Temperature effects on the feeding and growth of sea stars *Asterias rubens* and *Asterias forbesi*.

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Sea stars were among the first keystone species identified due to their crucial role in maintaining species diversity and richness within ecosystems. A recent shift in sea star populations along the Atlantic coast has been observed, where the once dominant northern species, *Asterias rubens*, is being gradually replaced by the more southern species, *Asterias forbesi*, in intertidal sites. Studying the growth and feeding behaviors of these sea stars not only sheds light on *A.forbesi* and *A.rubens* interactions but also provides insights into predator-prey dynamics and space utilization within their intertidal communities.

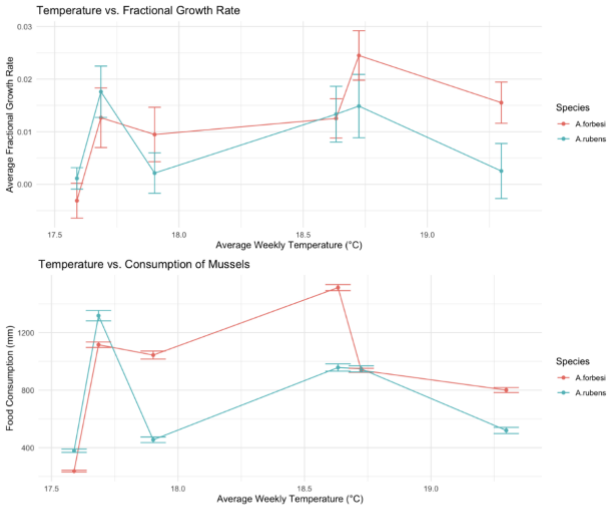

Figure 1. (a) The daily fractional growth rate for *A.forbesi* and *A.rubens* with increasing temperatures. (b) The weekly consumption of mussels for *A.forbesi* and *A.rubens* with increasing temperatures. Error bars represent one standard error.

In 2006, Marney Pratt, a post-doc, working with the Johnson Lab and conducted a study on the growth and survival of *A.forbesi* and *A.rubens* at different temperatures. Pratt observed that *A. forbesi* exhibited significantly faster growth and greater survival than *A. rubens* when exposed to warmer temperatures (Pratt 2006). However, Pratt's experiment had limitations as it involved chronic exposure to extreme temperatures—8ºC cold and 18ºC warm—thus not representing natural sea temperature fluctuations. Nonetheless, the results inspired further investigation into feeding and growth rates at additional temperatures.

My research focuses on assessing growth and feeding rates within a controlled laboratory environment while striving for ecological relevance. To achieve this, I used water directly from Casco Bay. This approach ensures that the sea stars experience natural temperature fluctuations typical of the summer season in Maine. I worked with 10 *A. forbesi* and 10 *A .rubens* and kept them in aquaria at the Schiller Coastal Studies Center with in-flow water from Casco Bay. The sea stars were fed mussels (*Mytilus edulis*) *ad-libitum*, weighed once a week, and length of mussels consumed was assessed daily except for weekends.

Both species displayed fluctuating growth and feeding rates within the temperature range of 17.5 - 19.5ºC, suggesting that sea star performance is sensitive to changes in temperature at this range. At temperatures higher than 18.5ºC, *A. forbesi* generally, although showed higher feeding and growth rates than *A. rubens*, suggesting potential differences in heat tolerance between the two species (Fig. 1). These results are consistent with Pratt's observations and with observed changes in population distribution. These results indicate that increased water temperatures due to climate change might allow *A .forbesi* to grow and feed more than *A. rubens*, resulting in continued changes in species distribution.

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References Cited:

Pratt, M. C. (2006). A star on the rise: how temperature affects distribution and abundance of sea stars on the coast of Maine. *Integrative and Comparative Biology.* 46: E113