

Giant croc with T. rex teeth roamed Madagascar

www.scimex.org/newsfeed/giant-croc-with-t.-rex-teeth-used-to-roam-in-madagascar

Embargoed until: Publicly released:

PeerJ

A fossil of the largest and oldest predatory crocodyliform, which lived in the Jurassic period, has been found in Madagascar and had a jaw bone filled with T-rex-like serrated teeth, say Italian and French palaeontologists. The massive jaws and teeth suggest the land-based ancient croc fed on hard tissue like bone and tendons, and would have outcompeted many dinosaurs at the top of the food chain. Because of where the *Notosuchia* fossil was found, the researchers think it would have been endemic to Madagascar, which was separating from Gondwana at that time. Similar *Notosuchia* fossils have also been found in South America, but this one is one million years older (and much bigger).



- Location of Interest:
- International

Natural History Museum of Milan, Italy; Natural History Museum of Toulouse, France

- Environment / Climate / Energy
- Other Science

Last updated: Sat 8 Jul 2017

Media Release

From: PeerJ

Gigantic crocodile with T. rex teeth was a top land predator of the Jurassic in Madagascar

Paleontologists document the features of a giant crocodile relative - the largest and oldest known “notosuchian”, predating the other forms by 42 million years.

Little is known about the origin and early evolution of the *Notosuchia*, hitherto unknown in the Jurassic period. New research on fossils from Madagascar, published in the peer-reviewed journal PeerJ by Italian and French paleontologists, begin to fill the gap in a million-year-long ghost lineage.

Deep and massive jaw bones armed with enormous serrated teeth that are similar in size and shape to those of a T-rex strongly suggest that these animals fed also on hard tissue such as bone and tendon. The full name of the predatory crocodyliform (nicknamed ‘Razana’) is *Razanandrongoibe sakalavae*, which means “giant lizard ancestor from Sakalava region”.

A combination of anatomical features clearly identify this taxon as a Jurassic *notosuchian*, close to the South American *baurusuchids* and *sebecids*, that were highly specialized predators of terrestrial habits, different from present-day crocodylians in having a deep skull and powerful erect limbs. “Like these and other gigantic crocs from the Cretaceous, ‘Razana’ could outcompete even theropod dinosaurs, at the top of the food chain”, says Cristiano Dal Sasso, of the Natural History Museum of Milan.

Razanandrongobe sakalavae is by far the oldest - and possibly the largest - representative of the Notosuchia, documenting one of the earliest events of exacerbated increase in body size along the evolutionary history of the group.

“Its geographic position during the period when Madagascar was separating from other landmasses is strongly suggestive of an endemic lineage. At the same time, it represents a further signal that the Notosuchia originated in southern Gondwana”, remarks co-author Simone Maganuco.

Document type	Source	Extra info	Type / Size	Last modified
Research	PeerJ	The URL will go live after the embargo ends	Web page	03 Jul 2017 3:39pm

Multimedia



Image 1

Paleontologists Cristiano Dal Sasso (right) and Simone Maganuco (left) exhibit some skull bones of *Razanandrongobe sakalavae* at the Natural History Museum of Milan. The teeth are enormous, approaching in shape and size those of a T. rex. The tip of a shed tooth shows a deeply worn surface caused by contact with hard food, such as bone and tendon: this animal was both predator and scavenger. The origin of the preserved bones from opposite sides of the upper and lower jaws was a hindrance to the study of how they aligned. However, new technologies helped Cristiano Dal Sasso and colleagues solve the puzzle...

File Size: 6.4 MB

Attribution: Giovanni Bindellini.

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

• Image 2

Reconstruction of the jaws of *Razanandrongobe sakalavae*, including the original left dentary, right premaxilla (courtesy of the Natural History Museum of Toulouse), and their counterlateral copies (in grey), printed in 3-D from CT data by FabLab Milan, and then mounted at the Natural History Museum of Milan.

File Size: 5.4 MB

Attribution: Giovanni Bindellini



Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:09pm

Note: High resolution files are only available for download by registered journalists.

- Image 3

Paleontologists Cristiano Dal Sasso (left) and Simone Maganuco (right) standing next to the jaws of “Razana” at the Natural History Museum of Milan. Dal Sasso indicates the firmly sutured mandibular bones, Maganuco points to the confluent nares facing to the front of the snout: two anatomical features that indicate crocodylian affinities, in spite of the unusually deep skull. The original left dentary, right premaxilla, and maxillary fragments were rearticulated to counterlateral copies, printed in 3-D from CT data.



File Size: 6.7 MB

Attribution: Giovanni Bindellini

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

- Image 4

Paleoartistic restoration of *Razanandrongobe sakalavae* scavenging on a sauropod carcass in the Middle Jurassic of Madagascar. Unlike extant crocodylians, this terrestrial predator had a deep skull and walked on erect limbs



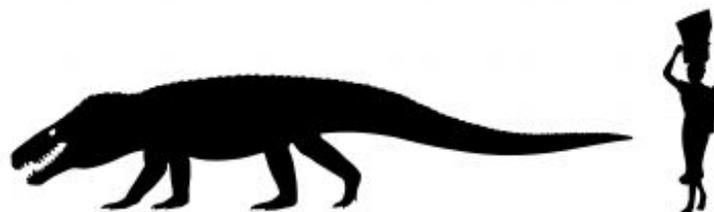
File Size: 8.1 MB

Attribution: Fabio Manucci

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.



- Image 5

Comparison between the estimated body size of the giant notosuchian crocodyliform *Razanandrongobe sakalavae* (nicknamed “Razana”) and a human.

File Size: 2.2 MB

Attribution: Marco Auditore

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:09pm

Note: High resolution files are only available for download by registered journalists.

- Image 6

Unique to *R. sakalavae* are the alveoli with labiolingual diameter larger than mesiodistal diameter, the mesial teeth incisiform, U-shaped in cross-section, and the presence of denticles that are even larger than those of large-bodied theropods, *Tyrannosaurus rex* included. (A), first premaxillary tooth still growing in its alveolus; (B) mesial tooth with apparent wear surface (ws); (C) fourth premaxillary tooth; (D) lateral tooth. Scale bars = 10 mm.



File Size: 3.7 MB

Attribution: Michele Zilioli

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

- Image 7

Computed tomography of the fossil cranial bones of “Razana” provided information on tooth replacement process and tooth/root size. The largest dentary tooth (C,D) is 13.76 cm long and the largest premaxillary tooth (A,B) is 15.04 cm long; the root of the latter, still firmly implanted, fully encloses a 6.41 cm long replacement tooth.



File Size: 3.5 MB

Attribution: Cristiano Dal Sasso

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

- Image 8

Paleoartistic restoration of the head of *Razanandrongobe sakalavae*. Unlike extant crocodylians, this terrestrial predator had a deep skull.

File Size: 8.1 MB

Attribution: Fabio Manucci

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.



- Video A (no audio)

At the Natural History Museum of Milan, living and extinct animals such as a Nile crocodile and a T. rex are used for comparison in the study of a new fossil crocodile from the Jurassic of Madagascar, whose banana-like teeth are serrated with apparent denticles, that are even larger than those of Tyrannosaurus and other carnivorous dinosaurs. Living crocodylians have conical unserrated teeth.

File Size: 14.9 MB

Attribution: Cristiano Dal Sasso

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

- Video B (no audio)

Paleontologists Cristiano Dal Sasso (left) and Simone Maganuco (right) studying the skull bones of “Razana” (nickname for *Razanandrongobe sakalavae*) at the Natural History Museum of Milan. The teeth are enormous; the largest one is the second premaxillary tooth. The tip of a shed tooth shows a deeply worn surface, caused by contact with hard food, such as bone and tendon: this animal was both predator and scavenger. The origin of the preserved bones from opposite sides of the upper and lower jaws was a hindrance to the study of how they aligned. However, new technologies helped Cristiano Dal Sasso and colleagues solve the puzzle... (see video C).

File Size: 30.8 MB

Attribution: Paolo Magliocco

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.

- Video C (no audio)

Computed tomography of the fossil cranial bones of *Razanandrongobe sakalavae* (this is the name of this

Jurassic crocodylomorph) provided information on the tooth replacement process and tooth/root size. The largest dentary tooth is 14 cm long and the largest premaxillary tooth measures 15 cm. CT data also allowed to 3-D print the missing counterlateral bones at FabLab Milan, and so to reconstruct the front of the skull at the Natural History Museum of Milan. Technician Andrea Passoni mounts the bone pieces.

File Size: 47.4 MB

Attribution: Cristiano Dal Sasso

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:09pm

Note: High resolution files are only available for download by registered journalists.

- Video D (no audio)

Paleontologists Cristiano Dal Sasso (left) and Simone Maganuco (right) standing next to the jaws of *Razanandrongobe sakalavae* at the Natural History Museum of Milan. Unlike present-day crocodiles and alligators, this terrestrial predator had a deep skull. On the other hand, the nares confluent and facing to the front of the snout, and the tip of the lower jaw formed by four firmly sutured bones, indicate that this animal is a crocodylomorph reptile, not a dinosaur

File Size: 18.6 MB

Attribution: Paolo Magliocco

Permission Category: © - Only use with this story

Last Modified: 08 Jul 2017 10:10pm

Note: High resolution files are only available for download by registered journalists.