A NONLINEAR MODEL FOR ROCKY SHORE BIOACOUSTIC SIGNATURE OFF CABO FRIO ISLAND

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Different marine habitats have distinct acoustic signatures (Radford et al., 2014). These signatures are composed by anthropogenic, natural and biological sounds. In coastal zones, the acoustic signature has a stronger influence of benthic organisms that form the bioacoustic chorus (Butler et al., 2017), that we will term as the Rocky Shore Bioacoustic Signature (RSBS). However, RSBS patterns can be influenced by circadian and lunar cycles, wind, tide, temperature, luminosity and others. Yet, to better understand the influence of abiotic and biotic factors in the RSBS pattern it is very important to model, identify and quantify contributions of each these factors.

This work aims at proposing a nonlinear model for the RSBS, based on data collected off Cabo Frio Island, Brazil. This area sustains a unique environment due to strong upwelling occurrence and other hydrodynamic characteristics (Ferreira, 2003; Calado et al., 2018). A bottom structure with 4 hydrophones and temperature/luminosity sensor was installed near a rocky shore during 82 days. A meteorological dataset (rain, wind, solar radiation) from National Institute of Meteorology (INMET) were utilized for RSBS modelling. The RSBS model was based on a nonlinear least squares multiple regression technique.

Regression analysis revealed that temperature and luminosity explain approximately 50% of the RSBS variance, while other abiotic factors explain just 5%, approximately. Another important result was the nonlinear relationship between luminosity and RSBS. This puts in evidence that the biorhythm can be one of the principal of contributors for RSBS, increasing in twilights. In addition, this model may help to understand RSBS patterns and its variations, and help for developing bioacoustic inversion applications as abiotic data measuring, populational density of benthic organisms and marine health monitoring.

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