

3-D Scans of Fossil Beaks Show How Modern Birds Came to Be

The early seabird had the sharp teeth of its dinosaur relatives but a bird-like body



Fossil reconstruction and illustration of *Ichthyornis dispar*. (Michael Hanson/Yale University)

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In the 1870s, scientists found the first *Ichthyornis dispar* fossil—and they were thoroughly confused.

The toothed, seabird-like animal lived during the Cretaceous between 100 and 66 million years ago. And as Gretchen Vogel for *Science*, paleontologists initially thought the fossil was an amalgamation of two animals: a small bird's body with a marine reptile's jaw.

Even when they realized it was indeed one animal, another thing confused the scientists: The original fossil was missing an upper jaw. This led to the assumption that early birds had a fixed upper jaw.

Now, a team of scientists from the U.K. and U.S. are finally teasing through the confusing details of *Ichthyornis dispar*. The researchers have 3-D scanned four fossils of the bird to develop a much clearer picture of the confusing critter. And as *The Guardian*'s Nicola Davis writes, the study is helping researchers better understand how toothy dinos evolved into modern beaked birds.

The research “represents a pivotal moment in the transition from dinosaurs to modern-day birds,” according to a [press release](#), and among other findings, shows that *I. dispar* actually had movable upper jaws.

As John Pickrell reports for *National Geographic*, the latest study can be traced back to 2014 when Fort Hays State University undergraduate student Kristopher Super found a limestone-embedded fossil of *I. dispar* in Kansas. His colleagues soon realized the surprisingly complete remains were something special.

The team shared the find with Bhart-Anjan Bhullar of Yale University. And rather than removing the fossil from the limestone, Bhullar and his colleagues used computerized tomography to scan it.

Along with the newly found fossil, they also found and scanned three other fossils previously kept in museum collections—none of which had been identified as *I. dispar*. They also went back to look at the original fossil found in the 1870s. Now held at Yale's Peabody Museum of Natural History, that fossil contained two key bones from the jaw that were missing in the newer scans.

As Pickrell reports, out of nearly a hundred specimens of *Ichthyornis* previously found, most of these fossils were compressed almost flat, so researchers could only guess the shape of the head. But the latest study, published in the journal *Nature*, offers an unprecedented look at this ancient bird. Combined, the scans created a complete model of a skull of *I. dispar*, marking the first time that scientists have assembled a complete view of a skull.

“Right under our noses this whole time was an amazing, transitional bird,” Bhullar, principal investigator of the study, says in a statement. “It has a modern-looking brain along with a remarkably dinosaurian jaw muscle configuration.”

What did the toothed ancient bird's head look like? Sharp, curved teeth, filled its large jaws like its dino relatives. Only at the very tip of the snout does the beak become recognizable, covered in a hard layer of keratin similar to modern birds. And like modern birds, it could move its top and bottom jaws independently.

“It was flying around eating probably fish, shellfish and other things, plucking them out of the water with its abbreviated little pincer-tip beak and then tossing them back into its mouth and crunching down on them with its powerful dinosaur-like jaws,” Bhullar tells Davis.

As Vogel writes, the new research suggests that beaks appeared earlier than previously thought, probably around the same time as wings.

Stephen Brusatte, a paleontologist at the University of Edinburgh, tells Davis the latest find is an important contribution to the understanding of birds' evolution.

“It shows us the face of the earliest birds. And it's a bit different than I would have expected,” says Brusatte, who was not involved in the study. “The earliest birds had Frankenstein creature heads and it was only through a long and gradual period of evolution that the fully modern bird skull—beak, no teeth, huge brain, tiny jaw muscles—evolved.”

About Julissa Treviño

Julissa Treviño is a writer and journalist based in Texas. She has written for *Columbia Journalism Review*, *BBC Future*, *The Dallas Morning News*, *Racked*, *CityLab* and *Pacific Standard*.