

## **RISING TEMPERATURES, FALLING FISHERIES: CONSEQUENCES OF CROSSING THE TIPPING POINT IN A SMALL-PELAGIC FISHERY**

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**Abstract:** Ocean warming affects fisheries around the globe. Commercial fish respond to it depending on their preferences for certain temperatures. The small pelagic fish community responds faithfully to environmental changes, making it a good early warning system to understand and prevent the biological communities shift. Indeed, the occurrence of regime shift of the pelagic communities caused by environmental factors has catastrophic consequences on the society, causing changes in the economic and cultural dimensions. Here, we explored the causes of the regime shift that occurred in the small pelagic community on Madeira Island. To do so, we focused on the landings of four species that ensemble the small fish pelagic community, Boops boops, Scomber colias, Sardina pilchardus, and Trachurus picturatus, over a 40-year period (1980-2019).

On the environmental side, we collected information on Sea Surface Temperature Anomaly (SSTA) and North Atlantic Oscillation data (NAO), for each year of the time series. To shed light on the causes of shift landings, we performed a set of General Additive Models to fit the nonlinear trends. Our results showed that the regime shift of the small fish pelagic community occurred in 2002, with a transition period from 2000 to 2003. Where the simultaneous factors SSTA and NAO explained up to 88.2 % of the small fish pelagic community shift, both of which were significant. This trend was unyielding despite the implemented management actions to preserve these stocks. The present findings are further evidence of the major effects of ocean warming on small pelagic catch levels. An urgent need to consider ocean warming in the proper management of fish stocks is required. The economic consequences are devastating considering the importance of small pelagic by artisanal fishermen from several geographic areas.

**Key words:** Key: Regime shift, Resilience, Global change, Fisheries management