

Paleontologists identify a new fossil fish genus

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Fossil fish of the new genus †*Simpsonigobius*. Credit: Moritz Dirnberger

Gobies or Gobioidae are one of the most species-rich groups of marine and freshwater fish in Europe. Spending most of their lives on the bottom of shallow waterbodies, they make substantial contributions to the functioning of many ecosystems.

With the identification of a new genus of a fossil freshwater goby, students of the international master program Geobiology and Paleobiology at LMU and paleontologist Bettina Reichenbacher, professor at the Department of Earth and Environmental Sciences at LMU, have made a discovery that provides critical insights into the evolutionary history of these fish.

The find is reported in the [*Journal of Systematic Palaeontology*](#).

Measuring up to 34 mm, the small fish of the new genus †Simpsonigobius were discovered in 18-million-year-old rocks in Turkey and are marked by a distinct combination of morphological features, including otoliths (hearing stones) with a unique shape.

Modern research techniques elucidate position in family tree

To determine the relationships of †Simpsonigobius within the gobioid phylogenetic tree, the researchers utilized a "total-evidence" phylogenetic dataset, which they enhanced in order to combine a total of 48 morphological characters and [genetic data](#) from five genes for 48 living and 10 [fossil species](#).

In addition, the team employed "tip-dating" for fossil gobioid species for the first time. This is a phylogenetic method in which the age of the fossils (= tips) included in the [phylogenetic tree](#) is used to infer the timing of the evolutionary history of the entire group.

The results show that the new genus is the oldest skeleton-based member of the family Oxudercidae—which is classified among the "modern" gobies (families Gobiidae and Oxudercidae)—and the oldest freshwater goby within this modern group.

The tip-dating analysis estimated the emergence of the Gobiidae at 34.1 million years ago and that of the Oxudercidae at 34.8 million years ago, which is consistent with previous dating studies using other methods. Moreover, stochastic habitat mapping, in which the researchers incorporated fossil gobies for the first time, revealed that the gobies probably possessed broad salinity tolerance at the beginning of their evolutionary history, which challenges previous assumptions.

"The discovery of †*Simpsonigobius* not only adds a new genus to the Gobioidae, but also provides vital clues about the evolutionary timeline and habitat adaptations of these diverse fishes. Our research highlights the importance of analyzing [fossil records](#) using modern methods to achieve a more accurate picture of evolutionary processes," says Reichenbacher.

First author Moritz Dirnberger, currently a doctoral candidate at the University of Montpellier, adds, "The findings are expected to pave the way for further studies on gobioid evolution and the role of environmental factors in shaping their diversity."

More information: Moritz Dirnberger et al, A new freshwater gobioid from the Lower Miocene of Turkey in a significantly amended total evidence phylogenetic framework, *Journal of Systematic Palaeontology* (2024). [DOI: 10.1080/14772019.2024.2340498](https://doi.org/10.1080/14772019.2024.2340498)

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