

High frequency echolocation, ear morphology, and the marine-freshwater transition: A comparative study of extant and extinct toothed whales

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This study compares the bony ear morphology of freshwater and marine odontocetes (toothed whales). Odontocetes are unique among marine mammals in two important respects: 1) they use echolocation; 2) at least three lineages have independently evolved obligate freshwater habits from marine ancestries. Freshwater odontocetes include the so-called "river dolphins," a paraphyletic group that each evolved convergent external morphological characters that distinguish them from oceanic dolphins (Delphinoidea). In addition to their convergent external morphology, "river dolphins" all have echolocation that use one peak (narrow-band) frequency around 100. kHz, compared to oceanic delphinoids which use a two peak (bimodal) frequency ranging from 40 to 140. kHz. The differences in echolocation suggest that the sensory systems responsible for detecting these different sound frequencies should also differ, although quantitative assessments of the cetacean hearing system remain understudied and taxon