Large scale shifts occurred in climatic and oceanic conditions in the North Atlantic Ocean which can be measured by quasi-decadal variability of the winter North Atlantic Oscillation index. Low frequency, high amplitude and abrupt changes in species abundance, community composition and trophic organization that occur concurrently with physical changes in the climate system indicate a *regime shift.*

We examine trophic level, size spectra and other community metrics and the demersal-pelagic ratio, concurrently with the physical properties, NAO, wind and mean surface temperature variabilities, for West Portugal Upwelling Region.

Keywords: Climate change, regime shift, community metric, fishing effects.

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ICES CM 2004/M:12

Plankton biomass, production and variability in the Norwegian Sea ecosystem

Webjørn Melle, Francisco Rey, Bjørnar Ellertsen and Hein Rune Skjoldal

More than 10 years of extensive marine investigations in the Norwegian Sea have culminated in a comprehensive book, to be published in 2004, describing the major features and variability of the ecosystem. Here the main characteristics of the phytoplankton and zooplankton community are reviewed with respect to standing stock, diversity, production and trophic interactions. Primary production, new production and phytoplankton spring bloom dynamics are linked to the physical processes related to winter mixing depth and water column stabilisation. It is shown that the classical Sverdrup critical depth hypothesis applies to the phytoplankton of the Atlantic water masses in the Norwegian Sea, giving rise to variable timing of the spring bloom. The reproduction and recruitment of *Calanus finmarchicus*, the main herbivore of the Norwegian Sea, is closely linked to the bloom and shows the same pattern of variability. Egg production and survival through the nauplius stages of *C. finmarchicus* occurs during the early bloom period while recruitment to the first copepodite stage coincides with the bloom.

Total biomass of krill, amphipods, shrimps and three size fractions of zooplankton are calculated. It is shown that interannual variability in zooplankton biomass is related to climate and the growth of the major planktivorous fish stock; the Norwegian spring spawning herring.

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ICES CM 2004/M:13 Withdrawn

ICES CM 2004/M:14

Evidence for regime shifts in the Pacific Ocean

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Early ecologists focused on competition and predation as the important forces structuring communities and causal for population changes over time. While competition and predation are certainly at work it has now become abundantly clear that natural climate variations can have large impacts on ocean ecosystem structure and productivity. El Niño first called attention to the effects of climate variability on Pacific Ocean ecosystems and the 1982-83 El Niño showed that the oceanic warming in the tropical Pacific had global effects on climate. Oceanic effects were originally thought to be restricted to the tropical and eastern Pacific but careful studies in the center of the North Pacific Ocean close to Hawaii uncovered El Niño effects there as well. The past several decades has seen growing awareness of La Niña, the counterpart or opposite condition of El Niño and more recently focus has shifted to multi-decadal changes that show remarkable Pacific basin-wide coherence and strong impacts on oceans ecosystems. This paper reviews evidence for multi-decadal fluctuations or regime shifts in Pacific Ocean ecosystems and discusses potential explanations for the biological variability.

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