

## **UNDERWATER SOUNDSCAPE PATTERN DURING HIGH SEASON OF NAUTICAL TOURISM IN CABO FRIO ISLAND, BRAZIL**

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The underwater sounds are related to abiotic, biotic and human activities. All these activities compose the underwater soundscape that may change in time and/or space (Pijanowski et al., 2011). Several ecological relationships are associated to information generated through soundscape patterns. However, anthropogenic sounds have been recently regarded as underwater noise pollution (Williams et al., 2015).

This study aims to characterize the underwater soundscape of Cabo Frio island, a marine protected area in Arraial do Cabo, Rio de Janeiro, Brazil, evaluating biological and anthropogenic acoustic patterns. Signals were recorded from December 2016 to January 2017. The duty cycle was established as a one-minute recording every five minutes, totalizing 20% of day. Three frequency ranges were selected (“A” 0.1–22 kHz, “B” 0.1–2 kHz and “C” 2–22 kHz) and the following acoustic measurements were taken: average power, average entropy and maximum frequency.

Biological patterns were observed in all three frequency ranges, mainly during twilight and nighttime. Based on the association among the acoustic measurements, the presence of touristic and fishery boats was recorded in the region mainly at frequencies approximately 200 Hz range during the daytime. Average power peaks were observed in frequency range B. These power peaks were louder than biological power peaks during daytime and can be related to the highest traffic of touristic boats. Also, average power peaks associated to biological sounds were recorded during twilight. The results suggest that the constant disturbance caused by boats can impaired the establishment of the natural underwater soundscape of the region during the touristic activities. The association among the acoustic measurements can be a potential tool for boat traffic management in marine protected areas.

Pijanowski, B.C., Farina, A., Gage, S.H., Dumyahn, S.L., and Krause, B.L. (2011). “What is soundscape ecology? An introduction and overview of an emerging new science,” *Landscape ecol.* 26, 1213-1232.

Williams, R., Erbe, C., Ashe, E., and Clark, C.W. (2015). “Quiet (er) marine protected areas,” *Mar. Pollut. Bull.* 100, 154-161.