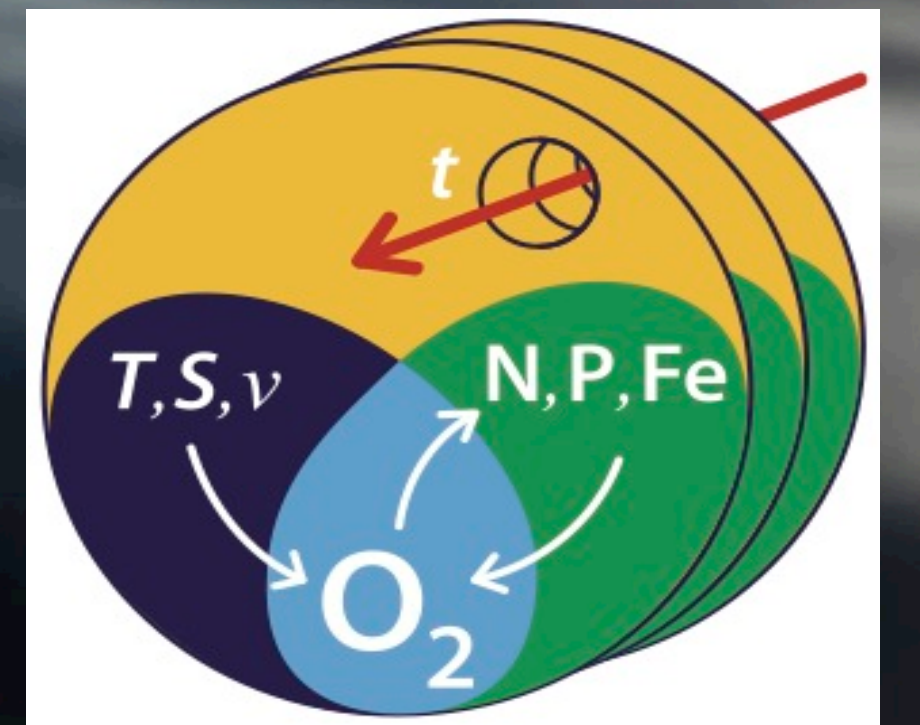


# Modelling responses in mesocosm food web succession to changes in nutrient stoichiometry



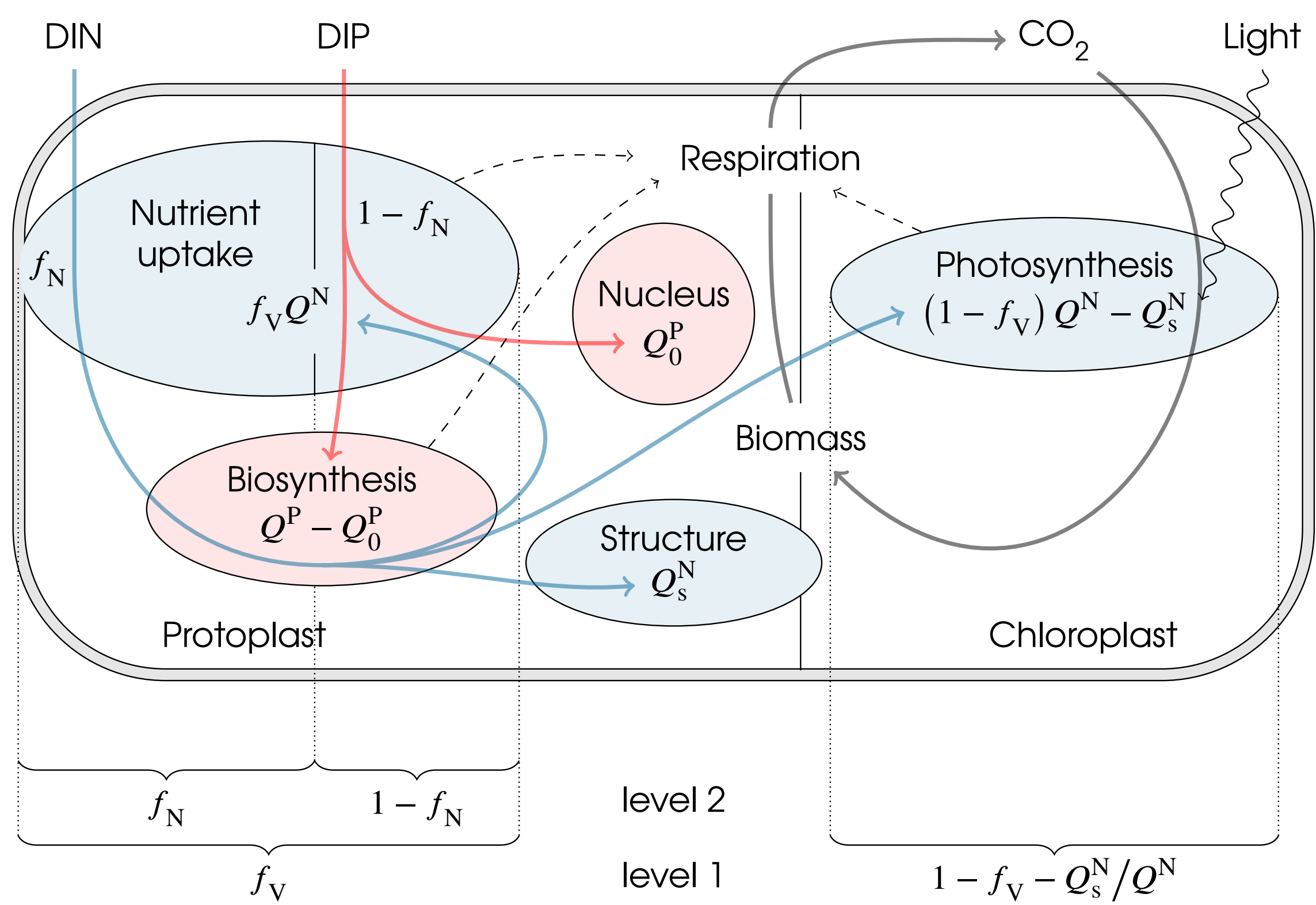
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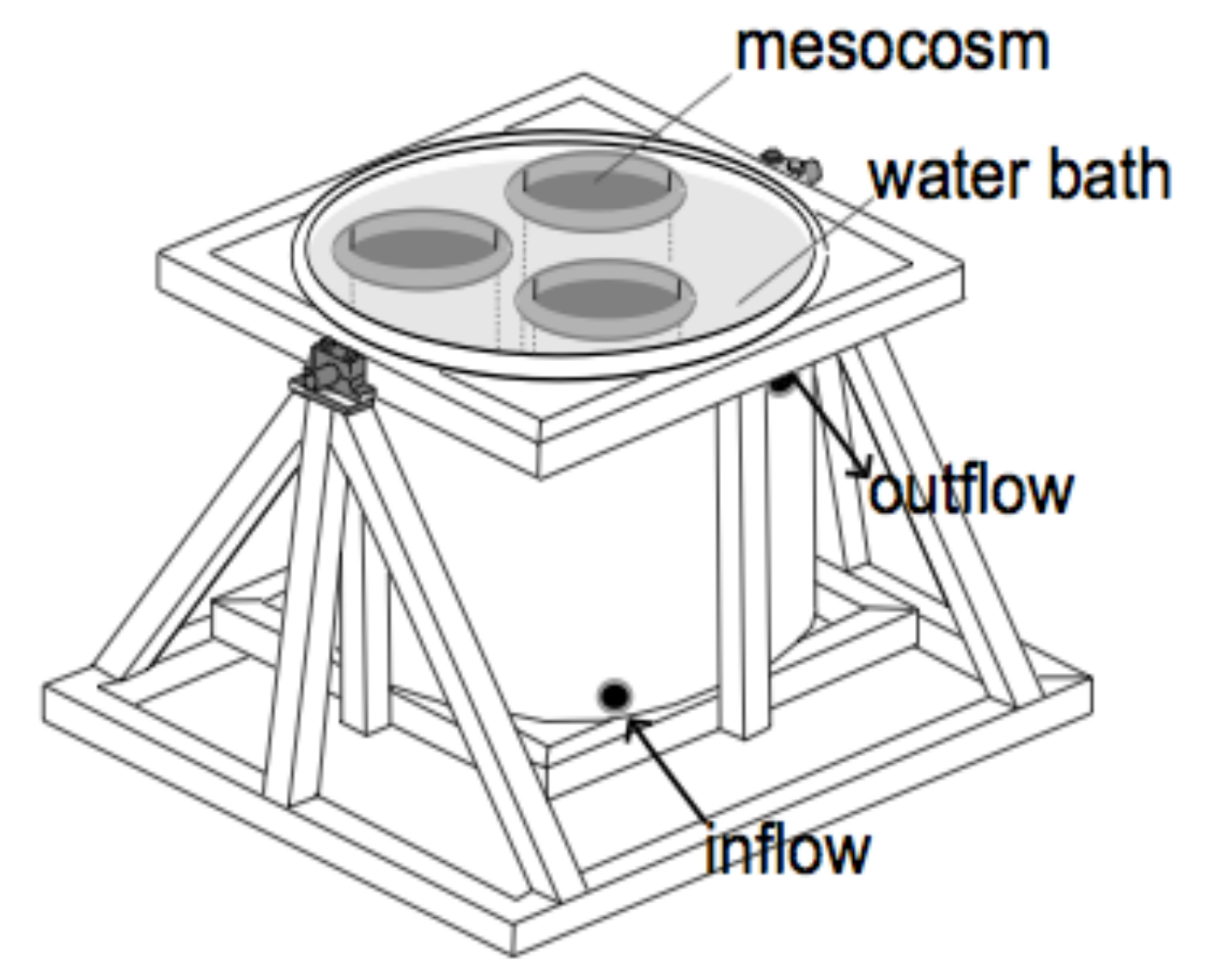
## Phytoplankton: Optimality based chain model



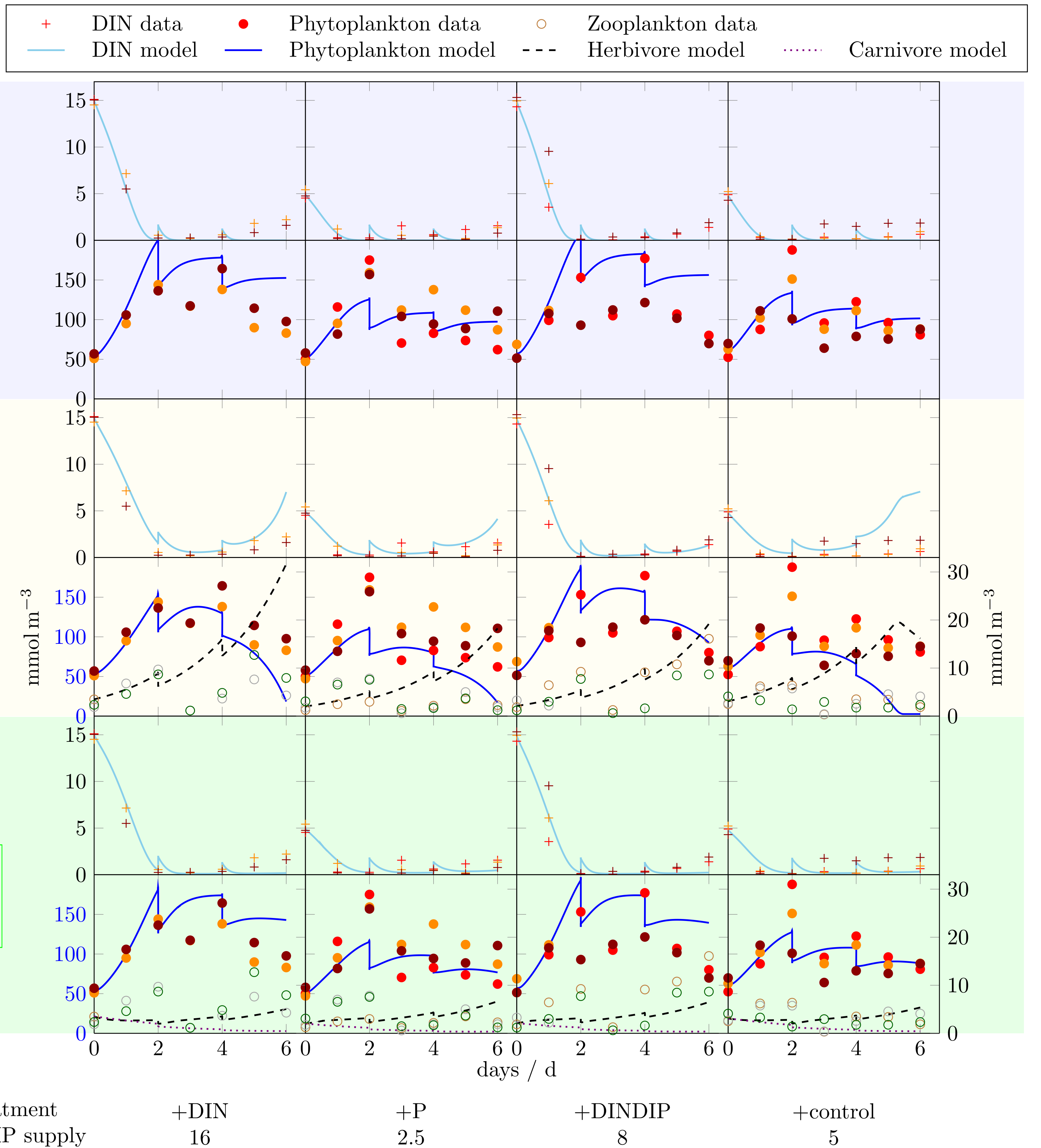
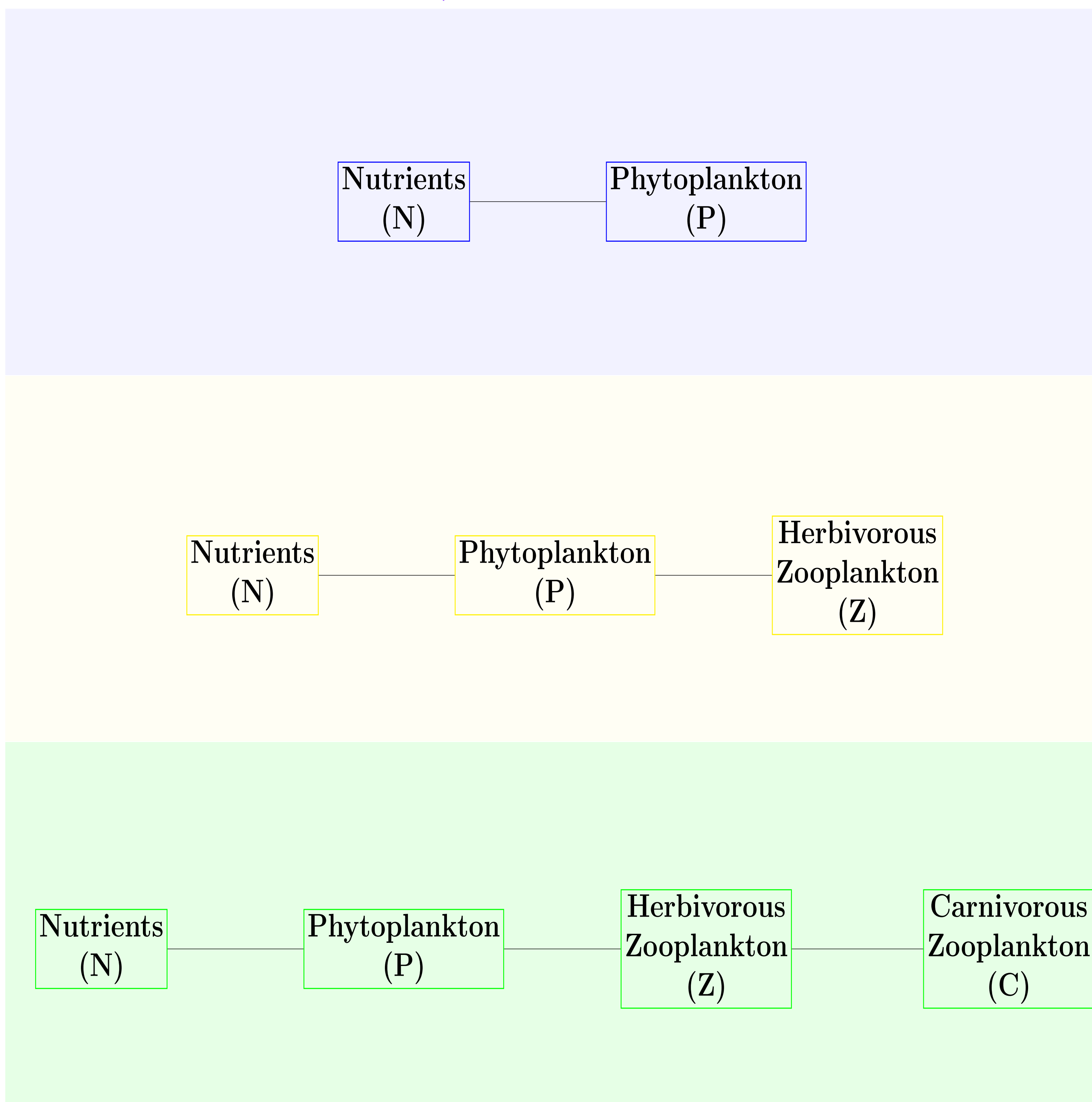
We combine an optimality based chain model with an optimal current-feeding model. Three model configurations are used to analyse plankton-related processes with observations from mesocosm experiments:

1. Nutrient and phytoplankton only (NP), with parameters adjusted to simulate nutrient impoverished conditions; remineralisation is not captured in this configuration.
2. Nutrient, Phytoplankton, and herbivorous zooplankton model (NPZ); Parameters for Z represent ciliate behaviour as this results in better model performance than parameters for copepods or dinoflagellates.
3. Nutrient, Phytoplankton, herbivorous Zooplankton, and carnivorous Zooplankton (NPZC), where the carnivore is configured with the same parameters as the herbivore.

## Schematic draft of Mesocosms

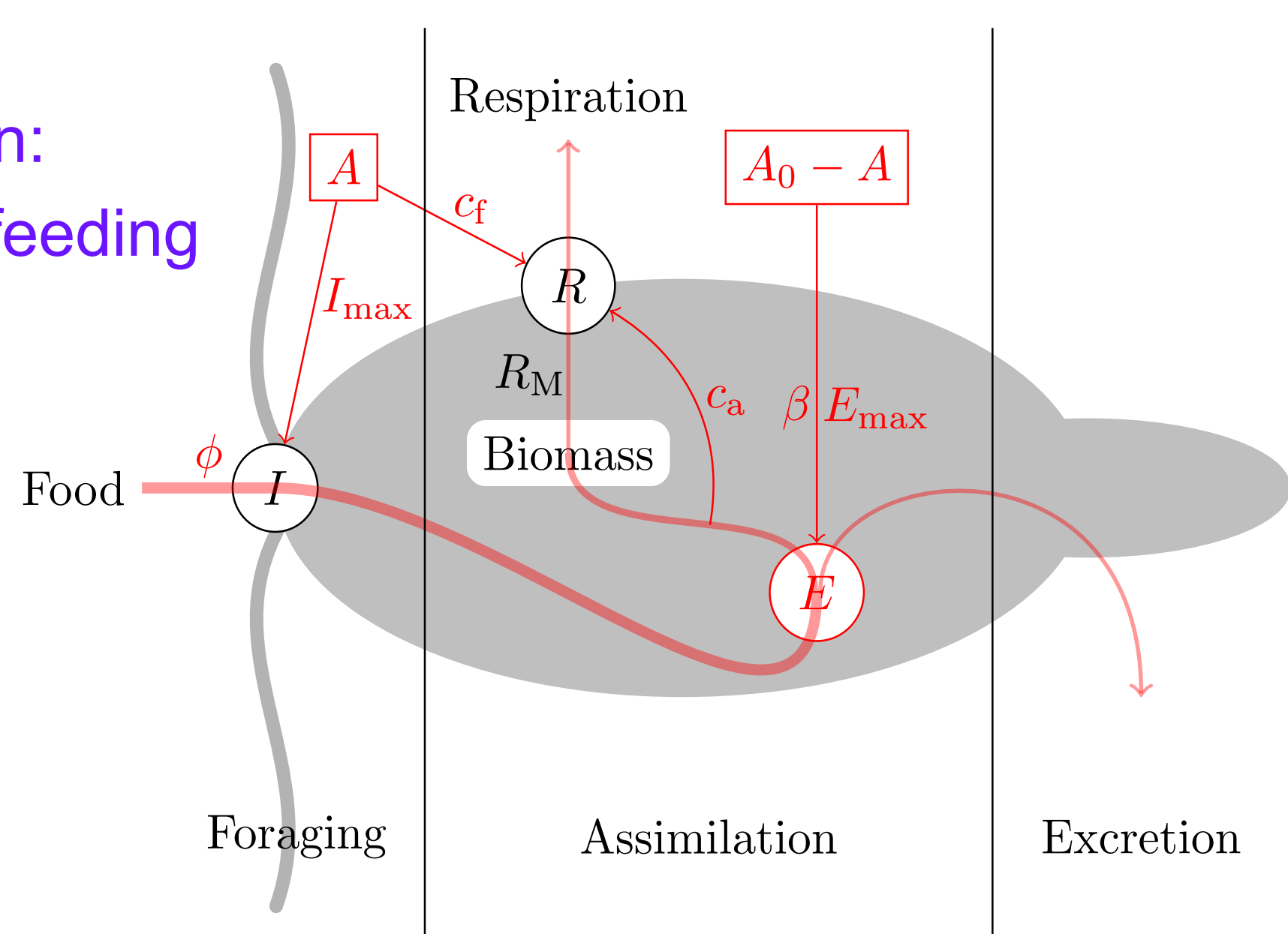


## Validation of three different model configurations at four different nutrient treatments, each with three mesocosms



Nutrient data from Franz et al., 2012: Dissolved Inorganic Nitrogen (DIN) includes nitrate, nitrite, and ammonia; Dissolved Inorganic Phosphorus (DIP) includes phosphorus ( $PO_4^{3-}$ ) and all other orthophosphates; Phytoplankton and Zooplankton data of microscopic cell-counts from Hauss et al., 2012.

## Zooplankton: Optimal current-feeding model



## Conclusions:

- The NP configuration reproduces only the first half of the mesocosm experiments. However, the model fails to reproduce the reduction in phytoplankton and increase in nutrients towards the end of the experiments. This points to the importance of remineralisation and top-down processes, which are not captured in this configuration.
- The NPZ configuration has phytoplankton decline and nutrients rise towards the end of the experiments, but both processes appear too strong, also resulting in an overestimation of final zooplankton concentration.
- Only the NPZC configuration allows an acceptable simulation of the whole time-course of the mesocosm experiments.
- We propose that the major remineralisation and top-down processes were due to ciliates.

## Acknowledgements:

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