www.cnrs.fr

MUSÉUM
NATIONAL D'HISTOIRE NATURELLE

NATIONAL PRESS RELEASE | PARIS | DECEMBER 13, 2017

Discovery of world's oldest plesiosaur

While dinosaurs reigned on dry land and in the sky, other reptiles populated the seas and oceans. Of the latter, plesiosaurs, whose means of locomotion may be described as "underwater flight," formed the most diverse group. But when did they first appear? The discovery of the oldest of these reptiles provides evidence that they had diversified by the start of the Mesozoic Era, during the Triassic Period. What's more, analysis of their bones demonstrates they were warm-blooded and grew rapidly, which enabled their population to spread around the world and live past the Triassic-Jurassic extinction event. These findings by scientists from the University of Bonn (Germany); Osaka University and the University of Tokyo (Japan); and the MECADEV laboratory (CNRS / Muséum National d'Histoire Naturelle) have been published in *Science Advances* (December 13, 2017).

At the end of the Paleozoic Era, 250 million years ago, the largest known mass extinction eliminated 95% of all marine species. In the wake of this event, various groups of reptiles adapted to the marine environment. Among them, plesiosaurs formed the Mesozoic's most diverse group, and one of the most long-lived, dying off at the same time as the nonavian dinosaurs. Most plesiosaurs had a small head at the end of a long neck. Their stout bodies bore four flippers of similar shape, and their moved about very efficiently by a sort of underwater flight similar to sea turtle locomotion. Despite having been the object of study for about 300 years, scientists had yet to find a plesiosaur from the Triassic, the period that opened the Mesozoic.

Until 2013, when a private individual discovered an especially well-preserved fossil in Westphalia (Germany). A team of paleontologists has just published the first formal description of this find. The fossil skeleton includes part of the skull, the spinal column, the rib cage, the pectoral and pelvic girdles, and the left limbs. The animal in question lived at the end of the Triassic, 201–208 million years ago, and its length is estimated at about 2.3 meters, making it a rather small plesiosaur.

After completing a painstaking description of the fossil, the specimen was assigned to a new species, *Rhaeticosaurus mertensi*,[1] in the Pliosauridae family, which groups together plesiosaurs of relatively short necks and long skulls. Its place in the plesiosaur family tree shows that the group had already diversified by the Triassic and that many lineages had survived the mass extinction that occurred between the Triassic and Jurassic Periods.

In addition, the bones of *R. mertensi* and other plesiosaur species were examined using X-ray microtomography to reveal their internal structure, and under a microscope to study tissue composition.

1. This name alludes to the Rhaetian Stage (a geologic stratum) and pays homage to the man who discovered the fossil, Michael Mertens.

Based on these observations, the scientists were able to conclude that this particular plesiosaur was young (just over one year old) and that members of its species were fast growers. This rapid pace of development, close to that seen in mammals and birds, is common to all plesiosaurs, suggesting that they were warm-blooded animals.[2] Warm-bloodedness is consistent with their quick spread around the world, aided also by their effective means of propulsion. As they were able to regulate their body temperature, they could venture out into the high seas and colder waters, which undoubtedly helped them stave off a Triassic-Jurassic extinction.

Fossil* Rhaeticosaurus mertensi *plesiosaur, discovered in Westphalia (Germany).

Above: complete fossil. Bottom left: closeup showing spinal column; ribs; pelvic girdle; and, bottom right, the start of the femur (scale bar: 5 cm). Bottom right: cross section of femur under microscope. The line running under the top third of the specimen marks the end of the animal's first year of growth.

© Georg Oleschinski (top and left photos) / Martin Sander (right photo)

2. This also suggests that plesiosaurs adopted a reproductive strategy unlike that of most other reptiles: rather than having large broods, they focused their parental investment on a single offspring, as do cetaceans today.

Bibliography

A Triassic plesiosaurian skeleton and bone histology inform on evolution of a unique body plan, Tanja Wintrich, Shoji Hayashi, Alexandra Houssaye, Yasuhisa Nakajima, P. Martin Sander, *Science Advances*, 13 December 2017. DOI : 10.1126/sciadv.1701144

Contacts

CNRS researcher I Alexandra Houssaye I **T (+33) (0)1 40 79 81 19** I houssaye@mnhn.fr
CNRS press officer I Véronique Etienne I **T (+33) (0)1 44 96 51 37** I veronique.etienne@cnrs.fr