# Did dinosaurs have lice? Researchers say it's possible

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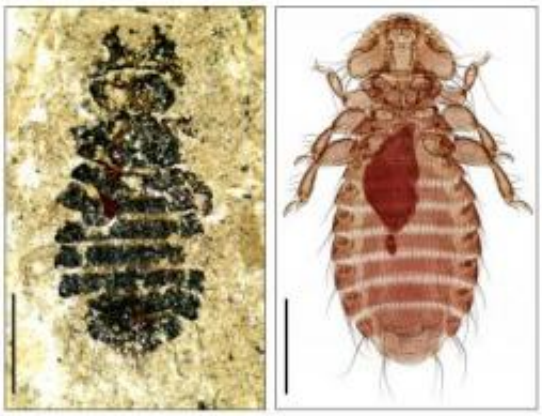

This 44-million-year-old louse fossil (left), discovered by co-author Vincent Smith and described in a paper in Biology Letters in 2004, helped the researchers anchor the lineages of lice that today parasitize aquatic birds (right). Credit: Vincent S. Smith

A new study louses up a popular theory of animal evolution and opens up the possibility that dinosaurs were early – perhaps even the first – animal hosts of lice.

The study, in *Biology Letters*, uses fossils and molecular data to track the evolution of lice and their hosts. It offers strong evidence, the researchers said, that the ancestors of lice that today feed on birds and mammals began to diversify before a mass extinction event killed off the dinosaurs about 65 million years ago.

"This study lends support to the idea that major groups of birds and mammals were around before the dinosaurs went extinct," said Kevin Johnson, an ornithologist with the State Natural History Survey at the University of Illinois and a principal investigator on the study. "If the lice were around, we know their hosts were probably around."

Scientists still are trying to understand the factors that led to the diversity of today's birds and mammals. One theory is that the extinction of the dinosaurs fostered the earliest stages of bird and mammal diversification and expansion (a process called "radiation") by opening vast new territories and types of habitats to them.

"Ducks do different things from owls, which do different things from parrots, for example," Johnson said, "and it was thought that after the dinosaurs went extinct that's when these birds or mammals diversified into these different niches."

"But based on the evidence from lice, the radiation of birds and mammals was already under way before the dinosaurs went extinct," he said.

Lice have developed unique methods for evading a host's defenses. Wing lice, for example, have elongated bodies that allow them to insert themselves between the barbs in a feather and thus evade preening. Gopher lice have grooves in the tops of their heads that clasp onto a single shaft of hair. This specialization makes it hard for lice to shift to other hosts. As a result, their evolutionary history coincides very closely with that of their hosts.

Johnson and his colleagues, including co-principal investigator Vincent Smith (a former postdoctoral researcher in Johnson's lab who now is at the Natural History Museum in London) built a partial family tree of lice by comparing the DNA sequences of genes from 69 present-day louse

lineages. Changes in gene sequence are a reliable measure of relatedness among different species in the same group (organisms in the same order, family or genus, for example). And because these changes accumulate over time, they also can be used to create a rough timeline of the evolution of related groups of organisms.

"Lice are like living fossils," Smith said. "The record of our past is written in these parasites, and by reconstructing their evolutionary history we can use lice as markers to investigate the evolutionary history of their hosts."

The researchers used louse, bird and mammal fossils to anchor precise time points in the tree. These fossils are dated according to the age of the geologic formations in which they were found. This gives only a minimum age for the animal found embedded there, Johnson said.

"If the oldest dove fossil is 20 million years old, we know that doves must have been around at that time," Johnson said, "so we know that the split that occurred between doves and the closest relative of doves must have occurred before 20 million years ago."

The oldest fossils found so far that resemble modern bird and mammal groups are less than 65 million years old, Johnson said. This led to the hypothesis that major bird and mammal lineages appeared only after the dinosaurs went extinct.

But more recent studies of the genetic changes in major groups of birds and mammals suggest that many of them were around before the dinosaurs disappeared.

The new study supports this idea, Johnson said.

"Our analysis suggests that both bird and mammal lice began to diversify

before the mass extinction of dinosaurs," Johnson said. "And given how widespread lice are on birds, in particular, and also to some extent on mammals, they probably existed on a wide variety of hosts in the past, possibly including dinosaurs."

Many scientists believe that birds are the descendants of feathered dinosaurs, Jonson said. "So maybe birds just inherited their lice from dinosaurs."

**More information:** "Multiple Lineages of Lice Pass Through the K-Pg Boundary," *Biology Letters*.

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