

Climate Change Effects on Planktonic Ecosystems: A Five Decade Perspective from CalCOFI

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Abstract: Interannual scale perturbations, especially El Niño, have long been known to influence vertical stratification, nutrient supply, geographic distributions of organisms, and food web structure in the California Current. Here we address longer term, multi-decadal scale influences on California Current planktonic food webs. We focus on both the species composition of zooplankton assemblages and on the stable N isotopes of selected species. Sampling was conducted by CalCOFI (the California Cooperative Oceanic Fisheries Investigations), the longest biological oceanographic time series in North America and among the most comprehensive ocean time series in the world. This research is a component of the U.S. GLOBEC Northeast Pacific program.

Some components of zooplankton assemblages show Pacific Decadal Oscillation-like dynamics, with certain subtropical taxa (especially species of doliolids, euphausiids) occurring at markedly elevated biomass during the warm phase of the NE Pacific between 1977-

1998, relative to the preceding 26 year and subsequent 5 year period. Conversely, a group of salp species was markedly more abundant during the cooler phase from 1951-1976 than during the warm phase, and some of these species reappeared after the cooling episode of 1999. The stable N isotopes of 2 particle-grazing copepod species (*Calanus pacificus* and *Eucalanus californicus*) do not show evidence of multi-decadal variability, while those of 2 carnivorous chaetognaths (*Sagitta bierii* and *S. euneritica*) show weak regime-shift like variations. The persistent altered characteristics of the upper water column in the most recent 4 years, including reduced temperature stratification and a modified zooplankton assemblage, make it difficult to rule out the possibility of an ecosystem shift in the upper ocean 1999.

The likely mechanisms underlying such changes in planktonic food webs, and implications for pelagic ecosystems, will be discussed.