

Warming effects on the lifecycles and ecological impacts of two invasive parasitic copepods infecting native blue mussels



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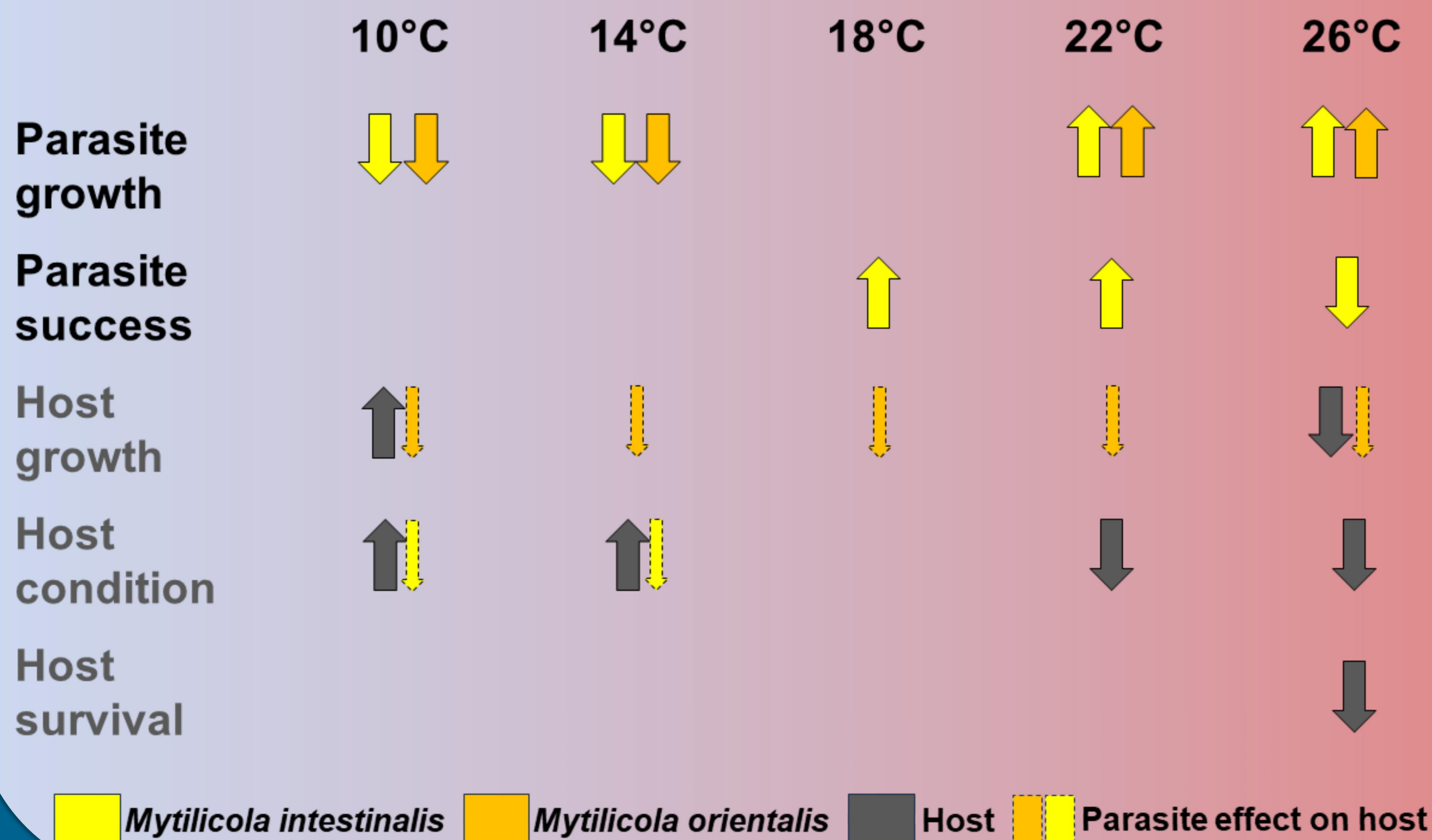
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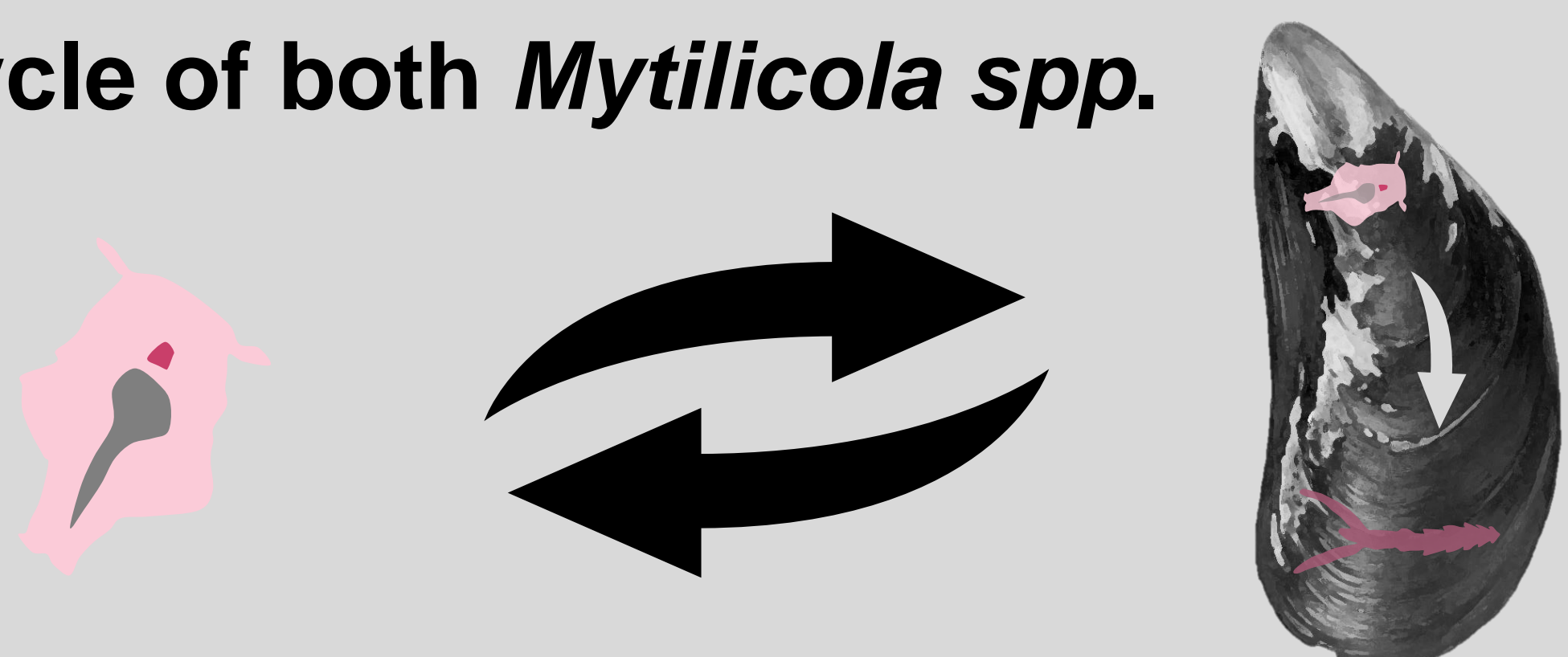
Figure 1. Temperature effects on the two parasites and blue mussel hosts



Invasive species, climate change and the Wadden Sea

- Temperature increase and invasive species can change existing multi-species communities
 - Their combined effect on host-parasite dynamics remains understudied
 - Environmental change can modulate the success and impact of invasive parasites and the interaction between native and invasive host species¹
- In the Wadden Sea
 - 1-2 new invasive species arrive every year and the water temperature is projected to increase by 1-5 °C by the end of the century²
 - Our model system consists of blue mussel (*Mytilus edulis*) hosts and two species of invasive parasitic copepods (*Mytilicola intestinalis* and *Mytilicola orientalis*) with simple lifecycles in the Wadden Sea

Lifecycle of both *Mytilicola* spp.



Aims: To determine the impact of temperature on:

- The development speed and success of the free-living and parasitic life stages of two invasive parasitic copepods
- The mussel hosts with and without copepod infections

Experiments and results

- Temperature-controlled laboratory experiments:
 - With free-living parasite life stages and by infecting mussels for 8-20 weeks (mussel tanks in the picture below)
 - Three parasite success measures: egg development, host entry, infection. Also parasite growth inside hosts was measured over time
 - Host survival, growth, condition and reproductive activity compared between infected and control mussels



• Main results in Figure 1

- Heatwave temperatures (26 °C) were harmful both for mussels and *M. intestinalis*
- *M. intestinalis* had a negative effect on mussel condition that was most pronounced at the lowest temperatures
- *M. orientalis* had a negative effect on mussel growth uniformly across temperatures
- Mussel reproduction occurred only at low temperatures (10-18 °C) and was not affected by infection
- Increase in temperature is likely to result in more parasite life cycles per year that can lead to an increase in infection pressure
- Data from the experiment will be combined with pre-existing data on parasite interactions³ and field data to inform eco-epidemiological model building

References

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2. Klopper S., et al. (2022) Wadden Sea Quality Status Report. Common Wadden Sea Secretariat, Wilhelmshaven, Germany. qsr.waddensea-worldheritage.org
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