

Symposium on Decadal Variability  
of the North Atlantic and its Marine  
Ecosystems: 2010-2019



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# Symposium on Decadal Variability of the North Atlantic and its Marine Ecosystems: 2010 – 2019

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## **MULTIDECADAL (1997-2020) TELECOUPLING OF WATER MANAGEMENT FOR TERRESTRIAL AGRICULTURE AND A MARINE FISHERY AT SOUTHERN SPAIN**

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Climate change is decreasing water supplies globally while water demand is rising, making water access and distribution essential for sustainability, equity, and efficiency. In response, water management has shifted towards practices that improve water efficiency. However, links between geographically separated socioecological systems, known as telecouplings, can obscure the potential consequences of water use. This study focuses on a telecoupling between terrestrial water use and marine fisheries for the period 1997 to 2020. We develop a case study in southern Spain using multidecadal time series of the Guadalquivir river's hydrology, its estuarine community, and the European anchovy (*Engraulis encrasicolus*) fishery in the Gulf of Cadiz. We found that water extracted to irrigate crops decreased the river's flow and seasonality. However, anchovies used the estuary as a nursery before recruiting to the ocean, where they were harvested. Anchovy recruitment improved when estuary hydrology matched the Guadalquivir River's historical hydrology (i.e., high discharge and seasonality). Then using hydro-economic modeling, we explored the outcomes of different water policies on the telecoupled socioecological systems. Our models predicted that improved water efficiency incentivized agricultural expansion. In contrast, continued marine fishery yields required management values that supported the value of the marine fishery. We highlight estuaries' critical role in driving marine systems; yet, upriver processes drive estuaries dynamics. Overall, marine-terrestrial telecouplings provide evidence that marine fisheries that rely on estuarine reliant species would benefit of water policy and management being extended beyond the water basin.

Poster presentation