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The role of adjusment to unfamiliar environments in biological invasions

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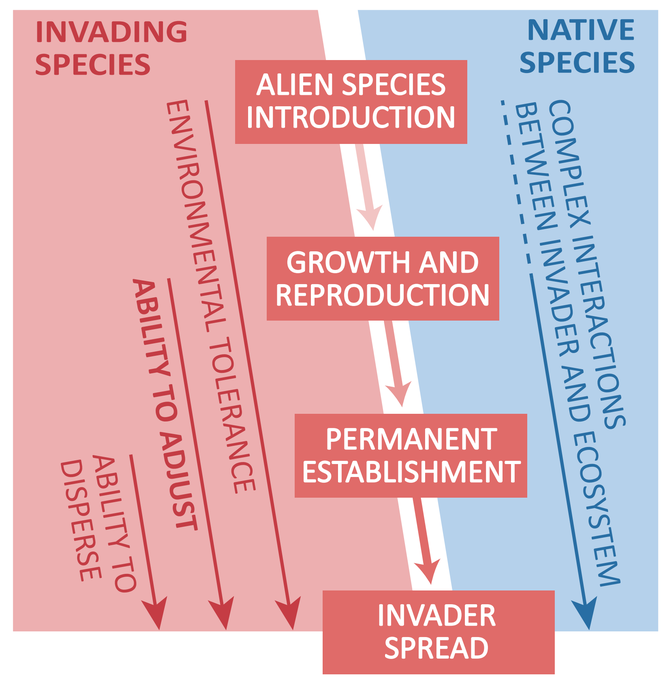
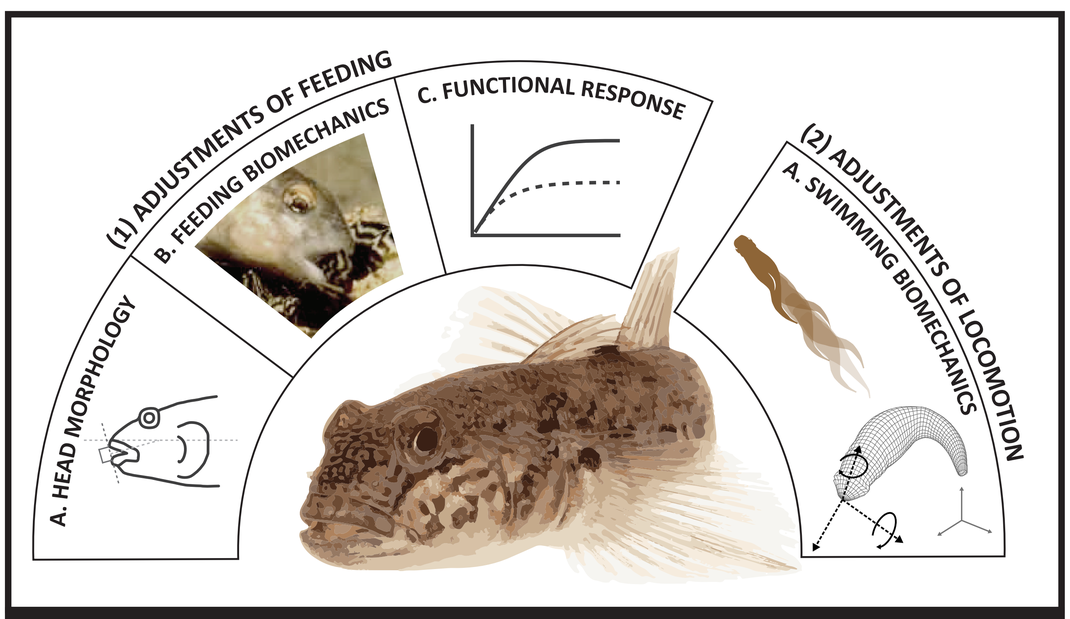
Biological invasions endanger human and animal health, our economy and the ecosystem. We are the main cause of this problem, by (un)willingly introducing new species into "naive" ecosystems. The species that become invasive seem to share the ability to first tolerate and then **quickly adjust to unfamiliar environments**. Understanding the role of adjustment during biological invasions is essential for effective and efficient management. This aspect is currently not well known and not incorporated in management practices.

Therefore, I aim to study the ability of a pervasive invader, **the round goby** (*Neogobius melanostomus*), to adjust to different aquatic ecosystems. This fish has a generalist diet and broad tolerance to (a)biotic conditions, which are vital during introduction into unfamiliar environments. Subsequently, rapid adjustment is expected when conditions become stable. The knowledge gained on their ability to adjust will improve management and prevention programmes for invasive gobies and aid those for other invasive species.



Overview of the steps of invasion. Each step requires different species characteristics of the invader, which are influenced by complex interactions with native species and the receiving ecosystem.



Overview of the objectives and sub-objectives of my proposal. In this project, I will study the round goby's adjustments of feeding and locomotion to local environmental pressures. Central: round goby. Photos: G. Lashbrook & K. Johnson (round goby feeding on a zebra mussel) and J. Herder (central image).

I will study the ability of round goby to adjust by incorporating state-of-the-art biomechanical methods in a comparative framework across spatial scales, focussing on:

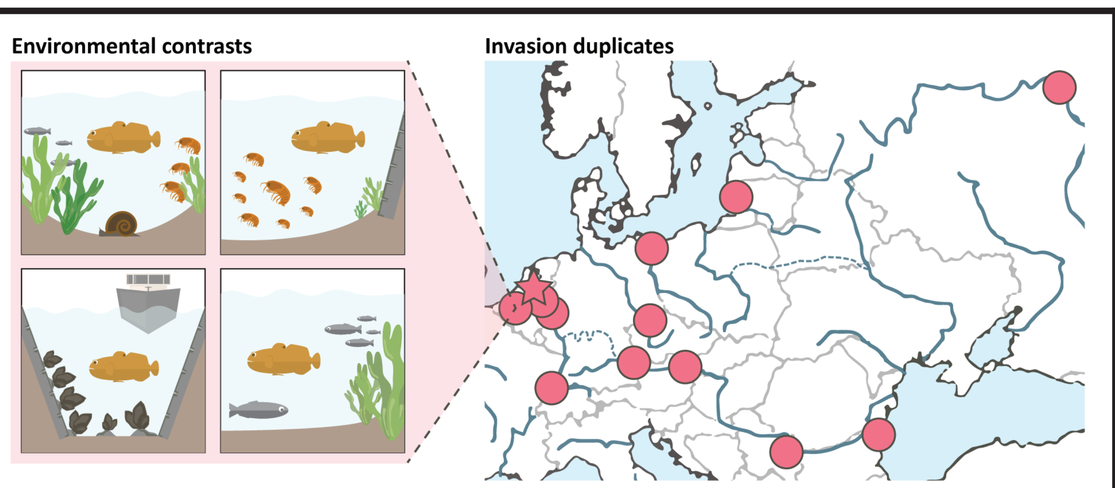
(1) Adjustments of feeding

I will measure functional characteristics of populations that differ in diet. For example, I will study the role of head morphology and feeding biomechanics in their food uptake performance.

(2) Adjustments of locomotion

I will examine the effect of dispersal and predation pressure on swimming performance. Does swimming performance in established populations and those dispersing at the invasion front reflect a burst versus endurance trade-off?

I expect to find adjustments to morphology and performance that reflect specialization to local conditions. My findings will provide a mechanistic basis for currently used methods predicting invasiveness; will aid ecosystem management and biological invasion prevention programmes; and will ultimately benefit our understanding of species' ability to adjust to a changing climate and environment.



Examples of invaded environments include (clockwise starting top left) a balanced system offering a varied diet, a crustacean-dominated system, a mollusc-dominated system, and a fish-dominated system. Such contrasts on a small spatial scale occur at multiple locations in the round goby's range (invasion duplicates). My existing collaborators (circles) and home institution (star) are indicated in red.

This research proposal will be submitted to the Netherlands Organisation for Scientific Research (NWO).