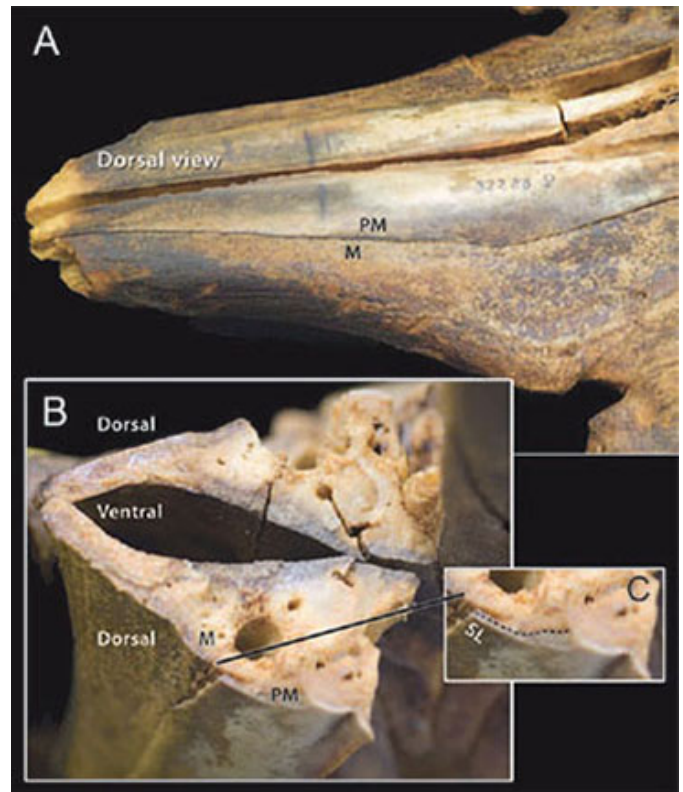




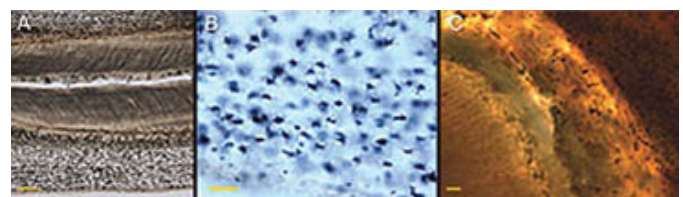
Narwhal Anatomy

Narwhal tusks, although well described and characterized within publications, are clouded by contradictory references, which refer to them as both incisors and canines. Males have the characteristic left canine tooth extending approximately 2.4 meters, variable depending on the whale and the age. The right tooth – which remains embedded in the skull – measures roughly 30.5 cm. Fetal narwhal initially develop six pairs of maxillary (or upper) teeth, and two pairs of mandibular (or lower) teeth. Only one pair from the maxillary jaw develop; the others are vestigial. Vestigial teeth are thought to have no functional use and on a pathway of evolutionary obsolescence.

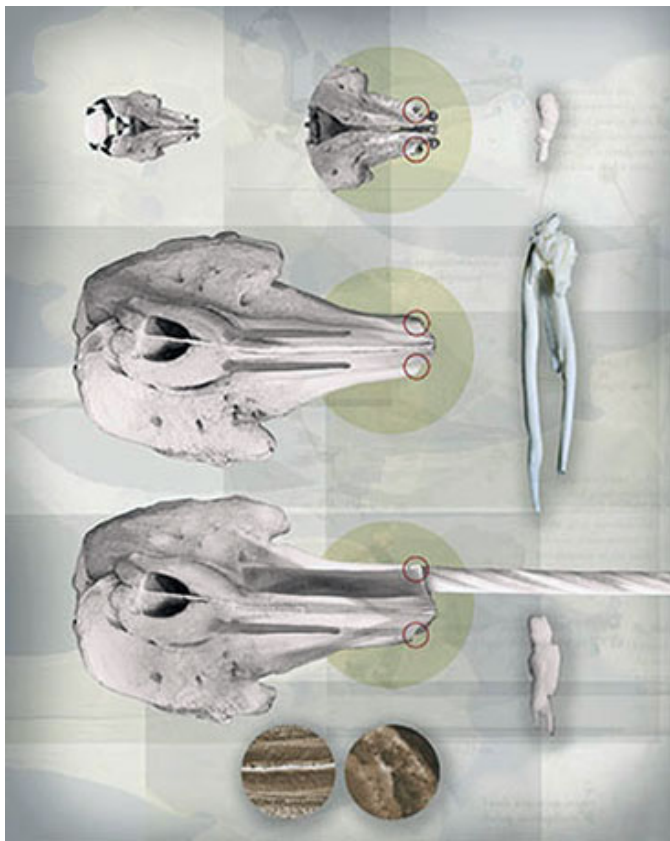
Tusk length, girth, morphology, wear and coloration are all quite variable. Male tusks are usually longer and have a wide variation in ridge morphology, often appearing gently wave-like when looking down the horizontal axis. Female tusks are shorter, straighter, have a more regularly defined morphology, and do not collect as much proteinaceous or algae on the surface, thus appearing whiter. The tusk is hollow during early growth and calcifies with age. An average male tusk weighs 10 kg (22 lb). About one in 500 males has two tusks.



(A) Canadian Museum of Nature female specimen 32288 with a transverse cut at the distal insertion of the right embedded tusk and extending to the premaxillary suture. (B) Transverse section with the caudal section below. (C) Premaxillary-maxillary suture lines (SL) on the dorsal surface and maxillary bone housing the tusk.

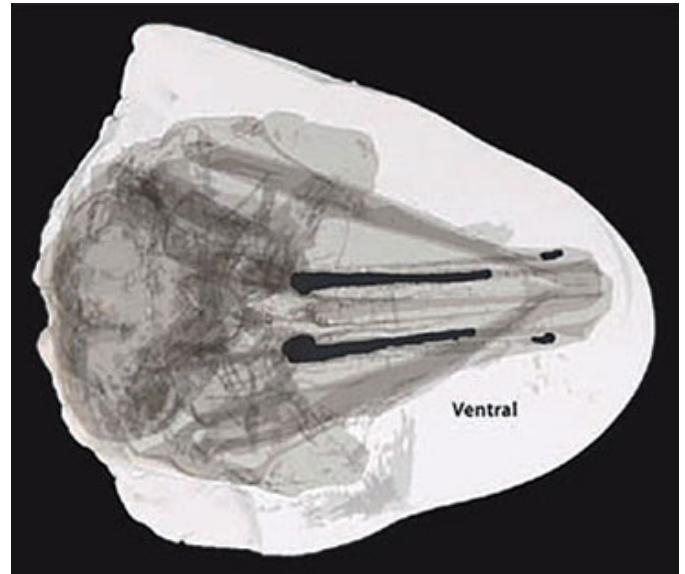


Anatomy and histology of vestigial narwhal teeth. (A) Unstained thin section of vestigial tooth showing the open pulp chamber surrounded by dentin with dark parallel dentinal tubules; beyond the dentin is a thin layer of acellular cementum and then cellular cementum with abundant cementocytes extending to the tooth surface; no Sharpey's fibers are observed; bar = 200 μ m. (B) Cementocytes in cellular cementum in root area of vestigial tooth. Surface of tooth area is near the 50 μ m scale bar. (C) Section of the knob-like crown of a vestigial tooth. Dentin, pictured on the lower left, is covered with a thin amorphous layer, membrana preformativa, and then

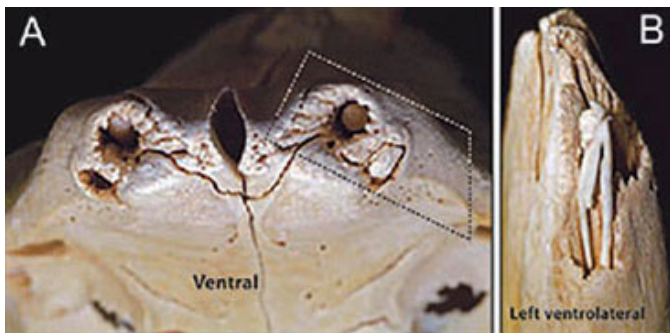


Pictured above (top to bottom) are a fetal narwhal, an adult female, and an adult male. Associated vestigial teeth are shown at the far right.

a layer of acellular cementum followed by a thick layer of cellular cementum with abundant cementocytes. Tooth sections are unstained; light scattering causes a reddish-brown tint in (A) and (C).



Computerized tomography of adult female head. Ventral view showing relationship of unerupted tusk to the vestigial tooth; soft tissue pathways for nerve and blood supply are positioned rostral to the vestigial teeth and caudal to the embedded tusks.



Subadult female specimen. (A) Anterior-ventral view showing spatial relationship of vestigial tooth ventrolateral to the embedded tusks. (B) Magnified ventral view of the vestigial tooth two thirds removed from its socket, with characteristics of multiple roots and variable crown morphology.

Nweeia et al. 2012. *The Anatomical Record*, 295:1006-1016.

