

**Effects of climate on cod life history and ecology along a temperate-arctic gradient**

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**Abstract**

The distribution and abundance of fish are closely linked to climate dynamics, and warming trends in the North Atlantic are causing shifts in ecosystem structure and function. For Atlantic cod, *Gadus morhua*, life history and ecological traits have been changing due to climatic effects and fisheries regulations. A northward expansion has recently been noted, with Atlantic cod now residing in areas on the west coast of Svalbard traditionally dominated by polar cod. This potentially represents a change in distribution with ecosystem -level implications. Over longer time scales cod might develop local adaptations as the species is highly sedentary. In this paper, we present results on the effects of climate upon cod life history and habitat use across a temperate-arctic gradient by means of sclerochronology. Otoliths from cod collected inside fjord (Porsanger) and offshore (Lofoten islands) of mainland Norway were compared with those from Svalbard (Isfjord and Kongsfjorden), were employed to develop short-term chronologies and perform trace element analyses. Results showed that there are no apparent differences in age -specific growth among the different sites. Following the removal of age effects from the chronologies, there is an underlying growth synchrony within sites, but asynchrony among sites. PCA analyses on trace element data revealed differences in microchemical composition of otoliths in relation to site and age. These results are discussed in terms of cod migratory behavior and their relevance for management.

**Keywords:** Chronology, Life history traits, Latitudinal gradient, Otolith microchemistry

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