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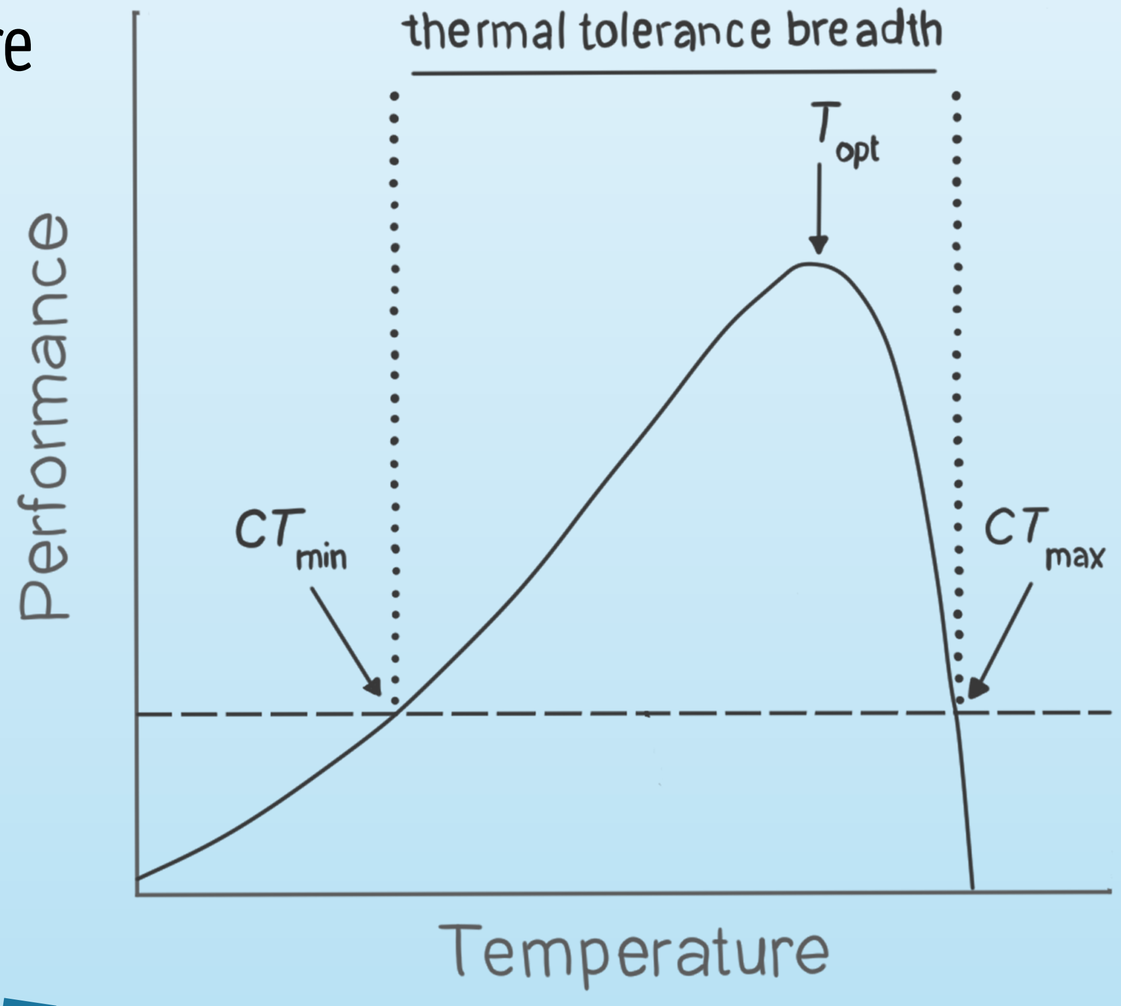
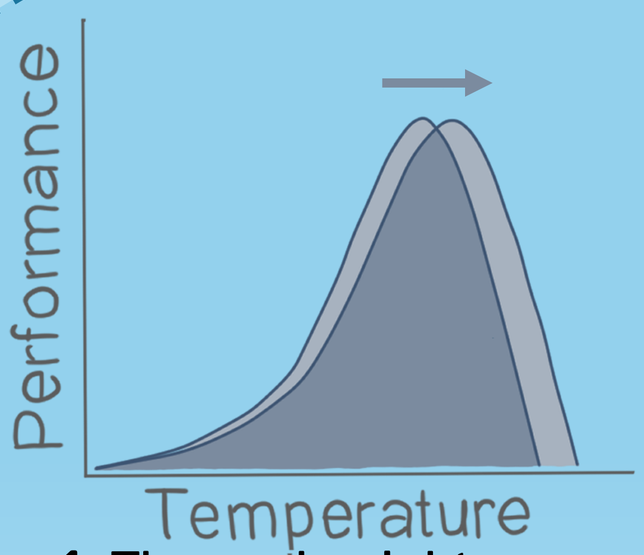
Temperature performance curves

Every species has a temperature range where it performs best—this is shown by a Temperature Performance Curve (TPC). The curve usually looks like a hill:

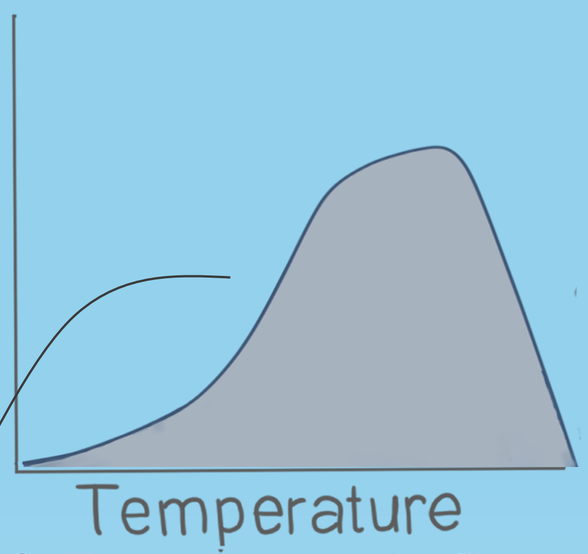
Rising slope: Performance improves as temperature increases.
Peak: The optimal temperature (T_{opt})
Falling slope: Performance drops as temperatures get too hot.
Critical thermal limits (CT): Beyond these, survival is at risk.



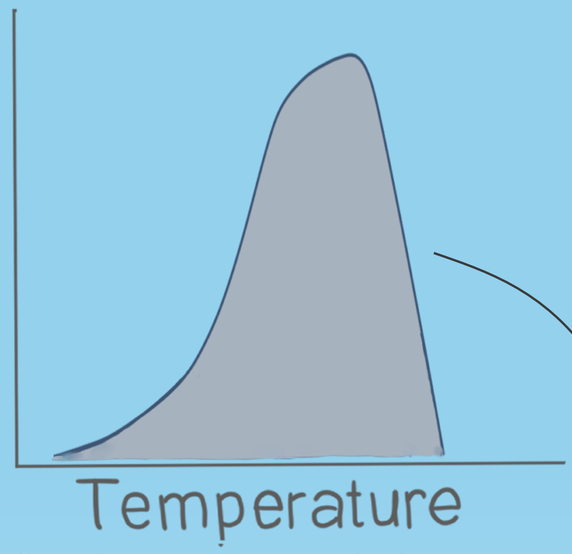
TPCs can shift with acclimation or evolution



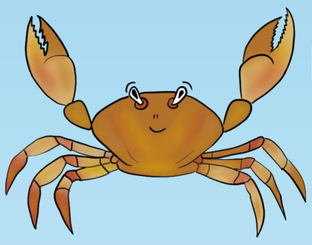
1. The peak might move to a higher temperature.



2. The curve might flatten, allowing broader tolerance.



3. Or the curve might narrow, making a species more vulnerable.



Generalists have broad TPCs—can handle a wide range of temperatures.

Specialists have narrow TPCs—thrive in stable conditions but are more sensitive to heatwaves.

Why this matters

As oceans warm and heatwaves become more frequent, species with narrow thermal tolerance may struggle to survive, while those with flexible or shifting TPCs may adapt or expand their range.