

FIRST WORKSHOP

"DYNAMICAL SYSTEMS APPLIED TO
BIOLOGY AND NATURAL SCIENCES "

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ABSTRACT | Ricardo Lemos

Title

"Environmental forcing on northeast Atlantic bluefin tuna abundance"

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Abstract

In this work we analyze the association between northeast Atlantic bluefin tuna abundance, August sea surface temperature, zonal wind speed and the North Atlantic Oscillation, during the 19th and 20th centuries. We employ hierarchical Bayesian methods to weight time series of trap catches and environmental data into principal components of variability (PCVs), decompose these into supra decadal harmonics and first order autoregressive processes, explore crossed covariance between data types, and model the spatial structure of residual variability. Accounting for measurement error and estimation uncertainty are important aspects of the analysis.

Results show that PCVs include cycles whose features (periods, phases and relative amplitudes) are coherent among data types. Also, high frequency shocks appear correlated. The spatial weighting scheme reveals parts of the Mediterranean basin as more dynamic regions. As these coincide with known spawning grounds, we postulate that environment-driven reproductive success is the main long-term cause for fluctuations in abundance. The approach brings novel statistical methods to the field of ecological analysis.