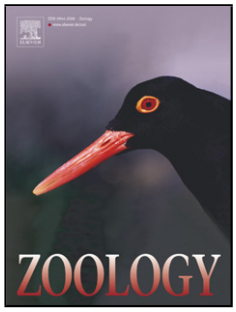

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Biomechanics of the jaw of the durophagous bonnethead shark

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Highlights

- Second moment of area, *I*, was measured for cross sections of *S. tiburo* lower jaw.
- *I* was found to increase from the anterior of the jaw to the posterior.
- The gradient of *I* corresponded with the transition from grasping to crushing teeth.

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ABSTRACT

Durophagy in chondrichthyan fishes is thought to entail a set of morphological characteristics, such as hypertrophied adductor muscles, molariform teeth, and high bite forces. However, these characteristics are not common to all durophagous chondrichthyans. In some durophagous chondrichthyans, the jaws are better suited biomechanically to resist bending in the area where prey is processed. Resistance to bending is in part, quantified by second moment of area (*I*), which uses the neutral axis of an object to analyze the arrangement of material. This study investigated whether the lower jaw of the bonnethead shark, *Sphyrna tiburo*, is more resistant to bending under the crushing/molariform teeth compared to the grasping teeth. Using computerized tomography (CT) scanning, the jaws of ten bonnethead sharks were visualized, then digitally resliced at identical positions along the jaw for all specimens. *I* increased along the lower jaw from anterior to posterior as the teeth transform from grasping to crushing, with the largest absolute increase occurring about the transition from grasping to crushing teeth. When the lower jaw is compared to that of a rod of similar cross-sectional area, the shape exceeds that of a rod by 1.6 to 5.7 times, meaning the shape of the jaw is better suited to resist bending than if the same size jaw