

Short Note



Sperm whale teeth from the late Miocene of Cessaniti (Southern Italy)

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INTRODUCTION

This note reports nine sperm whale (Cetacea, Odontoceti, Physeteroidea) teeth from Cessaniti, a late Miocene fossiliferous locality in the Monte Poro - Capo Vaticano area (Vibo Valentia, Calabria, Italy) at geographic coordinates: N 38°39'3.97" - E 16°02'4.98" (Fig. 1). From the upper Miocene beds outcropping at Cessaniti and the surrounding area comes a rich fossil assemblage of marine and terrestrial mammals, including sirenians (*Metaxytherium*), cetaceans (e.g., *Heterocetus* and *Squalodon*), elephants (*Stegotetrabelodon*), giraffes (*Bohlinia* and *Samotherium*), bovids, and rhinoceros (Ferretti et al., 2003; Carone & Domning, 2007; Marra et al., 2011; Carone et al., 2013; Ferretti et al., accepted). Cessaniti is located in a Neogene succession consisting of three stratigraphical units, and it is representative of a marine transgression that occurred during the Tortonian, followed by a regression recorded during the Messinian (Gramigna et al., 2008; Marra et al., 2011). The lower Unit 1 consists of black clays with abundant shells of *Cerithium* spp. and ostreids and represents a marginal lagoon. Unit 2 consists of gray sandstones lying above the previous

unit through a sharp, erosional contact, and represents the onset of marine conditions of shallow water, and precedes the uppermost transgressive, marine, Unit 3 (Gramigna et al., 2008; D'Amico et al., 2012). The majority of the mammal remains, including the sperm whale teeth here described, are from Unit 2.

MORPHOLOGICAL DESCRIPTIONS

The teeth were found in 2011 in the Gentile's quarry, near Cessaniti and are in collections of the Civico Museo Paleontologico di Santa Domenica di Ricadi (VV) with the catalogue number 93(ces). The nine teeth belonging to the same individual (Fig. 2) were associated to fragmentary bones of skull and/or mandibles that unfortunately were destroyed during the quarry activity. The teeth are robust and fusiform, circular to elliptical in cross section, with a relatively short enameled crown. Their maximum length ranges from 10.6 to 14.2 cm and their maximum diameter (MD) from 2.9 to 4.3 cm. The enamel layer is rather thick and superficially sculptured with longitudinal crenulations. The gingival collar is clearly visible in the root surface near the maximum diameter of the teeth (Fig. 2c). The apical wear varies from weak to strong and the distal portion of the root, above the gingival collar, is marked by weak occlusal wear facets in contact with opposing teeth (Fig. 2d). The robust and relatively elongated root compared with the small crown is typical of fossil Physeteroidea (mostly stem physeteroids). The open pulp cavity and the relatively reduced wear suggest an immature animal, even if the specimen is too fragmentary for a reliable valuation of the age of the animal.

Due to the limited systematic significance of sperm whale teeth (Bianucci & Landini, 2006), an assignation of Physeteroidea indet. is proposed for this fragmentary record.

DISCUSSION AND CONCLUSIONS

Sperm whales are today represented by a giant species (genus *Physeter*) and two small species (genus *Kogia*). They are the only survivors of a diversified group of toothed whales with a wide temporal distribution (late



Fig. 1 - Geographical location of the fossil-bearing site.

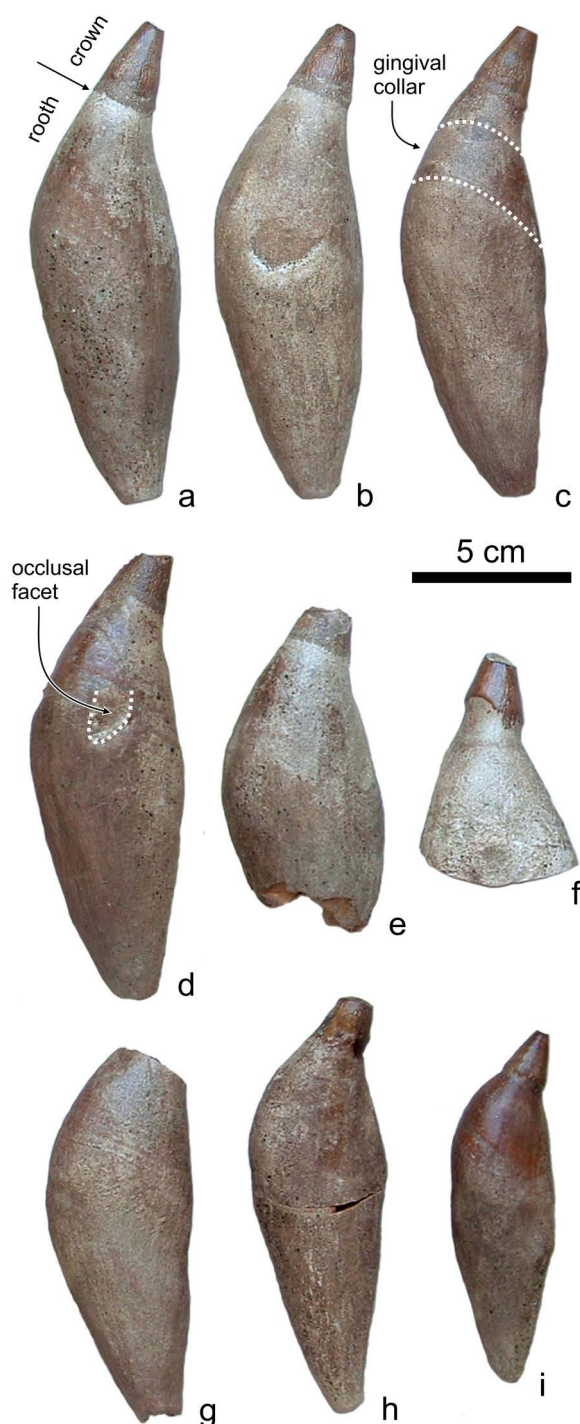


Fig. 2 - Nine teeth of Physeteroidea indet. from the upper Miocene of Gentile's Quarry (Cessaniti, VV).

Oligocene-Recent) (Bianucci & Landini, 2006; Lambert et al., 2008, 2010, in press). The three extant species have lost functional maxillary teeth and feed in deep water using suction to capture principally squid and octopus. On the contrary, several sperm whales from the Miocene are characterized by a complete set of large teeth both in lower and upper jaws and exhibit some features, for example a large temporal fossa and a high coronoid process of the mandible, suggesting well developed masticatory

muscles for raptorial feeding behavior (Lambert et al., 2016). Although in the past the sperm whale teeth - relatively frequent in the Miocene fossiliferous beds - were considered diagnostic and several species were erected (often referred to the genus *Scaldicetus*) based even on a single tooth, recent studies noted the limited diagnostic significance of these anatomical elements (Bianucci & Landini, 2006). Nevertheless, some important information can be provided by this fragmentary material. In fact, the occlusal wear observed in the Cessaniti teeth indicates that there were functional teeth both in lower and upper jaws, suggesting that this sperm whale had a raptorial feeding behavior. Moreover, the size of the Cessaniti teeth is intermediate between the one of *Zygophyseter varolai* Bianucci & Landini, 2006 (MD = 4.7-5.6 cm) and *Acrophyseter deionodon* Lambert et al., 2008 (MD = 2.5-3.2 cm), significantly smaller than *Livyatan melvillei* (Lambert et al., 2010) (MD = 8.1-12.1 cm). Considering the body length estimations of *Z. varolai* (6.5-7 m) and *A. deionodon* (3.9-4.3 m), we can speculate a moderately large size (ca 5 m) for the Cessaniti sperm whale. This estimated body size suggests that the Cessaniti sperm whale may have fed on the small (ca 2.2 m) sirenian *Metaxytherium serresii* (Gervais, 1847) whose continuous presence in the same area where the sperm whale remains deposited is documented by an impressive fossil record (Carone & Domning, 2007; Carone et al., 2013). Finally, this new sperm whale record further suggests a high diversity of the fossil assemblage of Cessaniti that stimulates future research addressed to reconstruct the intriguing ecological structure of the Tortonian marine vertebrate fauna that lived in this sedimentary basin.

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