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2024 AFSC Seminar Series

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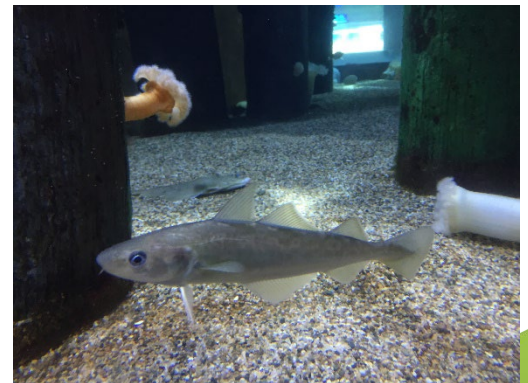
Tuesday, March 12th @ 10 am Pacific

Warmer, earlier, faster: Cumulative effects of Gulf of Alaska heatwaves on the early life history of Pacific cod



Warming climates are creating unprecedented environmental conditions, such as more frequent and intense marine heatwaves (MHWs), that directly impact phenology and growth of fish and other marine organisms. Understanding individual phenological and growth responses to temperature is critical to predict species and population responses to climate change; however, doing so requires disentangling the effects of temperature on phenology, size, and growth in wild populations. We quantified the relationships between temperature and hatch timing, size-at-age, and early growth in a population of Pacific cod (*Gadus macrocephalus*) affected by

recent MHWs in the Gulf of Alaska. Pacific cod juveniles were collected near Kodiak Island, Alaska, USA, across 11 years, categorized as before (2007, 2009–2010, 2012–2014), during (2015, 2016, 2019) and between (2017, 2018) multiple recent MHWs. We estimated age and growth with otolith structural analysis. Hatching occurred on average 14 days earlier during MHWs and 26 days earlier between than before MHWs. Approximately 53% and 16% of these respective shifts in timing were attributable directly to warmer temperatures during incubation. Size-at-age was similar across periods at younger ages (90 days), but approximately 7 mm and 11 mm larger than before MHWs at older ages (132 days) during and between MHWs, respectively. Observed differences in growth rate could not fully account for the observed increases in size-at-age. We found that temperature alone could not explain the changes in growth and phenology; thus, factors such as parental effects, epigenetics, and selection likely contributed.



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