SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Ecology and Biodiversity

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

DANG Thi Nhu Y

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Nutrients out of balance in Vietnamese aquatic ecosystems

Promotor:

Prof. dr. Harry olde Venterink

The defence will take place on

Thursday August 22 2019 at 15:00 hour

in Auditorium E.0.12 at the Campus Humanities, Sciences and Engineering of the Vrije Universiteit Brussel, Pleinlaan 2 - 1050 Elsene, and will be followed by a reception.

Members of the jury:

Prof. dr. Ludwig Triest (chairperson)
Dr. Vanessa Minden (secretary)
Prof. dr. Nguyen Van Hop (co-promotor, Hue Univ.)
Dr. Duong Van Hieu (co-promotor, Hue Univ.)
Prof. dr. Marc Elskens
Dr. Aleksandra Lewandowska (Univ. of Helsinki)
Dr. Dedmer Van de Waal
(Netherlands Institute of Ecology)

Curriculum vitae

Dang Thi Nhu Y (°1983) obtained a BSc degree in Biology (2006) and a MSc degree in Ecology (2009) from College of Sciences, Hue University (Vietnam).

She did her PhD study from 2014 to 2019 at the Biology Department of the VUB. During this period she was also teaching at the Environmental Sciences Department of Hue University.

One of her PhD chapters is published in an international journal, whereas two others are in the review process. She also participated in international conferences and research projects.

Her research areas of interest are eutrophication in freshwater and coastal ecosystems as well as aquatic ecosystems management.

Abstract of the PhD research

Nutrient enrichment is among the most prevalent anthropogenic impacts on surface waters. It can accelerate primary production and alter the composition and functioning of aquatic ecosystems. The importance of the relative contributions of nitrogen (N) or phosphorus (P) to this enrichment or of the balance between these nutrients is often unclear. The overall aim of this PhD study was to investigate relationships between nutrient availability and species richness, abundance and tissue quality of phytoplankton and plants in some aquatic ecosystems in Vietnam, with a focus on growth-limiting and non-limiting nutrients, as well as the balance between them.

The first objective was to assess interspecific and spatio-temporal variation in foliar carbon (C), N and P concentrations, as well as ratios and isotopic composition of these elements, in four common submerged aquatic plant species (*Najas indica*; *Halophila beccarii*, *H. ovalis* and *Halodule uninervis*) in the Cau Hai lagoon. Moreover, I also wanted to evaluate to which extent variation in these nutrient and isotope variables was correlated to environmental factors, such as salinity, water depth or nutrient concentrations in water and sediment. Foliar C, N, $\delta^{13}C$ and $\delta^{15}N$ varied largely among species, space, time, and were explained by variations of salinity, water depth and N concentrations in the water. The results suggested that these aquatic plants varied in resource acquisition strategies or in resource use, and in their response to salinity, water depth and N enrichment in the water.

The second objective was to evaluate the importance of the variation in N and P availabilities and their stoichiometry for species richness and abundance of phytoplankton in both freshwater ecosystems as well as a brackish coastal lagoon in the Thua Thien Hue province, Central Vietnam. Both P availability and the N:P ratio in the seston were the main drivers for variation in phytoplankton species richness and abundance in the brackish coastal Cau Hai lagoon. The relationship between biomass and P availability was driven by cyanobacteria, and the relationship between species richness and N:P ratio by diatoms. Also in the freshwater ecosystems of the Hue Citadel, variation in phytoplankton abundance was driven by fluctuation in P availability. Increasing availability of the non-limiting nutrient nitrogen had a negative effect on species richness due to potential toxicity. Also, a high phytoplankton biomass likely reduced species richness through reduced light availability in the water column.

The results of the PhD study showed that both the supply rate of the limiting nutrient (mostly P) as well as that of the non-limiting nutrient (mostly N) can strongly affect freshwater and brackish ecosystems, either directly or through a changed N:P balance. These effects result in different level of nutrient uptake of the macrophytes and in species richness and abundance of phytoplankton. Sustainable management of these aquatic ecosystems requires that both P and N input fluxes from human activities should be controlled or reduced.