Resilience of Aquatic Ecosystems under Biological Invasions

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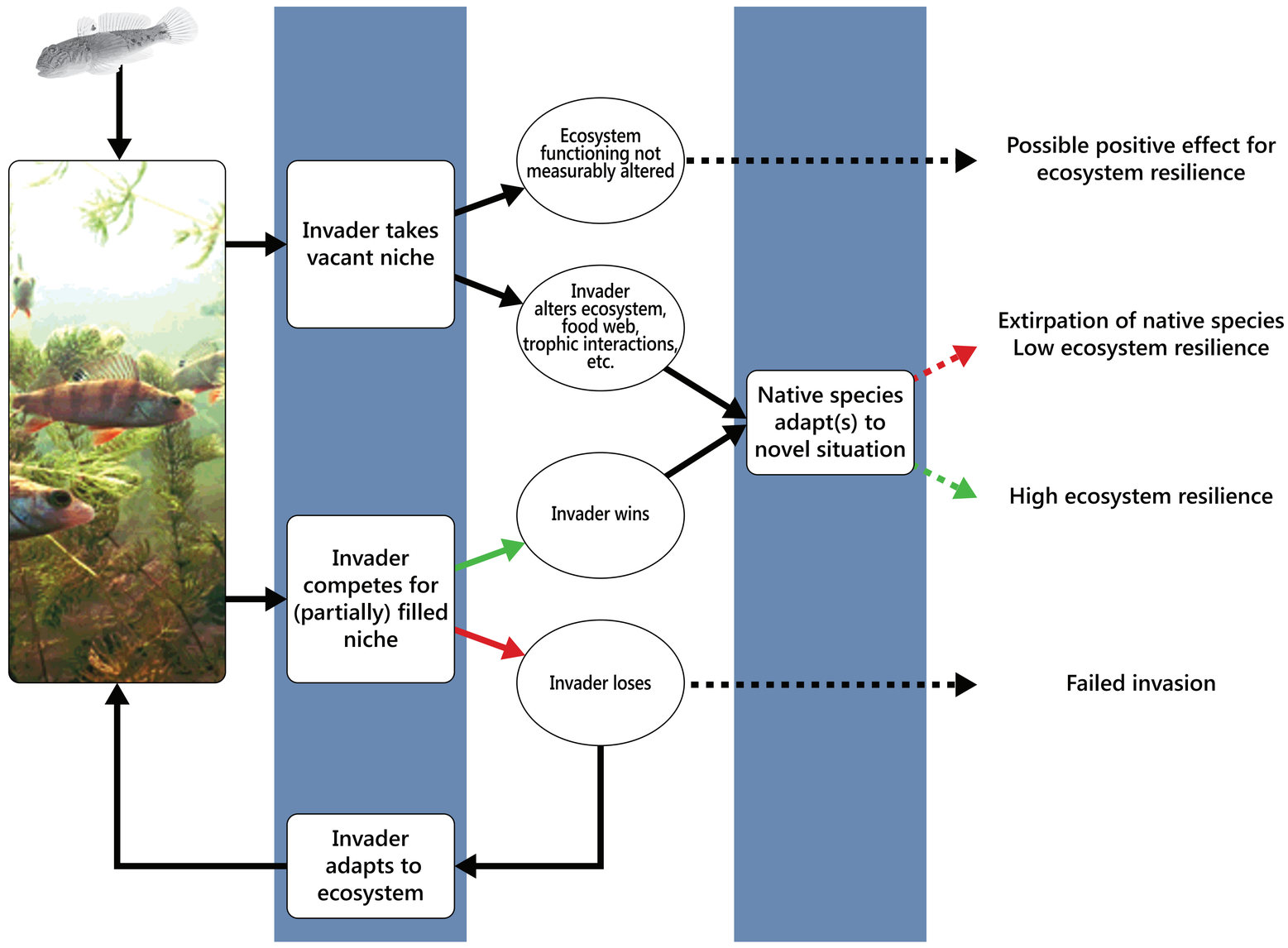
Biological invasions have been identified as one of the most widespread and serious threats to the functioning of ecosystems worldwide. They often have detrimental effects on local biodiversity, cause a decline or extirpation of native species and potentially lead to an ecosystem regime shift or even ecosystem collapse. A key priority for the near future is therefore to **increase understanding of the processes that determine the resilience of ecosystems to biological invasions**.

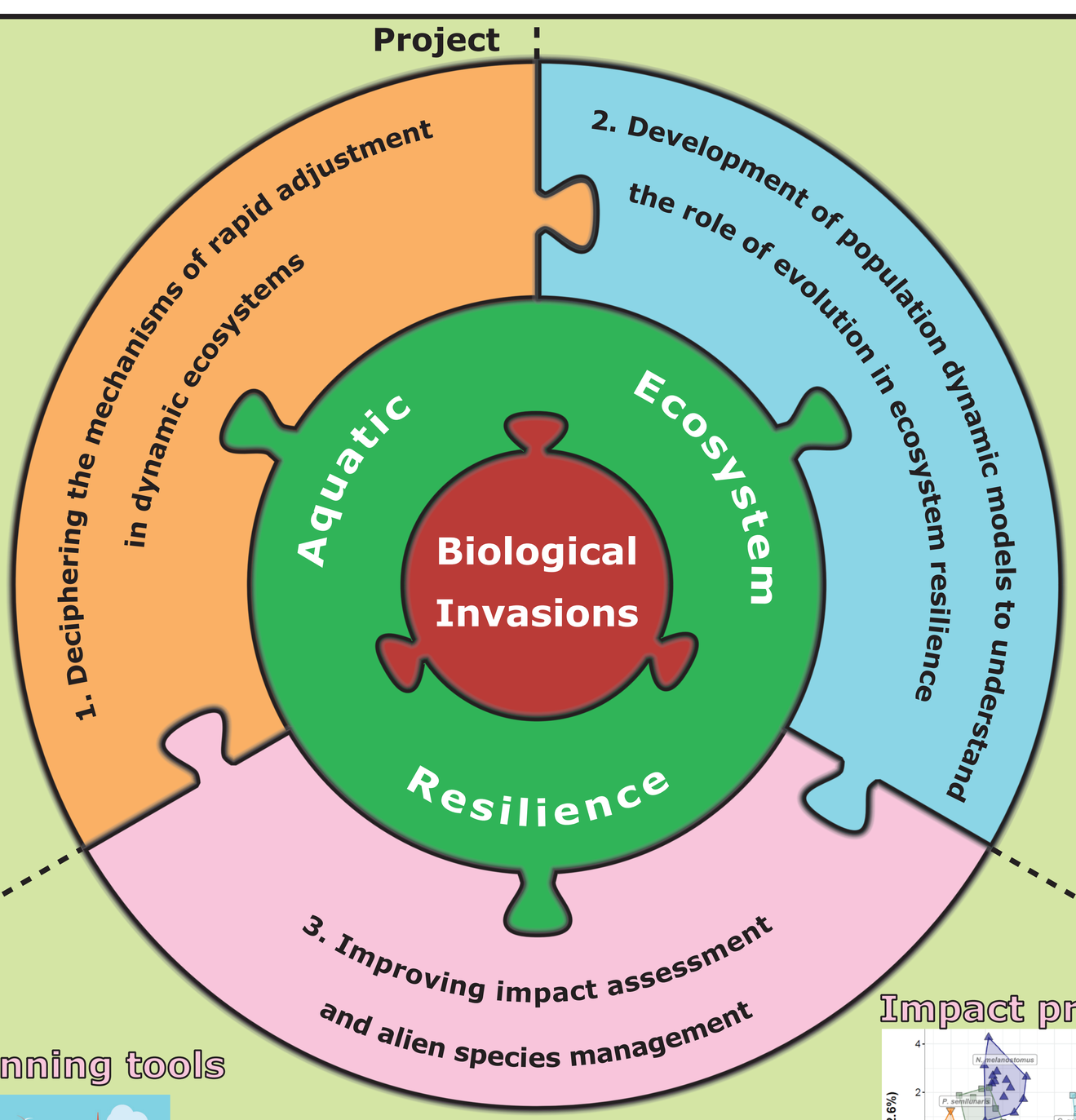
Traditionally, ecosystems have been viewed as 'static, passive recipients' of invasive species that cannot adapt themselves to the invader. In this project, we advocate a **novel framework** in invasion biology by arguing that ecosystems should instead be seen as **dynamic systems that can rapidly adjust** to the introduction of invasive species. We further argue that the potential for **rapid evolution at 'ecological time scales'** (i.e. occurring over tens of generations or less) is instrumental in such adaptability, and that this is a still largely unrecognized yet crucial aspect of ecosystem resilience.

We propose a **highly integrative, multidisciplinary research** program to study the underlying mechanisms of adaptation in native species after the introduction of invasive (alien) species into the ecosystem. We will further develop a new line of population-dynamic models by incorporating the possibility of co-evolution of the native and invasive species. By introducing the concept of a 'dynamic adaptive ecosystem' that can respond in new, predictable ways to biological invaders, we will bring about a paradigm shift in the field of Invasion Biology and change the way scientists think about ecosystem resilience. Together with our co-financing partners, we will combine these novel insights from our resilience project to develop **(1)** novel trait-based risk-assessment tools and **(2)** new water management strategies in the Netherlands aimed at increasing ecosystem resilience.

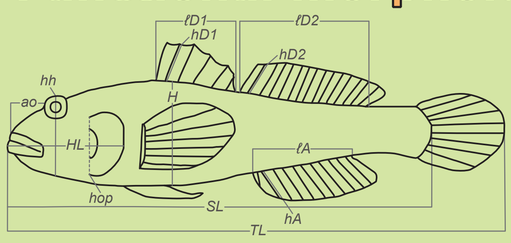
Hypothesis



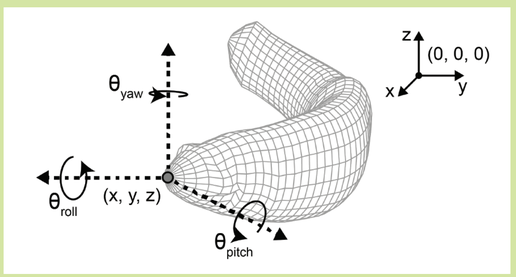
Project



Functional morphology



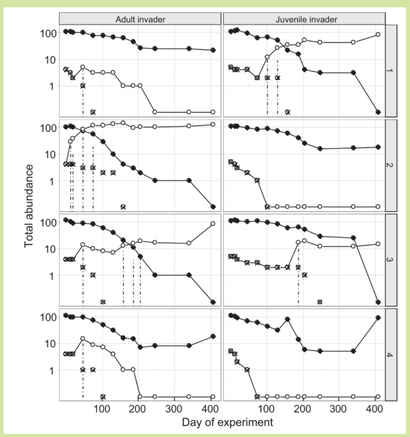
Biomechanics



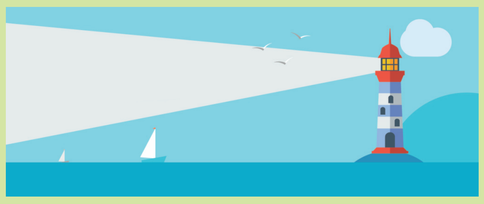
Genetics

In silico modelling

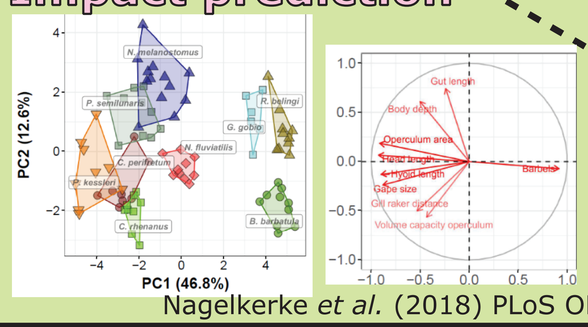
Dynamic models



Horizon scanning tools



Impact prediction



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Brigade partners

University of Amsterdam

Wageningen University & Research

hogeschool

Bureau Waardenburg Ecology & Landscape

NIOO

Radboud University

van hall larenstein university of applied sciences

Rijkswaterstaat
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Sportvisserij Nederland