

MUTTABURRASAUROS

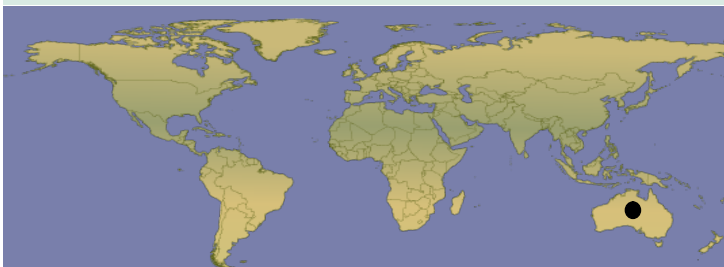
(mutt-a-BURR-a-SAWR-us) "Muttaborra Lizard"

CLASSIFICATION

Kingdom.....	Animalia
Phylum.....	Chordata
Class.....	Sauropsida
Superorder.....	Dinosauria
Order.....	Ornithischia
Suborder.....	Cerapoda
Infraorder.....	Ornithopoda
Family.....	Iguanodontidae
Genus.....	<i>Muttaborrasaurus</i>
Species.....	<i>langdoni</i>

FOSSIL LOCATION

Australia



SIZE

Length 7-7.5 m
(22.9-24.6 ft)

WEIGHT

1.7-2 tons
(3,747-4,409 lbs)

DIET

Herbivore

LIFESPAN

Approximately
30-35 years

TIME PERIOD

Muttaborrasaurus
Early Cretaceous
112-99.6 million years ago

INTRODUCTION

Muttaborrasaurus was a large herbivorous dinosaur living in Early Cretaceous Australia. The species is an early representative of a group of dinosaurs that dominated the northern hemisphere in the Late Cretaceous period.

In the Triassic period (roughly 251–201 million years ago), the continents of the earth were united in a single land mass known as **Pangaea**. Dinosaurs evolved during this period and spread across the world. In the Jurassic and Cretaceous, tectonic forces and changing ocean levels caused Pangaea to split into two supercontinents, Laurasia in the north and Gondwana in the south.

Muttaborrasaurus represented a group of dinosaurs that evolved from a common ancestor present in both the southern and northern hemispheres before the breakup of Pangaea. In the Cretaceous period, the descendants of this ancestor species thrived in the northern hemisphere, while only a few species, including *Muttaborrasaurus*, survived in Australia, South America and Africa in the southern hemisphere.

CLASSIFICATION

Paleontologists use two primary methods to classify organisms into different groups. Linnaean taxonomy, or "systematics," groups organisms according to overall physical similarity, while an alternative system, called "cladistics," creates groups of organisms called "clades" in an effort to reconstruct the evolutionary relationships between species.

Systematic analysis places *Muttaborrasaurus* in the order ornithischia, based on the "bird-like" orientation of the animal's pelvis. From there, the species is placed in the **ornithopoda**, or "bird-footed," infraorder, which shared the development of beaks and teeth. The bird-hipped, herbivorous ornithopods have been found on all seven continents.



Triassic Period

250 - 201 million years ago

Jurassic Period

200 - 146 million years ago

Cretaceous Period

145 - 65 million years ago

Muttaborrasaurus

(mutt-a-BURR-a-SAWR-us)
"Muttaborra Lizard"



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Cladistic analysis places *Muttaborrasaurus* in the clade ornithopoda, which is defined by developments of the teeth, the articulation of the jaw, and other features of the skull. Next, *Muttaborrasaurus* is placed into the clade iguanodontia, made up primarily of large, bipedal animals with characteristic features of the skull. *Muttaborrasaurus* has been further placed into the clade styracosterna, known for distinguishing characteristics such as spike-like thumbs, enlarged size, and hoof-like claws on the feet.

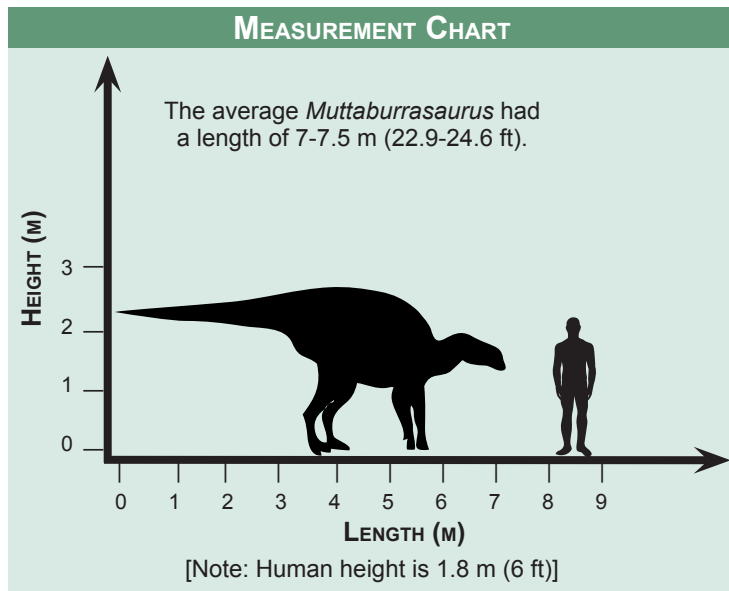
ANATOMY

Muttaborrasaurus was a large dinosaur, reaching lengths of between 7 and 7.5 meters (22.9–24.6 ft) and weighing 1.7 to 2 metric tons (3,747.8–4,409 lbs). The species was capable of

both bipedal and quadrupedal movement, probably alternating as needed.

Muttaborrasaurus' legs were longer and thicker than its arms and terminated in hoof-like claws on its feet. Its arms were thinner and shorter, and the hands were adapted for terrestrial movement, with the three middle digits terminating in blunt claws.

The animal had a flexible neck, supporting a large head. The eyes were set on the sides of the skull, increasing the animal's vision, and it had an enlarged snout with wide nasal passages. The end of the snout evolved into a shearing beak and the animal had teeth in its cheeks. The tail was long and heavy and reinforced for stability, possibly serving as a counterbalance.



INTELLIGENCE

Paleontologist James A. Hopson used the ratio of brain to body mass, called the **encephalization quotient (EQ)**, to estimate the intelligence of several groups of dinosaurs. Hopson found that most dinosaurs fell between 1.0 and 2.0 on a scale that extends to an upper limit of 8.0, the value calculated for the human brain. EQ measurements indicate that most dinosaurs were generally less intelligent than modern mammals and birds living in similar ecological niches. A few groups of dinosaurs had EQ ratings as high as 5.8, similar to some modern predatory mammals and birds.

The **hadrosaurs**, or “duck-billed” dinosaurs, were close relatives to the iguanodontids and had EQ ratings in the range of 1.5, placing them mid-range in terms of dinosaur intelligence. Many of the hadrosaurs and iguanodontids were large-bodied animals, and probably used their size to discourage predators, reducing the need for advanced intelligence.

REPRODUCTION & POPULATION

Paleontologists have not yet discovered *Muttaborrasaurus* eggs or juvenile specimens, and currently know little about the animal’s reproductive behavior. Eggs and nests have been found for the closely related hadrosaurs, indicating that many of these species laid eggs in shallow nests covered with vegetation and debris to insulate the eggs against the environment. Paleontologists suspect that many hadrosaurs were social breeders, gathering into groups to lay eggs in communal breeding grounds. This social breeding behavior may have evolved only among the hadrosaurs, while iguanodontids like *Muttaborrasaurus* may have been solitary breeders.

Muttaborrasaurus is known only from a few isolated specimens, indicating that the species may have been rare within its range. Some paleontologists have suggested that the enlarged dome on the muzzle of *Muttaborrasaurus* may have been a characteristic specific to only males or females of the species, a phenomenon known as **sexual dimorphism**. If this was the case, the enlarged nose may have served a reproductive purpose, helping animals to attract or identify potential mates.

DIET

Most paleontologists believe that the ornithomimid dinosaurs were primarily herbivorous. There were a wide variety of plants available in Early Cretaceous Australia (East Gondwana), including many representatives of the gymnosperm groups such as conifers. Another common plant group, the **cycads**, were abundant in the area, growing into a variety of tree and bush-like species that may have formed part of *Muttaborrasaurus*’s diet.

Unlike some other iguanodontids, *Muttaborrasaurus* had unusual teeth that came together in such a way as to create a cutting surface. Some paleontologists have suggested that this adaptation may have allowed *Muttaborrasaurus* to lead an omnivorous lifestyle, though most paleontologists believe that the animal was primarily an herbivore.

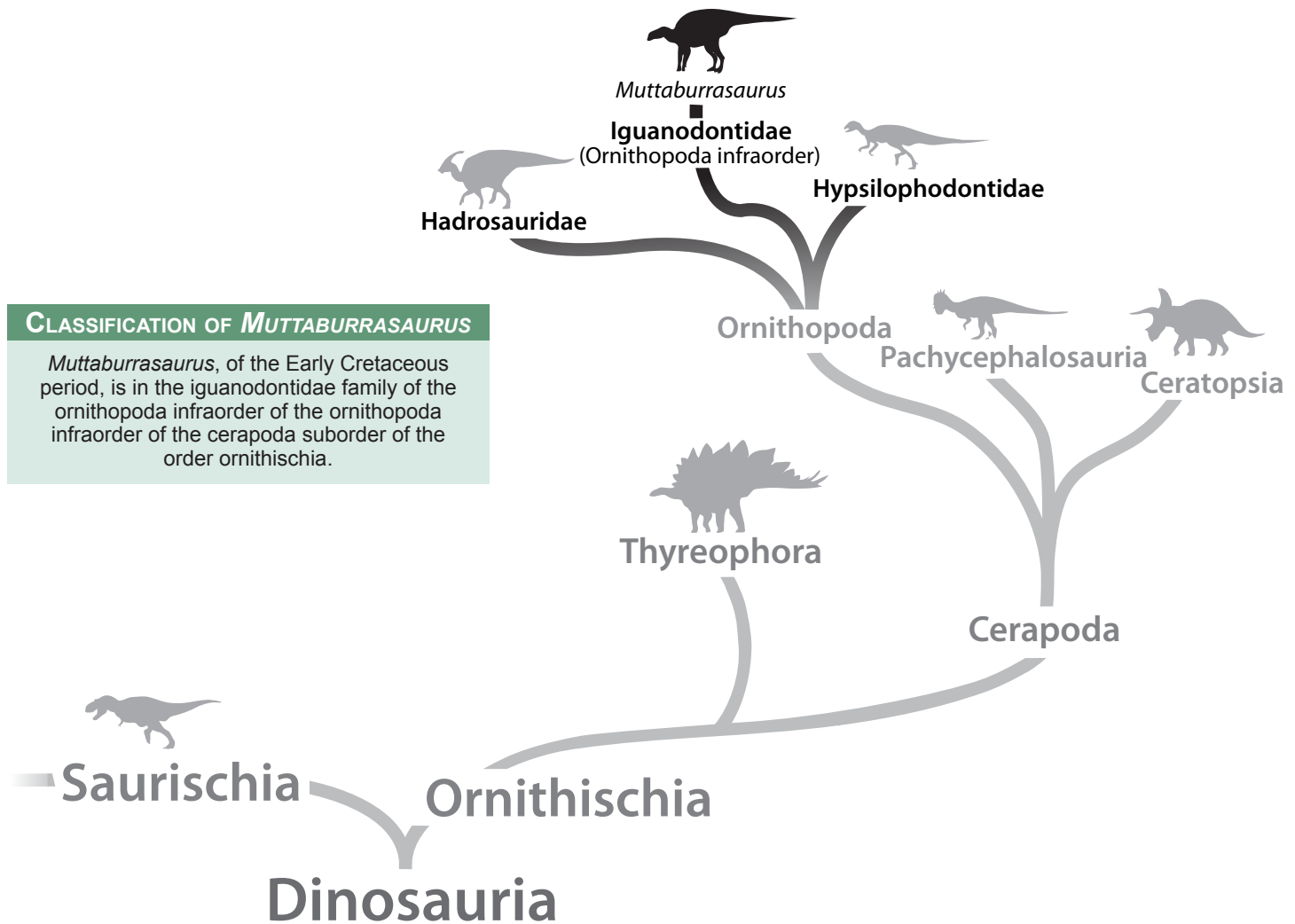
BEHAVIOR

Little is known about the behavior of *Muttaborrasaurus*. While later hadrosaurs are thought to have been social animals, traveling in herds and perhaps migrating in search of food, no evidence of social behavior exists for *Muttaborrasaurus* and closely related species.

The enlarged nose on *Muttaborrasaurus* may have allowed the animal to generate unique vocalizations, perhaps producing deep tones that could travel over greater distances. The species may have used their vocalizations to keep in contact with other members of its species, to find and attract mates, or to organize territory and warn intruders from straying into its feeding grounds.

HABITAT & OTHER LIFE FORMS

Paleontologists believe that Early Cretaceous Australia was a seasonal environment, with a cool, darker dry season alternating with a wet, warm season. There were a variety of species living in the environment, including a number of reptiles and amphibians, as well as pterosaurs, the flying reptiles that dominated the skies and lived among dinosaurs



during the Mesozoic. *Muttaborrasaurus* fossils were discovered near the shores of what was once a large inland sea, and the animal may have foraged on coastal vegetation.

In addition to *Muttaborrasaurus*, other herbivorous dinosaurs living in early Cretaceous Australia included a sauropod dinosaur known as *Austrosaurus*, which is believed to have been a large herbivore. A variety of small herbivorous dinosaurs have been found in the region, including *Leaellynasaura* and *Fulgurotherium*, both also representatives of the ornithopod group. Australia was also home to the small ankylosaurid dinosaur *Minmi*, one of the best-known species from Australia.

Predatory dinosaurs in Australia included the large theropod *Raptor*, which may have been feathered and lived as a scavenger/predator on the scrub plains of Australia, and

Australovenator, a large predatory dinosaur related to the North American Jurassic dinosaur *Allosaurus*.

RESEARCH

Muttaborrasaurus was discovered by Doug Langdon, who discovered the fossil by chance while riding his horse in the Muttaborra area in Queensland. Paleontologists Alan Bartholomai and Ralph Molnar named the species in the early 1980s, first publishing the name in a 1981 journal article. Additional partial skeletons and teeth belonging to *Muttaborrasaurus* have been found in other parts of Australia, suggesting that the species may have been widespread. *Muttaborrasaurus* remains well known as one of the most complete fossils uncovered within Australia.

Because Australia was a temperate, seasonal environment, the presence of large dinosaurs like *Muttaborrasaurus* has

provided evidence that dinosaurs may have been **endothermic**, or warm-blooded animals. Some paleontologists suggest that if dinosaurs were “cold-blooded,” or **ectothermic**, like modern reptiles, they would not have been able to survive in environments that reached such cold temperatures.

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VOCABULARY

Cycads: A diverse group of gymnosperm plants that evolved into a variety of species in the Mesozoic era, often having large palm-like leaves and thick, woody trunks.

Ectothermic: Type of organism that does not maintain internal body temperature utilizing metabolism, but depends on external environmental conditions to regulate internal temperature.

Encephalization Quotient (EQ): Method used to evaluate animal intelligence by comparing the ratio of an animal's brain mass to body mass to that of other organisms of similar size. The primary assumption is that higher brain/body mass ratios correlate positively with increased intelligence.

Endothermic: Type of organism that utilizes an internal metabolism to maintain its body temperature within a certain range.

Hadrosaurs: Any of a group of large herbivorous dinosaurs, also known as “duck billed” dinosaurs, that were one of the dominant herbivore groups in Cretaceous Laurasia.

Ornithopoda: A large group of herbivorous dinosaurs known for their bipedal movement, beaks, and the evolution of cheek teeth.

Pangaea: A supercontinent that contained all landmasses and existed more than 250 million years ago; meaning “all lands” in Greek.

Sexual Dimorphism: Trait of a species in which males and females differ in size or other aspects of appearance.

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