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Old leaves reveal a bug's life

By Jim Erickson, News Science Writer

When a 6-mile-wide asteroid slammed the Earth 65 million years ago, it wiped out the dinosaurs, about 80 percent of the world's plant species, and all animals bigger than a cat.

But what happened to the bugs?

It's been tough for scientists to determine how the insects fared because they rarely leave behind fossils.

But a Denver paleontologist and his Smithsonian Institution colleagues found a way around the problem: By studying insect damage etched into thousands of fossil leaves, they determined that many plant-eating bugs perished in the big impact.

"These little insects are leaving their calling cards on the fossil leaves, and we have an excellent fossil record of leaves," said Kirk Johnson, curator of paleontology at the Denver Museum of Nature & Science.

"So by looking at the insect damage on the leaves before and after the dinosaur extinctions, we can make a pretty good educated guess of what happened to the insects."

Johnson and his collaborators estimate that 55 to 60 percent of plant-eating insects were exterminated. Their findings are reported in this week's *Proceedings of the National Academy of Sciences*.

Over the past 20 years, Johnson has collected 13,441 plant fossils from quarries in southwestern North Dakota.

When the asteroid hit Mexico's Yucatan Peninsula, it threw up clouds of dust that traveled around the globe. Johnson pulled the fossils from rock layers directly above and below those sediments.

At the time, southwestern North Dakota was a warm, forested plain with lots of broad-leafed trees.



Maria Avila © News

Denver paleontologist Kirk Johnson points out insect damage on 66-million-year-old leaf fossils. Johnson used the fossils to determine what happened to bugs when a 6-mile wide asteroid slammed the Earth 65 million years ago, destroying most living species.

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Some leaves, now stored at the Denver museum and at Yale University, are up to a foot long. Individual leaf veins are visible, as are the diagnostic chomp marks, tunnels and holes left by prehistoric beetles, grasshoppers, butterflies and moths.

Some insects rely on a single species of plant for sustenance; others are generalists that feed on several plant types.

By analyzing insect-damaged leaves before and after the impact, the researchers determined that the generalists survived, while 70 percent of the specialists did not.

Smithsonian Institution entomologist Conrad C. Labandeira, lead author of the research paper, studied the leaves at the Denver museum. The third author is Peter Wilf of the Smithsonian Institution and the University of Michigan.

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