Insect attack may have been death knell for dinosaurs

by David Stauth

CORVALLIS, Ore. â€“ Asteroid impacts or massive volcanic flows might have occurred around the time dinosaurs became extinct, but a new book argues that the mightiest creatures the world has ever known may have been brought down by a tiny, much less dramatic force â€“ biting, disease-carrying insects.

Tick found in Burmese amber. (Photo Courtesy OSU)

An important contributor to the demise of the dinosaurs, experts say, could have been the rise and evolution of insects, especially the slow-but-overwhelming threat posed by new disease carriers. And the evidence for this emerging threat has been captured in almost lifelike-detail â€“ many types of insects preserved in amber that date to the time when dinosaurs disappeared.

â€œThere are serious problems with the sudden impact theories of dinosaur extinction, not the least of which is that dinosaurs declined and disappeared over a period of hundreds of thousands, or even millions of years,â€• said George Poinar Jr., a courtesy professor of zoology at Oregon State University. â€œThat time frame is just not consistent with the effects of an asteroid impact. But competition with insects, emerging new diseases and the spread of flowering plants over very long periods of time is perfectly compatible with everything we know about dinosaur extinction.â€•

This concept is outlined in detail in â€œWhat Bugged the Dinosaurs? Insects, Disease and Death in the Cretaceous,â€• a book by George and Roberta Poinar, just published by Princeton University Press.

In it, the authors argue that insects provide a plausible and effective explanation for the slow, inexorable decline and eventual extinction of dinosaurs over many thousands of years. This period is known as the famous â€œK-T Boundary,â€• or the line between the Cretaceous and Tertiary Period about 65 million years ago. There is evidence that some catastrophic events, such as a major asteroid or lava flows, also occurred at this time â€“ but these provide no complete explanation for the gradual decline of dinosaur populations, and even how some dinosaurs survived for thousands of years after the K-T Boundary.

Insects and disease, on the other hand, may have been a lot slower, but ultimately finished the job.

â€œWe donâ€™t suggest that the appearance of biting insects and the spread of disease are the only things that relate to dinosaur extinction,â€• Poinar said. â€œOther geologic and catastrophic events certainly played a role. But by themselves, such events do not explain a process that in reality took a very, very long time, perhaps millions of years. Insects and diseases do provide that explanation.â€•

Poinar and his wife, Roberta, have spent much of their careers studying the plant and animal life forms found

preserved in amber, using them to re-create the biological ecosystems that were in place millions of years ago. They are also authors of â€œThe Amber Forest: A Reconstruction of a Vanished World.â€•

As a semi-precious gem that first begins to form as sap oozing from a tree, amber has the unique ability to trap very small animals or other materials and â€“ as a natural embalming agent â€“ display them in nearly perfect, three-dimensional form millions of years later. This phenomenon has been invaluable in scientific and ecological research, and among other things, formed the scientific premise for the movie Jurassic Park, for the "dinosaur DNA" found in mosquitoes.

â€œDuring the late Cretaceous Period, the associations between insects, microbes and disease transmission were just emerging,â€• Poinar said. â€œWe found in the gut of one biting insect, preserved in amber from that era, the pathogen that causes leishmania â€“ a serious disease still today, one that can infect both reptiles and humans. In another biting insect, we discovered organisms that cause malaria, a type that infects birds and lizards today.

â€œIn dinosaur feces, we found nematodes, trematodes and even protozoa that could have caused dysentery and other abdominal disturbances. The infective stages of these intestinal parasites are carried by filth-visiting insects.â€•

In the Late Cretaceous, Poinar said, the world was covered with warm-temperate to tropical areas that swarmed with blood-sucking insects carrying leishmania, malaria, intestinal parasites, arboviruses and other pathogens, and caused repeated epidemics that slowly-but-surely wore down dinosaur populations. Ticks, mites, lice and biting flies would have tormented and weakened them.

â€œSmaller and separated populations of dinosaurs could have been repeatedly wiped out, just like when bird malaria was introduced into Hawaii, it killed off many of the honeycreepers,â€• Poinar said. â€œAfter many millions of years of evolution, mammals, birds and reptiles have evolved some resistance to these diseases. But back in the Cretaceous, these diseases were new and invasive, and vertebrates had little or no natural or acquired immunity to them. Massive outbreaks causing death and localized extinctions would have occurred.â€•

In similar fashion, the researchers suggest, insects would have played a major role in changing the nature of plant life on Earth â€“ the fundamental basis for all dinosaur life, whether herbivore, omnivore or carnivore. As the dinosaurs were declining, their traditional food items such as seed ferns, cycads, gingkoes and other gymnosperms were largely being displaced by flowering plants, which insects helped spread by their pollination activities. These plants would have spread to dominate the landscape. Also, insects could have spread plant diseases that destroyed large tracts of vegetation, and the insects could have been major competitors for the available plant food supply.

â€œInsects have exerted a tremendous impact on the entire ecology of the Earth, certainly shaping the evolution and causing the extinction of terrestrial organisms,â€• the authors wrote in their book. â€œThe largest of the land animals, the dinosaurs, would have been locked in a life-or-death struggle with them for survival.â€•

The confluence of new insect-spread diseases, loss of traditional food sources, and competition for plants by insect pests could all have provided a lingering, debilitating condition that dinosaurs were ultimately unable to overcome, the researchers say. And these concerns â€“ which might have pressured the dinosaurs for thousands of years â€“ may have finished the job, along with the changing environment, meteor impacts and massive lava flows.

â€œWe canâ€™t say for certain that insects are the smoking gun, but we believe they were an extremely significant force in the decline of the dinosaurs,â€• Poinar said. â€œOur research with amber shows that there were evolving, disease-carrying vectors in the Cretaceous, and that at least some of the pathogens they carried infected reptiles. This clearly fills in some gaps regarding dinosaur extinctions.â€•

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