化石研究会会誌
[Original Report]

Journal of Fossil Research, Vol. 34(2), 55-57(2001)

Identity of small symmetrical teeth of the Late Cretaceous lamniform shark, *Cretoxyrhina mantelli*, from western Kansas, U.S.A.

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Abstract

Small symmetrical teeth are known to occur in the Late Cretaceous lamniform shark, *Cretoxyrhina mantelli* (Agassiz). Their exact identity remains uncertain. However, they may represent abnormal teeth based on the occurrence of abnormally symmetrical teeth on a jaw specimen of the modern bigeye thresher, *Alopias superciliosus* (Lowe).

Cretoxyrhina mantelli (Agassiz) is a Late Cretaceous cretoxyrhinid shark representing the only extinct lamniform with a reasonably reconstructed dentition (Shimada, 1997a; Fig. 1A) and jaws (Shimada, 1997b). Teeth of *Cretoxyrhina mantelli* occur in marine deposits worldwide (e.g., Cappetta, 1987; Siverson, 1992, 1996). Its body form and body size could have resembled the modern great white shark, *Carcharodon carcharias* (Linnaeus) (Shimada, 1997b). The fossil record suggests that *Cretoxyrhina mantelli* fed on active large marine vertebrates (Shimada, 1997c).

Eastman (1895, plate 17) figured an associated tooth set of *Cretoxyrhina mantelli* from the Niobrara Chalk of western Kansas, U.S.A.. The tooth set included two small symmetrical teeth (Eastman, 1895, plate 17, figs. 35, 36; Fig. 1B). Eastman suggested that these teeth are symphysial teeth. Shimada (1997a) considered these symmetrical teeth as abnormal, although Shimada (1997a) also noted the possibility that they may be from a row of medial teeth (note: medial tooth row here refers strictly to that situated directly on a jaw symphysis, and medial teeth are not known in any non-embryonic lamniforms: Shimada, in press).

The true identity of the small symmetrical teeth in *Cretoxyrhina mantelli* remains uncertain. This is because the teeth were disarticulated from the jaws, and their developmental history would never be known from the fossil record. However, Shimada's (1997a) interpretation is maintained here that they are abnormal teeth, because this view is further supported by the presence of dental abnormality in one jaw specimen of the modern bigeye thresher, *Alopias superciliosus* (Lowe), as described below.

Alopias superciliosus is a coastal-oceanic alopiid shark found in circumtropical areas, and it occurs as deep as 500 m from the surface (Compagno, 1984). *Alopias superciliosus* may attain about 550 cm total length (TL) (Kato *et al.*, 1967). Stomach contents of *Alopias superciliosus* suggest that this shark feeds on small to moderate pelagic and benthic crustaceans, cephalopods, teleosts (Fitch and Craig, 1964; Stillwell and Casey, 1976; Gruber and Compagno, 1981), and elasmobranches fishes (Bass *et al.*, 1975). A typical dentition of *Alopias superciliosus* is shown in Figure 1C. In *Alopias superciliosus*, teeth of females are slightly broader than those of males (Bass *et al.*, 1975; Gruber and Compagno, 1981; Cadenat and Blache, 1981; Cigala-Fulgosi, 1983).

Received March 19, 2001; Accepted October 21, 2001

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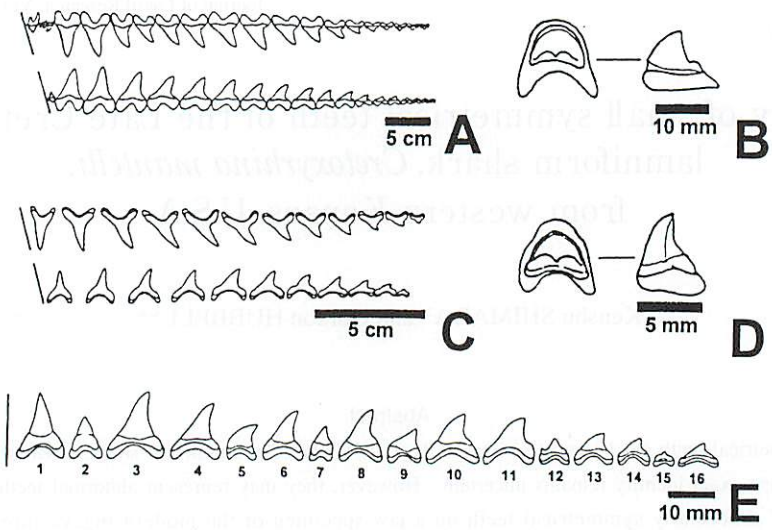

Fig.1. Teeth of *Cretoxyrhina mantelli* and *Alopias superciliosus*. A, upper and lower dental series of *Cretoxyrhina mantelli* (straight lines = jaw symphysis; mesial to the left; after Shimada, 1997a); B, apical (left) and profile (right) views of one of the small symmetrical teeth of *Cretoxyrhina mantelli* presented by Eastman (1895); C, upper and lower dental series of *Alopias superciliosus* (straight lines = jaw symphysis; after Bass *et al.*, 1975); D, apical (left) and profile (right) views of small symmetrical tooth of *Alopias superciliosus* (GH-Alop1-09); E, whole right lower dental series of GH-Alop1-09 which includes the tooth (tooth "2") illustrated in D (labial view; straight line = jaw symphysis [image reversed; cf. Fig. 2]; teeth 2, 5, 7, 9, 12, and 15 are abnormal).

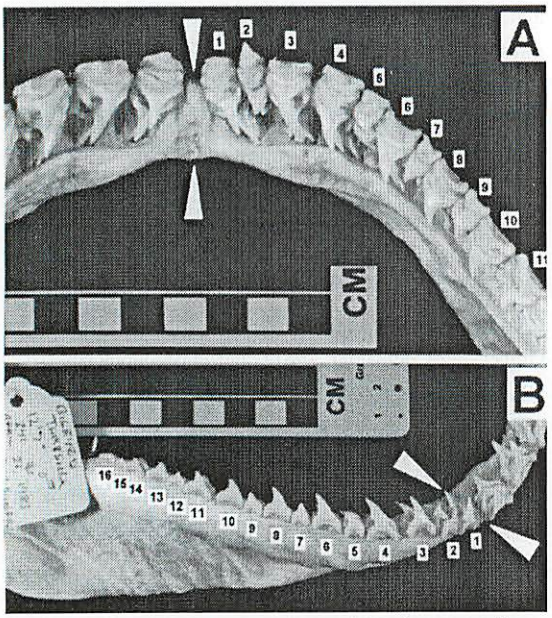

Fig.2. Photographs of jaw specimen of *Alopias superciliosus* (GH-Alop1-09) showing multiple abnormal teeth on the right lower dental series (cf. Fig. 1E). A, occlusal view (anterior to the top); B, lateral view (anterior to the right). Arrows indicate position of jaw symphysis.

Abnormalities in tooth morphology are also known to occur occasionally in this species (Cigala-Fulgoshi, 1983), but reported abnormal teeth do not include symmetrical forms.

One jaw specimen of *Alopias superciliosus* that belongs to the second author's (GH) collection (GH-Alop1-09, 384 cm TL, male, caught off Florida coast; Figs. 1D-E, 2) shows many rows of abnormal teeth, that occur throughout both upper and lower dental series (note: more extensive in the lower dental series: Fig. 2). Among the abnormal teeth are those characterized by small symmetrical teeth (Figs. 1D, 2), that remarkably resemble the symmetrical teeth of *Cretoxyrhina mantelli* (Fig. 1B). None of the abnormal teeth are situated at the jaw symphysis, so they are not medial teeth. Although not conclusive, it is plausible to consider that a similar dental abnormality could have occurred in *Cretoxyrhina mantelli*. It is intriguing that *Cretoxyrhina mantelli* is close phylogenetically to *Alopias* on a cladistic basis (Shimada, 1999).

Acknowledgments

We thank the following individuals for their assistance in various ways: D. Bardack, S. A. Cohn, M. Goto, L. Grande,

W. S. Greaves, K. Hubbell, E. E. LeClair, R. Plotnick, T. Poulson, L. K. Shimada and H. Yabe.

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