Declines in mean body size of exploited fishes are relatively widespread and may negatively impact fisheries by decreasing yields (REF) and altering community dynamics (REF). Such declines may be linked to reduced individual growth due to unfavorable environmental conditions (e.g. altered prey community, increased competition) or fisheries that selectively remove larger individuals (REF). In the case of Pacific salmon, many populations have exhibited relatively strong temporal trends in size, as well as regionally coherent shifts in growth, age-at-maturity, and survival (REF), suggesting large-scale environmental drivers moderate interannual variation in traits such as body size. Unsurprisingly, identifying the processes that drive this variability is of considerable interest to management, both as a means of improving forecasts and by bounding expected levels of future productivity.

Evidence suggest that both bottom-up and top-down drivers can regulate salmon growth during marine residence. For example, changes in sea surface temperature may influence metabolic rate (REF), as well as the quantity and quality of prey available to salmon. Salmon growth and survival is often associated with indices such as the Pacific Decadal Oscillation, North Pacific Gyre Oscillation, and ENSO, which integrate environmental conditions over relatively large spatial and temporal scales (REF). Although population-level responses to these temperature indices are regionally coherent, they vary across the species range with northern populations responding positively to temperature increases and southern populations the opposite. Wind stress indices, such as ALPI, may also be correlated with growth by moderating nutrient transport to surface layers (REF). Investigations into top-down effects have largely focused on changes in the abundance of potential competitors during marine residence, which may result in density-dependent declines in growth or survival. In recent years, pink salmon abundance has garnered particular attention due to increased hatchery production that has been associated with reduced productivity and size-at-maturity across many Pacific salmon populations (REF).

Previous investigations provide important clues about how salmon may respond to environmental changes, their broader context is uncertain. Are our recent observations representative of how these populations have always responded to their environment? Or are they fundamentally altered by rapid increases in temperature and the abundance of hatchery origin fish?