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Asteroid impact in vivid detail

An impaled turtle is among the latest finds from a geological site claimed to document the day a space rock slammed into Earth 66 million years ago, reports **Bas den Hond**

THE Chicxulub asteroid that jolted our planet 66 million years ago is widely thought to be responsible for wiping out the dinosaurs and many other species. Now, we might be seeing its effects on individual animals too.

A remarkable but controversial geological site seems to show how the asteroid caused the death of a turtle – which became impaled by a branch as the wave of destruction from the impact swept across the planet.

What's more, the evidence suggests that this happened during the northern hemisphere's spring or summer.

The findings come from excavations at the Tanis site – in the Hell Creek Formation of North Dakota – and were presented last week by Robert DePalma and Riley Wehr at the annual meeting of the Geological Society of America in Portland, Oregon.

As DePalma told it, the turtle that his team found led a charmed life before its untimely end. There is evidence of bite marks on its shell, probably made by some species of crocodile that tried and failed to catch it. It had dodged predators and other dangers for five years – its estimated age at death – before the asteroid hit.

"First, it would have experienced an odd seismic jolt, some minutes after the impact," DePalma told the conference. "And then it would have seen tiny, red-hot glass beads [in the sky] as the ejecta would have started to come in from the Chicxulub site. Then, the surge rushed up, about 10.5 metres in depth. At that point, he or she got impaled by a branch. So it was a very bad day for the turtle."

The manner of the turtle's death confirms that the Tanis site preserves evidence of a violent natural disaster, said DePalma,

ROBERT DEPALMA



Fossil fish and other organisms that died at the Tanis site 66 million years ago

who is studying for a PhD at the University of Manchester, UK.

In 2019, he and his colleagues published the first description of the Tanis site, arguing that it gives a snapshot of life on a river on the day of the impact. Back then, Tanis was an elevated region of sediment in the bend of a river near the coast of the Western Interior Seaway – a large inland sea that almost bisected what is now the US. The seismic reverberations of the impact, which occurred at a site in the south of the Gulf of Mexico, caused huge waves in the sea. These ran upriver, burying many creatures under mud.

To support this claim, the 2019 publication reported fossils of fish



preserved in the Tanis mud with glassy spherules from the impact lodged in their gills. Now, the analysis of growth patterns in the bones of those fish leads DePalma and his colleagues to conclude that the asteroid hit during the period when fish grow fastest: spring and summer.

This, together with other indicators, such as fossils of mayflies and traces of insect larvae activity on leaves preserved at the site, led DePalma and his colleagues to conclude that the impact time was between late spring and the end of summer. This means it coincided with late autumn or winter for the southern hemisphere, which is important, DePalma told *New Scientist*.

"Ecologies are going to experience global scale or major hazards differently depending on the time of year," he says.

Knowing the season of a global impact makes it possible to investigate and explain differences between sites.

For any of this to be convincing, other geologists must accept that the Tanis site does indeed preserve

"First, the turtle would have felt a seismic jolt, then it would have seen red-hot glass beads in the sky"

evidence of impact day. Thomas Tobin at the University of Alabama wasn't 100 per cent convinced in 2019, and he says he is reserving judgement on the new findings until they appear in a peer-reviewed scientific journal. "They haven't published anything new yet, so I haven't seen anything that changes my previous opinion," he says. "I would certainly re-evaluate my views if and when further publications are available."

Even if DePalma is right about the Tanis site, not everyone will agree that it clinches the argument about the extinction of all dinosaurs apart from their descendants, modern birds.

Fabien Condamine at the Montpellier Institute of Evolutionary Sciences in France recently described a decline in dinosaur diversity starting 10 million years before the asteroid impact. "Certainly, there were places where dinosaurs were in a 'good ecological status', like in Hell Creek," he says, but in most places they weren't faring so well.

DePalma thinks that the Tanis site shows that the fossils found so far worldwide aren't telling the whole story. He says it is only by gathering new data at sites like Tanis that we will really understand the nature of the dinosaur extinction. "This is a job for scientific investigation and not for looking at old data," he says. ■