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Composition, microstructure, and mechanical properties of *Megalops atlanticus* scales

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ABSTRACT

In recent years, there has been an increased interest on understanding the mechanical behavior and microstructure of fish scales aiming at the development of bioinspired materials. This study presents a study of the composition, microstructure, and mechanical properties of the scales of Tarpon fish (*Megalops atlanticus*). Mechanical properties were evaluated in uniaxial tension as a function of positions along the length of the fish (head, midlength, and tail). Because of the possible anisotropy of the scales, additional tensile tests were performed on three different orientations (0°, 45°, and 90°). Examination of the fish scale microstructure and composition were performed by means of Scanning Electron Microscopy and RAMAN spectroscopy. The results showed that the scales are anisotropic with variation of the mechanical properties as a function of body position. *Megalops atlantiticus* scales are composed of fibrous collagen and hydroxyapatite crystals. The scales have a nonhomogenous distribution crosswise and lengthwise, providing multifunctional characteristics, which can be exploited on bioinspired materials.