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Controlling factors in fish early life history and how they combine to influence trophic links across the North Atlantic Ocean.

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The transfer of energy through an ecosystem is shaped by the overlap of predator and prey distributions in both space and time. Here, we identify the plastic vs. adaptive factors controlling timing of Atlantic cod (*Gadus morhua*) early life stages and how these factors combine to shape the overlap between first-feeding cod and their zooplankton prey. Atlantic cod populations exhibit remarkably similar life histories despite spanning wide ranges in latitude (40 to 80°N) and climate (e.g. -1 to 20°C). In previous work, we demonstrated that temperature-standardized spawning time (i.e. the thermal constant of spawning) shows systematic and parallel declines with increasing latitude for populations on both sides of the Atlantic (Neuheimer & MacKenzie, 2014, Ecology. 95:3364-3375). Here we explore these patterns as evidence of adaptation (i.e. countergradient variation) to growing season timing by comparing estimates of first-feeder- and prey-timing proxies for populations across the species' range. We discuss how adaptive vs. plastic factors combine to shape energy transfer from lower trophic levels, and how these trophic links may change in the future.