

Embargoed until: December 19th 2018: 7am EST /
12pm UK time

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PRESS RELEASE

*PeerJ – the Journal of Life
& Environmental Sciences*

The oldest large-sized predatory dinosaur comes from the Italian Alps

Paleontologists document the oldest ceratosaurian, which predates the massive meat-eating dinosaurs by over 25 million years and sheds light on the evolution of the three-fingered hand of birds.

Early Jurassic predatory dinosaurs are very rare, and mostly small in size. *Saltriovenator zanellai*, a new genus and species described in the peer-reviewed journal *PeerJ – the Journal of Life and Environmental Sciences* by Italian paleontologists, is the oldest known ceratosaurian, and the world's largest (one ton) predatory dinosaur from the Lower Jurassic (Sinemurian, ~198 Mya).

This unique specimen, which also represents the first Jurassic dinosaur from Italy, was accidentally discovered in 1996 by a fossil amateur within a quarry near Saltrio, some 80 km N-E of Milan. Many bones of *Saltriovenator* bear feeding marks by marine invertebrates, which represent the first case on dinosaurian remains and indicate that the dinosaur carcass floated in a marine basin and then sunk, remaining on the sea bottom for quite a long time before burial.

Although fragmentary, "*Saltriovenator* shows a mosaic of ancestral and advanced anatomical features, respectively seen in the four-fingered dilophosaurids and ceratosaurians, and the three-fingered tetanuran theropods, such as allosaurids", says first author Cristiano Dal Sasso, of the Natural History Museum of Milan, who reassembled and studied the fossil for several years.

"Paleohistological analysis indicates that *Saltriovenator* was a still growing subadult individual, therefore its estimated size is all the more remarkable, in the context of the Early Jurassic period", says co-author Simone Maganuco.

“The evolutionary 'arms race' between stockier predatory and giant herbivorous dinosaurs, involving progressively larger species, had already begun 200 million of years ago.”

The evolution of the hand of birds from their dinosaurian ancestors is still hotly debated. “The grasping hand of *Saltriovenator* fills a key gap in the theropod evolutionary tree: predatory dinosaurs progressively lost the pinky and ring fingers, and acquired the three-fingered hand which is the precursor of the avian wing”, remarks co-author Andrea Cau.

Full Media Pack including images and videos and extended press releases in ENGLISH and ITALIAN: https://drive.google.com/open?id=1P_VRiSH9v-DNty0L3T3tB88q-3O-Q7-W

Scientific contents commented on the blog of coauthor Andrea Cau: <http://theropoda.blogspot.com/> (after embargo lift)

Link to the article (quote this link in your story – the link will ONLY work after the embargo lifts): <https://peerj.com/articles/5976> your readers will be able to freely access this article at this URL.

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Images:



Image 1: Left, outline map of Italy highlighting Lombardy and the position of Saltrio, the locality where the fossil amateur Angelo Zanella discovered the dinosaur now named after him. Top right, the Saltrio quarry is less than eighty km North of Milan, a stone's throw from the Swiss border. Bottom right, recovering the blocks with the dinosaur bones. Credit: Simone Maganuco.

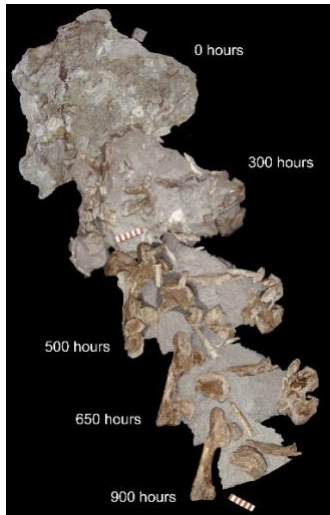


Image 2: Bones of *Saltriovenator* in temporal sequence (top to bottom), gradually emerging from the embedding sediment during acid preparation of the main block. Dissolving the hard calcareous rock with a chemically-controlled process took more than a year. Credit: Cristiano Dal Sasso and Giovanni Bindellini.



Image 3: At the Natural History Museum of Milan, paleontologist Cristiano Dal Sasso (left) and co-authors Andrea Cau and Simone Maganuco (center and right) examine the bones of *Saltriovenator*, deposited in the Museum collections. Credit: Gabriele Bindellini.



Image 4: The most diagnostic bone of *Saltriovenator* is a massive, hourglass-shaped hand element, called second metacarpal (top), featuring a deep pit bordered by a very prominent lip of bone, which are not found so hyper-developed in any other dinosaur. The articulation with its very short phalanx (bottom) reveals a strong grasping finger, with a wide range of motion. Credit: Gabriele Bindellini.

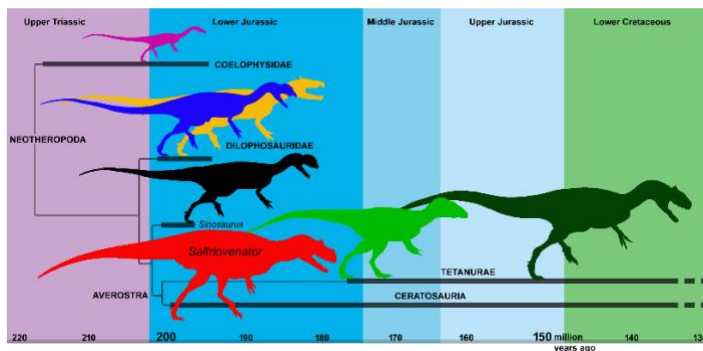


Image 5: Simplified evolutionary tree of predatory dinosaurs (theropods). *Saltriovenator* predates the massive meat-eating dinosaurs by over 25 million years: it is the oldest known ceratosaurian, and the world's largest predatory dinosaur from the Lower Jurassic. During the Jurassic, the three-fingered tetanuran theropods appeared, which gave rise to birds. Credit: Andrea Cau.



Image 6: The bones of *Saltriovenator* bear bites (green arrows) and other feeding marks (red arrows) produced by fishes and marine invertebrates. These traces, the first ones ever detected on dinosaur remains, indicate that the carcass of the animal floated in a marine basin and then sunk, remaining on the sea bottom for quite a long time before burial. Credit: Giovanni Bindellini.



Image 7: Cristiano Dal Sasso (left) and Angelo Zanella (right) match the shoulder girdle and right forelimb of *Saltriovenator*, reassembled and mounted, with a life-size silhouette of the dinosaur. Coloured parts are replicas of the original bones, white parts are reconstructed from similar dinosaur species (mainly *Ceratosaurus* and *Dilophosaurus*). Credit: Gabriele Bindellini.

For more images, go to: https://drive.google.com/open?id=1P_VRiSH9v-DNty0L3T3tB88q-3O-Q7-W

VIDEOS – all videos can be found here:

https://drive.google.com/open?id=1P_VRiSH9v-DNty0L3T3tB88q-3O-Q7-W



Video A: Video-abstract about the recovery, preparation, and casting of the fossil bones of *Saltriovenator*. Original images and sound recorded in the Saltrio quarry with Angelo Zanella, who found the dinosaur now named after him, and in the Preparation Lab of the Natural History Museum of Milan, where the bones were extracted from the hard rock and then cast with silicon and resin. Credit: Cristiano Dal Sasso.

Video B: At the Natural History Museum of Milan, paleontologist Cristiano Dal Sasso (speaking) and co-authors Simone Maganuco and Andrea Cau (center and right) examine the bones of *Saltriovenator*, deposited in the Museum collections. Credit: Gabriele Bindellini.

Video C: Cristiano Dal Sasso describes the unique anatomy of *Saltriovenator zanellai*, new genus and species of predatory dinosaur, which represents the oldest ceratosaurian in the world and the first Jurassic dinosaur from Italy. Most bones also display feeding marks by marine invertebrates, the first ones ever found on dinosaur remains. Credit: Gabriele Bindellini.

Video D: At the Natural History Museum of Milan, paleontologist Cristiano Dal Sasso and technician Andrea Passoni model the missing bones of *Saltriovenator* and restore replicas of the original ones, then assemble the right shoulder girdle, forelimb, and ankle, for display in the Museum's dinosaur hall. Riprese: Gabriele Bindellini.

Video E: At the Natural History Museum of Milan, paleontologist Cristiano Dal Sasso compares the reconstructed forelimb and ankle of *Saltriovenator* with a silhouette of the whole dinosaur in actual size. The proportions of the preserved bones indicate a 7.5 m long hunter (*venator* in Latin). Credit: Gabriele Bindellini.

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EMBARGOED until December 19, 2018: 7 am EST; 12 midday UK time (i.e. the date of publication)

Link to the Published Version of the article (quote this link in your story – the link will ONLY work after the embargo lifts): <https://peerj.com/articles/5976>
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Citation to the article: Dal Sasso C, Maganuco S, Cau A. 2018. The oldest ceratosaurian (Dinosauria: Theropoda), from the Lower Jurassic of Italy, sheds light on the evolution of the three-fingered hand of birds. PeerJ 6:e5976 DOI 10.7717/peerj.5976

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Media Contacts

For the authors:

Geological context, taphonomy, anatomy

Cristiano Dal Sasso
Sezione di Paleontologia dei Vertebrati
Museo di Storia Naturale di Milano
Phone +39 02 88463301
Email: cdalsasso@yahoo.com

Skeletal reconstruction, histology

Simone Maganuco
Collaboratore Sezione di Paleontologia dei Vertebrati
Museo di Storia Naturale di Milano
Phone +39 347 1868851
Email: simonemaganuco@iol.it

Phylogeny, hand evolution

Andrea Cau
Collaboratore Museo Geologico "Giovanni Capellini"
Bologna, Italy
Phone +39 347 1868851
Email: cauand@gmail.com

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