

Evolutionary history and dental variation in tiger sharks (Chondrichthyes, *Galeocerdo*)

JULIA TÜRTSCHER¹, FAVIEL A. LÓPEZ ROMERO¹, PATRICK L. JAMBURA¹, RENÉ KINDLIMANN², DAVID J. WARD³, KEIICHI SATO⁴, TAKETERU TOMITA⁵ & JÜRGEN KRIWET¹

¹University of Vienna, Department of Palaeontology, 1090 Vienna

²Haimuseum und Sammlung R. Kindlimann, Aathal-Seegräben, Switzerland

³Department of Earth Sciences, The Natural History Museum London

⁴Okinawa Churashima Research Center, Motobu-cho, Okinawa, Japan

⁵Okinawa Churaumi Aquarium, Motobu-cho, Okinawa, Japan

Sharks possess a lifelong tooth replacement, which has led to their fossil record comprising mostly isolated teeth rather than complete skeletons. Dental traits therefore represent important characters for species identification and to reconstruct phylogenetic interrelationships. Tiger sharks (*Galeocerdo*) are known since the early Eocene (ca. 56 Ma) and include several ambiguous extinct species only known from isolated teeth. The seemingly complex fossil record of *Galeocerdo* resulted in an unresolved and controversial evolutionary history of this genus. Possible heterodonties (i.e., exhibition of different tooth morphologies) and incomplete dental descriptions represent additional challenges in unravelling open questions on the evolutionary and developmental history of tiger sharks.

Here, we present a comprehensive revision of the fossil record of tiger sharks as well as thorough descriptions of different tooth shapes occurring across ontogeny in the modern tiger shark *Galeocerdo cuvier*. We used landmark-based 2D geometric morphometrics on teeth of different tiger shark species to quantify intra- and interspecific tooth shape variation and to analyse the presence or absence of possible heterodonties. Our results allow us to reinterpret the fossil record of *Galeocerdo* by re-assessing several species and thus reducing the number of valid taxa from 23 to four valid species. Moreover, a weak but noticeable ontogenetic heterodonty in extant tiger sharks was detected. Besides providing a better understanding of the evolutionary history of the tiger shark group, our data helps elucidating the underlying developmental and evolutionary processes behind the dental diversity in sharks today and in deep time.