

Fossils explained V—Vertebrates

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Overview

The evolution of vertebrates—animals with backbones—treads a familiar course that has been described in most books since the discovery of their fossil remains in abundance in the early part of the nineteenth century: fishes to amphibians, amphibians to reptiles, reptiles to mammals. The earliest fishes are known from rocks as far back as the Cambrian. Fishes represent one of the most important of all fossil groups, and some of the best well-known fossils are fish—including the state fossil of Wyoming, *Knightia*, found in the Palaeogene fossil beds near Kemmerer, USA (Fig. 1), and sharks teeth of similar age (Fig. 2).

The discovery that one mysterious group of miniature teeth-like fossils (known to palaeontologists as conodonts), were actually the complex jaw apparatus of an early vertebrate came from discoveries made in the Carboniferous rocks of Scotland, and many other fossil fishes are known from the Devonian rocks of Caithness. Scotland has also seen the discovery, in spectacular preservation, of what is reputedly the earliest known reptile (*Westlothiana lizziae*) from Bathgate in the outskirts of Edinburgh, some 340 million years old.

Perhaps the most spectacular of all fossils, are the dinosaurs, organisms that rose to prominence in the Mesozoic, and whose fossils have been found across the globe, including the continent of Antarctica. The rise of the dinosaurs was first recorded in British rocks, the earliest examples being described from teeth and other bones in southern England: *Megalosaurus* (1822) and *Iguanodon* (1824). These early discoveries were later swept together into the Dinosauria, a name first announced by Richard Owen in 1841. From these early beginnings, later discoveries in America and elsewhere later in the nineteenth century would greatly add to our knowledge. Today, the rich discoveries in North and South America, and latterly in China, have greatly expanded our view of the diversity of life on Earth during this period. Replacing the dinosaurs after the great extinction event 65 million years ago, the remains of birds and mammals are found, their beginnings the micromammals of Jurassic rocks. The mammals and birds have produced spectacular fossils, found across the continental interiors of North and South America, for example, and the study of these allows us to consider the development of the terrestrial ecosystems, as well as plotting environmental change, with the Ice Age mammals being perhaps the largest evidence of this.

Details

This release gives details of just a few vertebrate groups, indicative in some way of the great diversity of fossils available.

Anaspids are Silurian–Devonian fishes that some consider relatives of the living lamprey. Unlike their contemporaries, they did not possess armour, or even scales.

Ichthyosaurs are contemporaries of the dinosaurs, marine reptiles such as ichthyosaurs and plesiosaurs have been found intact since the early nineteenth century in the Jurassic rocks of Whitby in northern England, and, famously, Lyme Regis, where fossil collector Mary Anning supplied the scientific community with many of its most spectacular fossils. Less spectacular examples of fragments of their skeletons are still commonly found fossils (Fig. 2). Like the dinosaurs, they went extinct at the end of the Cretaceous.

Theropod dinosaurs are perhaps the most celebrated of all fossils (Fig. 3), and include the giant carnivore species *Tyrannosaurus rex*. Appearing in the latter part of the Triassic, the theropods became extinct with the rest of the dinosaurs at the close of the Cretaceous. And while dinosaurs like *T. rex* were striding across the plains of North America, in the skies were the **pterosaurs**, equipped with huge wingspans and spectacular head crests.

The **sabre-toothed cats** are a diverse group, consisting of species from at least three separate felid subfamilies, as well as some marsupials thrown in for good order. A diverse and complex group to study, cats with elongate, sabre-like canines first appeared towards the end of the Cretaceous and lived on into the Ice age world.



Fig. 1. *Knightia*, the state fossil of Wyoming, and the commonest vertebrate fossil known, from the Eocene rocks near Kemmerer. (Image: P. Doyle).



Fig. 2. A diversity of sharks' teeth, often found in fossil assemblages from Palaeogene clays (Image: P. Doyle).



Fig. 3. Ichthyosaur vertebrae from the Jurassic of southern England (Image: P. Doyle).



Fig. 4. *Allosaurus*, a theropod 'star' in the American Museum of Natural History. (Image: P. Doyle).



Fig. 5. Sabre-toothed cat, *Smilodon*, in the American Museum of Natural History (Image: Wallace63/Wikimedia Commons).