosystem of that period and what type of animals lived in it. The specimen may also advance understanding of insect flight and evolution from smaller, non-flying scurrying animals.

"Once we pin down what type of insect it is we can begin to think about the conditions, the climate and life that must have existed in the environment to support its life," says Knecht. "One focus is the insect itself. Another is the broader big picture of the world it lived in."

A moment 300 million years ago

The insect lived in the Pennsylvanian Era - the second half of the Carboniferous Period - and dates back to about 310 million years. Nearby sites of similar age exist in the Canadian Maritimes, Pennsylvania and the southeastern United States. There are no other active explorations of Pennsylvanian rock formation in New England.

The paper was published a year later in the *Geological Society of America Bulletin.*

Source: Tufts University

Citation: Researchers uncover world's oldest fossil impression of a flying insect (2008, October 14) retrieved 14 May 2024 from https://phys.org/news/2008-10-uncover-world-oldest-fossil-insect.html

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