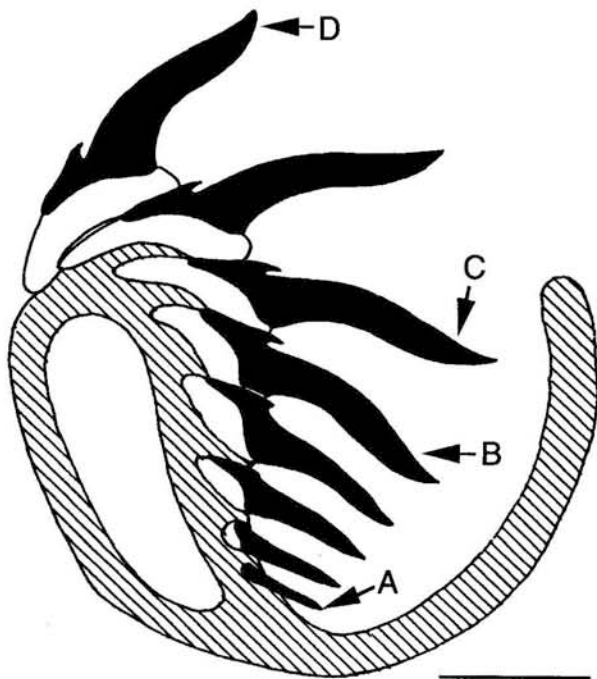


## Tooth Replacement

Sharks and rays have a **polyphyodont** dentition; that is, they shed old teeth and replace them with new ones throughout their lives. Figure 7 illustrates this process. Teeth develop along the inner surface of the jaw cartilage in association with infolding of epidermal tissue. They are attached to the dental membrane and advance anteriorly in a conveyor-belt fashion, erupt and become functional for a time.

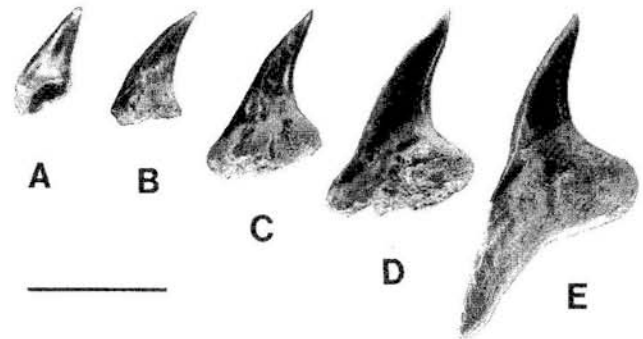


**Figure 7.** Cross section through the lower jaw (Meckel's cartilage) of the sand tiger shark *Carcharias taurus* Rafinesque 1810 showing the ontogeny of an anterior tooth row A-D. A) new tooth, B) incomplete replacement tooth, C) fully formed nonfunctional replacement tooth, D) functional tooth. Scale line = 1 cm.

An enamel-like crown cap forms first. The root develops later, filling in the crown, and becomes fully formed by the time the tooth reaches a functional position.

Many teeth are lost in the feeding process but many others are simply shed due to this conveyor-belt process. This is one reason shark teeth are so common in the fossil record. Teeth that have been shed during life may have broken or worn crowns,

but the roots will always be fully developed. In contrast, the teeth lost as a result of the death of an individual will contain all tooth growth stages from simple enameloid caps through intermediate and mature stages of root and crown formation. An example of one such developmental sequence is evident in the associated dentition of the late Albian shark *Paraisurus compressus* (Figure 8). Often, collectors assume that a tooth with a poorly formed root is broken when in fact it may be an incompletely developed, nonfunctional, replacement tooth.



**Figure 8.** Ontogenetic growth series of teeth from an associated dentition of *Paraisurus compressus* (Albian, Weno Formation, Tarrant County) illustrating the progression of root and crown development (A-E). Immature tooth (A) has only a thin enameloid cap and no crown-filling dentine. Mature tooth (E) has a fully formed crown and root. Scale line = 1 cm.

## Tooth Orientation

Describing teeth requires a terminology that clearly conveys tooth orientation. The following terms pertain, in part, to a single tooth (Figure 9) or the entire dentition (Figure 10).

**Upper and lower teeth** refer to the teeth from the upper jaw (**palatoquadrate cartilage**) and the lower jaw (**Meckel's cartilage**).

**Symphysis** is the midline of each jaw where the left and right jaw cartilages meet.

**Labial** and **lingual** refer to the faces of the tooth. The lingual side is toward the tongue (inner face) and the labial side is toward the lips (outer face).