Biomechanics of prey capture in crocodylians

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Abstract: The capture of small, free-floating prey in an aquatic medium presents difficulties for predators because water is incompressible. As jaws, beaks or other capture mechanisms close on the prey, the incompressible water pushes the prey away. The problem is greatest when prey size is much less than the predator and reduced as their size and water resistance/inertia converge. A solution is to 'trap' prey against the bottom or the surface, but in open water with small prey this problem is unavoidable. Aquatic vertebrate predators have solved this problem in several interesting morphological and behavioral ways. Many aquatic birds use a narrow profile, low resistance beak combined with a flexible extendable neck. Baleen whales use a very unique inversion of the tongue into a ventral space to ingest water, then expel it through baleen. Most toothed whales are suction feeders with unique structures to allow this. Most teleost fish expand their opercular apparatus to enlarge the mouth, sucking in prey that are retained on bony gill rakers and teeth while whale sharks and manta rays use a passive flow-through mechanism. Crocodylians do not demonstrate any of these structures or behaviors, but even large crocodylians ingest very small fish, shrimps and other tiny prey—How? This presentation reviews these mechanisms and using the general consideration that function is reflected in form, generates a hypothesis that crocodylians use a unique combination of their tongue and lingual morphology, their large hyoid apparatus and peg-like teeth to capture small prey by expanding their gular region and sucking the prey into their mouth where it is retained by the teeth as the water is expelled. Variations and exceptions like gharials, are discussed.

Keywords: Small prey, Capture biomechanics, Crocodylians.

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