

ID: W2073221851

TITLE: Ecosystem responses to recent oceanographic variability in high-latitude Northern Hemisphere ecosystems

AUTHOR: ['Franz J. Mueter', 'Cecilie Broms', 'Kenneth F. Drinkwater', 'Kevin D. Friedland', 'Jonathan A. Hare', 'George L. Hunt', 'Webjørn Melle', 'Maureen H. Taylor']

ABSTRACT:

As part of the international MENU collaboration, we compared and contrasted ecosystem responses to climate-forced oceanographic variability across several high latitude regions of the North Pacific (Eastern Bering Sea (EBS) and Gulf of Alaska (GOA)) and North Atlantic Oceans (Gulf of Maine/Georges Bank (GOM/GB) and the Norwegian/Barents Seas (NOR/BAR)). Differences in the nitrate content of deep source waters and incoming solar radiation largely explain differences in average primary productivity among these ecosystems. We compared trends in productivity and abundance at various trophic levels and their relationships with sea-surface temperature. Annual net primary production generally increases with annual mean sea-surface temperature between systems and within the EBS, BAR, and GOM/GB. Zooplankton biomass appears to be controlled by both top-down (predation by fish) and bottom-up forcing (advection, SST) in the BAR and NOR regions. In contrast, zooplankton in the GOM/GB region showed no evidence of top-down forcing but appeared to control production of major fish populations through bottom-up processes that are independent of temperature variability. Recruitment of several fish stocks is significantly and positively correlated with temperature in the EBS and BAR, but cod and pollock recruitment in the EBS has been negatively correlated with temperature since the 1977 shift to generally warmer conditions. In each of the ecosystems, fish species showed a general poleward movement in response to warming. In addition, the distribution of groundfish in the EBS has shown a more complex, non-linear response to warming resulting from internal community dynamics. Responses to recent warming differ across systems and appear to be more direct and more pronounced in the higher latitude systems where food webs and trophic interactions are simpler and where both zooplankton and fish species are often limited by cold temperatures.

SOURCE: Progress in oceanography/Progress in Oceanography

PDF URL: None

CITED BY COUNT: 96

PUBLICATION YEAR: 2009

TYPE: article

CONCEPTS: ['Oceanography', 'Environmental science', 'Ecosystem', 'Sea surface temperature', 'Trophic level', 'Zooplankton', 'Marine ecosystem', 'Latitude', 'Productivity', 'Biomass (ecology)', 'Regime shift', 'Plankton', 'Groundfish', 'Ecology', 'Geography', 'Geology', 'Biology', 'Fishing', 'Fisheries management', 'Geodesy', 'Macroeconomics', 'Economics']