Breeding success of Tufted Puffins in BC reflects ocean temperatures

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Variation in sea-surface temperatures (SSTs) off the coast of British Columbia occurs within and among seasons. Some of this variation corresponds to decadal oscillations, but some appears to be indicative of global warming. Changes in ocean temperature are likely to influence a variety of marine organisms and oceanic processes, but there is little quantitative information about these effects. Studying these relationships may make it possible to identify species that will be most vulnerable to further temperatures increases and, possibly, to predict the effects of warming on the abundance, distribution, and ecological relationships of other marine species. We examined the relationship between SSTs and reproduction of tufted puffins (*Fratercula cirrhata*) breeding on Triangle Island, NW of Vancouver Island. We found substantial inter-annual and decadal variation in temperatures measured over the last 66 years, but also a warming trend caused mainly by warmer SST's over the last two decades. We compared these temperatures to 16 years of reproductive data collected between 1975 and 2002, to show that extreme variation in reproductive performance exhibited by tufted puffins was related to changes in SST both within and among seasons. Puffin nestlings exhibited drastically decreased growth rates and fledging success when SSTs were either unusually cool (as they were in the 1970's) or, especially, when they were unusually warm, as they were during the 1990's. Similar relationships between chick growth and SST occurred within seasons. The rapidity of these within-season changes suggest that puffins are responding to rapid SST-mediated changes in the distribution or abundance of their prey, which consists mainly of sand lance (*Ammodytes hexapterus*). Our data also suggest that tufted puffins are highly vulnerable to the effects of SST, and hence climate change, at this site. For this reason, they may serve as a valuable indicator of biological change in the North Pacific. Although the adult population has not yet shown a decline, further and prolonged increases in ocean temperature could make Triangle Island, which contains the largest tufted puffin colony in Canada, unsuitable as a breeding site for this species.