



Changing Arctic Ocean NERC



Understanding the links between pelagic microbial ecosystems and organic matter cycling in the changing Arctic (Micro-ARC)



THE MARINE BIOLOGICAL ASSOCIATION

Michael Cunliffe @ Marine Biological Association

Anja Engel & Markus Schartau @ GEOMAR

Eva-Maria Nöthig @ AWI

Ben Ward @ University of Southampton

UNIVERSITY OF Southampton



Aims & Objectives

Progress Update

Future Cruises

Other Plans of Interest



Dr Michael Cunliffe
Lead Investigator



Professor Dr Anja Engel
Lead Investigator



Dr Julia Grosse
Postdoctoral researcher



Vanessa Lampe
PhD student



Dr Eva-Maria Nöthig
Co-investigator



Dr Markus Schartau
Co-investigator



Dr Ben Ward
Co-investigator



Dr Birthe Zänker
Postdoctoral researcher



Anabel von Jackowski
PhD student

Collaborators



Dr Hartmut Herrmann
Leibniz Institute for Tropospheric Research, Germany



Dr Manuela van Pinxteren
Leibniz Institute for Tropospheric Research, Germany

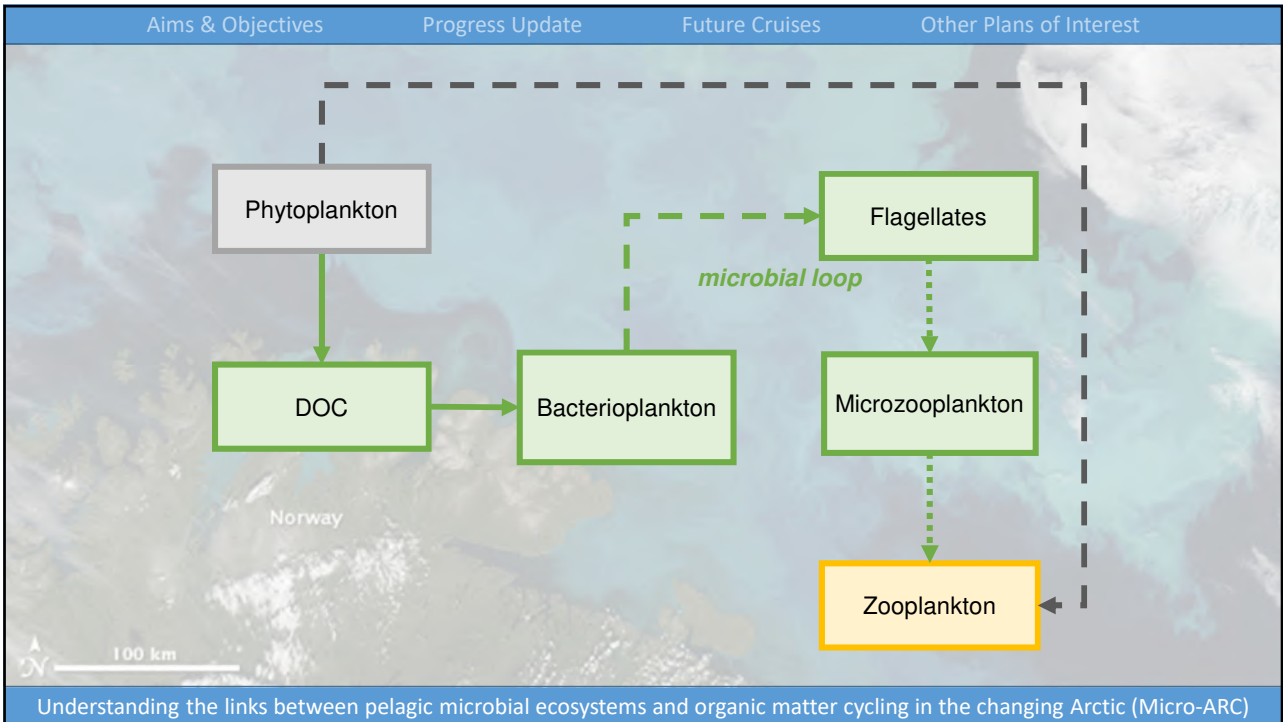
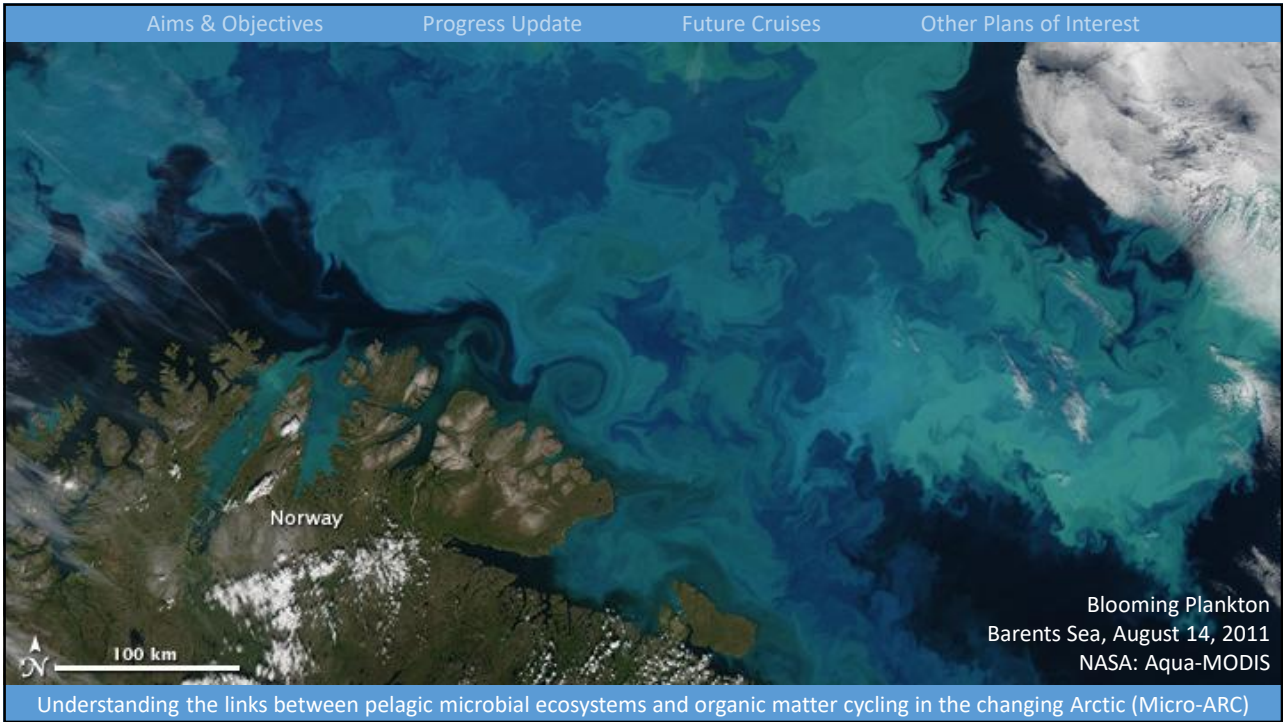


Morten Iversen
Alfred Wegener Institute for Polar and Marine Research, Germany

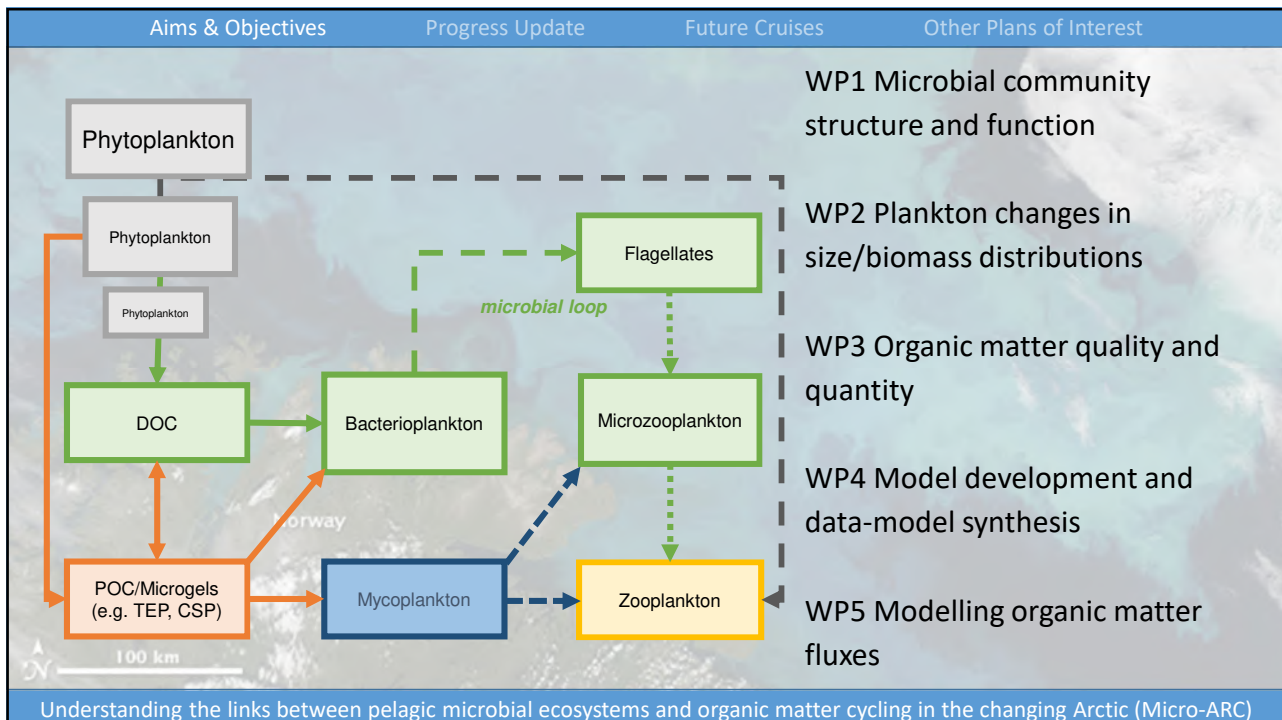


The Multidisciplinary Drifting Observatory for the Study of Arctic Climate (MOSAIC)

Understanding the links between pelagic microbial ecosystems and organic matter cycling in the changing Arctic (Micro-ARC)



Aims & Objectives	Progress Update	Future Cruises	Other Plans of Interest
<ul style="list-style-type: none"> • Micro-ARC has the overarching objective to improve our understanding of how short-term (e.g. seasonal-scale) and long-term (e.g. climate-driven) changes in the physical environment of the Arctic Ocean are impacting pelagic microbial ecosystems, and the effects of these impacts on current and future organic matter (OM) biogeochemistry • Our main interest is to better understand how changes in the lower food-web structure (diversity, size, biomass, composition) relate to changes in OM quantity, quality and turn-over rates. A focus thereby will be on marine gel particles (TEP, CSP) as microbial substrates and as drivers of carbon flux 			
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Aims & Objectives

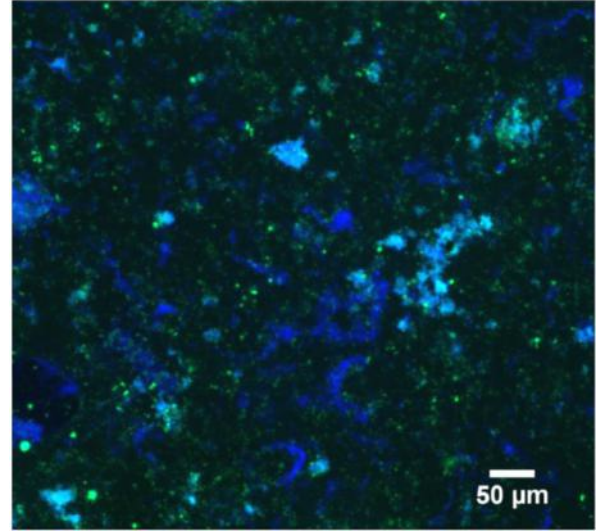
Progress Update

Future Cruises

Other Plans of Interest

WP1 Microbial community structure and function – *Progress so far*

- MBA postdoc started in September 2018
- Samples collected by German team in summer from Greenland Sea/Fram Strait (PS114July)
- Focused on developing and optimising protocols



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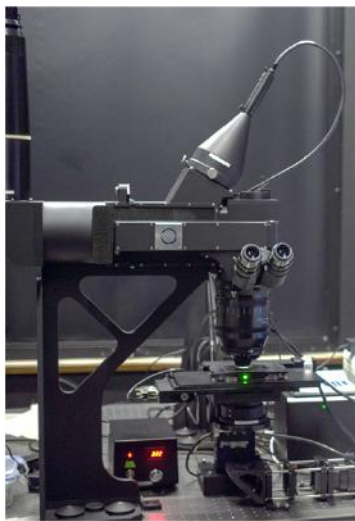
Aims & Objectives

Progress Update

Future Cruises

Other Plans of Interest

WP1 Microbial community structure and function – *Progress so far*



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Aims & Objectives

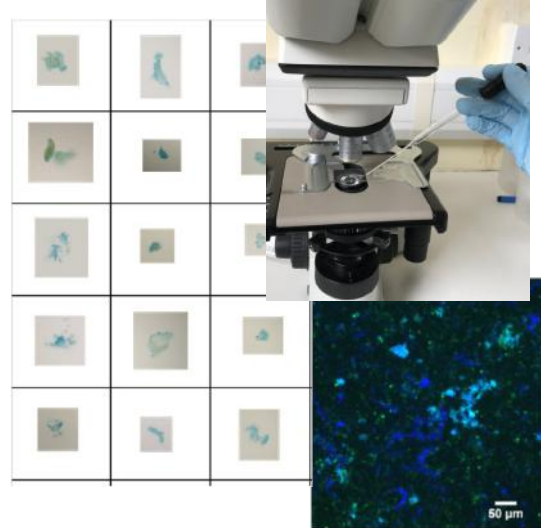
Progress Update

Future Cruises

Other Plans of Interest

WP1 Microbial community structure and function – *Plans for 2019*

- Processing 2018 collected samples
- July – Barents Sea
- August – Fram Strait



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Aims & Objectives

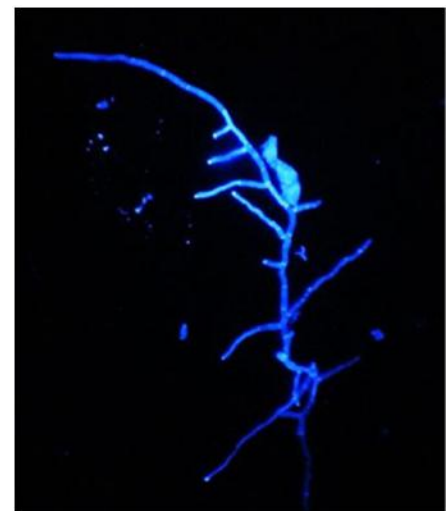
Progress Update

Future Cruises

Other Plans of Interest

WP1 Microbial community structure and function – *Available data*

- The group will provide results on:
 - Transparent Exopolymeric Particles (TEP)
 - Coomassie stainable particles (CSP)
 - Microbial (free living and particle attached)
 - Phytoplankton abundance
 - Microbial diversity (Molecular)
 - Bacteria
 - Archaea
 - Protists (including phytoplankton)
 - Fungi



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Aims & Objectives

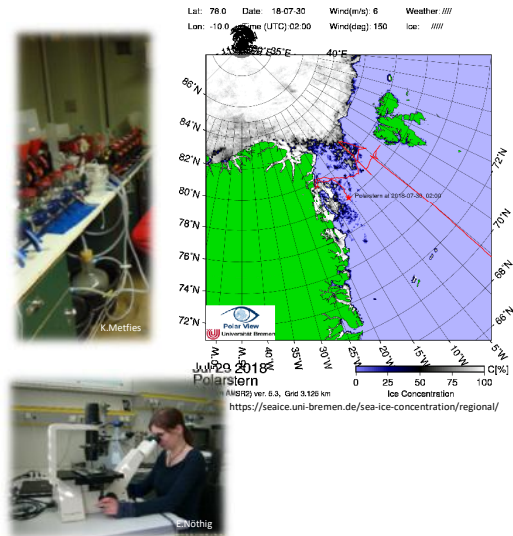
Progress Update

Future Cruises

Other Plans of Interest

WP2 Plankton changes in size/biomass distributions – *Progress so far*

- Participated in two cruises *PS114* and *MSM77* and collected material for microscopic species counts, POC and chlorophyll-*a* measurements (1 HiWi)(link to WP3)
- Started to compile available data from former cruises regarding species composition and size measurements of unicellular plankton (link to WP1 & 5)
- Additional counting of samples of summer cruises 2016 and 2017 to Fram Strait (1 HiWi) (links to WP 1 & 5)



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Aims & Objectives

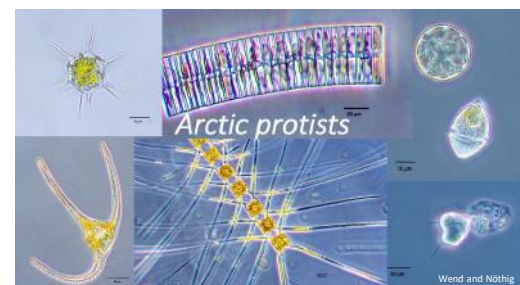
Progress Update

Future Cruises

Other Plans of Interest

WP2 Plankton changes in size/biomass distributions – *Plans for 2019*

- Analyse chlorophyll-*a* and POC filters of *PS114* and *MSM77*
- Continue to compile available data from former cruises regarding species composition and size measurements of unicellular plankton
- Count samples of summer/fall cruises 2018 to Fram Strait (*PS114*, *MSM77*; 3-4 HiWis)
- Participate in two cruises *PS121* and *MOSAiC* to collecting material for microscopic species counts, POC and chlorophyll-*a* measurements



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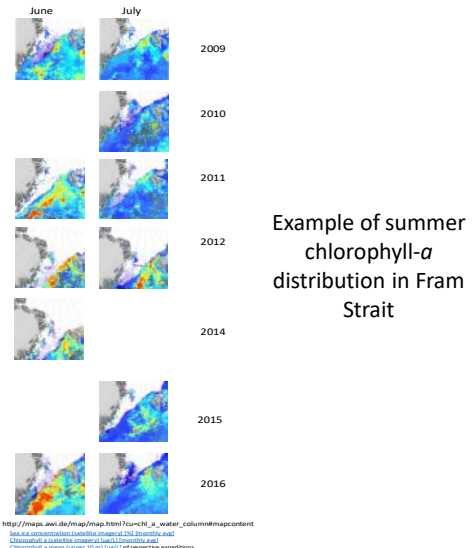
Progress Update

Future Cruises

Other Plans of Interest

WP2 Plankton changes in size/biomass distributions – *Available data*

- Chlorophyll-*a* (1991- 2016 in PANGAEA & GIS at maps.awi.de; 2017 in preparation)
- POC data in preparation for PANGAEA (1991-2017)
- Counts and measurements of unicellular plankton of former cruises – most have to be adapted to a common format (available but not complete: PS 92, 2015; PS 99, 2016; PS107, 2017)



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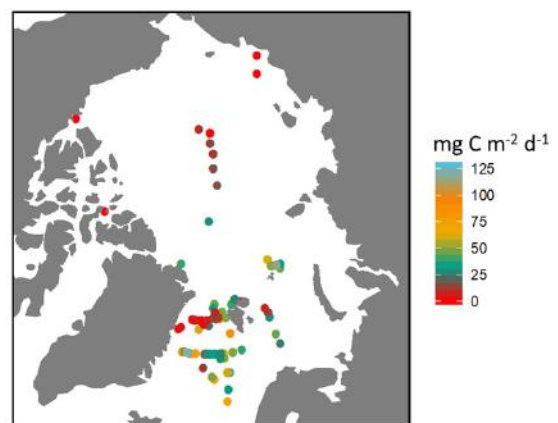
Progress Update

Future Cruises

Other Plans of Interest

WP3 Organic matter quality and quantity – *Progress so far*

- Sampling for identical microbial biogeochemical parameters on two cruises
- Summer (PS114; Greenland Sea; July)
- Autumn (MSM77; Greenland Sea; September-October)
- In initial stages of data analysis from 2018 cruises
- Pan-Arctic assessment of microbial activity



Bacterial Production from 1988-2014
 See Poster; Anabel von Jackowski *et al* *The Changing Arctic Ocean – a bacterial perspective*

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Future Cruises

Other Plans of Interest

WP3 Organic matter quality and quantity – *Plans for 2019*

- Data analysis and mining of time-series data sets (2009-2019)
- Sampling campaign to continue time-series in the Fram Strait
- Summer (PS121; August)
- Preparation and departure on MOSAiC Expedition
- Microbial activities and organic matter cycling in the central Arctic winter (PS122 Leg 2)



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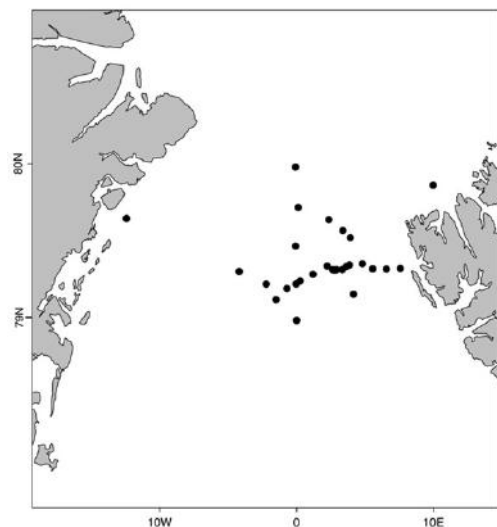
Progress Update

Future Cruises

Other Plans of Interest

WP3 Organic matter quality and quantity – *Available data*

- Expedition Report (PS114, MSM77) are available on: www.pangaea.de/expeditions
- The group will provide results on:
 - Dissolved Organic Matter (DOC/DON/DOP)
 - Carbohydrates
 - Amino Acids
 - Transparent Exopolymeric Particles (TEP)
 - Coomassie stainable particles (CSP)
 - Bacteria and Phytoplankton abundance
 - Primary and Secondary Production



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Aims & Objectives

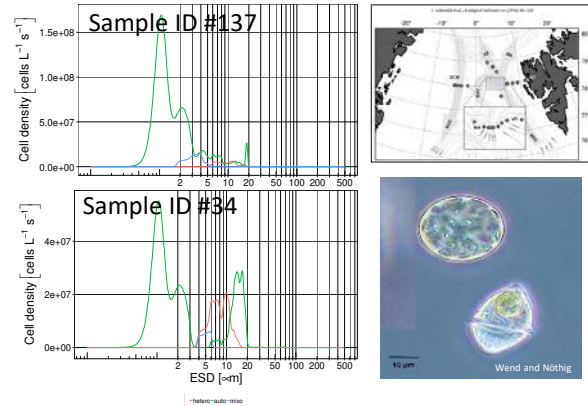
Progress Update

Future Cruises

Other Plans of Interest

WP4/5 Model development, data-model synthesis & flux estimation – *Progress so far*

- Continuous plankton size spectra derived by Vanessa Lampe (GEOMAR), based on microscopic measurements of Eva-Maria Nöthig (WP 2; year 2017, AWI HAUSGARTEN, Fram Strait)
- Assessment of the statistics considered for deriving continuous size spectra and their confidence limits
- Assess differences between individual plankton size spectra



See Poster & ECR presentation; Vanessa Lampe *et al*
Measuring the smallest – phytoplankton size spectra
in a Changing Arctic Ocean

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Aims & Objectives

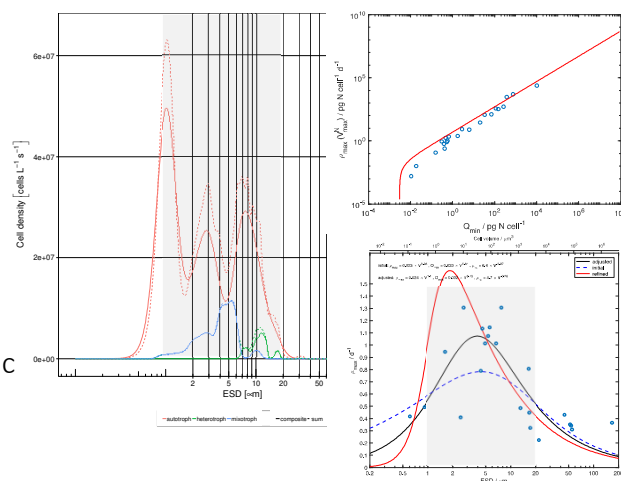
Progress Update

Future Cruises

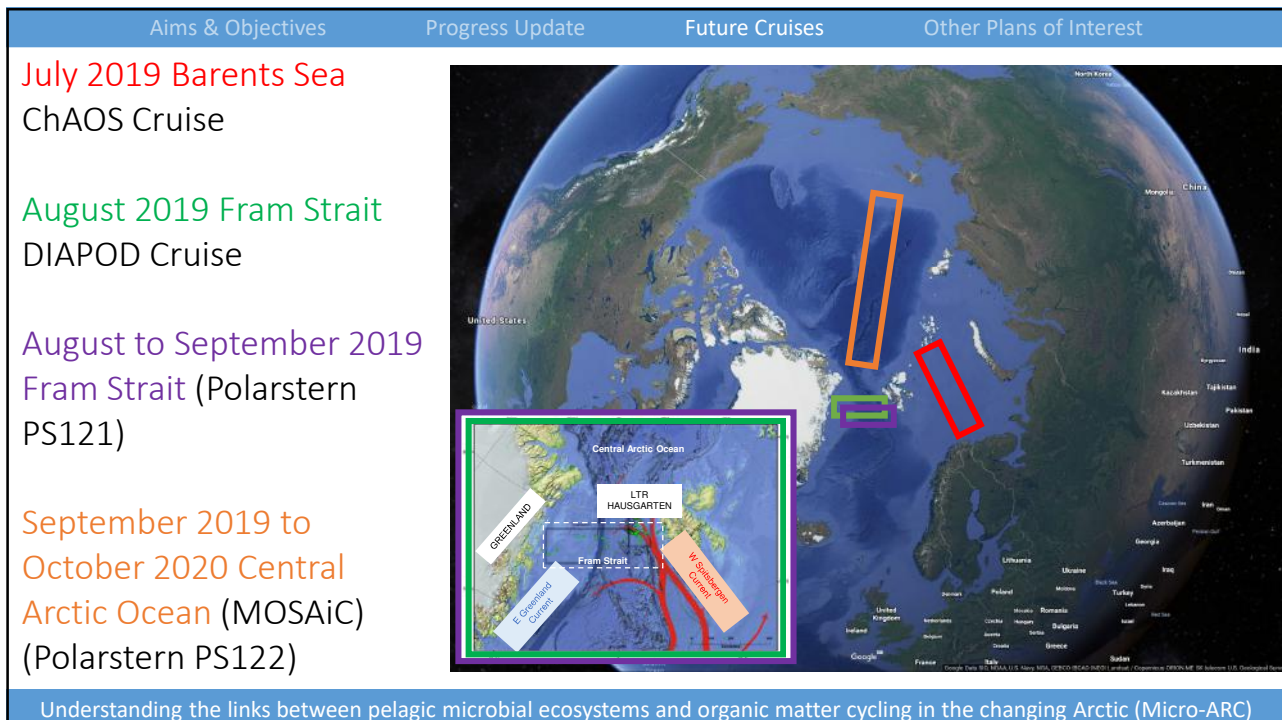
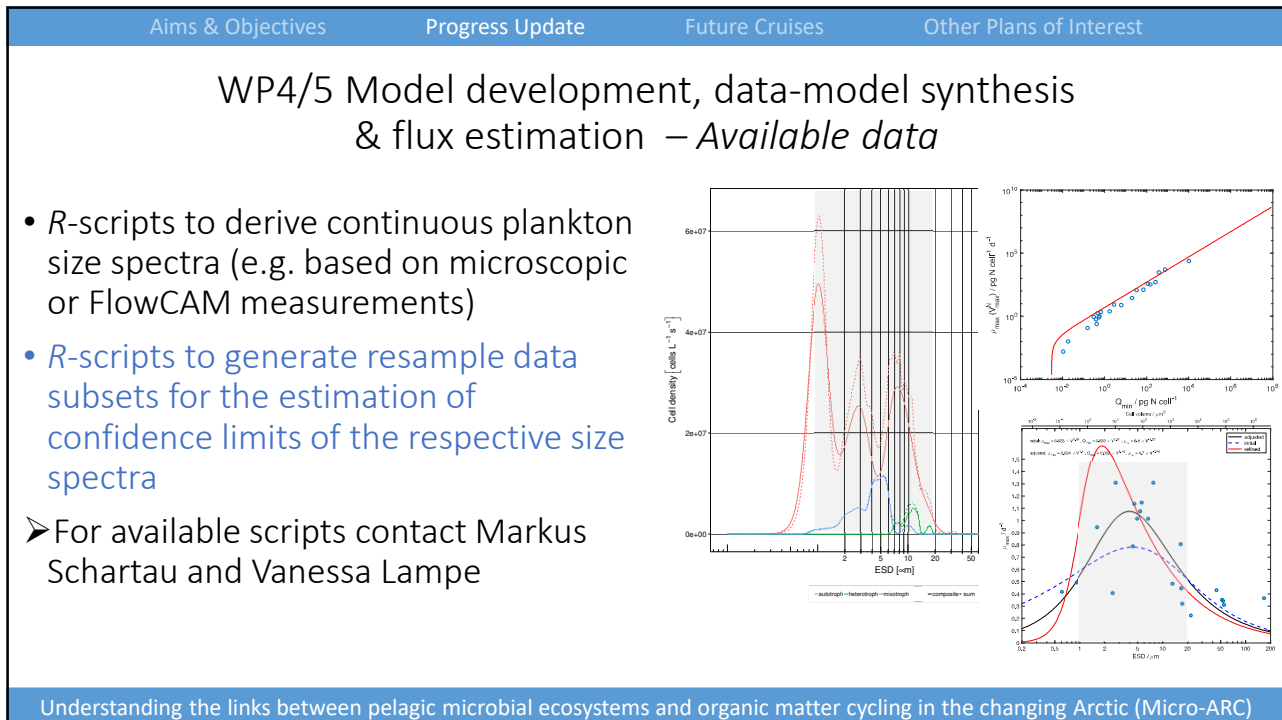
Other Plans of Interest


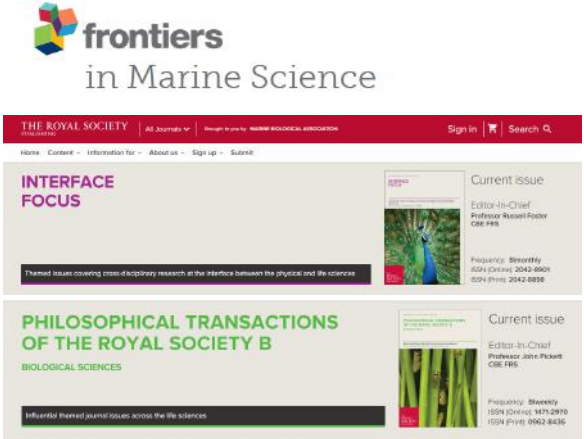
WP4/5 Model development, data-model synthesis & flux estimation – *Plans for 2019*






- Data Analysis :
 - a) Comparisons between continuous plankton size spectra
 - b) Relate changes in size spectra to changes in biomass
- Model Development:
 - a) Revise known allometric dependencies with respect to biomass
 - b) Devise theory that combines known allometric dependencies (e.g. Ward et al., 2017) with model of optimal resource allocation (of Pahlow et al., 2013)



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Aims & Objectives	Progress Update	Future Cruises	Other Plans of Interest
<ul style="list-style-type: none"> • Proposal of special session, such as at European Geosciences Union General Assembly • Proposal of journal themed issues <ul style="list-style-type: none"> • Life science focused and/or cross-disciplinary <p>➤ Discussed further at the Micro-ARC Spring May meeting in Plymouth</p>	 		
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<p>QUESTIONS?</p>	
 	<p>← From the MBA archive Edward Nelson, a plankton biologist who worked at the MBA, sampling through the ice during the Terra Nova expedition (1910-1913)</p>
	
 	
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