About 14 % of host's nitrogen is transfer to parasites and some of it to zooplankton, supporting the *mycoloop theory*. Parasites have been proven to provide a high-quality food source to zooplankton

Trophic position, elemental ratios and nitrogen transfer in a planktonic host-parasite- consumer food chain

Virginia Sanchez Barranco, Marcel T.J. van der Meer, Maiko Kagami, Silke Van den Wyngaert, Dedmer B. Van de Waal, Ellen Van Donk5, Alena S. Gsell

INTRODUCTION

- Parasitic consumers dominate food web links but only few studies assess the trophic position of phytoplankton parasitic consumers and their role in nutrient transfer (1)
- **Chytrids**, fungal parasite of phytoplankton, have a key role in changing the nutrient flow in aquatic ecosystems, regulating the dynamics and population densities of phytoplankton hosts and in the structure of pelagic plankton food webs (4)
- The "**mycoloop**" proposes that chytrid infections of phytoplankton transfer elements from large or inedible phytoplankton to zooplankton through the production of edible zoospores and thereby change the flow of nutrients through the food chain (5)

GOALS

- Assess the trophic position of parasites based on isotopic signatures
- Quantify the transfer of nitrogen throughout the food chain
- Determine the C:N elemental ratios of all food chain components to evaluate changes in nutritional quality

METHODS

Two experiments were performed consecutively: the **Natural-Abundances Experiment** assessed the trophic position (2) and the **N-Transfer Experiment** quantified the transfer of nitrogen (N) from the host to its fungal parasitic consumer and assessed the qualitative transfer of N onwards to the rotifer predatory consumers (3). Both experiments were set up identically (fig. 2), except for labelling the *Synedra* culture used to start the N-Transfer Experiment with 10 atom% ^{15}N nitrate.

The trophic position of the different components were assessed using the $\delta^{13}C$ and $\delta^{15}N$ values obtained from the Natural-Abundances Experiment.

The N-transfer within our experimental food chain was quantitatively calculated for the transfer from *Synedra* to the parasitic consumer and qualitatively assessed for the transfer from parasitic consumer to rotifers using the $\delta^{15}N$ values of the N-Transfer Experiment

Results and discussion

- Fungal parasites of phytoplankton did not show the expected ^{15}N enrichment relative to their host
- But took up about **14 % of host nitrogen** per day
- Moreover, the **parasite** showed **lower carbon to nitrogen ratios** relative to the host, suggesting that fungal parasites are a high food quality resource for zooplankton.
- This study supports the **mycoloop** concept and suggests a role for chytrids in rerouting N flows from inedible producers to consumers

Graphs

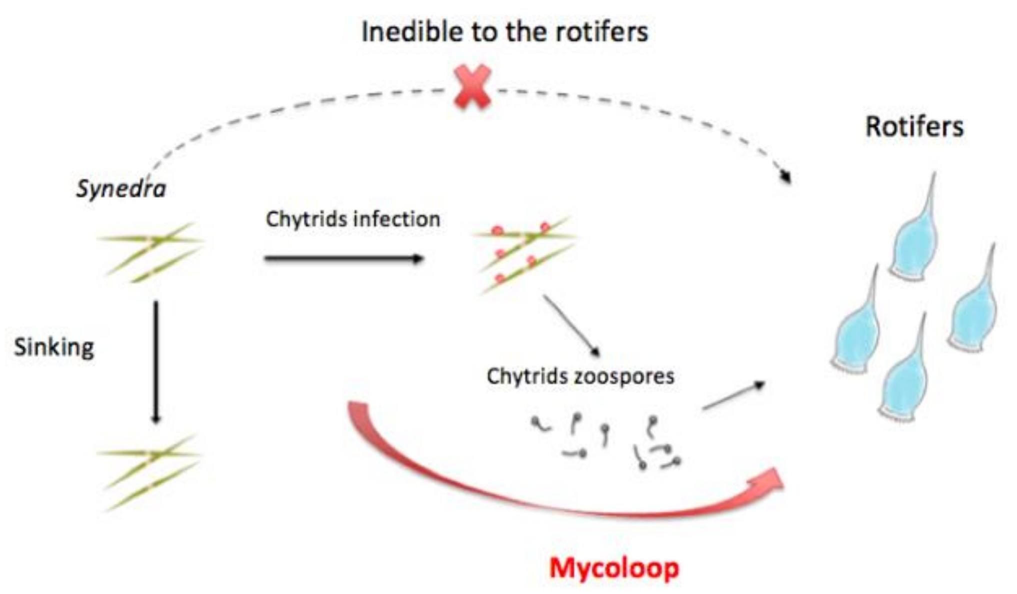

Figure 1. Diagram of the mycoloop in a system that includes the inedible diatom (*Synedra*), the obligate parasitic consumer of the diatom (Chytrid) with a sessile (sporangium) and a motile (zoospore) life stage, and the rotifer (*Keratella*), which can consume the parasitic consumer zoospores but not the host diatom

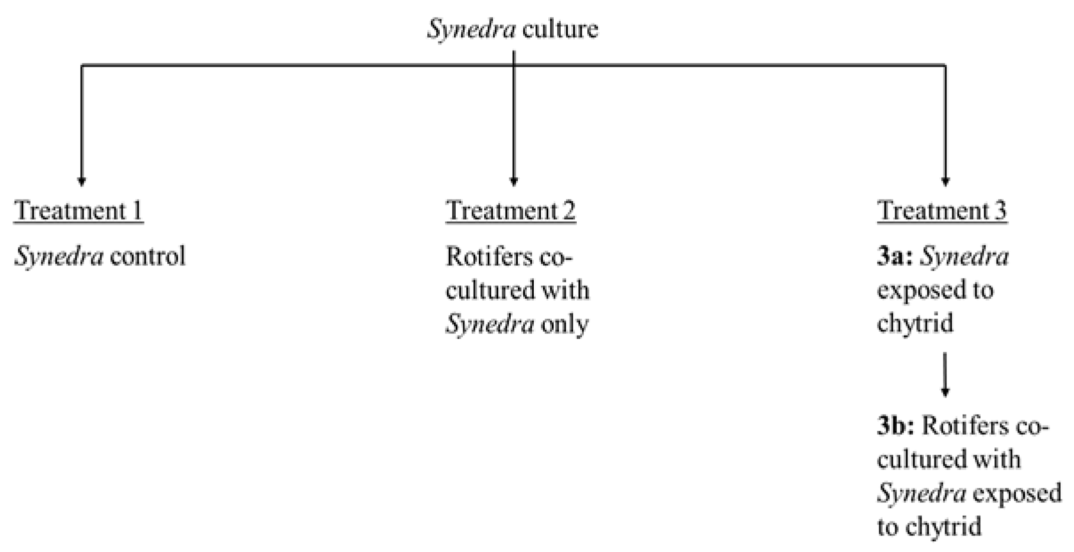

Figure 2. Figure ESM1. Scheme of the three treatments performed in each experiment. Treatment 1 was a control of Synedra growth and labelling dilution; Treatment 2 tested if rotifers feed on *Synedra* and if N-transfer could be observed; Treatment 3 a) tested N- transfer from *Synedra* to chytrids 3b) assessed if rotifers feed on zoospores of chytrids and if N-transfer could be observed. Run twice, one labelled and one unlabelled

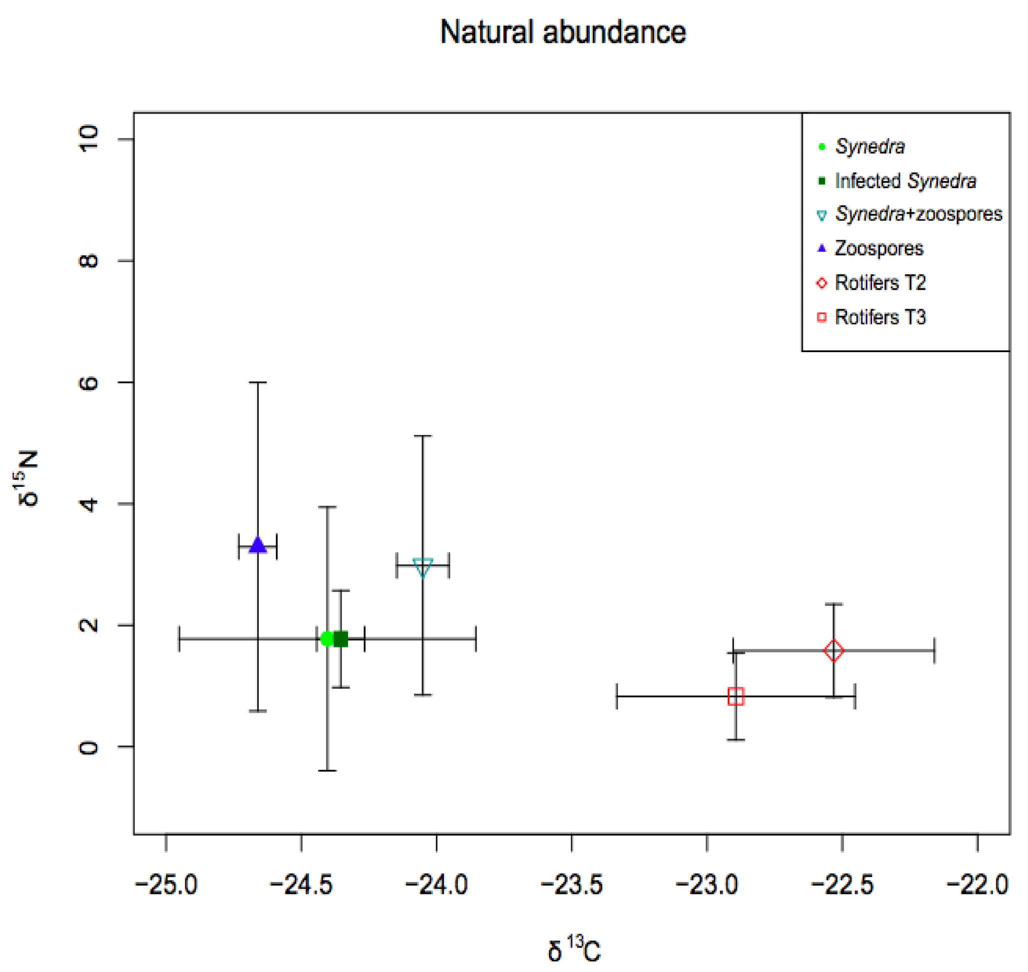

Figure 3. Bivariate plot of means and standard deviations of $\delta^{13}C$ vs. $\delta^{15}N$ values from the different predetermined trophic levels: Healthy *Synedra*, Infected *Synedra*, *Synedra* with zoospore suspension, zoospores and rotifers without (treatment 2) and with zoospores of chytrids as food source (treatment 3b)

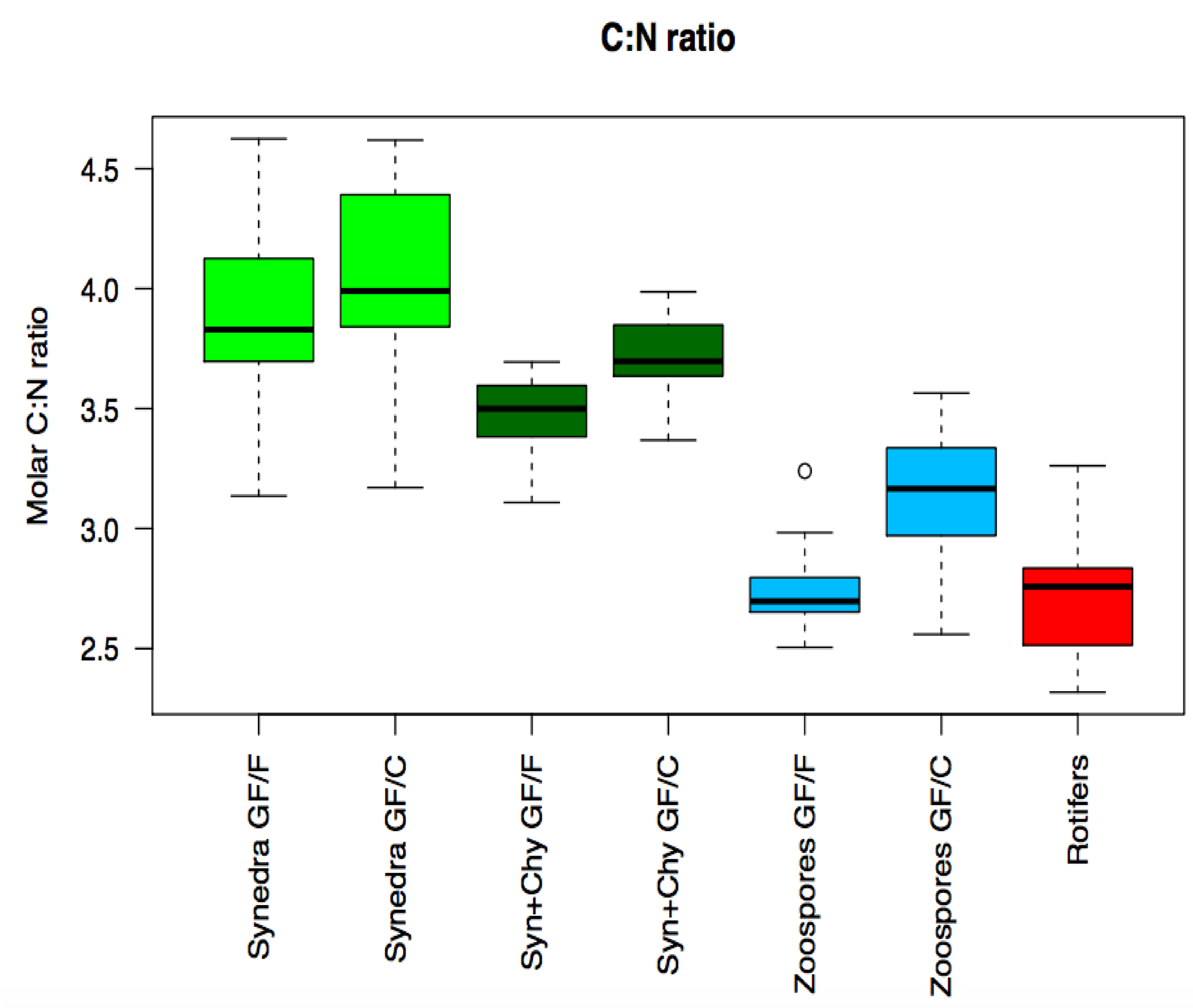

Figure 4. C:N ratios of the predetermined trophic levels: Representation of ratio of molar carbon to nitrogen (C:N ratio) of the GF/F (including bacteria) and GF/C (excluding bacteria) filter measurements of *Synedra*, infected *Synedra*, zoospores and rotifers

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Contact

Virginia Sánchez Barranco
Utrecht University
Email: v.sanchezbarranco@uu.nl

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