= Paranthodon =

Paranthodon (p? @-@ RAN @-@ th? @-@ don) is a genus of extinct stegosaurian dinosaur that lived in South Africa during the Early Cretaceous , approximately 145 @.@ 5 ? 136 @.@ 4 million years ago . Discovered in 1845 , it was one of the first stegosaurians found . Its only remains , a partial skull and isolated teeth , were found in the Kirkwood Formation . Although Owen initially identified the fragments as those of the pareiasaur Anthodon , after years of storage in the British Museum of Natural History , Broom identified the partial skull as belonging to a different genus , and named the specimen Palaeoscincus africanus . Several years later , Nopcsa , unaware of Broom 's new name , similarly concluded that it represented a new taxon , and named the binomial Paranthodon owenii . However , since the Nopcsa 's species name was assigned after Broom 's , and Broom did not assign a new genus , both names are now synonyms under the current naming , Paranthodon africanus . The genus name was chosen from the Ancient Greek para , " near " and Anthodon , for the originally proposed similarity of the specimens .

In identifying the remains as those of Palaeoscincus , Broom basically classified Paranthodon as an ankylosaurian , a statement backed by the research of Coombs . Nopcsa however , identified the genus as a stegosaurid , which most modern studies agree with . In 1981 , the genus was reviewed , and found to be a valid genus of stegosaurid . Paranthodon is one of a few genera found in the Kirkwood Formation ; other such taxa include theropods , like Nqwebasaurus ; ornithopods ; and sauropods , like Algoasaurus .

= = Discovery and naming = =

In 1845 , amateur geologists William Guybon Atherstone and Andrew Geddes Bain discovered several fossils near Dassieklip , Cape Province , in the Bushmans River Valley . This was the first dinosaur find in all of the Southern Hemisphere and Africa . In 1849 and 1853 , Bain sent some of the fossils to the British paleontologist Richard Owen for identification . Among them was an upper jaw Bain referred to as the " Cape Iguanodon " ; as such the site was named " Iguanodonhoek " . Atherstone published about the find in 1857 , but lamented in 1871 that it had thus far received no attention in London . Only in 1876 did Owen name a series of specimens from the collection as Anthodon serrarius . Anthodon means " flower tooth " . The partial holotype skull BMNH 47337 , the left jaw BMNH 47338 , the matrix BMNH 47338 including bone fragments and impressions of the anterior skull , and the vertebrae BMNH 47337a were all assigned to Anthodon . In 1882 , Othniel Charles Marsh assigned Anthodon to Stegosauridae based on BMNH 47338 , and in 1890 , Richard Lydekker found that although Anthodon was a pareiasaur , its teeth were similar to those of Stegosauridae .

In 1909 , the South @-@ African paleontologist Robert Broom visited the collection of the British Museum of Natural History . He concluded that Owen had mixed the partial distorted skull , teeth , and a mandible of a pareiasaur and a partial upper jaw of a dinosaur BMNH 47338 , which were actually from two different species . Broom kept the name Anthodon for the pareiasaur , but identified the other fossil as a member of the genus Palaeoscincus , naming the new species Paleoscincus africanus in 1912 . He found that the anatomy of the teeth were quite different , even thought they resembled each other , as well as those of Stegosaurus . In 1929 , Baron Franz Nopcsa , unaware of Broom 's previous publication , provided a new name for Broom 's P. africanus , as D.M.S. Watson believed that the jaw should be differentiated from Anthodon . Nopcsa named the species Paranthodon Owenii , with the genus name derived from the Latin para , meaning " similar " , " near " , or " beside " , and Anthodon , and specific name honoring Owen . Due to present conventions , the specific name was later emended to owenii . In 1978 , Walter Coombs incorporated both names into the current nomenclature , Paranthodon africanus , as Paranthodon was the first new genus for the fossils and africanus was the first named species . This makes Palaeoscincus africanus and Paranthodon owenii junior synonyms of Paranthodon africanus .

The holotype of Paranthodon , BMNH 47338 , was found in a layer of the Kirkwood Formation dated between the Berriasian and early Valanginian ages . It consists of the back of the snout ,

containing the maxilla with teeth , the posterior caudodorsal ramus of the premaxilla , part of the nasals , and some isolated teeth probably from the lower jaw . One additional specimen can be assigned to it based on the dentition , BMNH 47992 , including only isolated teeth sharing the same morphology as those from the holotype . However , the teeth do not bear any autapomorphies of Paranthodon , and were referred to an indeterminate stegosaurid in 2008 .

= = Description = =

Paranthodon was a small stegosaurid relative to larger relatives such as Stegosaurus . Thomas R. Holtz Jr. estimated that the animal was 5 @.@ 0 m (16 @.@ 4 ft) long and weighed between 454 and 907 kg (1 @,@ 001 and 2 @,@ 000 lb) . The snout is elongated , though not extremely so , and convex on top . The back of the premaxilla is long and broad , and the external nares are large . The teeth have a prominent primary ridge . The fossilized nasal and maxillary bones are relatively complete , and an incomplete premaxilla is also preserved . The partial snout resembles Stegosaurus in its large posterior premaxillary process and the extension of the palate . However , Stegosaurus is the only stegosaurid known from adequate cranial material to compare with Paranthodon , and even though their resemblance is great , tooth morphology is very distinguishing among the stegosaurians . For example , cranial material is only known from Stegosaurus , Paranthodon , Kentrosaurus , and Tuojiangosaurus , and in all of them , the tooth morphology differs .

The maxilla of Paranthodon preserves the tooth row , and shows that there is little to no overhang . This differs from ankylosaurians , where there is a large amount of overhang of the maxilla . The teeth also have a middle ridge , with five fewer prominent ridges on either side . This is similar to the size ridges seen on Kentrosaurus . Like all stegosaurians , the denticles on the teeth are rounded at the tips , in contrast to ankylosaurians . Also , like Huayangosaurus , but unlike Kentrosaurus and Stegosaurus , Paranthodon possesses a prominent buccal margination (a ridge beside the tooth row) . Paranthodon teeth preserve wear , possibly cause by rubbing with other teeth . However , wear is absent on most teeth , similar to Huayangosaurus , meaning it is likely that Paranthodon lacked occlusion between teeth . Paranthodon is distinguished from other stegosaurs by a long , wide , posterior process of the premaxilla , teeth in the maxilla with a very large cingulum , and large ridges on the tooth crowns . Not all of these features were considered valid in a 2008 review of Stegosauria , with the only autapomorphy found being the possession of a partial second bony palate on the maxilla .

= = Classification = =

Currently , Paranthodon is classified as a stegosaurus related to Stegosaurus , Tuojiangosaurus , and Loricatosaurus . However , when Broom assigned the name Palaeoscincus africanus to the Paranthodon fossils , he classified them as an ankylosaurian . This classification was later changed by Nopcsa , who found that Paranthodon best resembled a stegosaurid (before the group was truly defined) . Coombs (1978) found Paranthodon to be an ankylosaurian , like Brooms , naming it Ankylosauria incertae sedis . However , in reviews by Galton in 1981 , it was found to instead represent a stegosaurid from the Late Cretaceous . Multiple phylogenetic analyses have placed Paranthodon in Stegosauria , and often in Stegosauridae . A 2010 analysis including nearly all species of stegosaurians found that Paranthodon was outside Stegosauridae , and in a polytomy with Tuojiangosaurus , Huayangosaurus , Chungkingosaurus , Jiangjunosaurus , and Gigantspinosaurus . However , when the latter two genera were removed , Paranthodon grouped with Tuojiangosaurus just outside Stegosauridae , and Huayangosaurus grouped with Chungkingosaurus in Huayangosauridae . Below is the analysis with all included genera .

Other analyses have found Paranthodon closely related to Tuojiangosaurus , Loricatosaurus , and Kentrosaurus within Stegosaurinae . Even though phylogenetic analyses recognize Paranthodon as a stegosaurid , the type material actually bears no synapomorphies of Stegosauria . However , the material is likely of stegosaurian nature , and phylogenies by many authors have found it to be

within the group .

= = Paleoecology = =

The Kirkwood Formation is in South Africa , and many fossils of different species and genera have been discovered in it , with Paranthodon being the first uncovered . The formation is of a Late Jurassic to Early Cretaceous age , with the oldest deposits from the Tithonian , about 145 @.@ 5 million years ago , and the youngest rocks being from the Valanginian , about 136 @.@ 4 million years ago . A large variety of different animal groups have been found in the formation , including dinosaurs , at least two different sphenodontian lizards , multiple teleost fishes , a few crocodylians , some frog specimens , and also turtles . However , a large amount of the material of the Kirkwood formation only includes isolated teeth or partial and fragmentary pieces of bone . Dinosaurs of the formation include a basal tetanuran and the primitive ornithomimosaurian Nqwebasaurus , the possible brachiosaurid Algoasaurus and a potential titanosaurian , and many ornithischians , Paranthodon , a genus of iguanodontian , and a " hypsilophodontid " (the family Hypsilophodontidae is no longer considered to be a natural grouping) .