

## Scales of opportunity in Pacific Ocean fisheries ecosystems

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Most marine fish populations display natural fluctuations in their biomass and distribution. The long-term variability in many of these stocks is synchronous throughout an ocean basin or globally. Furthermore, these stocks fluctuate in tandem with large-scale physical conditions, suggesting a biological response to ocean-climate variability. In the north Pacific, the primary time scales of ocean variability observed are interannual (ENSO), intradecadal (regime shifts), and global (possibly anthropogenic). There is a 'dynamical similarity' in the spatial structure and mechanisms of climate variability on these scales, meaning that the patterns of physical variability driving fishery ecosystems on seasonal to interannual scales may be useful in defining the processes responsible for long-term shifts in marine populations. Local ecosystem variability is linked to global change and variability; so global climate forcing is modulated by local factors and processes (such as coastal upwelling and freshwater inflow). We are still largely at a 'proxy' stage in incorporating environmental information into the stock assessment process. Many of the indices of climate change are based on fields (such as atmospheric pressure and winds) that may represent or be correlated with the factors influencing marine organisms, but are not directly linked to biological processes. However, we are evolving from a 'correlation' to 'mechanistic' approach to describing environmental-fisheries links. As integrators of environmental variability, ecosystem change may 'foretell' physical change.

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