SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Ecology and Biodiversity

has the honor to invite you to the public defense of the PhD thesis of

Lana Ramaekers

to obtain the degree of Doctor of Sciences

Joint PhD with KU Leuven

Title of the PhD thesis:

Freshwater zooplankton under elevated pCO_2: from individual to community effects

Promotor:
Prof. dr. Bram Vanschoenwinkel (VUB)

Co-promotors:
Prof. dr. Luc Brendonck (KU Leuven)
Dr. Tom Pinceel (KU Leuven)

The defense will take place on
Friday, October 7, 2022 at 16h in the promotion room D 2.01

Livestream link

Members of the jury

Prof. dr. Iris Stiers (VUB, chair)
Dr. Tom Van der Stocken (VUB, secretary)
Dr. Kristien Brans (KU Leuven)
Prof. dr. Sandra Brucet (University of Catalunya)
Dr. Christina Fasching (Hemholtz Centre for Environmental Research)

Curriculum vitae

Lana Ramaekers obtained her Bachelor of Science in Biology at the University of Hasselt in 2015 and her Master of Science in Biology at KU Leuven in 2017. Afterwards, she started her PhD research, joint between the VUB and the KU Leuven after receiving a personal FWO mandate. She has presented her work at three international conferences and has one article published and one in major revision at peer-reviewed journals. She has also assisted in several courses and excursions at both universities and supervised several bachelor's and master's thesis students at KU Leuven.

Abstract of the PhD research

Economic development and human population growth have been accompanied by increasing emissions of greenhouse gasses since the industrial revolution. It has been well documented that high carbon dioxide (CO_2) levels will acidify oceans and affect marine life. Although evidence is growing that CO_2 levels are also rising in freshwater, the impact of rising CO_2 and associated acidification on freshwater ecosystems has been largely overlooked. In this thesis we explored the impact of elevated dissolved CO_2 in freshwater, indicated by the partial pressure (pCO_2), on zooplankton. We studied effects on individual, population and community level using an experimental approach.

Our results show strong direct effects of elevated pCO_2 that differed between species including reduced survival and growth and delayed maturation in a water flea (Cladocera: *Daphnia magna*) and a seed shrimp (Ostracoda: *Heterocypris incongruens*) and delayed population growth in a rotifer (Rotifera: *Brachionus calyciflorus*). We also identified a reduced tissue calcium content in the water flea suggesting problems with calcification. Both elevated pCO_2 as well as the combination of pCO_2 and climate warming resulted in changes in the zooplankton community composition, with differential sensitivity zooplankton species. Finally, we detected potential adaptation to elevated pCO_2 in a related water flea (*Simocephalus vetulus*). We also showed that these responses can impact the species composition of a zooplankton community via an eco-evolutionary feedback.

Rising pCO_2 and related acidification is a newly identified stressor and potential threat to inhabitants of freshwater ponds and shallow lakes. It has the potential to change ecosystem functioning by reducing efficient control of algal growth and changing available biomass for animals that depend on zooplankton for food such as fish. While some species show higher tolerance or the capacity to acclimate or adapt to these changes, communities will very likely change since other stressors such as warming and pollution might constrain adaptation ability even in the most tolerant species. The main conclusion of this thesis is that elevated pCO_2 and related acidification must not be overlooked and should be considered in predictions of species responses to global change.