DFG Deutsche Forschungsgemeinschaft

2018

Annual Meeting Program

Priority Program 1704 DynaTrait

Annual Meeting

08.10.2017 - 11.10.2018

University of Potsdam, Germany

Contents

Program of the DynaTrait Annual Meeting Oct 08 – 11, 2018
at Campus Neues Palais at the University of Potsdam, Germany

Color code: Yellow: Presentations in plenary room; Blue: facultative talks in parallel sessions; ORANGE: Other work activities; Gray: Breaks and free time activities.

Monday	**Program**	**Where***
ca. 12:30	Self-organized lunch at Mensa (pay yourself, no catering!)	Mensa
	Plenary	
14:00	Welcome note & Introduction to DynaTrait 2nd funding period: Ursula Gaedke (DynaTrait chair, U Potsdam, GER)	Obere Mensa *
	Reports from DynaTrait subprojects: research results / future plans Speakers reporting from subprojects are in **bold** face (not necessarily PIs). Project members present at the meeting are listed alongside speakers.	
14:10	**Hans-Peter Grossart** (IGB), **Sabine Wollrab** (IGB), Patch Thongthaisong (IGB) • 2014-2018: *Comparing phenotypic plasticity in bacterial prey traits and ecological consequences by using specialist vs. Generalist strains and organic aggregates as model systems* • 2018-2021: *Alternative states of a simple predator-prey system induced by competition between small edible and large inedible algae and fungal parasitism*	Obere Mensa
14:20	**Alexander Wacker** (U Potsdam), Svenja Schälicke (U Potsdam), Michael Raatz (U Potsdam) • 2014-2018: *Trait heterogeneity effects on trophic interactions: the role of essential nutrients*	Obere Mensa
14:30	**Stefanie Moorthi** (ICBM), Sabine Flöder (ICBM) • 2014-2018: *Consumer diversity effects in multispecies predator-prey systems* • 2018-2021: *The relevance of consumer competition and feeding traits, as well as their trade-offs, in determining multispecies trophic interactions*	Obere Mensa
14:40	**Ralph Tollrian** (RUB), Sandra Trogant (RUB) • 2014-2018: *The effect of phenotypic plasticity and clonal sorting on ecological and evolutionary dynamics in bi- and tri-trophic systems*	Obere Mensa
14:50	**Linda Weiss** (RUB), Kathrin Lampert (U Cologne), Ralph Tollrian (RUB) • 2018-2021: *The influence of environmental changes and individual trait variability (phenotypic plasticity) on biodiversity and ecosystem stability* • 2018-2021: *Ecoevolutionary feedbacks of phenotypic plasticity and mono- vs polyclonal communities in bi- and tritrophic systems*	Obere Mensa
15:00	Coffee break (30min, catering)	Obere Mensa
15:30	**Markus Weitere** (UFZ), Thomas Berendonk (TU Dresden), Ellen van Velzen (U Potsdam) • 2014-2018: *Effect of trait variability on the dynamics of coupled, bi-trophic plankton-biofilm systems* • 2018-2021: *Trait variability and defense costs in coupled bi-trophic plankton-biofilm systems: effects on predator-prey dynamics and coexistence*	Obere Mensa

15:40	**Birte Matthiessen** (GEOMAR), Thorsten Reusch (GEOMAR), Giannina Hattich (GEOMAR), Luisa Listmann (U Hamburg / GEOMAR) • 2014-2018: *Eco- evolutionary coupling in competing marine phytoplankton communities* • 2018-2021: *Nutrient uptake-related trait variability and trade-offs - adaptive evolution and community functioning in competing phytoplankton species*	Obere Mensa
15:50	**Lutz Becks** (U Konstanz), Ruben Hermann (U Konstanz), Elias Ehrlich (U Potsdam) • 2014-2018: *Impact of trade-offs on eco-evolutionary dynamics in predator-prey systems* • 2018-2021: *Indirect response to external drivers through trait variation in predator-prey systems*	Obere Mensa
16:00	**Maren Striebel** (ICBM), Alexander Wacker (U Potsdam) • 2014-2018: *Trait- based biodiversity and multitrophic dynamics under external forcing: a combined planktotron and modelling approach*	Obere Mensa
16:10	**Fredrik Berggren** (AWI), Maarten Boersma (AWI) • 2018-2021: *Does stoichiometric variation in primary producers mediate coexistence in grazers?*	Obere Mensa
16:20	**Maria Stockenreiter** (LMU), Patrick Fink (U Cologne), Luna Benitez Requena (U Cologne), Jessica Titocci (U Cologne) • 2014-2018: *Diversity loss and trait dynamics in natural plankton communities (DYNATLOSS)* • 2018-2021: *Trait - related feedback dynamics in natural plankton communities*	Obere Mensa
16:30	Coffee break (30min, catering)	Obere Mensa
17:00	**Evangelia Charalampous** (GEOMAR), Ulrich Sommer (PI at GEOMAR, not present at meeting) • 2014-2018: *Trait shift history: Do grazing induced trait shifts in phytoplankton determine the sensitivity to nutrients and sinking?*	Obere Mensa
17:10	**Kai Wirtz** (HZG), Onur Kerimoglu (HZG) • 2014-2018: *Dynamics of phytoplankton size-structure as explained by bio-physical principles and ecological history: a trait-based adaptive dynamics modeling approach*	Obere Mensa
17:20	**Esteban Acevedo-Trejos** (ZMT), Maren Striebel (ICBM) • 2014-2018: *The adaptive capacity of multitrophic plankton communities in a changing ocean* • 2018-2021: *Inter- und intra-specific Size Diversity of phytoplankton and its impacts on ecosystem functions*	Obere Mensa
17:30	**Friederike Prowe** (GEOMAR), **Markus Pahlow** (GEOMAR) • 2014-2018: *Diversity effects of trait-based zooplankton feeding interactions in a global ecosystem model* • 2018-2021: *Modelling Seasonal Vertical Migration in Marine Zooplankton*	Obere Mensa
17:40	**Ursula Gaedke, Toni Klauschies**, **Ellen van Velzen**, Ruben Ceulemans, Nadja Kath, Elias Ehrlich, Michael Raatz (all from U Potsdam) • 2014-2021: *Interplay between trait variation, food web dynamics and maintenance of biodiversity*	Obere Mensa

ca. 18:00	Catering from Café Kieselstein / Get together with drinks	Obere Mensa
21:45	End of day / Rooms are closed	Obere Mensa

*All rooms are located at the address: Mensa Am Neuen Palais, Haus 12, 14469 Potsdam if not indicated otherwise. See map at the end of document.
"Obere Mensa" = plenary room on 1st floor (OG 1) of house 12 where also the regular Mensa is located. "Large room / small room" = There are two seminar rooms behind the plenary room also at 1st floor (OG 1) of house 12.

Tuesday	**Program**	**Where**
	Plenary	
9:00	**Keynote by Ken Haste Andersen (DTU Denmark)** ***The trait-based approach to plankton ecology***	Obere Mensa
10:00	Coffee break (30min, catering)	Obere Mensa
10:30	**Dr. Claudia Neusüß** *Uncertainty in Science Part 1*	Obere Mensa
12:00	Lunch break (pay yourself at Mensa)	Mensa
13:00	**Dr. Claudia Neusüß** *Uncertainty in Science Part 2*	Obere Mensa
14:30	Coffee break (30min, catering)	Obere Mensa
15:00	**Hartmut Arndt** (U Cologne) • 2018-2021*: Influence of chaotic dynamics on the coexistence of traits: Experimental studies with aquatic microbes*	Obere Mensa
15:10	Formation of breakout and synthesis groups	Obere Mensa
	Group activities	
ca. 15:20	Poster session / Breakout groups / Open space	All rooms
17:30	PI meeting from funding periods 1 & 2	Large room
17:30	Juniors meeting from funding periods 1 & 2	Small room
18:30	Going together to dinner at Sagar Indian Restaurant (group dinner paid by DynaTrait)	Sagar restaurant*

*Sagar Indian restaurant is at Kaiser-Friedrich-Strasse 2, 14469 Potsdam (see details under "Locations" at the end of the document).

Wednesday	Program	Where
9:00	**Keynote by Ellen DeCaestecker (KU Leuven, BEL)** *The role of the Daphnia microbiome along the parasitism-mutualism continuum and its implications for eco-evo dynamics*	Obere Mensa
10:00	Coffee break (30min, catering)	Obere Mensa
	Group activities and parallel 20min-talks	
10:30-12:30	Poster session / Breakout groups / Open space	Obere Mensa
10:30	**Luisa Listmann** (U Hamburg / GEOMAR) *Rapid experimental selection changes species interactions and the CO_2 response in a two-species phytoplankton community through eco-evolutionary coupling*	Large room
	Breakout groups	Small room
10:50	**Linda Weiss** (RUB) *The influence of environmental changes and individual trait variability (phenotypic plasticity) on biodiversity and ecosystem stability*	Large room
	Breakout groups	Small room
11:10	**Nadja Kath** (U Potsdam) *The shape of the trade-off between defense and growth governs seasonal trait dynamics in a phytoplankton community*	Large room
	Breakout groups	Small room
11:30	**Subhendu Chakraborty** (DTU) *Latitudinal variation in plankton traits and ecosystem function*	Large room
	Breakout groups	Small room
11:50	**Maria Grigoratou** (U Bristol) *A trait - based approach to planktonic foraminifera ecology*	Large room
	Breakout groups	Small room
12:10	**Alexey Ryabov** (ICBM) *Effects of cell volume on the morphological diversity of phytoplankton cells*	Large room
	Breakout groups	Small room
12:30	Lunch (pay yourself at Mensa)	Mensa
13:15	Optional walk through Park Sanssouci & Frisbee or visit the nearby palace “Neues Palais”	Park Sanssouci
14:45	**Keynote by Gregor Fussmann (McGill, CAN)** *The tricky “evo” part of eco-evo dynamics*	Obere Mensa
	Group activities and parallel 20min-talks	
15:45-18:00	Poster session / Breakout groups / Open space	Obere Mensa
15:50	**Friederike Prowe** (GEOMAR) *Biogeography of feeding strategy*	Large room
	Breakout groups	Small room
16:10	**Elias Ehrlich** (U Potsdam) *Not attackable or not crackable—How pre-and post-attack defenses with different competition costs affect prey coexistence and population dynamics*	Large room
	Breakout groups	Small room
16:30	Coffee break (30min, catering)	Obere Mensa

17:00	**Ruben Ceulemans** (U Potsdam) *Functional diversity dampens trophic cascading and enhances productivity and resilience in a tritrophic model*	Large room
	Breakout groups	Small room
17:20	**Onur Kerimoglu** (HZG) *Modelling the response of planktonic ecosystems to environmental change*	Large room
	Breakout groups	Small room
17:40	**Teppo Hiltunen** (U Helsinki) *Eco-evolutionary dynamics in microbial model communities*	Large room
	Breakout groups	Small room
Ca. 18.00	Optional: join the group going to a nearby restaurant ** or self-organized evening	Diverse locations**

** The optional dinner location is a restaurant located about a 20-min walk through Park Sanssouci or 10-15min away by bus. If you prefer to organize your evening yourself, ask Potsdam staff for recommendations of suitable restaurants.

Thursday	**Program**	**Where**
9:00	**Keynote by Mathilde Cadier (DTU, Denmark)** *Modeling optimal strategies, competition and seasonal succession within unicellular plankton using a mechanistic trait-based approach*	Obere Mensa
10:00	Coffee break (30min, catering)	Obere Mensa
	Group activities	
10:30	Poster session / Breakout groups / Open space	All rooms
	Plenary	
11:30	**Keynote by Lynn Govaert (KU Leuven, BEL)** *Eco-evolutionary signatures in space*	Obere Mensa
12:30	Wrap-up session	Obere Mensa
13:00	Lunch (pay yourself at Mensa)	Mensa
14:00	Facultative thesis committees and synthesis groups	All rooms
16:00	End of meeting	-

Abbreviations of affiliations

AWI – Alfred-Wegener-Institute - Helmholtz-Centre for Polar and Marine Research, Bremerhaven / Helgoland, Germany
DTU– National Institute of Aquatic Resources. Centre for Ocean Life. Technical University of Denmark, Denmark
EAWAG – Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland
GEOMAR – Helmholtz-Zentrum für Ozeanforschung, Kiel, Germany
HZG – Helmholtz-Zentrum Geesthacht, Geesthacht, Germany
ICBM – Institute of the Chemistry and Biology of the Marine Environment, Oldenburg, Germany
Ithaca – Ithaca College, State of New York, USA
JAMSTEC – Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan
IGB – Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany
KU Leuven – University of Leuven, Leuven, Belgium
LMU – Ludwig-Maximilians University of Munich, Munich, Germany
McGill – McGill University, Canada
RUB – Ruhr University Bochum, Bochum, Germany
UFZ – Helmholtz-Zentrum für Umweltforschung, Leipzig / Magdeburg, Germany
U Bristol – University of Bristol, Bristol, UK
U Cologne – University of Cologne, Cologne, Germany
U Liverpool – University of Liverpool, Liverpool, UK
U Konstanz – University of Konstanz, Konstanz, Germany
U Potsdam – University of Potsdam, Potsdam, Germany
ZMT – Leibniz Center for Tropical Marine Ecology, Bremen, Germany

Presentation abstracts

Tuesday, October 09

Ken Haste Andersen, DTU, Denmark

The trait-based approach to plankton ecology

Trait-based ecology merges evolutionary with classical population and community ecology and is a rapidly developing branch of ecology. It describes ecosystems as consisting of individuals rather than species, and characterizes individuals by few key traits that are interrelated through trade-offs. In this talk I will present the mechanistic approach to trait-based ecology as it is practised at the Centre Ocean Life. The approach is an interdisciplinary enterprise that integrates laboratory experiments, mathematical modelling, and statistical analysis. The approach rests on four pillars: establishing trade-off between traits for individual organisms, scaling from trade-offs to populations and communities, estimating biogeography of trait-distributions in nature, and scaling from traits to ecosystem function. I will illustrate the approach with five examples from the work at the Centre for Ocean Life on unicellular plankton: trophic strategy, cell size, stoichiometry, toxins as a defence strategy, and temperature scaling of pelagic food webs.

Wednesday, Oct 10

Ellen DeCaestecker, KU Leuven, Belgium

The role of the Daphnia microbiome along the parasitism-mutualism continuum and its implications for eco-evo dynamics.

The importance of microbiomes in shaping *Daphnia* phenotypes in response to stressors and the presence of genotype-specific microbiomes is becoming increasingly appreciated. The relationship between *D. magna* and its microbiota goes from mutualistic to antagonistic associations. Removing the microbiota results in decreased growth, survival and reproduction of the *Daphnia* host. But antagonistic associations with bacterial parasites are ample described. My research group focuses on how the microbiome impacts phenotypes, with emphasis on direct and indirect, microbiome-mediated effects of environmental change on phenotypes of *Daphnia*, and how these are host genotype-dependent. To better understand the phenotype and its plasticity, we test how host genotype together with its microbiome shape the host phenotype in response to important environmental stressors: cyanotoxins and parasites. Overall, these results indicate strong reciprocal interactions between *Daphnia* genotypes, their gut microbiome and the surrounding bacterioplankton, and illustrate the potential impact of the host microbiome in eco-evolutionary dynamics and as ecosystem engineer.

Gregor Fussmann, McGill, Canada

The tricky "evo" part of eco-evo dynamics

An ecological community's response to stress will depend partly on how individual species adapt and interact with others. Although there is a clear expectation that the evolutionary response to environmental change be adaptive, studies conducted in natural ecosystem contexts frequently fail to produce adaptive responses. A sizeable number of studies either report the absence of adaptation (i.e., "eco", not "eco-evo" dynamics) or even mal-adaptive evolutionary change. I will present some examples of such non- or mal-adaptive outcomes from my own and other labs and discuss how these unexpected results might have arisen in the context of ecosystem complexity. I will also present a simple, conceptual evolutionary model that can explain how evolutionary dynamics that seek to increase trait fitness in stressful environments can result in apparently maladaptive outcomes.

Onur Kerimoglu, HZG, Germany

Modelling the response of planktonic ecosystems to environmental change

Increasing volume and intensity of antrophogenic activities result in alteration of environmental conditions at ever-increasing rates. Coupled physical-biogeochemical models are among the useful tools for understanding and predicting the response of ecosystems to these changes. However, in such model frameworks, flexibility and adaptive capacities inherent at various organismal scales are often underrepresented. Lately, increasing efforts have been made to fill this gap, e.g., by representing the diversity of plankton communities and physiological acclimation of individual organisms. I will highlight some specific examples from our recent and ongoing work on simulating the response of southern North Sea to the changing nutrient inputs to the system: our findings so far point to the relevance of acclimation and stoichiometry of phytoplankton to their resource environment, but they are subject to uncertainties due to the oversimplified representation of the plankton food web, improvement of which is in progress. I will discuss the benefits of a modular approach for describing the plankton food webs, structure and complexity of which may depend on the study site and question at hand.

Linda Weiss, RUB, Germany

The influence of environmental changes and individual trait variability (phenotypic plasticity) on biodiversity and ecosystem stability

Diversity is a major precondition for the adaptive reaction to environmental change. Biodiversity at all levels (genetic, species, interactions) is crucial for ecosystem function and stability as higher biodiversity means redundancy which stabilizes ecosystems because extinct species/genotypes can be replaced. In addition, the presence of individual trait variation and/or phenotypic plasticity can stabilize population fluctuations and thereby prevent extinction. Recently however, biodiversity is declining at a rapid rate while environmental disturbances and large scale changes are increasing in frequency and severity. We are therefore interested in the effect of individual trait variation on a population's genetic diversity together in the light of predator-prey interactions and how this might influence ecosystem function and stability. Two scenarios can be considered: (I) Phenotypic plasticity (trait variation) might increase the biodiversity of ecosystems because it allows for a better niche use. (II) Phenotypic plasticity (trait variation) might decrease biodiversity because it enables the plastic organism to exploit several niches rather than allowing a specialization of different genotypes. This system will further be challenged by testing how environmental (abiotic) stress affects ecosystem stability. We will use the model predator-prey system *Daphnia pulex* and its predator *Chaoborus larvae* in a two-fold approach and test the influence of predation and anthropogenic stressors on artificial *D. pulex* populations in mesocosms. We monitor the clonal diversity of the prey species within 12 weeks.

In a second step, a modeling approach will provide us with predictions about feedback loops on prey genotypic diversity and phenotype/genotype interaction and predator and prey survival capacities under different environmental conditions. With this integrative approach we will get a deeper insight into the effect of individual trait variation and phenotypic plasticity on the clonal diversity of populations as well as an estimate of how clonal diversity influences an ecosystem's function and stability.

Elias Ehrlich, U Potsdam, Germany

Not attackable or not crackable—How pre-and post-attack defenses with different competition costs affect prey coexistence and population dynamics

It is well-known that prey species often face trade-offs between defense against predation and competitiveness, enabling predator-mediated coexistence. However, we lack an understanding of how the large variety of different defense traits with different competition costs affects coexistence and population dynamics. Our study focusses on two general defense mechanisms, that is, pre-attack (e.g., camouflage) and post-attack defenses (e.g., weaponry) that act at different phases of the predator—prey interaction. We consider a food web model with one predator, two prey types and one resource. One prey type is undefended, while the other one is pre-or post-attack defended paying costs either by a higher half-saturation constant for resource uptake or a lower maximum growth rate. We show that post-attack defenses promote prey coexistence and stabilize the population dynamics more strongly than pre-attack defenses by interfering with the predator's functional response: Because the predator spends time handling "noncrackable" prey, the undefended prey is indirectly facilitated. A high half-saturation constant as defense costs promotes coexistence more and stabilizes the dynamics less than a low maximum growth rate. The former imposes high costs at low resource concentrations but allows for temporally high growth rates at predator-induced resource peaks preventing the extinction of the defended prey. We evaluate the effects of the different defense mechanisms and costs on coexistence under different enrichment levels in order to vary the importance of bottom-up and top-down control of the prey community.

Friederike Prowe, GEOMAR, Germany

Biogeography of feeding strategy

The trait-based approach is increasingly used in plankton ecology to understand diversity, community dynamics, and biogeography. While on the global scale phytoplankton traits are fairly well established, zooplankton traits are only beginning to be understood. One taxa-transcending aspect of zooplankton diversity is the distinction between ambush and active feeding strategies. We present a global-scale empirical estimate of feeding strategy derived from copepod abundance observations, which for the first time suggests a distinct trait biogeography with ambush feeding as the dominant feeding strategy at higher, but not at lower latitudes. To explain this trait biogeography we develop a minimalist trade-off based model of feeding strategies based on encounter rates between zooplankton predators and their phyto- and zooplankton prey. Encounter rates are governed by the two traits, size and motility, that trade off against predation risk. Coupled to a 3D dynamic green ocean model, our idealized encounter model captures the observed feeding strategy biogeography. In the model, this pattern arises from competing dominant food chains within the food web and is shaped by a trophic trait cascade of active vs. passive feeding in adjacent trophic levels. The dominant feeding strategy structures the pathways and efficiency of energy and biomass transfer through the model food web, with consequences for primary production, export and higher trophic levels. Understand feeding strategies is therefore important for fisheries, biogeochemical cycling, and long-term predictions of ecosystem dynamics and functioning by global dynamic green ocean models.

Ruben Ceulemans, U Potsdam, Germany

Functional diversity dampens trophic cascading and enhances productivity and resilience in a tritrophic model

Diverse communities can adjust their trait composition to altered environmental conditions, which may strongly influence their dynamics. Previous studies of trait-based models mainly considered only one or two trophic levels, whereas most natural system are at least tritrophic. Therefore, we investigated how the addition of trait variation to each trophic level influences population and community dynamics in a tritrophic model. Examining the phase relationships between species of adjacent trophic levels informs about the degree of top-down or bottom-up control in non-steady-state situations. This analysis revealed that trait variation buffers trophic cascading and increases the reliability of biomass production at the community level through compensatory dynamics between functionally different species within a trophic level. Furthermore, even without trait variation, our tritrophic model always exhibits regions with two alternative states with either weak or strong nutrient exploitation, and correspondingly low or high biomass production at the top level. However, adding trait variation increased the basin of attraction of the high-production attractor, and decreased the likelihood of a critical transition from the high- to the low-production state with no apparent early warning signals. Hence, our study shows that trait variation enhances resource use efficiency, productivity, stability, and resilience of entire food webs.

Subhendu Chakraborty, DTU, Denmark

Latitudinal variation in plankton traits and ecosystem function

Understanding of trophic strategies of plankton is crucial to describe plankton ecosystem structure and functions, and the emergent bio-geochemical cycles of the world's oceans. For example, the presence of mixotrophs increases both primary production and the efficiency of energy transfer to higher trophic levels. Mathematical models with proper adjustment of trophic strategies of plankton according to environmental conditions are lacking. Here we develop a trait-based model of unicellular plankton with cell size as the master trait and three investment traits that determine trophic strategies: investments in photosynthesis, nutrient uptake, and phagotrophy. The model uses optimization of trophic strategy to reduce the number of state variables. We use the model to study the latitudinal variation of emergent plankton community structure in 1D vertical water column. The model reproduces observed latitudinal patterns in biomass and primary production, both increase with increasing latitude. Lower latitude waters have a stable subsurface biomass maximum dominated by obligate mixotrophs, while higher latitudes have a seasonal succession with spring dominance of large organisms mainly gaining from phototrophy followed by the dominance of small phototrophs and mixotrophs during summer. A large size range of organisms prefer mixotrophic strategy at lower latitudes and that mixotrophic size range is invariant with seasons. Energy transfer efficiency to the higher level also increases with latitudes; high efficiency has been observed during late spring and summer at high latitudes while it remains consistently low at low latitudes. The models' ability to adapt to different environmental conditions, combined with its simple structure and few state variables makes it well suited for global simulation studies.

Alexey Ryabov, ICBM, Germany

Effects of cell volume on the morphological diversity of phytoplankton cells

Shapes of phytoplankton cells have a huge variety and constitute an important component of adaptation to environmental conditions. Here we analyze the shape and abundance of more than 10000 samples of unicellular marine phytoplankton and show that there are regular patterns in both shape distributions and effects of shape on cell dominance. First, cells with either small or large volume tend to be spherical, while the shape of intermediate cells ranges from oblate and spherical to extremely elongated. Second, the cell longest linear dimension ranges from 1 to 1000 µm, but the ratio between the longest and shortest dimension is less than 100 and decreases with cell size, indicating likely the presence of mechanistic constraints of cell elongation. Third, the dominating cells are either spherical or cylindrical approaching a minimal surface to volume ratio, suggesting that minimizing the cell wall area is a more profitable strategy than increasing the surface to volume ratio which is often considered as a driver of volume specific resource uptake. Finally, we show that the variety of cell shapes can be described in terms of a simple neutral model based on few empirically derived constraints of cell geometry.

Teppo Hiltunen, U Helsinki, Finland

Eco-evolutionary dynamics in microbial model communities

Understanding when and how rapid evolution drives ecological change is fundamental for our understanding of almost all ecological and evolutionary processes such as community assembly, diversification and the stability of communities and ecosystems. Evolution has been recognized to significantly alter especially the interaction between consumers and their resources, a key interaction in all ecological communities. While these eco-evolutionary dynamics have been shown to occur when prey populations are evolving, little is known about the role of predator evolution and co-evolution between predator and prey in this context. Here I present results from series of experiments on how predator adaptation to prey affects the link between rapid evolution and ecological change using experimental evolution with the bacterium *Pseudomonas fluorescens* and its predator *Tetrahymena thermophila*. Three years ago, inspired by Richard Lenski's famous long term evolutionary experiment, we started selections lines where eight different bacterial species evolve alone and with ciliate *Tetrahymena thermophila* in one bacteria + *T. thermophila* combinations. With this system we have created a massive "fossil record" of co-evolving communities over thousands of generations. This material allows us to constructs communities with controlled trait variability. I addition to presenting the first results from this long-term experiment, I will present recent results using a multispecies bacterial model community constructed in our laboratory that can be used as a model for eco-evolutionary dynamics in more complex communities.

Maria Grigoratou, U Bristol, UK

A trait- based approach to planktonic foraminifera ecology

Planktonic foraminifera are fifty holoplanktonic heterotrophic protozoans and the most important calcify zooplankton group, supplying between 23-55% of the total marine planktonic carbonate production. Despite their important role in regulating the ocean carbonate production and in reconstructing paleoclimate, our knowledge of planktonic foraminifera ecology is limited. Here we take a novel mechanistic approach for studding planktonic foraminifera ecology based on the traits and trade-offs of size, calcification and feeding behaviour. To do that we build the first OD trait-based model which accounts for the biomass of a prolocular (20 µm) and adult stage (160 µm) of non-spinose in oligo-, meso- and eutrophic environmental conditions at three different water temperatures (10°C, 20°C and 30°C). Our results show that the energetic cost of calcification varies between 25-50% and 20-35% for the prolocular and adult stage respectively. Additionally, for both stages, the benefit of shell protection against pathogens (viruses, bacteria) is more important than predation. Planktonic foraminifera's low biomass is a key element for the survival from predation following by their carbonate shell. In the model, both temperature and food resources are important environmental parameters for planktonic foraminifera's biomass. We found that food availability and resource competition is a key controlling factor for the adults and defines their type of feeding strategy (herbivorous versus omnivorous) for different nutrient concentration environments. Building on the results, our next step is to include our foraminifera trait -based OD model into the 3D EcoGeNie ecosystem model. With EcoGeNie we aim to raise our understanding on planktonic foraminifera's ecology and their response to a changing climate, especially the impact of multiple drivers on physiology, distribution, and carbonate production.

Luisa Listmann, U Hamburg / GEOMAR, Germany

Rapid experimental selection changes species interactions and the CO2 response in a two-species phytoplankton community through eco-evolutionary coupling

Ecological and evolutionary processes shape how species and communities will react to cli-mate change, but the ways how ecology and evolution are intertwined are poorly understood. We studied adaptation in two bloom forming and globally co-occurring phytoplankton spe-cies, Emiliania huxleyi and Chaetoceros affinis, in response to long-term exposure to in-creased CO_2 including the effect of species interactions. Here we show that over approxi-mately 200 generations, the interactions of *C. affinis* and *E. huxleyi* changed strongly, con-verting the winner to the loser species and vice versa. Surprisingly, these changes were asso-ciated with rapid and reproducible genotype sorting that left a single remaining genotype among the initial nine genotypes of each species. We therefore conclude that the experimental conditions of semi-continuous batch cycles with a nutrient limited stationary phase represented a selection regime overriding the manipulated CO_2 and two-species treatments. However, the results demonstrate that eco-evolutionary coupling alters the dynamics in the simplest possible two-species phytoplankton "community".

Nadja Kath, U Potsdam, Germany

The shape of the trade-off between defense and growth governs seasonal trait dynamics in a phytoplankton community

Understanding changes in the functional trait composition of communities under altering environmental conditions is a major challenge in ecology. Typically, species cannot simultaneously optimize all traits due to trade-offs promoting functional diversification. Theory predicts that the shape of a trade-off crucially determines the functional diversity and trait dynamics of communities. The empirical verification of this theory is essential to community ecology but still lacking in the field. Here, we reveal based on the natural phytoplankton community of large, deep Lake Constance that the lab-measured shape of the trade-off curve between defense and growth governs the observed community trait dynamics in response to seasonally changing environmental factors. A corresponding population model including the measured concave trade-off curve offered mechanistic insights into the observed dominance of fast-growing species with intermediate defense levels, the ongoing species sorting driven by altered grazing pressure and the maintenance of trait variation based on low fitness differences.

Thursday, Oct 11

Mathilde Cadier, DTU, Denmark

Modeling optimal strategies, competition and seasonal succession within unicellular plankton using a mechanistic trait-based approach

The trait-based approach is an emerging field of ecology which proves to be very well appropriate when studying plankton ecosystem. Indeed, ecologically relevant traits rather than taxonomic affiliation define ecosystem functions, and community composition is driven by the relationship between the organisms' features and the biotic and abiotic environment. In this talk, I will present a mechanistic model with two key functional traits of unicellular plankton: trophic strategy and vacuolation. The first trait describes the use of organic matter as a source of energy and carbon within mixotrophs to cope with inorganic nutrient limitation. The other trait describes gas vacuoles within the cell that expand the physical size relatively to cellular carbon content to face predation, reduce sinking and favor resource affinity. In terms of functional groups, the first trait represents flagellates and dinoflagellates with different investments in mixotrophy, and the second trait represents diatom with different vacuole size. The relative success (growth rate) and the outcome of the competition (relative biomass) between the two opposite strategies are assessed as a function of cell size for a set of environmental conditions during a seasonal cycle.

Lynn Govaert, KU Leuven, Belgium

Eco-evolutionary signatures in space

Ecological and evolutionary processes can occur at similar time scales, and hence influence one another. While there is much progress in the development of metrics that enable the quantification of ecological and evolutionary components to trait change over time, many empirical evolutionary ecology studies document genetic differentiation among populations structured in space. Both in time and space, the observed differentiation in trait values among populations and communities can be the result of interactions between non-evolutionary (phenotypic plasticity, changes in the relative abundance of species) and evolutionary (genetic differentiation among populations) processes. However, the tools developed so far to quantify ecological and evolutionary contributions to trait change are implicitly addressing temporal dynamics because they require directionality of change from an ancestral to a derived state. Identifying directionality from one site to another in spatial studies of eco-evolutionary dynamics is not always possible and often not desired. We here suggest three modifications to existing metrics that allow us to partition ecological and evolutionary contributions to changes in population and community trait values across landscapes. We then apply one of these modifications to a natural zooplankton metacommunity of which we have metacommunity data (spatial and environmental characteristics of the ponds combined with zooplankton community composition data), quantitative genetic trait data (local genotypic trait values of all *D. magna* populations and regional values for dominant species in the zooplankton metacommunity, both assessed in a common garden environment) and molecular genetic data (neutral genetic markers to characterize *D. magna* populations). We found that landscapes harbor sites with variable degrees of importance of local evolution for community trait composition, and that properties of other residents of the community (e.g. diversity and traits of competitor species) are better predictors of this importance than genetic properties of *D. magna* (e.g. their genetic diversity) or environmental features (environmental heterogeneity as a proxy for habitat diversity and genetic distance to other populations as a proxy for habitat isolation). These results indicate that the impact of evolution on ecology does not only depend on species' evolution but also on the ecological context itself.

Posters

We expect 28 posters from the following participants

Bei Su
Alexey Ryabov
Ruben Ceulemans
Onur Kerimoglu
Nadja Kath
Ken H. Andersen
Mathilde Cadier
Evangelia Charalampous
Ruben Hermann
Janne Hülsemann
Titocci Jessica
Christian Laumen
Markus Pahlow
Tobias Romankiewicz
Svenja Schälicke
Maria Stockenreiter
Patrick Thomas
Sandra Trogant
Ellen van Velzen
Alexander Wacker
Elias Ehrlich
Sabine Flöder
Toni Klauschies
Michael Raatz

Locations

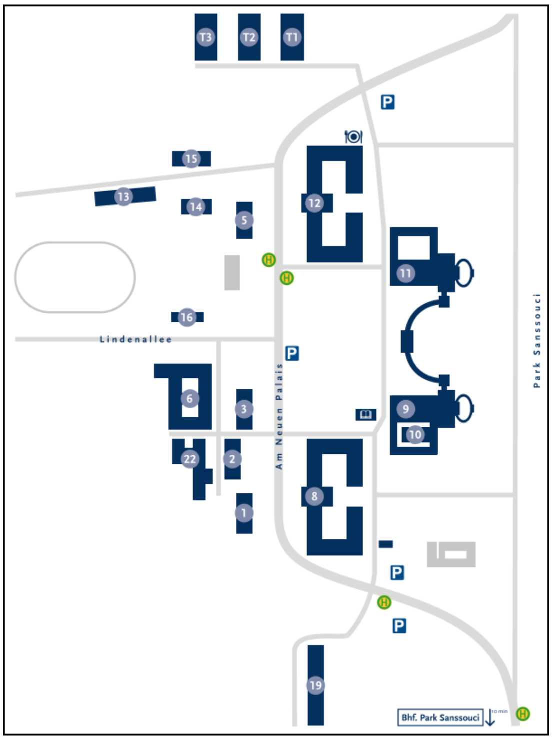
If you need assistance: call Alice: +49 177 88 99 329

The fastest way to get to the Campus Am Neuen Palais of the University of Potsdam is to take the regional train RE1 or RE21 to the station "Park Sanssouci Bahnhof". You can walk from here in 15min to the University campus or take the bus (2 stops).

Bus numbers 605, 606, and 695 leave from there – the bus stop is 50m away when you exit the trait station. Take the bus in direction towards the city center (695 "Hauptbahnhof") or "Wissenschaftspark Golm" (605, 606). Exit at the bus stop "Campus Universität / Lindenallee" (2 stops from the station Potsdam Sansscouci, see map below). The bus station "Campus Unversität / Neues Palais" can also be reached from Potsdam Hauptbahnhof in 25min by the same buses (coming from the other direction). Buses leave about every 20min from Bus stop "Campus Universität / Lindenallee" in both directions until midnight.

The one-way ticket prices in Potsdam are 1.70 EUR for 4 consecutive stations ("Kurzstrecken-Ticket") and 2.10 EUR for longer trips ("Potsdam AB Ticket") independent of the mode of transport (bus, tram, regional train). There is also a "4-Fahrten-Karte" at a reduced price (instead of buying 4 tickets for 4 trips). If you go to Berlin, all tickets are more expensive and the fare system is more complex. Please check out prices at https://www.vbb.de/en/tickets (and www.bvg.de).

In Potsdam, you need to present your ticket to the driver or buy a ticket at the vending machine inside of the bus. The drivers do NOT sell tickets. In Berlin, you also have to show your ticket to the bus driver who sometimes sell tickets, but there are also plenty of vending machines at larger stations (buy in advance: often the easier option!).



Left: Campus map of Am Neuen Palais, University of Potsdam. **The plenary room "Obere Mensa" is located in house no. 12, first floor, at the Campus Am Neuen Palais.** We will put up signs at the doors to help you find the rooms.

The **dinner location on Tuesday** (paid by DynaTrait) is the Indian Restaurant Sagar; www.sagar-restaurant.de
The restaurant is in 20min walking distance from bus stop "Campus Univeristät/Lindenalle". Alternatively, take bus 605/606 in direction "Golm" and get out at "Potsdam – Am Grünen Weg"), then walk to Kaiser-Friedrich-Strasse 2, 14469 Potsdam.

The **dinner location on Wednesday** (optional) will be a restaurant in 20min walking distance from the meeting place. We will ask you on Monday where you want to go and how many people want to join the group.