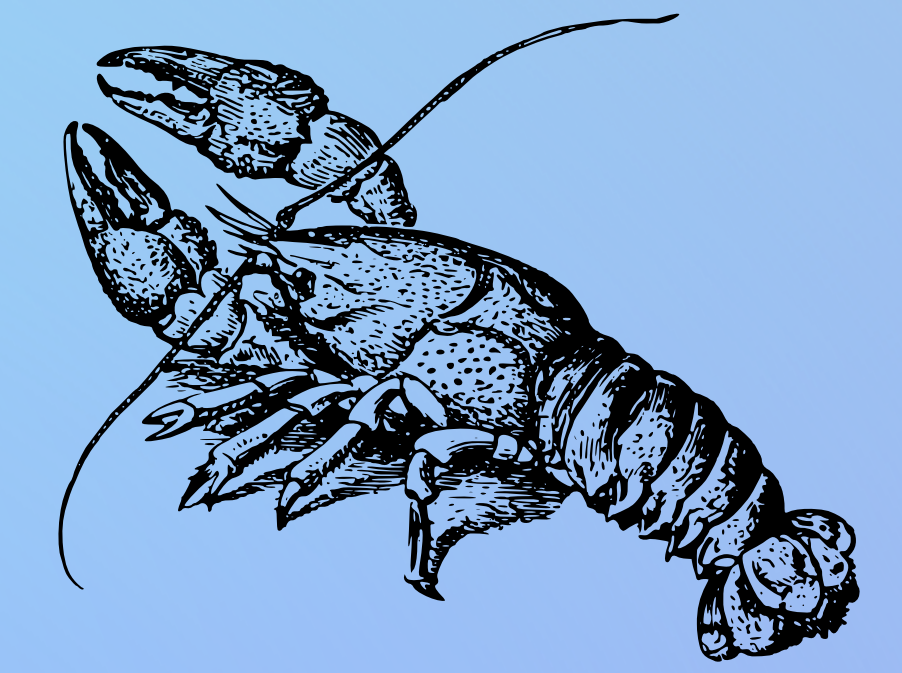


# The impact of temperature on consumption rates of the invasive Narrow-clawed crayfish and Signal crayfish

Amarni Newman, under the supervision of Dr. Josie South  
School of Biology, Faculty of Biological Sciences



## 1. Introduction

Invasive species have both environmental and socioeconomic impacts. They cause competition and restructure the ecosystem, which reduces native biodiversity, on which communities depend for their income, such as ecotourism and fishing. They can also cause flooding of important agricultural or cultural land through habitat engineering. Invasive freshwater crayfish are of particular concern due to being found globally, and their various damaging behaviours. One such behaviour is leaf shredding, which speeds up the breakdown of primary producer material, and thus alters the nutrient cycle within an ecosystem. This has both direct effects, such as competition between native species, and indirect effects, such as altering water quality. To investigate the impact of this behaviour, the rate of consumption of leaves was measured, comparing the well-studied Signal crayfish (*Pacifastacus leniusculus*) to the Narrow-clawed crayfish (*Pontastacus leptodactylus*), which is present in parts of the UK. These experiments were carried out at two temperatures to account for climate change predictions. These results are used to determine the impact of Narrow-clawed crayfish compared to Signal crayfish, which will aid in advising how to deal with current invasions, and how to mitigate an invasion in the future.

## 2. Aims & objectives

1. Determine the rate of consumption of both species at two temperatures
2. Provide advice on population management to stakeholders involved in the Boshaw reservoir in Yorkshire, UK

## 3. Research methodology

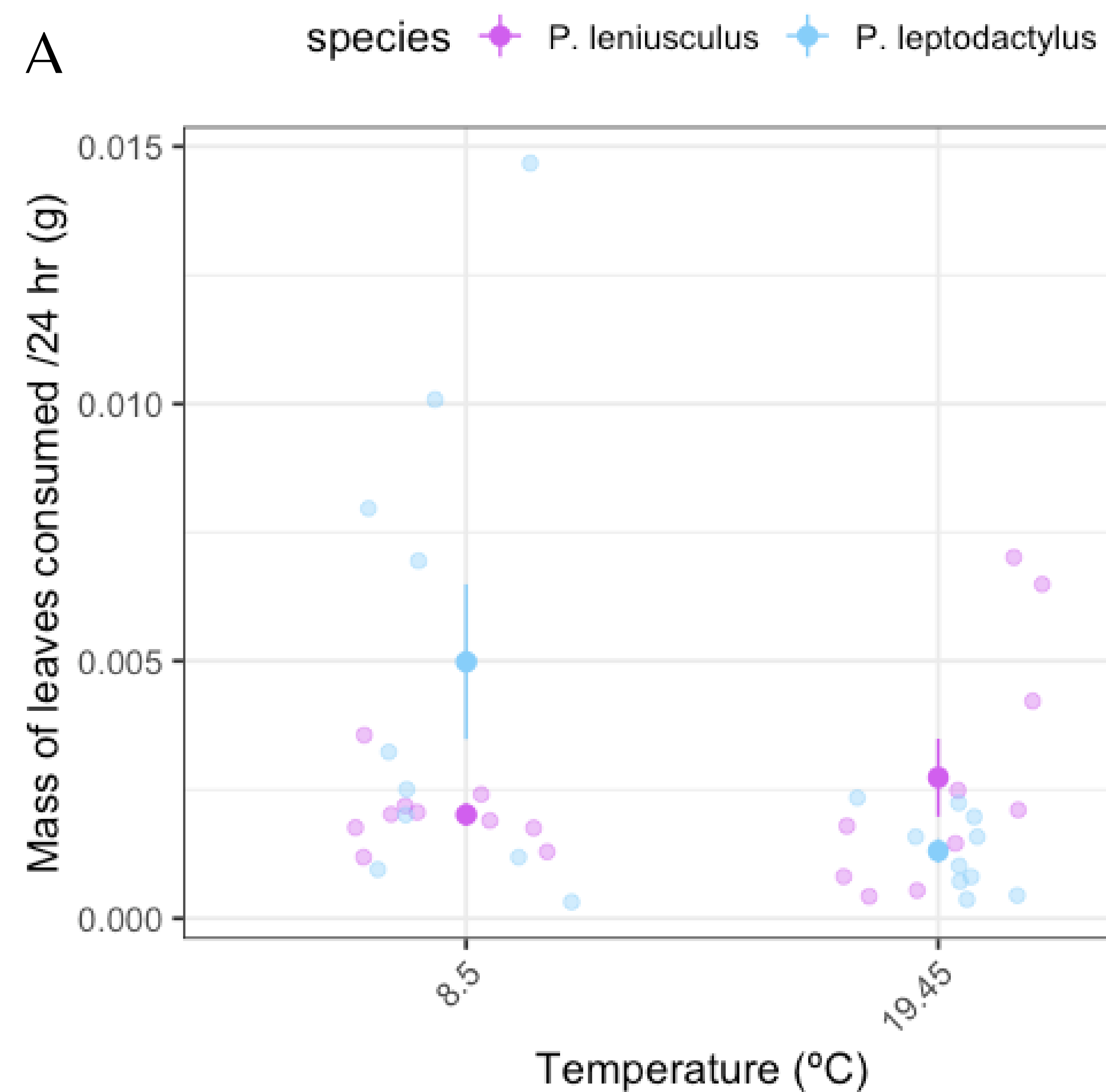
- Individual specimens were placed in experimental tanks for 24 hours to standardise hunger.
- Sycamore leaves (*Acer pseudoplatanus*) were conditioned in water for 24 hours prior to experiment.
- A standardised mass of conditioned leaves (30 g) was placed into experimental tanks with crayfish for 24 hours.
- Leaves remaining in tanks were collected, excess water removed, and weighed.
- A dry weight was taken of the collected leaves after drying in an oven over a 24 hour period at 60°C.
- Data was SQRT transformed, and ANOVA testing was used to determine differences between species and temperature

## 4. Results

There is little difference in consumption rates of *P. leniusculus* at the two temperatures, suggesting their impact is constant over temperature rises due to climate change. There is a significant difference ( $p < 0.05$ ) between the consumption rates of *P. leptodactylus* at the two temperatures, with consumption decreasing as temperature increases. This suggests that the impact of *P. leptodactylus* as an invasive species will decrease following climate change predictions. Both species have comparable impact at both temperatures.



B: Map of Boshaw Whams, Yorkshire, UK



A: A plot of mass of leaves consumed/24 hr (g) for both species against temperature (°C). The larger, opaque dots show the mean  $\pm$ SE of mass of leaves consumed (g), and the smaller, transparent dots are raw data points.

## 5. Conclusion

*P. leniusculus* is a well-studied invasive species with known negative impacts on the environment, whereas *P. leptodactylus* is data deficient. However, *P. leptodactylus* has comparable consumption rates to *P. leniusculus*, suggesting that management investments should be similar. Although rising temperatures due to climate change will decrease the consumption rates of *P. leptodactylus*, there will be no change in impact of *P. leniusculus*. This decrease in consumption rate will not be observed until temperatures rise significantly, and therefore there should be a focus on preventative management to reduce the changes to nutrient cycling caused by shredding behaviour.