

Fossil Shark Teeth in Alternative Traditional Medicine



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Abstract

Fossil invertebrates in amber inclusions and vertebrate animal remains are essential for the study of the evolution of life in a geologic context and have been used for centuries in alternative traditional medicine and folklore. In this context, sharks are components of medical folk tradition and a scientific question relevant in biomedicine. As addressed in this article, fossil shark teeth from different species, locations and epochs are common findings and have been used in palaeoichthyology and alternative traditional medicine based on their potential health beneficial properties and belief-based explanations. Although these folk traditions are not based on modern scientific evidence, ongoing research approaches shark teeth potential in novel biomedical applications.

Keywords: Alternative medicine; Biomedicine; Fossil; Palaeoichthyology; Shark tooth; Traditional medicine

Introduction

Fossils provide information of living organisms with different preserved remains. Accordingly, as stated by the National Park Service ([https://www.nps.gov/subjects/fossils/what-is-a-fossil.htm#:~:text=Fossil%20\(noun\);,much%20more%20narrow%20and%20specific](https://www.nps.gov/subjects/fossils/what-is-a-fossil.htm#:~:text=Fossil%20(noun);,much%20more%20narrow%20and%20specific)) fossils are scientifically defined as the “evidence of life preserved in a geologic context”.

Sharks represent important animals in human history ranging from sacred guardians in indigenous cultures to feared sea monsters in Western mythology [1]. Sharks are also components of medical folk tradition and a scientific question relevant in biomedicine for their unique immune system [2]. Shark fossils are mainly composed of teeth with signatures left by ancient organisms providing information about the history of life on sea and oceans on Earth through evolution and extinction processes relevant in palaeoichthyology [3].

Fossil Shark Teeth

As shown in these samples, fossil shark teeth represent multiple species (i.e., *Otodus (Carcharocles) megalodon* in Figures

1A & 1C, *Serratolamna* sp. in Figure 1B, *Carcharias* sp. in Figure 1D, *Otodus obliquus* in Figure 1E, *Paraorthacodus recurvus* in Figure 2A, and *Negaprion brevirostris* in Figure 2B) from different geographic origins (The Americas, Morocco and Russia) and epochs (Pliocene-Miocene-Eocene-Paleocene-Cretaceous; ca. 4-100 mya).

The *Otodus (Carcharocles) megalodon* (Elasmobranchii: Lamniformes: Otodontidae) (<https://en.wikipedia.org/wiki/Megalodon>) is an extinct transoceanic super predator associated with cosmopolitan distribution and body length estimated of 14.2 to 24.3 m [4-6] (Figures 1A & 1C). *Serratolamna* (Elasmobranchii: Lamniformes: Serratolamnidae) is an extinct genus of mackerel sharks no larger than 1.5 m found in North Africa including Moroccan Eocene (e.g., [7]) (Figure 1B). Sand tiger sharks (https://en.wikipedia.org/wiki/Sand_tiger_shark), *Carcharias* spp. (Elasmobranchii: Lamniformes: Otodontidae) (Figure 1D) are composed of mostly extinct species except for *Carcharias taurus* critically endangered with a length between 2.2 and 2.5 m. The *Otodus obliquus* (Elasmobranchii: Lamniformes: Carchariidae) (Figure 1E) are also extinct large (estimated 8-9

meters) macro-predatory sharks distributed worldwide [8,9]. *Paraorthacodus recurvus* Trautschold 1877 (Elasmobranchii: Synchodontiformes: Paraorthacodontidae) (Figure 2A) are considered medium-sized sharks with ca. 1-2 m and smaller than

modern cow sharks [10]. The lemon shark *Negaprion brevirostris* Poey 1868 (Elasmobranchii: Carcharhiniformes: Carcharhinidae) (Figure 2B) can grow to 3.4 m in length is currently a threatened species [11].



Figure 1: Fossil shark teeth. (A) *Otodus (Carcharocles) megalodon*, found in river deposits, origin: Cuba/South Carolina North Atlantic Ocean, Miocene, 5 – 24.5 mya, size: 8 cm long. (B) *Serratolamna* sp. (putative *S. gafsana*), origin: Morocco, Eocene-Paleocene, 38-66 mya, size: 2.2 cm long. (C) *Otodus (Carcharocles) megalodon*, origin: unknown, likely The Americas, Early Pliocene, ca. 4 mya, size: 6 cm long. (D) Sand tiger shark, *Carcharias* sp. (putative *C. taurus*), origin: Morocco, Cretaceous, ca. 72 mya, size: 1.2 cm long. (E) *Otodus obliquus*, origin: Khouribga, Morocco, Eocene, 38-54 mya, size: largest, 3.8 cm long.

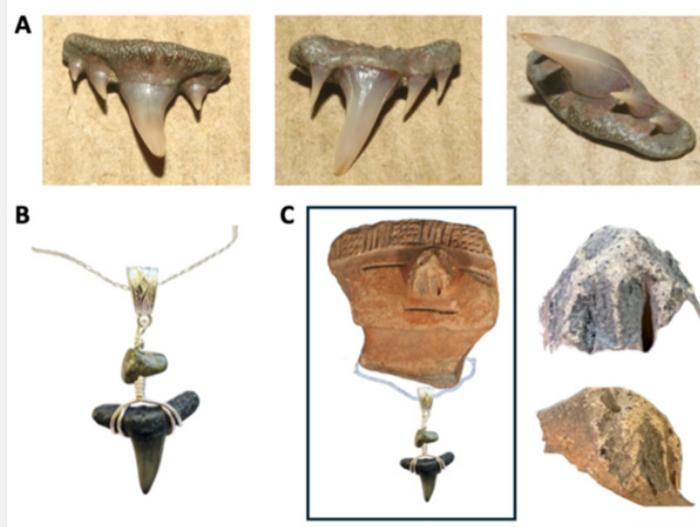


Figure 2: Fossil shark teeth and cultural representations. (A) *Paraorthacodus recurvus* Trautschold 1877, origin: Cenomanian (Upper Cretaceous) deposits near Fedorovka village in the Tambov region of Russia, Cretaceous, 66-100 mya, size: ca. 1 cm long. (B) Lemon shark *Negaprion brevirostris* Poey 1868, origin: Florida, U.S.A., Miocene, ca. 5 mya, size: ca. 2 cm long. The necklace is strung with silver plated wire and hanging from a solid sterling silver curb chain that has been strung with a polished Unakite bead (provided by JurassicJewellery Co. U.K., <https://www.jurassicjewellery.co.uk>). (C) Ceramic anthropomorphic head from pre-Columbian Mesoamerican culture (Colima, Mexico, Proto-classic period, 100 B.C. – 250 A.D.). Represented with the fossil shark tooth pendant necklace and a shark tooth-inspired nose.

Medical Implications

Fossils have a role in alternative traditional medicine based on the potential health beneficial properties of some compounds and belief-based explanations (e.g., [12-15]). In this context, fossil shark teeth have been used for centuries in alternative traditional medicine in different ancient cultures and folklore associated with multiple countries [16,17]. In medieval European cultures, fossil shark teeth were known as *glossopetrae* or tongue stones mainly from Megalodon were believed to be the petrified tongues of dragons or serpents often mounted in silver or gold pendants as protective amulets as illustrated in Figure 2A. In pre-Columbian cultures, shark teeth were also represented in sculptures with protective capacity (Figure 2B). Fossil shark teeth and representations were worn to detect or cure poison in food and drink, treat fevers and assist in childbirth. For medical interventions, shark teeth were crushed into powders or brewed with herbs to create therapeutic compound concoctions used to treat ailments such as sore throats and diphtheria, diseases of the bladder and urinary tract, musculoskeletal sprains and fractures and calcium deficiency.

Although these folk traditions are not based on modern scientific evidence, research interests address the composition of fluorapatite [$Ca_5(PO_4)_3F$] in shark teeth to approach potential novel methods for bio-friendly functional materials in interventions such as controlled tooth replacement and biopatites for bone filler applications in humans [18-20].

Conclusion

The study of fossil shark teeth provides information not only on palaeoichthyology but also on applications in alternative traditional medicine and folklore in ancient cultures. Based on this information and evidence, ongoing and future research directions would advance in the development of new biomedical interventions.

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