



PREHISTORIC BEASTS

COME FACE-TO-FACE WITH
AMAZING ANIMALS FROM THE PAST

Dr Dean Lomax • Illustrated by Mike Love

Discover
7 PREHISTORIC
ANIMALS with
POP-UP
pages

Have you ever wondered what a penguins great, great, great, great, GREAT grandparents looked like?

From tropical jungles and open oceans to polar lands, Earth is home to an amazing variety of animals. But did you know that lots of them have fascinating prehistoric secrets? By studying fossils from around the world, we can trace wild animals back to incredible beasts from the past.

ABOUT THE AUTHOR

Dr Dean Lomax

Palaeontologist (scientist who studies fossils)

Being a palaeontologist is one of the coolest jobs on the planet! Unearthing new fossils is one of the most exciting parts. Using special tools, rock is carefully chipped away to reveal the bones of prehistoric animals for the first time in millions of years. Some digs contain thousands of fossils and it may take tens of years to unearth them from their ancient rocky tombs.

When I'm not digging up fossils, I'm studying them. I piece together clues to work out which prehistoric animals are related to those alive today. From studies, we know that the only living dinosaurs today are birds! But many other modern animals, from the blue whale to the elephant, have equally fascinating ancient ancestors.

Some prehistoric animals are **ANCESTORS** of our favourite wild creatures. This means that if you traced a whales family tree back through enough generations, you'd eventually get to the oldest known whale.

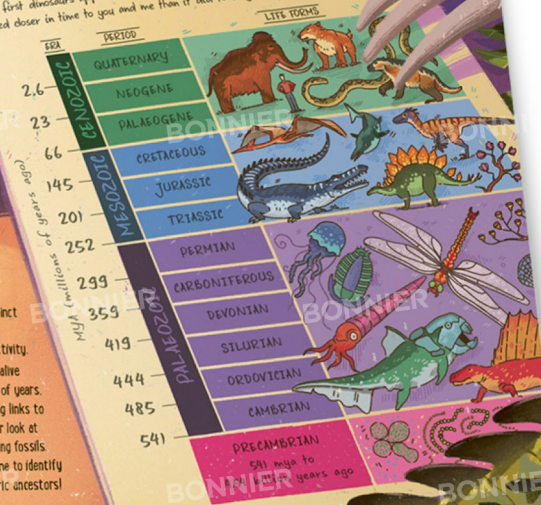
Other prehistoric animals are **RELATIVES**. This means that they are closely but not directly related. Like distant cousins, they share the same ancestor at one point far back in time.

Over time, living things may become extinct (die out). Today, animals are going extinct at a quicker rate than ever before because of human activity. All of the animals that are alive today evolved over millions of years, so losing them means losing links to the past. I've taken a closer look at seven wild animals and, using fossils, I've traced back through time to identify their remarkable prehistoric ancestors!

Let's meet them...

TIMELINE OF LIFE ON EARTH

Earth is around 4.54 billion years old! Its lifetime is split into segments called eras and periods, which show when different life forms lived. Not all prehistoric animals lived at the same time. In fact, some animals, such as the dragonfly relative *Meganura* (Carboniferous Period), were actually extinct and fossilised long before the first dinosaurs appeared in the Triassic Period. Even T. rex (Cretaceous Period) lived closer in time to you and me than it did to *Stegosaurus* (Jurassic Period)!



African Elephant

Meet Axel the African bush elephant. Not only do elephants have huge bodies, but they also have large ears, super-sized tusks and a long nose called a trunk. Axel is a mammoth belonging to the elephant family, called Elephantidae, whose earliest members appeared as much as 8 million years ago during the Miocene period.

AXEL'S TRUNK IS A VERY LONG ...
...and useful ... because it can ...
...be used to pick up food ...
...and use it to drink water ...
...and use it to scratch ...
...and use it to ...

DID YOU KNOW?

Some African elephants seek out salty rocks to eat in areas of the savanna that are not rich in salt.

And even on the African savanna, where it is extremely hot and dry for most of the year, it is easy for an elephant to find water. They can dig up their trunks to reach down to the water table.

Elephants can live up to 80 years old and can weigh as much as 7,000 kg. They are the largest land animals on the planet. They have thick skin and are very smart.

Mammuthus primigenius Unani mu-uh-uh-uh prim-i-jee-nee-uh-uh.

MAMMOTHUS

Axel's close cousin is the legendary woolly mammoth, *Mammuthus primigenius* (mam-mu-thus prim-i-jee-nee-uh). It was similar in body size to Axel but was covered fur! It lived across Europe, Asia and North America from at least 400,000 to just 4,000 years ago. The last woolly mammoth died almost 1,000 years after the ancient Egyptians had built the Great Pyramids of Giza!

FOSSIL FILE MIGHTY MAMMOTHS
The skeletons and remains of thousands of mammoths have been discovered. The first skeleton to be studied in detail, complete with skin and hair, was found frozen in ice in Siberia in 1799. Palaeontologists have identified two species of mammoth. The earliest lived in South Africa 52 million years ago. Some were larger than the woolly mammoth, whereas others about one metre tall.

250 centimetres



Axel's mammoth skull.

ICE BABY!

In 2002, a 42,000-year-old woolly mammoth calf was discovered in Siberia. Named Lyuba, it's the most complete mammoth ever found. The calf's organs, along with its last meal of the mother's milk, are preserved.



SHOVEL TUSK.

Platypus belongs to an unusual family of proto-mammals nicknamed 'shovel-tuskers'. They used the flat, shovel-shaped parts in their lower jaws to dig through soil.



DID YOU KNOW?

One of the greatest South sea discovered shows how gigantic Pleistocene mammoths (*Mammuthus columbi*) fighting with their tusks interlocked.



Mammuthus primigenius can be much older than that. The oldest known is 1.2 million years old. It was found in the state of Wyoming. It was found in the state of Wyoming. It was found in the state of Wyoming.

Great White Shark

This is Brody the great white shark. At up to 6 metres in length, this shark is the largest predatory fish. Found throughout the world's oceans, Brody is a top predator and skilled hunter, armed with a jaw full of triangular razor-sharp teeth. The earliest sharks evolved more than 400 million years ago during the Paleozoic Era.

Brody has a narrow mouth, such as seals and small whales. The jaw is held wide around 200 times a minute. It takes 40 days (1000 hours) to be moving around again. Brody has the best hearing that a creature has!

By using its powerful crescent-shaped mouth (held in from side-to-side), a great white shark can grab food through its gills to reach a top speed of 40 kilometres per hour - as fast as a 100-metre sprinter!

Great whites are dark on top and white underneath. This coloration is known as counter-shading and it is a form of camouflage that helps it to blend into its environment and prevent prey from spotting it.

DID YOU KNOW...

Sharks smell good! A shark can detect the equivalent of a teaspoon of blood in a swimming pool of seawater, but it takes many

MEGALODON

At up to 18 metres in length, more than three times longer than Brody, this is the mighty Megalodon. This supersized distant relative of the great white lived between 16 and 36 million years ago, ruling the world's oceans at the top of the food chain. The name Megalodon comes from its scientific name. *Otodus megalodon* (oh-toe-doh meg-ah-low-don).

Megalodon had a massive mouth - it could swallow a whale or a whale. It had the strongest bite of any animal ever known (stronger than a Tyrannosaurus Rex).

Like Brody, megalodon's mouth was made of up to 300 triangular teeth, each with serrated (sawy) pointed edges, perfect for slicing through flesh. Each row about six of teeth - so we say what's the same but also the difference?

FOSSIL FILE

BIG TOOTH

As Megalodon's skeleton was made of cartilage, are rarely found, but thousands of teeth have been found in places including Florida, US. Some of teeth from the same animal show that the fossil row contained 28 teeth in the upper jaw and 22 teeth in the lower jaw, and bite marks matching this teeth pattern have been discovered on whale bones.

CLOSE



Great white shark tooth

A DAY IN THE LIFE...

Megalodon travelled far and wide. Living in warm and temperate waters around the world. Due to its huge size, adults mostly lived offshore in the open ocean and probably hunted alone. Megalodon had no natural predators - except for another Megalodon and perhaps a giant toothed whale - and dined on large marine mammals, such as whales, as well as smaller prey including dolphins and turtles.

PTEROSAUR DINNER

A tooth from an 85-million-year-old shark called *Cretoxyphus* was found in the neck of a Pteranodon, a flying fish-eating reptile. *Cretoxyphus* may have swished it whilst the Pteranodon was diving underwater.

BUZZSAW SHARK

Heterodontus was an unusual shark-like fish that lived 275 million years ago. Rather than jaws filled with rows of teeth, it had a circular saw-like whorl of teeth. Old teeth were pushed into the centre of the spiral and replaced by new, larger teeth.

DID YOU KNOW...

Young Megalodon groups lived in shallower waters, called nursery grounds, where they were protected from larger predators.

Sloth

Meet moody Suzie the brown-throated sloth. She spends most of her day hanging around in treetops, sleeping the day away for up to 16 hours. Living in trees, Suzie gets most of her water from eating plenty of juicy leaves from multiple trees. Sloths belong to a group of mammals called xenarthrans, which appeared around 60 million years ago.

Suzie is incredibly slow so slow that falling leaf litter for slow-moving mammals. She survives by moving a special form of protein which helps to keep the protein out of sight from predators that fly all the way to the ground.

DID YOU KNOW...
The only four sloths descended from trees is to go up on the ground which they do about once a week.

Sloths form a kind with great eyes which gives them the long and narrow extra connection to her special protein-based hair in Central and South America. This is a beautiful adaptation called a xanthone. Animals such as moths and butterflies can see the fur and eat the skin.

Sloths are expert tree climbers that use their long hand-shaped claws and long upside-down feet to reach into branches and hang upside down from trees. The claws also serve as their way form of defence against attackers.

MEGATHERIUM

Suzie and her tree-living relatives are tiny compared with their colossal cousin, the giant ground sloth, Megatherium americanum (meg-ah-theer-ee-on ah-meh-ric-ah-nuhl). More than 1000 times heavier than Suzie, this elephant-sized sloth lived across several countries in southern South America from at least 100,000 to 10,000 years ago.

FOSSIL FILE SUPER-SIZED SLOTH
Paleontologists have identified several species of Megatherium in South America, including the mammoth that lived roughly 3 million years ago. Most of Megatherium americanum are mostly from the region of Argentina, but other remains are known from the south of Brazil. The first bones were found in 1821 by Charles Darwin discovered Megatherium fossils in Argentina in 1832, during his famous voyage around the HMS Beagle.

CLOSE



DIGGING DEEPER

Giant ground sloths dug burrows underground. Many of these burrow-like burrows have been found in South America. Some even have preserved claw marks which match the size and shape of giant sloth claws.

ARMOURD GIANTS

Car-sized armadillos called glyptodonts lived at the same time. They had a tough armour shell for protection. Dicotyles also had a spiky ribcage but that it used as a weapon.



Megatherium reached a size much larger than the sloth. It was a massive animal, a lot larger than the sloth. It was a lot larger than the sloth. It was a lot larger than the sloth.

It had massive arms with large hands fitted with strong curved claws. It used these for digging, pulling off the branches to eat and for protection.

A DAY IN THE LIFE...

Megatherium lived in grasslands and forested areas in a warm climate with little rain. It was a browser, doing a variety of plants including shrubs, leaves and fruits. Evidence suggests that ground sloths may have lived together in large groups. Despite its giant size, Megatherium had to watch out for dangerous hunters such as sabre-toothed cats and early humans.

DID YOU KNOW...
We can blame giant ground sloths for the mammoths. They were among the largest mammals capable of eating the whole forest and propogating out the seeds for the next world.



Megatherium could stand upright on its powerful back legs, standing tall. It's short but heavy. It's almost twice as heavy as a sloth. It's almost twice as heavy as a sloth. It's almost twice as heavy as a sloth.

Dragonfly

This is a dragonfly that spends most of its life as a nymph in the water. It has long legs and a long body. It can fly very fast and is a very good predator.

Having six legs, it can walk on land and in the water. It has a long body and a long tail. It can fly very fast and is a very good predator.

MEGANEURA

Its most ancient relatives are the extinct largest-known insects ever to have lived. *Meganeura monyi* (moyi) that lived between 305 and 299 million years ago in what is now Central France. Early insects like *Meganeura* evolved to evolve flight, long before birds, bats and mammals appeared.

With a wingspan of 50 centimetres, it is one of the largest insects ever to have lived. It has a long body and a long tail. It can fly very fast and is a very good predator.

Meganeura was a specialist that was able to quickly shift position and change direction. It had a wingspan of at least 70 centimetres, at least seven times the width of *Draco's* wingspan.

CLOSE

ON THE LIFE...

Meganeura lived in swamps and rivers in ancient tropical forests. Hovering across the water, it would have hunted large insects, fish and even small reptiles and amphibians. Its young (nymphs) also hunted, feasting on insects, small fish, and amphibians and their eggs. Higher oxygen levels may have allowed these insects to reach such sizes.

DID YOU KNOW?

Meganeura had six legs and a long body. It can fly very fast and is a very good predator. It has a long body and a long tail. It can fly very fast and is a very good predator.

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The size of the body had a long tail. It can fly very fast and is a very good predator.





Alligator
 High-Erie the
 predator that
 a reptile belongs
 grinned group
 whose earliest
 95 million years

DEINOSUCHUS

No crocodylian alive today is a match for Erie's ancient relative, the alligator-like *Deinosuchus* (die-no-soo'-suh-sus). Its gigantic size and bone-crunching bite made this creature a gator one of the most terrifying predators to ever live. It lived in various locations across North America between 82 and 75 million years ago when the continent was divided in two by an ancient inland sea.

Estimates of bite force suggest *Deinosuchus* had a bite five times more powerful than a saltwater crocodile. Clamping its immense jaws around its dinosaur dinner, its banana-sized teeth crunched bone and ripped flesh. There was no escape.

Deinosuchus skull

...have been found in 10 states and in Mexico. Hundreds of skull and partial skull fragments have identified...



A DAY IN THE LIFE...
Deinosuchus had a semi-aquatic lifestyle, spending time in marshes and rivers near the coast, as well as on land. Equipped with a fearsome bite, this croc was the top predator in its habitat, dining on large vertebrates like big fish, turtles and even dinosaurs! Like crocodiles today, it would have ambushed its prey.

DID YOU KNOW...
 ...early croc relatives like *Deinosuchus* lived 75-80 million years ago and walked upright on their back legs!

The osteoderms...
 ...on *Deinosuchus* were...
 Studies of...
 ...*Deinosuchus* suggest...

DID YOU KNOW...
 Some early croc relatives like *Corrupelex* lived 220 million years ago and walked upright on their back legs!

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER

BONNIER



Emperor Penguin

This is Waddle the emperor penguin. The largest penguin in the world, this bird might look clumsy when walking on land but is a super swimmer in the water of its Antarctic home. It is a member of the penguin group of seabirds, called Sphenisciformes, and the earliest known penguin fossil dates back 62 million years ago during the Paleocene Period.

As a member of the Sphenisciformes, the bones of an emperor penguin look like it belongs to a modern seabird, but it has a much longer neck and a larger head. Its beak is also much larger than that of a modern penguin. Its beak is also much larger than that of a modern penguin. Its beak is also much larger than that of a modern penguin.

ICADYPTES

Waddle would have had to look up to its prehistoric cousin, the long-beaked *Icadyptes* (ee-ah-dip-dees), which stood at 1.5 metres, *Icadyptes* is one of several supersized penguins and one of the largest ever found. It lived 36 million years ago in what is now Peru, South America.

The name *Icadyptes* comes from the Greek word for 'ice' and 'penguin'. It was found and named from the Greek word for 'ice'.

CLOSE

A DAY IN THE LIFE...

Icadyptes lived along coastlines in far warmer climates than the Antarctic. Like penguins today, it would have hunted in the water for prey, such as large fish and squid. Other extinct penguins are thought to have lived alongside *Icadyptes*, including the similarly sized *Idonypterus*.

DID YOU KNOW...

Emperor penguins, like *Sphenisciformes*, are one of the few birds that lay their eggs on the ground. The only other birds to do this are the kiwis.

A fossil of *Icadyptes* is one of the earliest penguin fossils ever found. It has feathers that are yellow and blue, showing that it was probably a warm water penguin.

DID YOU KNOW...

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