

# Too hot to handle: Can a critical foundation species cope with climate change?

## The California mussel

(*Mytilus californianus*)



marine bivalve mollusk shellfish



### What they eat?

Filter sea water for phytoplankton



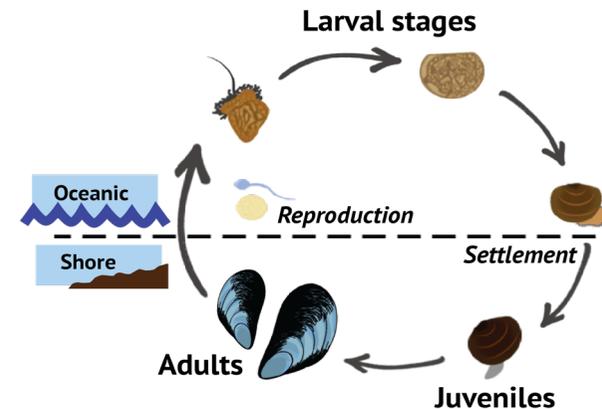
### Where they live?

West coast of North America from Baja California, Mexico to Alaska, USA



## How vulnerable are mussels to climate change? Will mussels be able to cope?

Mussel cover on California's coasts is *declining*! Why? Possibly due to increasing temperatures and heat waves.



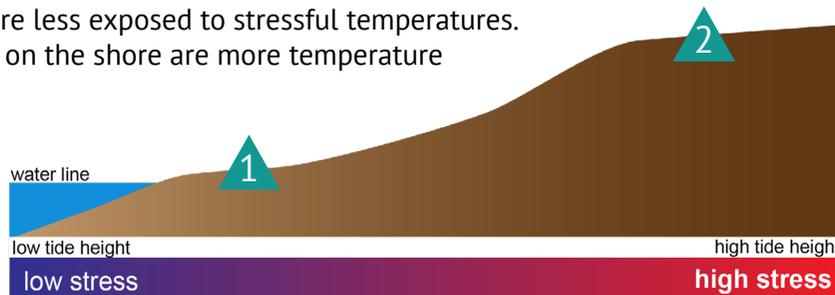
Mussels have a **complex life cycle** with several different stages—similar to a caterpillar! They start as larvae that live in the ocean for 3-5 weeks before metamorphosing and settling on the shore to grow into adults.

### Mussels are foundation species.

Similar to the foundation of a house, they form the base of a community. Mussels create space and habitat for other species. They're also a major food source. Without them, we'd have much less diversity!

### Mussels live in the intertidal zone of rocky shorelines.

Lower tide heights (areas lower on the shore) are covered by water more often, meaning they are less exposed to stressful temperatures. Mussels living higher on the shore are more temperature stressed.



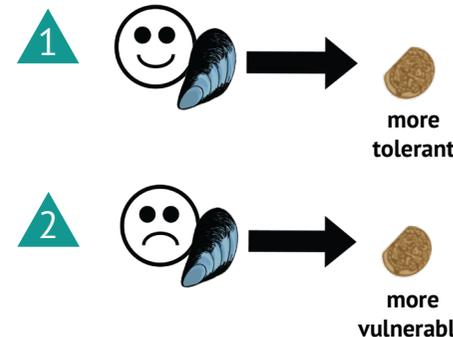
How do mussels deal with the heat?

### Safety in numbers...against heat?

Mussels experience temperature differences across tide height with the hottest at higher tide heights<sup>1,3</sup>. **Temperature exposure also depends on what microhabitat a mussel lives in** – are they next to other mussels, wrapped in algae, or in a shaded crevice? Hanging out by themselves is the hottest type of home for a mussel<sup>1</sup>! No wonder most mussels are found clumped together or hiding among algae!

### Does age matter?

Which life stage can last longest in the hot seat? Younger life stages are more sensitive to heating events<sup>2</sup>. **Juvenile mussels were more sensitive to stressful temperatures than adults<sup>1</sup>**. Adult mussels living in the most stressful locations high on the shore had babies (larvae) that were less tolerant and more vulnerable to temperature stress<sup>3</sup>. Why? Parents experiencing lower stress seem to invest more energy in reproduction, which could help larvae survive the heat!



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