

# Parasite in warming habitats

## Background

- Temperature change can have profound effects on individual species interactions.
- Parasites can play important ecological roles in modulating species interactions.
- Most temperature effects in parasites haven't been studied for the whole multi-host life cycle.
- The model system used to study host-parasite interactions under temperature change is *Schistocephalus solidus* (Figure 1).

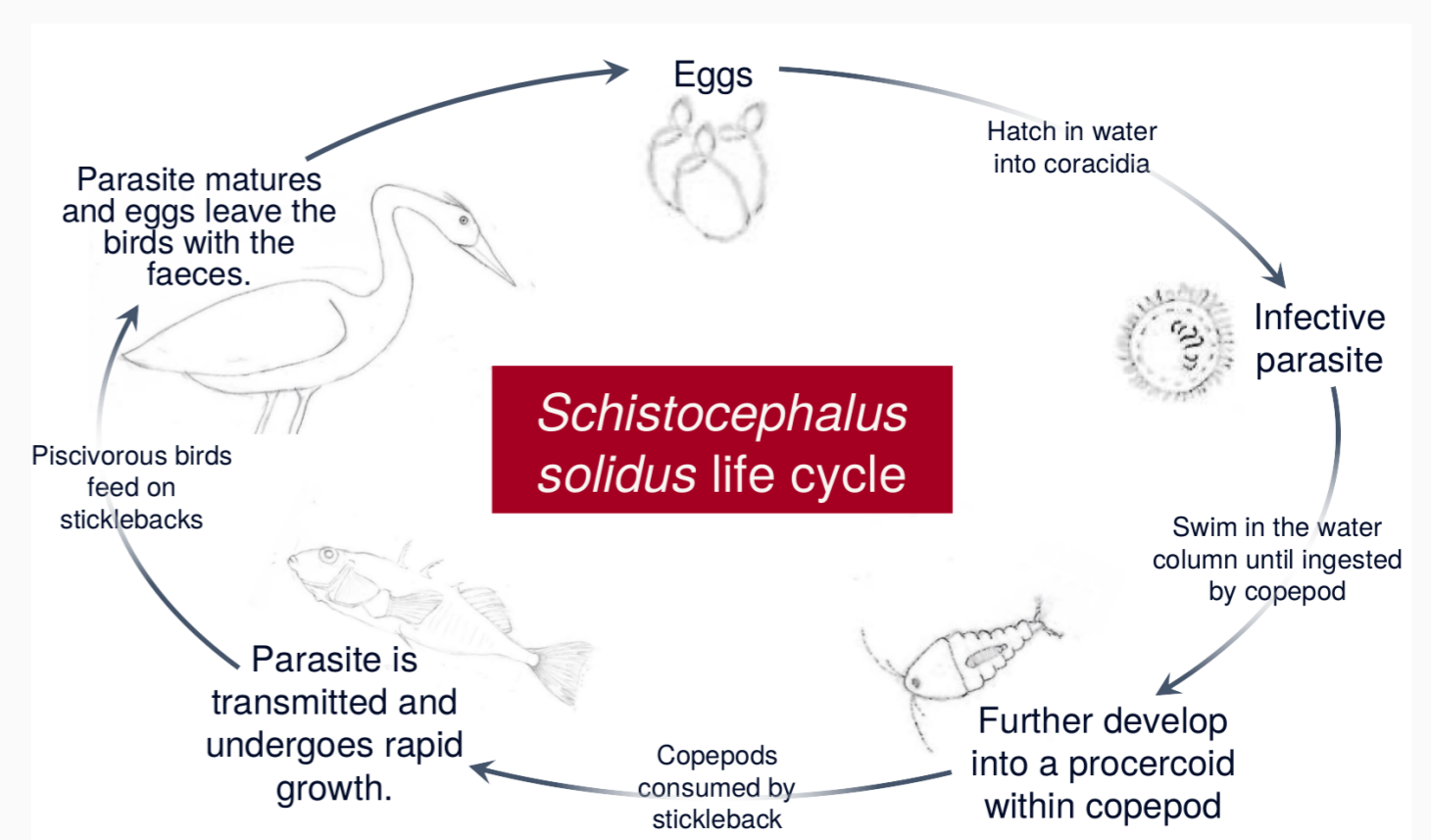


Figure 1. Schematic overview of the parasite life cycle.

## Main Questions

- How does temperature affect the individual life stages of *Schistocephalus solidus*?
- What do the effects on individual stages mean for the population as a whole?

## Parasite eggs



- Eggs and larvae (coracidia) are the only free living stages in the life cycle of *Schistocephalus solidus*.

- Number of eggs and free living larvae key to determining infection of different hosts.
- Proportion of eggs that hatch is **not affected** by temperature (Figure 2).

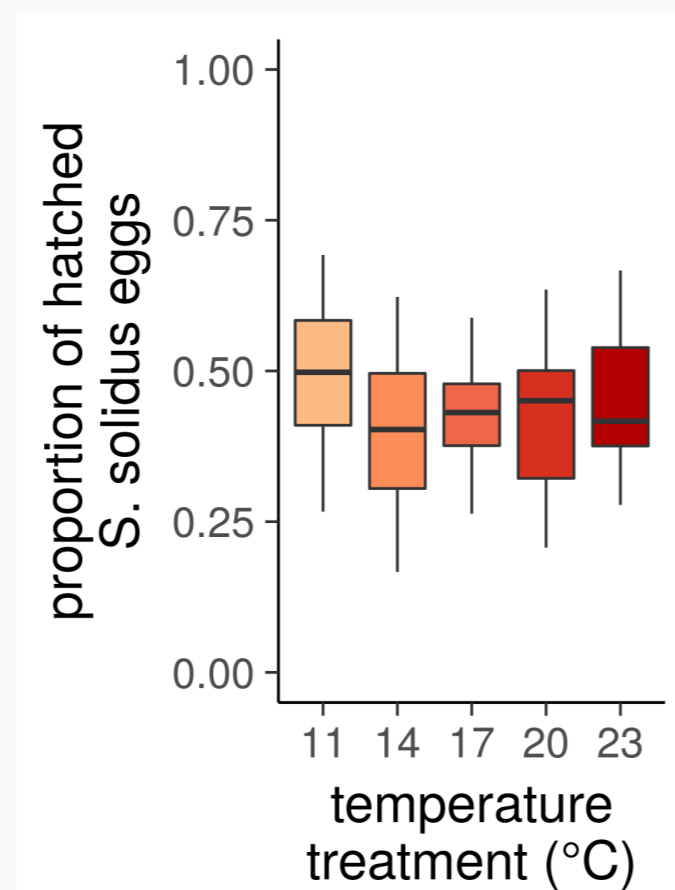


Figure 2. Total proportion of hatched parasite eggs.

## Parasite habitat



Figure 3. The whole life cycle of *Schistocephalus solidus* can be completed in places like Abbots Park.

## Further reading

For more research see  
[www.boriswberkhout.com](http://www.boriswberkhout.com)



## Fish health

- The fish host is important for the parasite as most growth occurs here. With warmer temperatures parasites grow better. Here we test the effect of temperature on fish growth to better understand the interaction.
- Sticklebacks **grow slower** at warmer temperatures (Figure 4A).
- Stress levels** in fish are **higher** in fish at higher temperatures (regardless of parasite infections; Figure 4B).

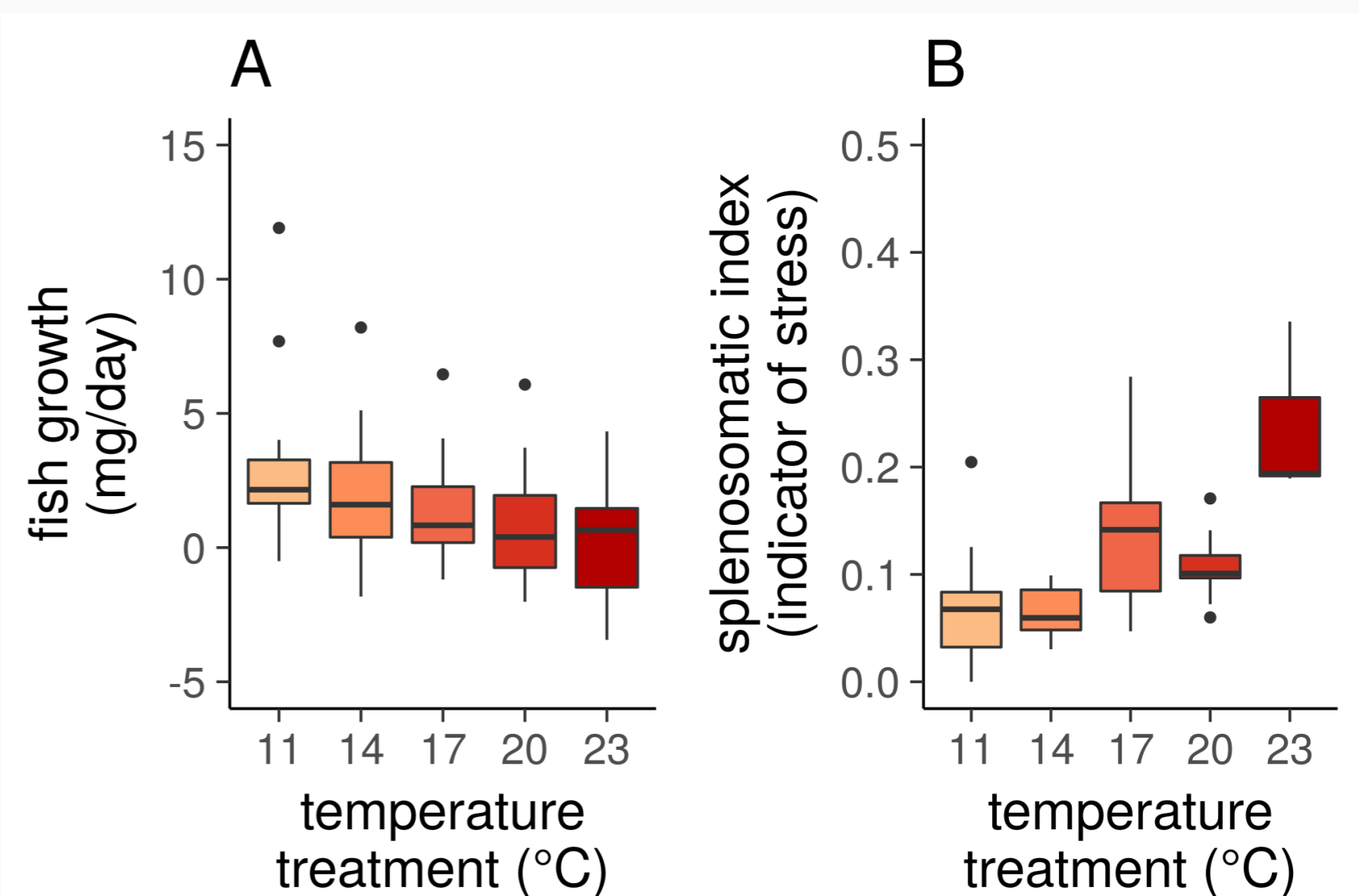
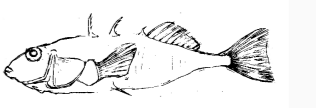


Figure 4. Effects of temperature on fish growth and health. At higher temperatures average individual growth rates decrease (A) and stress levels go up (B).

## Discussion

- Temperature can have **divergent effects** on individual stages and interactions of the **life cycle**. This can make it complex to draw general conclusions.
- Future work will focus on estimating life cycle effects using **mathematical modelling**.