

**Fellowship of fish, coral and tree rings**

Joyce JL Ong, Adam N Rountrey, Jens Zinke, Jessica J Meeuwig, Pauline F Grierson, Alison J O'Donnell, Stephen J Newman, Janice M. Lough, Mélissa Trougan, Mark G Meekan.

**Abstract**

The effects of climate change are difficult to predict for many marine species because little is known of their response to climate variations in the past. However, long-term chronologies of growth, a variable that integrates multiple physical and biological factors, are now available for several marine taxa. These allow us to search for climate-driven synchrony in growth across multiple taxa and ecosystems, identifying the key processes driving biological responses at large spatial scales. We hypothesized that in northwest Australia, a region predicted to be strongly influenced by climate change, the El Niño Southern Oscillation (ENSO) phenomenon would influence the growth patterns of organisms across ecosystems. To test this idea, we analysed the growth chronologies of two marine fish *Lutjanus argentimaculatus* and *Lethrinus nebulosus*, the coral *Porites* spp. and the tree *Callitris columellaris*. Principal components analysis and linear model selection showed evidence of ENSO-driven synchrony in growth among all four taxa at inter-annual time scales, the first such result for the Southern Hemisphere. Rainfall, sea surface temperature and sea surface salinity, which are linked to the ENSO system, influenced the annual growth of fishes, trees and corals. All four taxa had negative relationships with ENSO, where positive growth patterns occurred during strong La Niña years. This finding implies that future changes in the strength and frequency of ENSO events are likely to have major consequences for both marine and terrestrial taxa.

**Keywords:** Growth chronology, *Lutjanus argentimaculatus*, *Lethrinus nebulosus*, *Callitris columellaris*, *Porites* spp., El Niño Southern Oscillation, environmental drivers of growth, tree-ring, otolith, coral core

**Contact author:** Joyce ONG, University of Western Australia, +618 63694081, joyce.ong@research.uwa.edu.au