



**Department of Earth Sciences
Paleontology**

The life and times of the Dinosaurs.

A short discussion about Ichthyosaurs and Iguanodons.

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ICHTHYOSAURS

The name *Ichthyosaurs* can be deduced from the two greek words *ichthys* which means fish and *sauros* which means lizard or reptiles. Because of this, Ichthyosaurs sometimes are called fish-lizards. These animals evolved in the early *Triassic* era, survived the *Jurassic* era to eventually die out during the late *Cretaceous* era. (See figure 1 below.)

These names implies that ichthyosaurs were not fishes, however they looked a lot like fishes. So, what separates them from fishes and what are they if not fishes?

Ichthyosaurs are so called *Tetrapods*, which means that they had limbs with distinct digits. Further on, the shoulder girdle is not connected with the skull in case of Ichthyosaurs unlike fishes. Ichthyosaurs changed shape during their existence. From lizard-shape to eventually tuna-shape. In between those two shapes it also had the shape of a more or less regular fish. (See figure 2 below.)

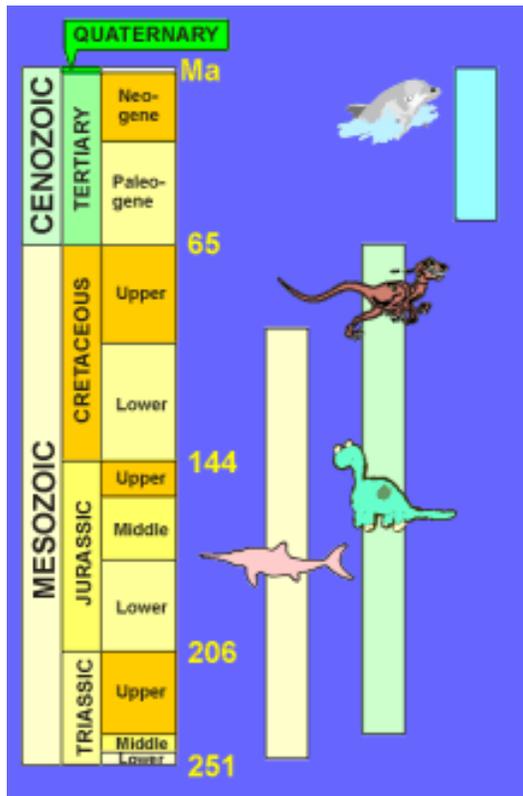


Fig. 1.
Time table showing in which eras Ichthyosaurs existed.

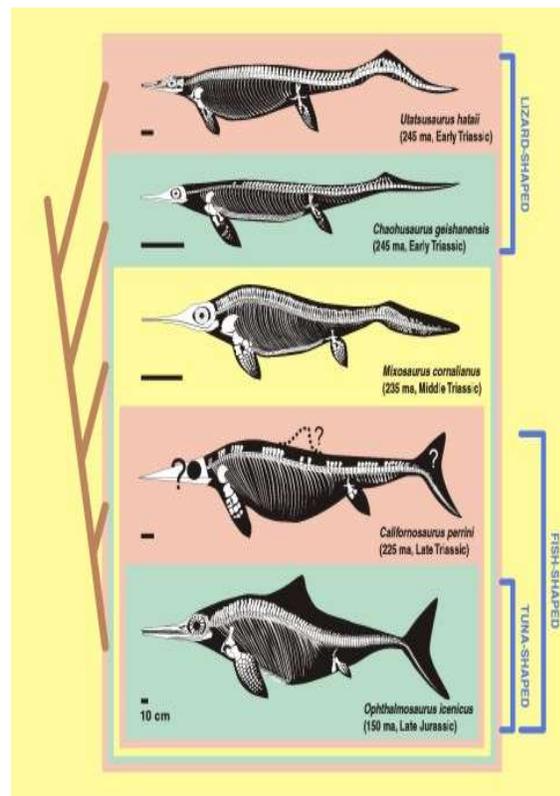


Fig. 2.
This figure shows the diversification of Ichthyosaurs during the time they existed.

These animals regularly had to approach the surface in order to breathe. They were so fully adapted to life in water that they could not crawl onto the land to lay eggs, but instead give birth to living youngsters, like mammals.

One thing which was however preserved all time was the enormous eyeball. This helped them hunting at night, since an eyeball of this size lets a lot of light in even in dark surroundings. This eyeball was held in place by a ring of bones called the *sclerotic ring*.

This Sclerotic ring probably helped keeping the eyeball's shape even when swimming. Due to the shape of Ichthyosaurs and the placing of their eyes, the front part of the eye was being pushed inwards when swimming, at the same time as the rear part of the eye was being pulled outwards. In this case the Sclerotic ring helped maintaining the shape of the eye.¹

Although it is not fully proved, these creatures did probably dive quite deep to collect their food. Why is that? There are some evidence that points in this direction. First of all, they had a very low f-number for their eyes. This means that they could see very good even in places with almost no light. Second, the bone structures covering their lungs is spongy in order to be lighter than on animals living on land. This also means that they could adopt their body when their lungs were flattened when diving in deep waters. Then the lighter bones made up for the lack of buoyancy from the lung. Third, they were squid eaters. Most squids lived in deep waters, which means that squid eaters would have to dive deep in to the sea to catch their food.²

We have not mentioned the size of Ichthyosaurs. This is pretty interesting, since it varied a lot depending on which Ichthyosaur you want to describe. One of the smallest one described is *Chaohusaurus geishanensis* (Early Triassic). It did not reach a length more than 70 cm. On the other hand there are quite large Ichthyosaurs described as well. Eg. *Shonisaurus popularis* and *Himalayasaurus tibetensis* (both Late Triassic) both probably reached the length of approximately 15 m. These big animals ofcourse needed quite a lot of food to survive. Most of them ate squids mixed with fish and other marine organisms. This can be told by studying fossils with more or less preserved stomachs.

So, why did an animal of this value die out? An animal which were around for quite some time, and also evolved in several steps.

Well, there is no exact answer to that question. However, there are ofcourse a number of possible reasons available. For example, the currents of the oceans may have played an important role in this case. Furthermore, the global temperature of the oceans may have caused the death of the marine lizards and dinosaurs.

1 <http://www.ucmp.berkeley.edu/people/motani/ichthyo/eyes.html>

2 <http://www.ucmp.berkeley.edu/people/motani/ichthyo/diving.html>

IGUANODON

This big herbivore (which lived back in the Cretaceous period, about 135 to 125 million years ago) was first brought to attention in 1825³ by Gideon Mantell, a doctor from Lewes, England, whose wife (Mary Mantell) found a few bones and teeth in Sussex, England. (It has after this been found in Germany, Spain, Belgium, China and possibly North America.)

Mantell first sent these find to a french anatomist named George Cuvier, who returned them saying that this belonged to an extinct rhinosaur and Dr. William Buckland, Professor of Geology at Oxford University who said that this was from a large fish. However, Mantell was not satisfied with this answer. He decided to examine it himself, and found similarities between his wives find and modern Iguanas (on a trip to London where he was shown a skeleton of a modern Iguana brought to England from India by Darwin), especially the teeth (see figure 3 below) (however, the teeth found by M. Mantell was much bigger). Therefore the name Iguanodon, which means Iguana Tooth.⁴



Figure 3. The tooth found by Mary Ann Mantell in 1822.

An interesting fact is that this was the second Dinosaur (after Megalosaurus) to be named and described.⁵

Iguanodon is the first known Dinosaur to be able to chew. It had a hinged upper jaw, that was able to flex from side to side. It did not have muscles to move its jaws from side to side (reptiles generally do not have these muscles, unlike mammals). But thanks to this hinged jaws it could move its upper teeth from side to side and hence crush whatever passed its teeth.⁶ This hinged jaw thus eliminated the need for grinding stones.

3 His paper announcing these discoveries was officially published in 1825 - "Notice on the Iguanodon, a newly discovered fossil reptile, from the sandstone of Tilgate Forest, in Sussex, " in: Philosophical Transactions of the Royal Society of London, vol. 115 (1825), pp.179-186 (<http://www.dinohunters.com/Iguanodon/discovery.htm>)

4 Kauri, H. Brehms, Djurens värld. Band 7. Grod- och kräldjur. p. 350.

5 Lambert, D. Naish, D. Wyse, E. Encyclopedia of Dinosaurs & Prehistoric Life. p. 180.

6 http://www.bbc.co.uk/dinosaurs/fact_files/sky/iguanodon.shtml

It was first thought that Iguanodon walked on two legs, since its front legs were so much shorter than its back legs. However, according to footprints found belonging to Iguanodon, they normally walked around on all four legs. What more could be said by looking at footprints from Iguanodon is that it normally walked in herds.



Fig. 3. Picture of Iguanodon. Notice the spike on its front leg.

Iguanodon copyright © DK, 2003

Something that has to be mentioned about Iguanodon is its thumb. It had a large spike attached to its thumb (see picture below). This spike was used as a weapon, mainly if Iguanodon was attacked by a predator.

This was not what was thought from the beginning. At first it was thought that the spike was attached to Iguanodon's nose. (Like the styracosaurus.) It was not until 1878 when 31 skeletons from Iguanodons were found in a deep ravine in Bernissart, Belgium where a man named Louis Dollo was able to figure out that this spike actually was placed on Iguanodon's thumb and not on its nose.

A funny fact is that these 31 skeletons were actually restored in a church since that was the only building that could carry out the skeleton from a large, bipedal creature.⁷ Iguanodon was approximately 5 meters high and 9 meters long and its weight was for about 4500 kg. Quite a large animal that is. However, all animals have their enemies. For Iguanodon it was amongst others:

In Asia:

Kagasaurus – a large theropod (bipedal meat-eater), from Japan, 135-100 mya.

Katsuyamasaurus – a large theropod, from Japan, 145-97.5 mya.

Kitadanisaurus – a small theropod, from Japan, 144-97.5 mya.

In Europe:

Wyleyia – a poorly-known theropod (perhaps) from England, 129-119 mya.

In North America:

No known large meat eaters from that time.

Africa, Australia and South America:

No finds of Iguanodon in those places.⁸

⁷ http://www.dinohunters.com/Iguanodon/bernissart_page.htm

⁸ <http://www.enchantedlearning.com/subjects/dinosaurs/mesozoic/cretaceous/ec.shtml>

Not so very many enemies as it looks. So, why did this rather successful animal die out? Well, perhaps there is a simple explanation for this. Iguanodon died out at the same time as Hadrosaurs (duck-billed dinosaurs) evolved. These animals were much more evolved dinosaurs at the same branch as Iguanodons. Eventually Iguanodons were conquered by Hadrosaurs in terms of food.⁹ Hadrosaurs were probably 2 legged, much faster than Iguanodon that is. They also had up to 960 teeth¹⁰ in their jaws, which made them more effective when it comes to eating plants.

So, as a conclusion we may say that eventually all these big animals were conquered by newer, more evolved creatures, often in the same branch. And as we know, all of these big animals eventually died out, by one or several reasons that are constantly being discussed. But that is a completely different discussion.

⁹<http://www.jmwebcenter.com/BellmawrPark/Iguanodon.html>

¹⁰<http://www.enchantedlearning.com/subjects/dinosaurs/glossary/Hadrosaur.shtml>

LITTERATURE:

Kauri, H. Brehms, Djurens värld. Band 7. Grod- och kräldjur.

DK - Encyclopedia of Dinosaurs & Prehistoric Life.

<http://www.ucmp.berkeley.edu/people/motani/ichthyo/>

Author: RYOSUKE MOTANI

<http://home.arcor.de/ktdykes/kt2.htm>

http://www.bbc.co.uk/dinosaurs/fact_files/sky/iguanodon.shtml

<http://www.dinohunters.com>

<http://www.jmwebcenter.com/BellmawrPark/Iguanodon.html>

<http://www.enchantedlearning.com/subjects/dinosaurs/glossary/Hadrosaur.shtml>