



PRESS RELEASE

State Museum of Natural History Stuttgart, Germany

Did life in the ancient seas become increasingly dangerous?

Scientists have addressed this question by measuring the frequency of disease and injury in the skeletons of ichthyosaurs from the Triassic and Jurassic periods.

Stuttgart, March 27, 2020. Did life in the ancient seas become increasingly dangerous over millions of years? Scientists from the Natural History Museum in Stuttgart and the University of Uppsala in Sweden have investigated this question by examining hundreds of ichthyosaur fossils from the Triassic period, 240 million years ago, and the Jurassic period, around 180 million years ago. The researchers noticed that in museum collections, the injuries - pathologies - visible on the skeletons of the fossils were largely similar. They wanted to see if they could find out more about the biology of marine reptiles from the Mesozoic through detailed analyses of the bones. In a research project funded by the DFG, they investigated which factors had the greatest impact on injuries to marine reptiles. The results of the investigation have been published in the journal *Scientific Reports*.

Hundreds of ichthyosaur skeletons were examined

The Stuttgart Natural History Museum has a globally significant collection of ichthyosaur skeletons, with many specimens of Jurassic age from southwestern Germany. This is where the ichthyosaur specialists Dr. Erin Maxwell and Dr. Judith Pardo-Pérez (Stuttgart) and Dr. Ben Kear from Uppsala began their research work. Due to the excellent conservation conditions in the Posidonia Shale, the fossils reveal a lot about the appearance of these extinct marine reptiles. Evidence of broken bones, diseases and skeletal damage such as healed bite marks is also preserved. The scientists categorized the nature and distribution of these injuries in over 100 fossils from the Stuttgart collection and found that they were not randomly distributed across species and across the skeleton. For example, one quarter of the skulls of *Temnodontosaurus*, the top predator in the Jurassic seas, showed bite marks most likely inflicted by members of the same species. The smaller ichthyosaur *Stenopterygius* also showed these injuries, but rarely. Broken ribs with signs of healing were found in all species.

Using these observations as a baseline, the researchers wondered whether the same pattern could be found in earlier time periods, namely the Triassic (240 million years ago). Skeletal injuries and diseases in Triassic marine reptiles have rarely been mentioned in the scientific literature. Was this an indication that life in the ancient seas has become increasingly dangerous over the course of millions of years during the Mesozoic, for example due to more aggressive predators? To answer this question, they analyzed the extent and type of skeletal damage in another 200 ichthyosaurs from the Middle Triassic Monte San Giorgio UNESCO world heritage site, housed in collections in Zurich and Milan. The results of the two time periods were then statistically compared.

Life in the past was not easier for marine reptiles

“With regard to the biology and behaviour of these animals, the results of our observations are particularly interesting. Overall, skeletal injuries were found in similar numbers in Triassic and Jurassic species. Triassic ichthyosaurs were no healthier than their Jurassic relatives,” said Dr. Erin Maxwell.



The scientists therefore ruled out that competition and predation pressure on ichthyosaurs in the Triassic and Jurassic seas increased in intensity over millions of years.

The type of injury differs

However, a comparison of the most common ichthyosaurs from both time periods - Mixosaurus from the Triassic and Stenopterygius from the Jurassic - shows that the type of skeletal injuries differs. In Mixosaurus, these injuries are concentrated on the hind fin and the tail. Stenopterygius has the fewest injuries in this part of the skeleton, but the most in the trunk and forefin. The scientists interpret the observed differences in the distribution of injuries as a result of changes in body shape and swimming style. The 240 million-year-old Triassic ichthyosaurs had a more elongated shape with a small tail fin, prone to traumatic injuries and joint diseases. In the Jurassic ichthyosaurs, on the other hand, the tail fin is stabilized with soft tissues. Therefore, mechanical stresses that affect this region do not lead to stress on the joints.

The experts suspect a similar cause for the high frequency of broken and healed ribs in Stenopterygius, which were not observed in Mixosaurus. Faster, less eel-like swimming increases the effectiveness of ramming behaviour and thus the likelihood of traumatic injuries to the trunk of Stenopterygius. The injuries result from fighting between animals of the same species and failed predation attempts.

Changes in body shape have the greatest impact

The researchers conclude that changes in ichthyosaur body shape have a greater influence on the type and frequency of the pathologies observed than changes at the ecosystem level. The results of the investigation have now been published in the journal Scientific Reports.

Original Publication:

Pardo-Pérez, J.M., Kear, B.P. & Maxwell, E.E. 2020. [Skeletal pathologies track body plan evolution in ichthyosaurs](#). Scientific Reports 10, 4206.
doi: <https://doi.org/10.1038/s41598-020-61070-7>

Science-Blog:

Further information on the research results can also be found on the Science Blog of the Natural History Museum at:
<https://smnstuttgart.com/>

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Media Contact:

Contact for specialist information:

Dr. Erin Maxwell
Staatliches Museum für Naturkunde Stuttgart
E-Mail: erin.maxwell@smns-bw.de

Dr. Erin Maxwell is a palaeontologist specializing in ichthyosaurs.

Press contact:

Meike Rech
Staatliches Museum für Naturkunde Stuttgart
E-Mail: meike.rech@smns-bw.de
Tel. 0176-83 17 83 39
Website: www.naturkundemuseum-bw.de



Images:

Mixosaurus_SMNS_J.Pardo-Pérez.jpg: Fossil of a 240 million-year-old Mixosaurus.

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Palaeopathology:

Paleopathological studies deal with diseases and degenerative changes in the skeletons and bones of extinct animals.