

University of Groningen

Ecology of benthic microalgae

Engel, Friederike Gesine

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2018

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Engel, F. G. (2018). *Ecology of benthic microalgae*. University of Groningen.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Ecology of Benthic Microalgae

Community Dynamics of Estuarine Primary Producers
in a Changing World

© 2018 by Friederike G. Engel

The research reported in this thesis was carried out at the Benthic Ecology group, Groningen Institute for Evolutionary Life Sciences (GELIFES), University of Groningen (The Netherlands) and at the Experimental Ecology group, GEOMAR Helmholtz Centre for Ocean Research in Kiel, Germany according to the requirements of the Graduate School of Science (Faculty of Science and Engineering, University of Groningen).

The research was funded by an Ubbo Emmius PhD scholarship from the University of Groningen and internal funds from the GEOMAR. The printing of this thesis was partly funded by the University of Groningen.

This thesis should be cited as:

Engel, F. G. (2018). Ecology of Benthic Microalgae. PhD Thesis, University of Groningen, Groningen, The Netherlands.

Layout, cover design, and photos: Friederike G. Engel
Printing: Ridderprint BV | www.ridderprint.nl.

ISBN: 978-94-6299-992-3

ISBN (electronic version): 978-94-034-0748-7



university of
 groningen

Ecology of Benthic Microalgae

Community Dynamics of Estuarine Primary Producers
in a Changing World

PhD thesis

to obtain the degree of PhD at the
University of Groningen
on the authority of the
Rector Magnificus Prof. E. Sterken
and in accordance with
the decision by the College of Deans.

This thesis will be defended in public on

Friday 8 June 2018 at 09.00 hours

by

Friederike Gesine Engel

born on 12 August 1987
in Hamburg, Germany

Supervisor

Prof. B. D. H. K. Eriksson

Co-supervisors

Prof. U. Sommer

Dr. B. Matthiessen

Assessment Committee

Prof. C. Smit

Prof. J. D. van Elsas

Prof. H. Hillebrand

Für meine Familie – Nah und Fern.

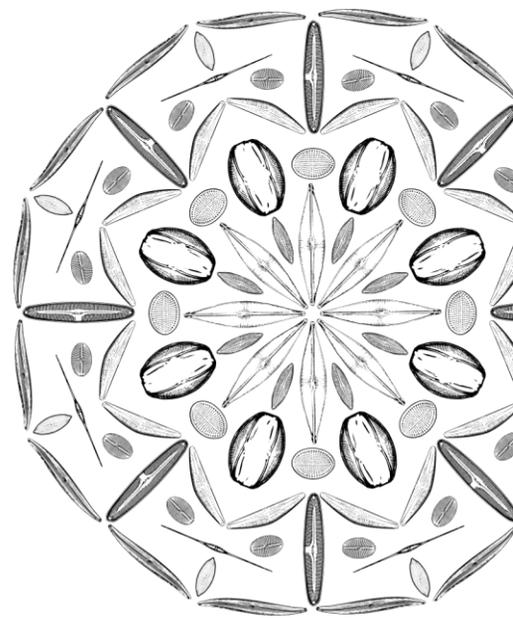
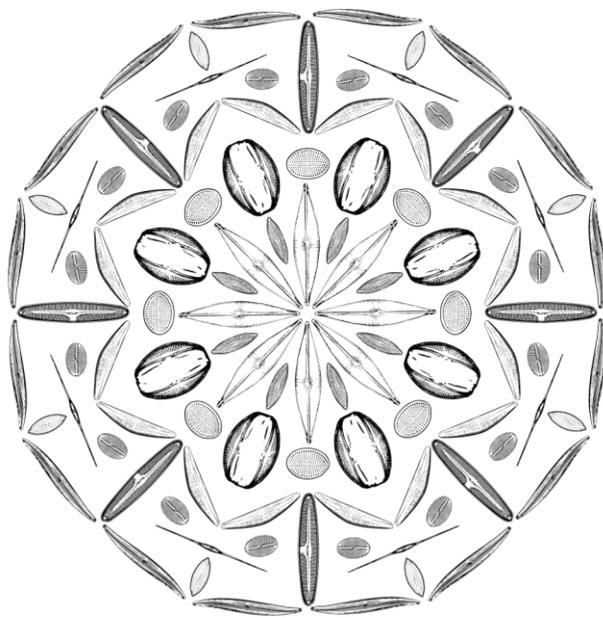
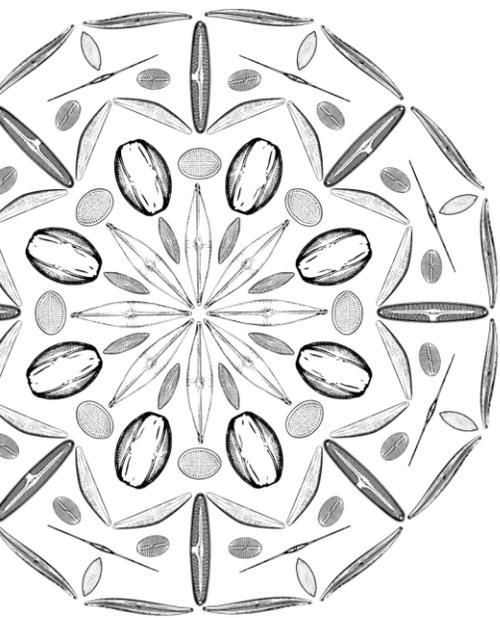
*The Road goes ever on and on
Down from the door where it began.
Now far ahead the Road has gone,
And I must follow, if I can,
Pursuing it with eager feet,
Until it joins some larger way
Where many paths and errands meet.
And whither then? I cannot say.*

- J.R.R. Tolkien (1954)

Contents



Preface.....	9
Chapter 1 Introduction.....	11
Chapter 2 Mussel beds are biological power stations on intertidal flats.....	25
Chapter 3 Dispersal maintains ecosystem functioning by mitigating bacterial dominance over microalgae competitors in a metacommunity.....	53
Chapter 4 A heatwave increases turnover and regional dominance in microalgae metacommunities	85
Chapter 5 Dispersal does not mitigate negative impacts of disturbance in a microalgae metacommunity.....	105
Chapter 6 Discussion	123
References.....	137
Summary	161
Zusammenfassung.....	164
Samenvatting.....	168
Acknowledgements.....	173
Author Affiliations.....	180
About the Author	181



Preface



Friederike G. Engel

Even though I was fascinated by and enjoyed being in nature for as long as I can think, I still remember the exact moment when I first realized that ecology is super cool. I was in high school, studying for my final exam in biology. As I was going over the material, it suddenly “clicked”: This all made sense! Of course, there were parts that I had to memorize, but there was a certain logic to ecological processes and theories that spoke to me. Everything was connected, one process explained another, and I could much better understand what was going on around me in nature. Since that day, I continued on the path to becoming an ecologist. I wanted to understand why certain species live in specific areas, how several species can coexist, and why some species disappear.

During my B.Sc. and M.Sc. studies, I got involved in experimental biology and was able to independently design my first experiments. I tested how different pH levels influence soft coral growth, studied the effects of hormones in the rivers on fish metabolism, and finally started experimenting with entire communities of organisms. I wanted to find out how changing conditions influence species diversity and ecosystem functioning in phytoplankton communities. The mechanisms governing the interactions between organisms and their environment intrigued me and fueled my interest in community ecology. Coupled with the eminent threat of global climate change and the global biodiversity crisis, this area of study was highly relevant to me.

My early attempts as an ecologist culminated in four years of doctoral research in experimental community ecology of benthic microalgae. During these years, through many ups and downs, such as new discoveries and failed experiments, I investigated interactions and habitat properties that influence diversity and ecosystem functioning of benthic microalgae in estuaries. In this thesis, I present the results of my work for which I experimentally tested how different predicted global change scenarios influence the community dynamics of benthic microalgae. This thesis marks the beginning of my journey as an experimental ecologist.

