The Arctic Ocean - A Bacterial Perspective

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Background

The **microbial loop** influences carbon export in the ocean by **acting** as a **sink** for **dissolved organic carbon (DOC)** or by linking dissolved organic matter (DOM) to higher trophic levels.

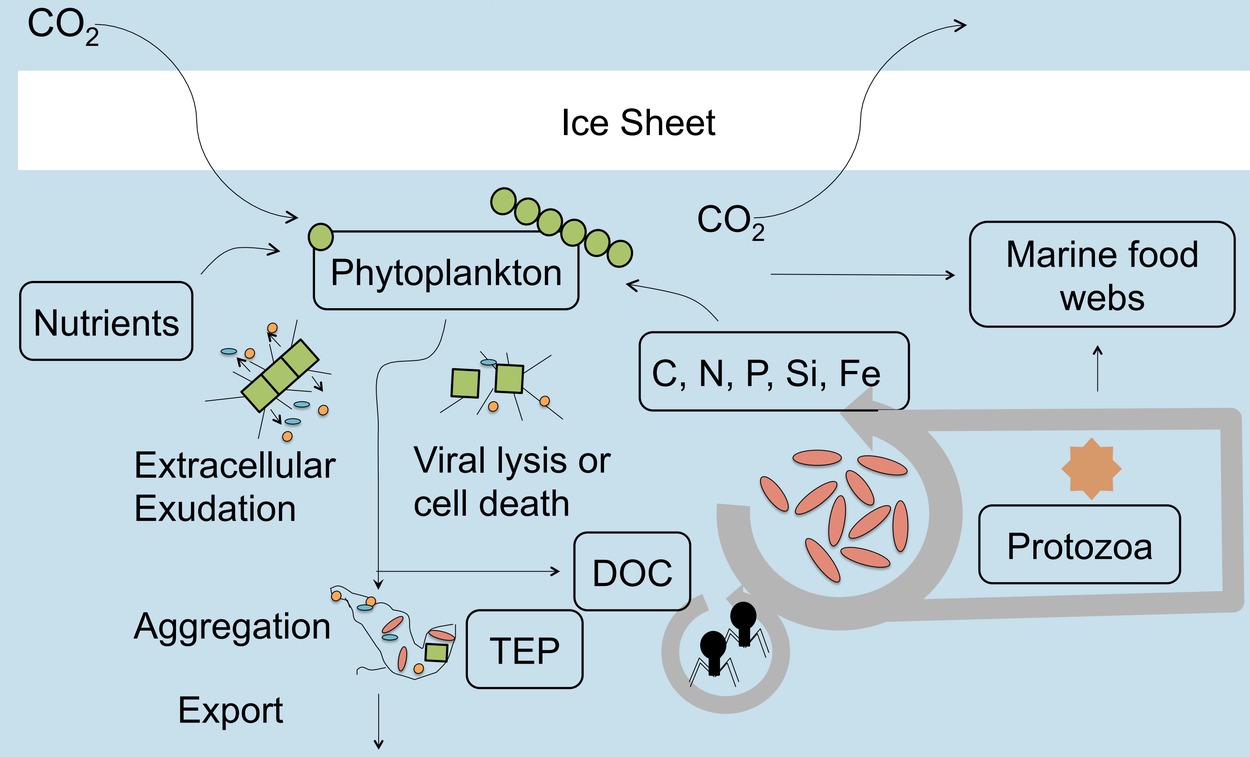

Figure 1 | The microbial loop in the Arctic Ocean

Our Goal

Our goal within Micro-ARC is to:

- Understand the **microbial activity** within the **Arctic basin** using available data
- Understand the microbial **cycling of organic matter** on seasonal scales within Fram Strait from newly acquired data (cruises 2018 and 2019/2020)

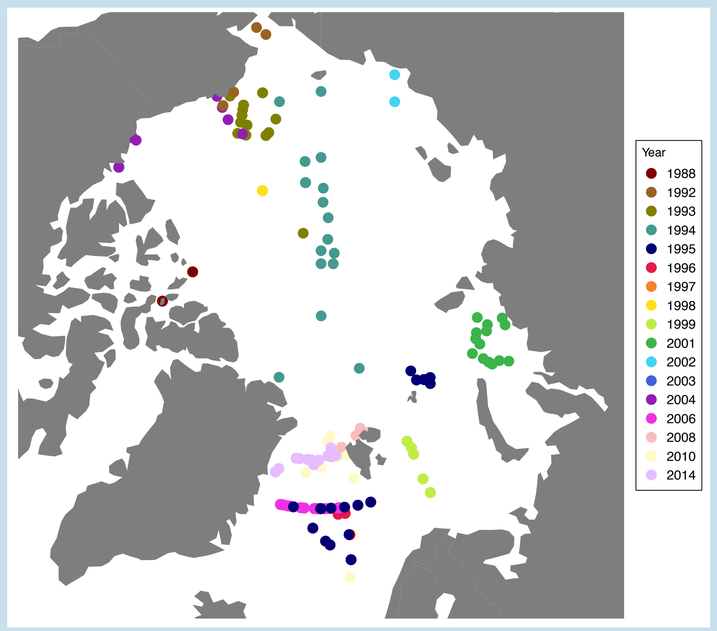

Figure 2 | Sampling locations for bacterial production within the Arctic Circle (66°N) from 1988-2014.

Current Knowledge About Microbial Activity

Table 1 | Publications for Bacterial Production measurements in the Arctic (Abb: Chla, Chlorophyll a; DOC, Dissolved Organic Carbon)

Study Area	Reference	Sampling Period	In-Situ Chla	Primary Production	DOC	Bacterial Abundance	Bacterial Production Method
Barents Sea	Müller-Niklas & Herndl (1996)	Summer	✓	✓	x	✓	^{3}H-Leucine
	Howard-Jones et al. (2002)	Summer	x	x	x	✓	^{3}H-Leucine
Beaufort Sea	Kirchman et al. (2005)	Spring	x	x	✓	✓	^{3}H-Leucine
	Vallières et al. (2008)	Summer	✓	✓	✓	✓	^{3}H-Leucine
	Garneau et al. (2008)	Annual	✓	x	x	✓	^{3}H-Leucine
	Garneau et al. (2008)	Summer	✓	x	x	✓	^{3}H-Leucine
Central Arctic Ocean	Pomeroy et al. (1990)	Summer	✓	x	x	✓	^{3}H-Leucine
	Rich et al. (1997)	Summer	x	✓	✓	✓	^{3}H-Leucine
	Sherr & Sherr (2003)	Summer	x	x	x	x	^{3}H-Leucine
	Fouilland et al. (2018)	Summer	✓	✓	x	✓	^{3}H-Leucine
	Sherr & Sherr (2003)	Winter	x	x	x	x	^{3}H-Leucine
	Sherr et al. (1997)	Winter, Spring	✓	✓	x	✓	^{3}H-Leucine
Chukchi Sea	Cota et al. (1996)	Summer	✓	✓	x	x	^{3}H-Leucine
	Steward et al. (1996)	Summer	x	x	x	✓	^{3}H-Leucine
	Wheeler et al. (1996)	Summer	✓	x	✓	x	^{3}H-Thymidine
	Malmstrom et al. (2007)	Summer	x	x	x	x	^{3}H-Leucine
	Kirchman et al., (2009)	Spring, Summer	✓	✓	x	✓	^{3}H-Leucine
Greenland Sea	Børsheim (2000)	Summer	x	x	x	✓	^{3}H-Thymidine
	Børsheim (2017)	Summer	✓	✓	x	✓	^{3}H-Thymidine
	Fadeev et al. (2018)	Summer	✓	x	x	✓	^{3}H-Leucine
	Fouilland et al. (2018)	Summer	✓	✓	x	✓	^{14}C-Leucine
Kara Sea	Meon & Amon (2004)	Summer	✓	x	✓	✓	^{3}H-Leucine
Norwegian Sea	Fouilland et al. (2018)	Summer	✓	✓	x	✓	^{14}C-Leucine

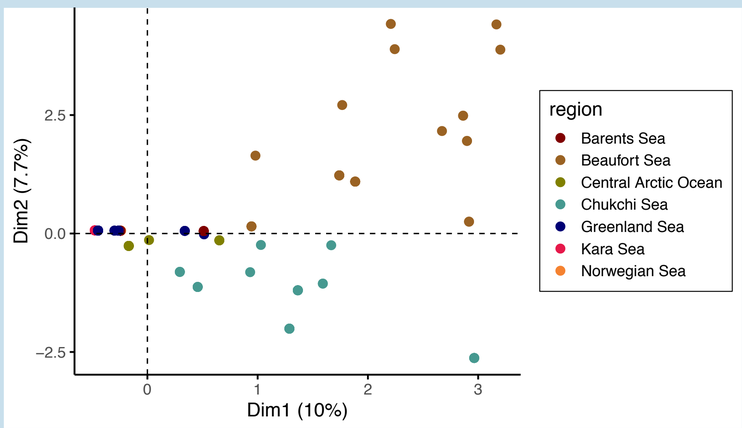

Figure 3 | Correspondence analysis (CCA) of pan-Arctic dataset

Challenges to address:

- Parameters **do not** cover **full range** of biological influences on **microbial activity**
- **Method** used to assess microbial production
- Conversion factors
- Incubation **temperatures**
- Sampling **depths** that hinder precise integration

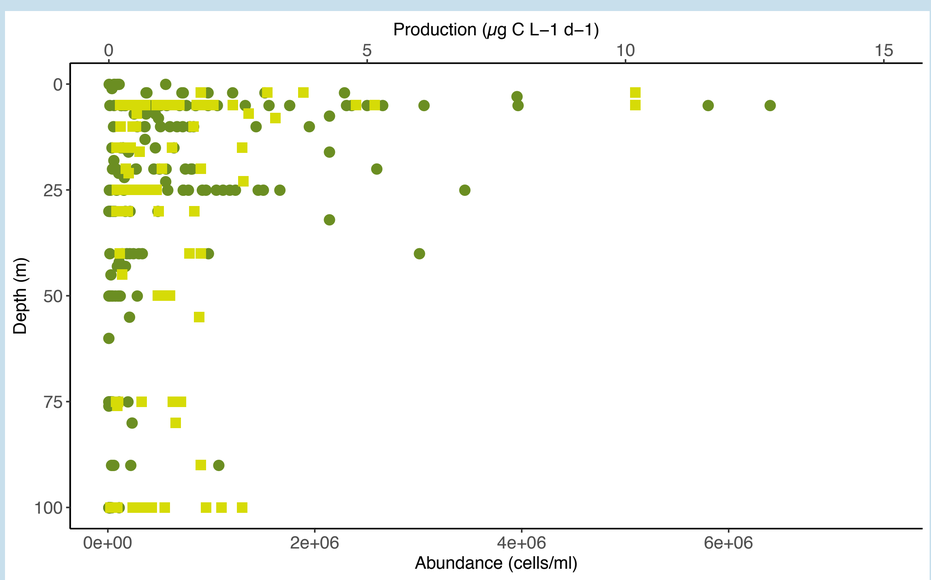

Figure 4 | Relationship of microbial parameters (Production, Abundance) with depth.

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