

# Evolution of population dynamics following invasion by a non-native predator

Sigurd Einum<sup>1</sup>, Emil Ullern<sup>1</sup>, Matthew Walsh<sup>2</sup>, and Tim Burton<sup>1</sup>

<sup>1</sup>Norwegian University of Science and Technology

<sup>2</sup>University of Texas at Arlington

June 21, 2022

## Abstract

Invasive predatory species are frequently observed to cause evolutionary responses in prey phenotypes, which in turn may translate into evolution of the prey's population dynamics. Research has provided a link between rates of predation and the evolution of prey population growth in the lab, but studies from natural populations are rare. Here we tested for evolutionary changes in population dynamics parameters of zooplankton *Daphnia pulex* following invasion by the predator *Bythotrephes longimanus* into Lake Kegonsa, Wisconsin, US. We used a resurrection ecological approach, whereby clones from pre- and post-invasive periods were hatched from eggs obtained in sediment cores and were used in a 3-month growth experiment. Based on these data we estimated intrinsic population growth rates ( $r$ ) and carrying capacities ( $K$ ) using theta-logistic models. We found that post-invasion *Daphnia* maintained a higher  $r$  and  $K$  under these controlled, predation-free laboratory conditions. Thus, whereas previous experimental evolution studies of predator-prey interactions have demonstrated that genotypes that have evolved under predation have inferior competitive ability when the predator is absent, this was not the case for the *Daphnia*. Given that our study was conducted in a laboratory environment and the possibility for genotype-by-environment interactions, extrapolating these apparent counterintuitive results to the wild should be done with caution. However, barring such complications, we discuss how selection for reduced predator exposure, either temporally or spatially, may have led to the observed changes. This scenario suggests that complexities in ecological interactions represents a challenge when predicting the evolutionary responses of population dynamics to changes in predation pressure in natural systems.

## Hosted file

Evolution of population dynamics Ecology and Evolution.docx available at <https://authorea.com/users/450380/articles/573855-evolution-of-population-dynamics-following-invasion-by-a-non-native-predator>