The use of synthesizing units in modelling multiple nutrient limitation in *Acartia tonsa*.

Lothar D.J. Kuijper[1] and Thomas R. Anderson[2] .

Nitrogen is commonly believed to be the factor limiting marine zooplankton growth. To date, mathematical methods of how food quality impacts on growth, respiration and excretion are simplistic. Basic stoichiometry involves the determination of a limiting element in food based on the relative elemental ratios of consumer and prey. The consumer's metabolism depends on which element limits growth.

Furthermore, basic stoichiometry predicts that nitrogen gross growth efficiency tends to 100% when this element is in relative shortest supply. Consequently, N excretion tends to zero under N-limiting conditions, whereas it is well-known that marine zooplankton actively excrete N. One hypothesized solution is to empirically fix the maximum N growth efficiency in models, so that N excretion occurs even when N is strongly limiting; the alternative is to use physiologically based models, which contain mechanistic descriptions of dominating metabolic processes. We use a simplified DEB-approach to model egg production of *Acartia tonsa*, a small copepod feeding on diatoms. The approach comprises the merging of potentially limiting nutrients at synthesizing units (SU's) to form metabolic products in a mechanistic way. SU's resemble enzymes in that they require substrates in fixed ratios, which makes them a promising candidate for future studies on stoichiometry in ecosystems. We will show that our model can explain natural phenomena that cannot be understood using classic stoichiometry.

[1]Vrije Universiteit Amsterdam, Dpt. Theoretical biology, De Boelelaan 1087, 1081HV Amsterdam, The Netherlands (e-mail: kuijper@bio.vu.nl).

[2]Southampton Oceanography Centre, University of Southampton Waterfront Campus, European Way, Southampton, SO14 3ZH, United Kingdom (e-mail: tra@soc.soton.ac.uk).