

**sDiv Workshop**  
***“Stoichiometric constraints of biodiversity – functioning relationships (sTOICHFUN)”***  
**25.-29.11.2013**  
**Workshop Summary**

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## **Areas of discussion and main conclusions**

StoichFun merges the theory on ecological stoichiometry (ES) with the framework on biodiversity effects on ecosystem functioning (BEF). The aim of the workshop was to understand how resource use traits are stoichiometrically linked and how this transfers into different primary and secondary production in terrestrial and aquatic ecosystems. To achieve this goal 4 topics were discussed in detail:

### ***Topic 1. Fertilization & plant diversity***

It was discussed how plant species richness affects the responses of autotrophs to fertilization and how diversity affects carbon, nitrogen and phosphorus stocks. This topic addresses two very similar tasks, which however require partly different analyses. Analysis 1 on responses of monocultures and mixtures to fertilization overlaps with the interests of the Stability workgroup sPLANTDIV (<http://www.idiv-biodiversity.de/sdiv/workshops/workshops-2013/splantdiv>). Thus it was decided to establish new collaboration between both groups. Analysis 2 re-analyses the effects of different biodiversity manipulation experiments for different elements.

### ***Topic 2. N:P ratio as predictor of fertilization effects***

This project asked if tissue N:P ratio is a good predictor of changes in biomass production and what is the role of diversity change in resource use. The group focused on analyzing experiments manipulating biodiversity or/and resource supply. First results suggest that there are large differences between aquatic and terrestrial ecosystems.

### ***Topic 3. Structural equation models***

Structural equation model allows on disentangling direct and indirect effects between measured and latent variables. For the workshop this tool was applied to look at the impact of resource supply and imbalance on diversity-productivity relationship across ecosystems. The original model presented by Cardinale et al. (2009) was discussed and extended by adding food web context. It was also discussed how to improve the calculation of imbalance between resources to make the prediction more realistic.

#### **Topic 4. Modelling and theory**

The group discussed about the gaps in recent stoichiometric models and how to improve them by adding information on species diversity. It was discussed how mechanisms of coexistence might explain biodiversity.

#### **Presentations**

- ***The Synthesis Centre for Biodiversity Sciences – sDiv (Marten Winter)***  
An introduction talk about the structure of iDiv and its goals.
- ***StoichFun (Helmut Hillebrand)***  
Helmut Hillebrand summarized two research frameworks: ecological stoichiometry, and biodiversity and ecosystem functioning. He highlighted the role of stoichiometry for diversity and biomass production and explained how biodiversity affects the resource use efficiency for multiple elements. He presented motivation for the workshop and the main goals.
- ***Stoichiometric constrains of biodiversity-functioning relationships (Aleksandra M. Lewandowska)***  
Aleksandra Lewandowska gave an overview on available data sets and presented first outcomes from structural equation models highlighting major problems and possible solutions.
- ***Diversity responses to resource availability (Dylan J. Craven)***  
Dylan Craven presented the workshop on stability organized by Nico Eisenhauer, Forest Isbell and himself. He showed first results of his analyses on the effects of nutrient additions on plant diversity and highlighted possible linkages to StoichFun.
- ***Trait-based approaches to plankton ecology (Christopher A. Klausmeier & Elena Litchman)***  
Christopher Klausmeier showed how functional traits and environmental parameters translate into phytoplankton community structure. He focused on the theory of species coexistence and presented mechanistic models of population interactions. He showed examples how evolutionary adaptation and species competition can interplay in space and time. This presentation was open for public.

## Planned outputs and work plan

The group plans 4 publications in peer-review journals, which will focus on the topics discussed during the workshop. Topic 1 will be realized in collaboration with Dylan Craven and main applicants for the workshop on stability. Topic 2 should result in 1-2 publications, depending on data availability. Topic 3 will be summarized in a conceptual paper showing not only the results of the analyses, but also defining gaps and future directions in the research on diversity-productivity relationships and its stoichiometric constraints. Topic 4 will result in a new model which predicts realized species pool and links the theory on ecological stoichiometry with the framework on biodiversity and ecosystem functioning.

## Working balance

Brain storming/working in groups: 80%

Presentations: 20%

## New collaborations

Collaboration with Dylan Craven (sDiv PostDoc), Nico Eisenhauer & Forest Isbell (main applicants for Stability workshop) within the framework on the effects of fertilization on plant diversity.

## Working atmosphere and feedback on sDiv support

The sDiv support was excellent and the rooms well equipped. The feedback of the participants was enthusiastic, however, the chance for a second meeting was asked for. Some issues need further improvement (e.g. data management system and online access to literature).

## Participants

Surname	Name	Institution	Homepage
Blasius	Bernd	Carl-von-Ossietzky University Oldenburg	<a href="http://www.icbm.de/mathematische-modellierung/">http://www.icbm.de/mathematische-modellierung/</a>
Cowles	Jane	University of Minnesota	<a href="http://www.cbs.umn.edu/lab/tilman/janecowles">http://www.cbs.umn.edu/lab/tilman/janecowles</a>
Daufresne	Tanguy	INRA Montpellier	<a href="http://www.firf.fr/team/tanguy/">http://www.firf.fr/team/tanguy/</a>
Declerck	Steven	Royal Academy of Science of The Netherlands	<a href="https://www.nioo.knaw.nl/users/sdeclerck">https://www.nioo.knaw.nl/users/sdeclerck</a>
Craven	Dylan	iDiv	<a href="http://www.idiv-biodiversity.de/sdiv/workshops/workshop-postdocs">http://www.idiv-biodiversity.de/sdiv/workshops/workshop-postdocs</a>

Guerrero Ramirez	Nathaly	Friedrich-Schiller-University Jena	<a href="http://www.ecology.uni-jena.de/en/Members_Abovegro_und_belowground+Interaction_s.html">http://www.ecology.uni-jena.de/en/Members_Abovegro_und_belowground+ Interaction_s.html</a>
Harpole	W. Stanley	Iowa State University	<a href="http://www.eeob.iastate.edu/faculty/profiles/HarpoleS/HarpoleS.html">http://www.eeob.iastate.edu/faculty/profiles/HarpoleS/HarpoleS.html</a>
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Shurin	Jonathan B	University of California San Diego	<a href="http://biology.ucsd.edu/faculty/shurin.html">http://biology.ucsd.edu/faculty/shurin.html</a>
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van Donk	Ellen	Royal Academy of Science of The Netherlands	<a href="https://www.nioo.knaw.nl/users/evandonk">https://www.nioo.knaw.nl/users/evandonk</a>
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