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Seasonal shifts in microzooplankton grazing in the UK Shelf Sea

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National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL
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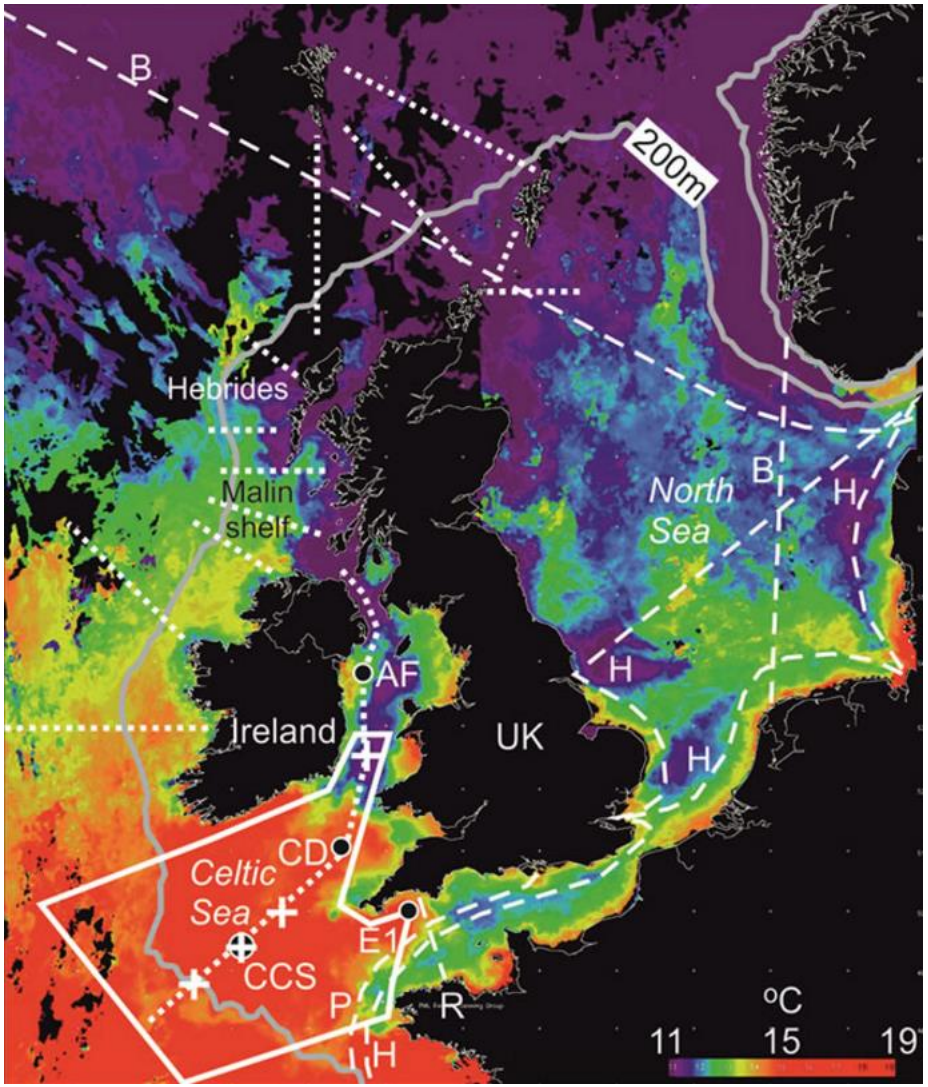
Shelf Seas

- ~5% of the global ocean area

- support 15-35% of global primary productivity

- provide ~90% of the global fish catches



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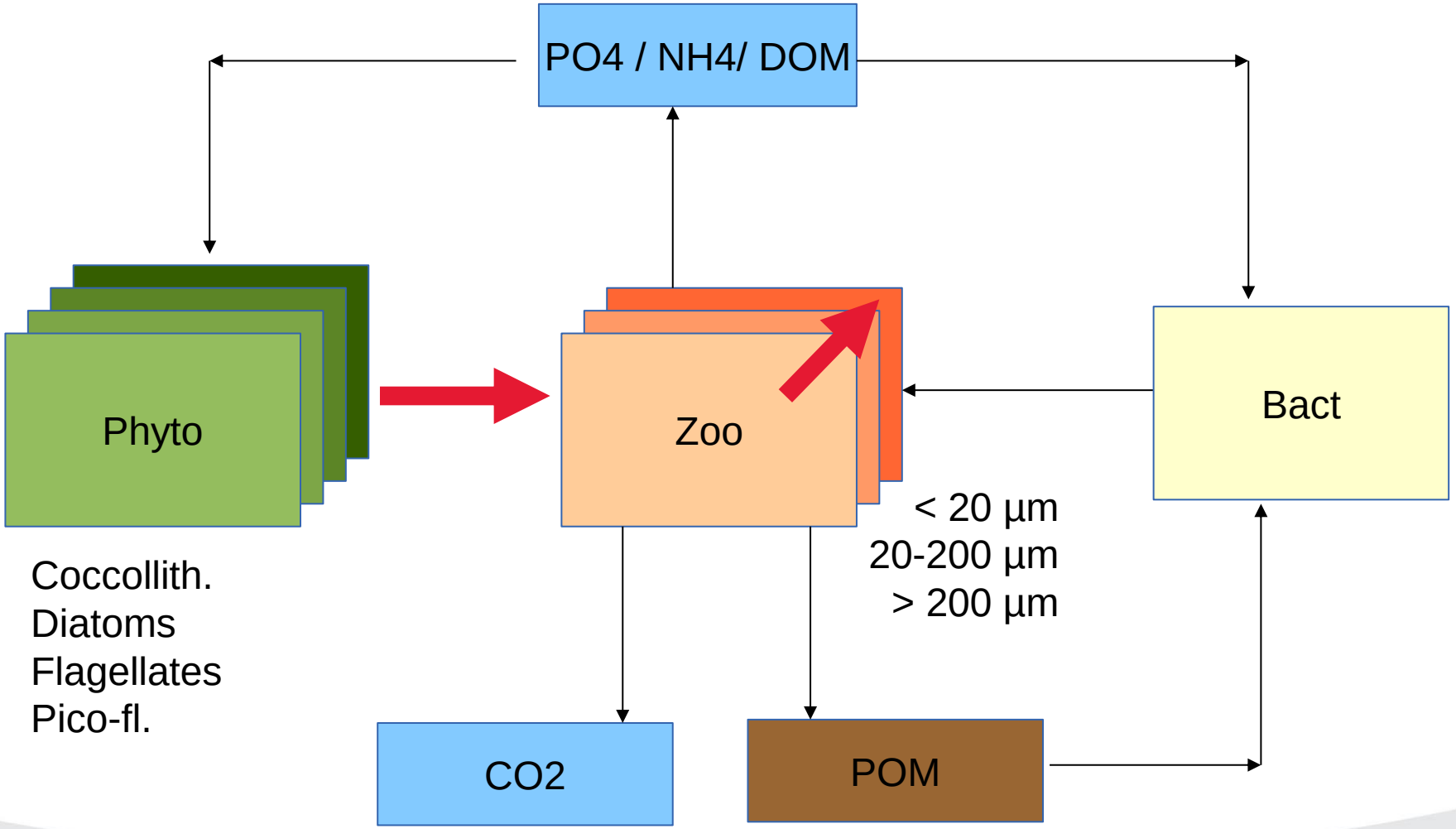
SSB Model (ERSEM)



Focus of this talk

What?

(1) Growth of pico & nanoplankton (0.2-20 and 2-20 µm)

(2) Grazing by microplankton (20-63 µm)

When and where?

In the Celtic Sea

(a) during Spring and Summer

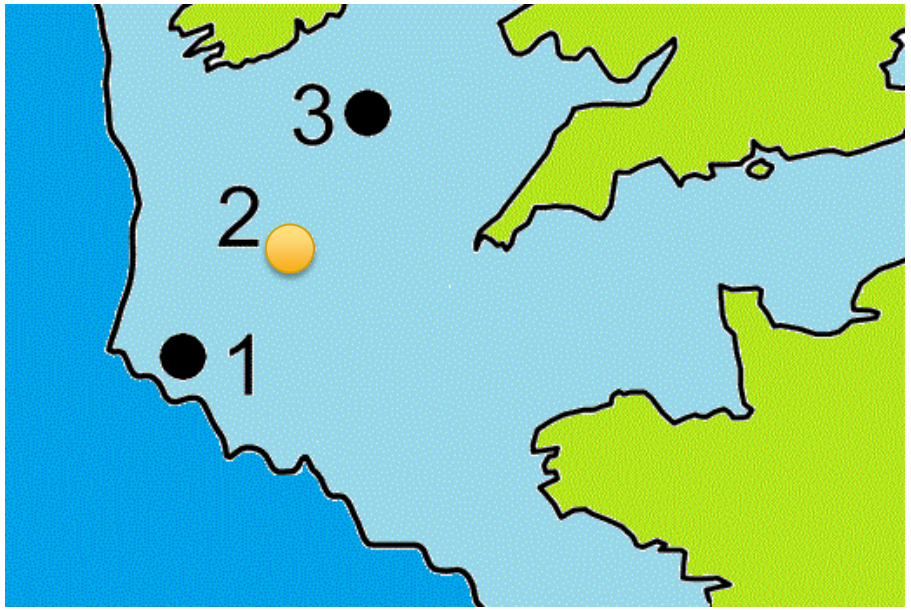
(b) in two depth strata

Central Celtic Sea (CCS) site

CCS

Apr 2015: 5x

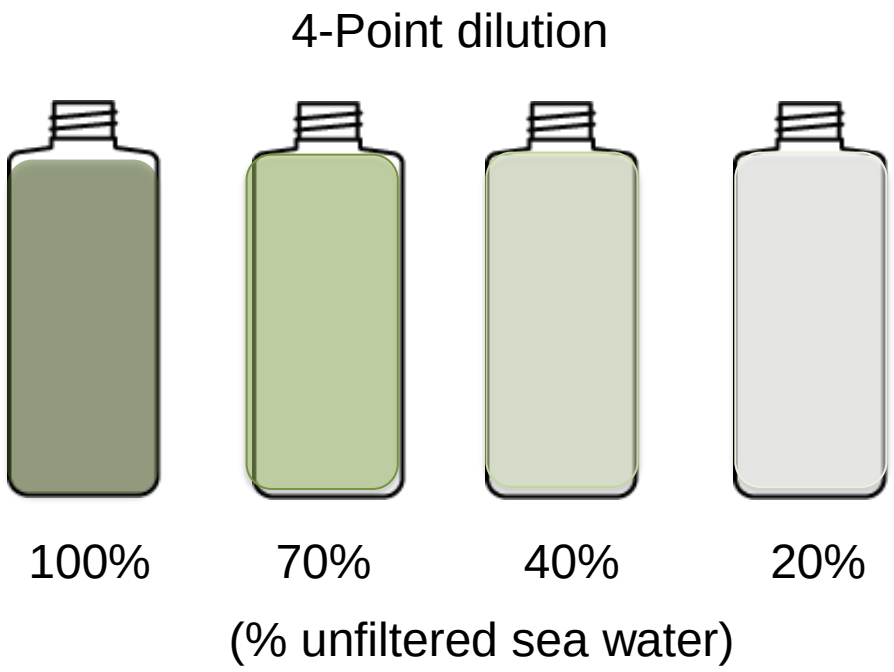
Jul 2015: 3x



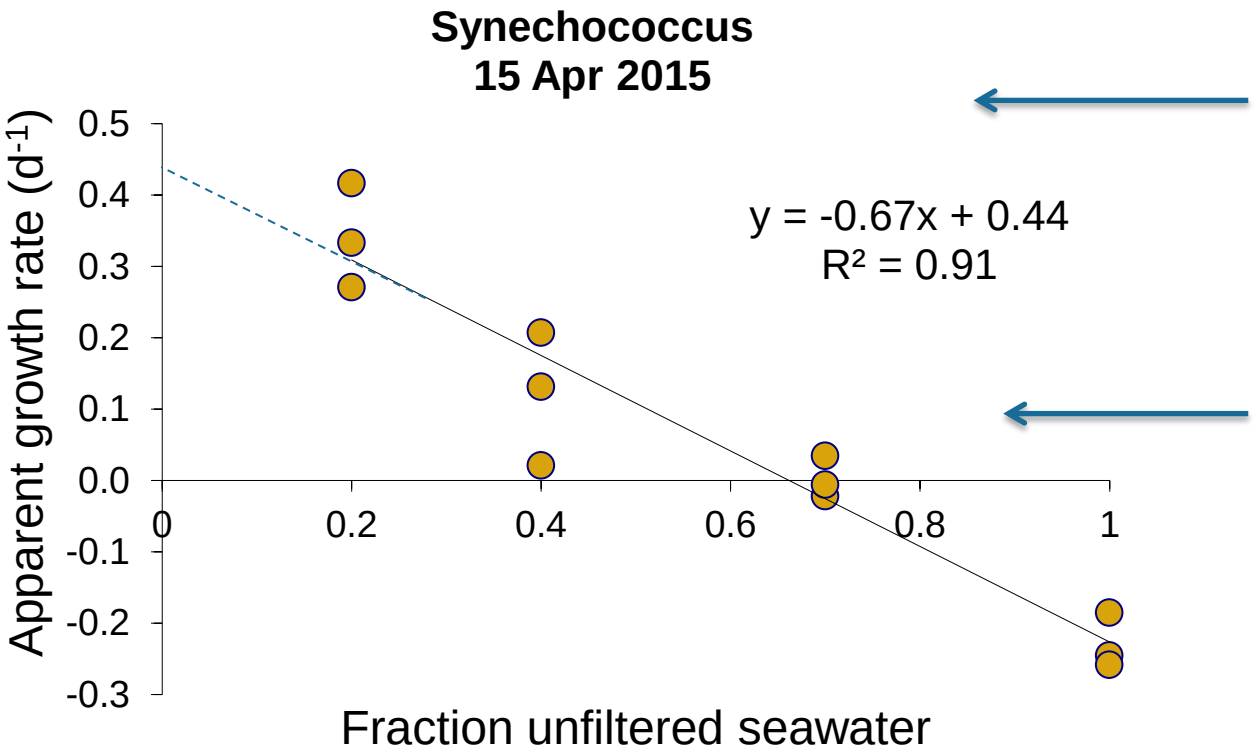
Growth and grazing by µ-zoo: Dilution technique

Series of seawater diluted with filtered (0.2 µm) sea water.

Data analysis very time-intensive (Chlorophyll a, cell counts)



Dilution technique



intercept (k) is the phytoplankton growth rate (d^{-1})

slope (g) is mortality rate of phytoplankton due to grazing (d^{-1})

Landry & Hassett (1982), Landry et al. (1995)

Cell counts

Nano- & picoplankton (0.2 – 10 µm)

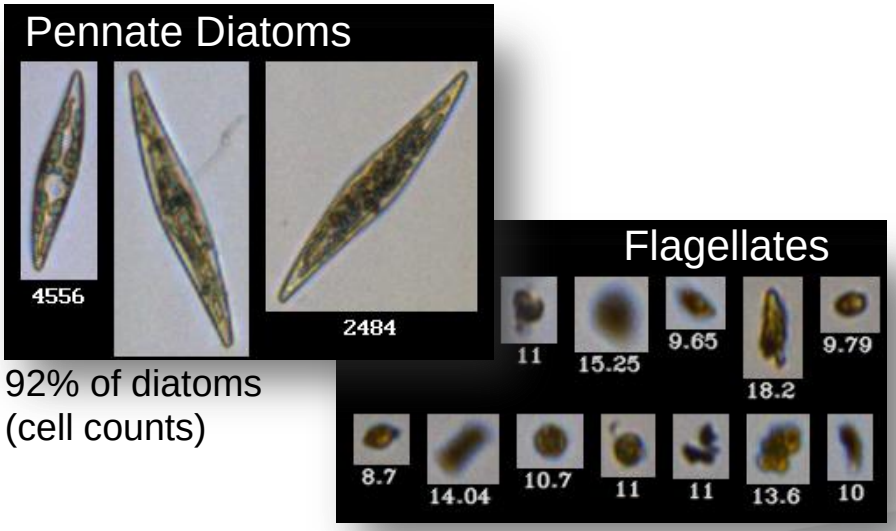
Flowcytometry on board

1. Synechococcus
2. Picoeukaryote phytoplankton
3. Nanoeukaryote phytoplankton
4. Coccolithophores
5. Cryptophytes

Microplankton (10 – 63 µm)

FlowCam at PML (Plymouth, UK)

1. Ciliates
2. Flagellates
3. Diatoms
4. Dinoflagellates



92% of diatoms (cell counts)

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Cell counts

Nano- & picoplankton (0.2 – 10 µm)

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Growth & grazing

Microplankton (10 – 63 µm)

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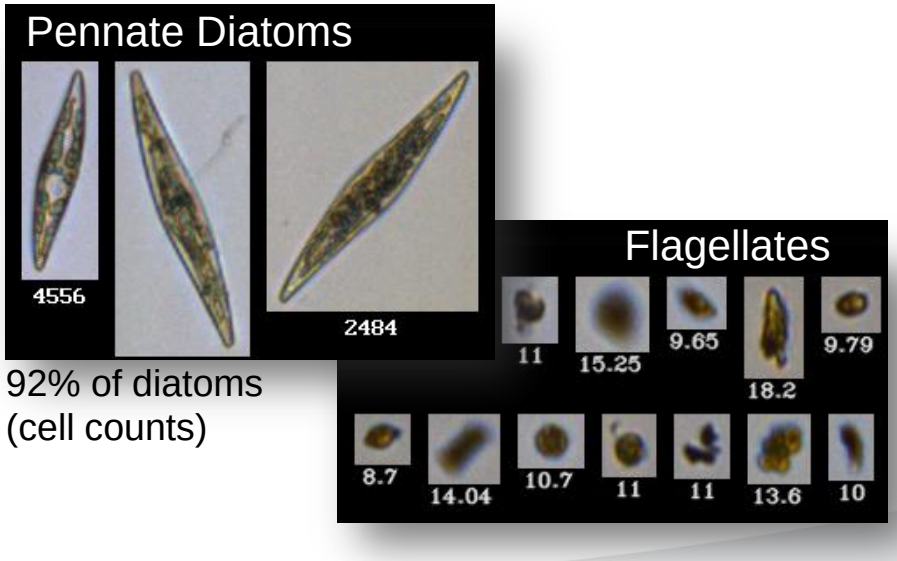


92% of diatoms
(cell counts)

Cell counts

Nano

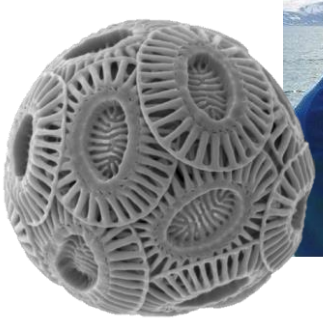
Flow

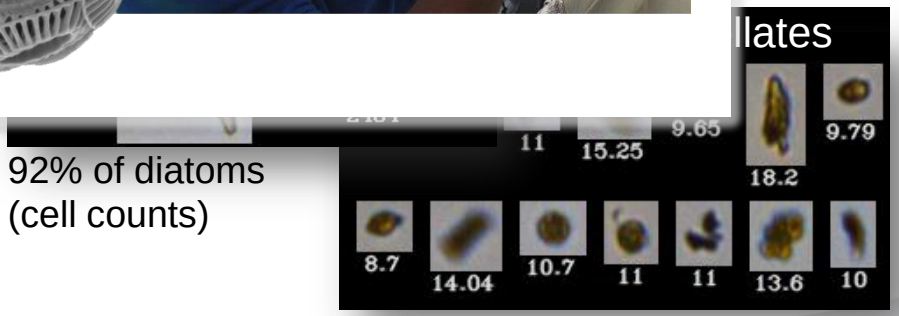
1. S
2. P
3. N
4. C
5. C

Kyle Mayers

Does microzooplankton grazing influence the fate of coccolithophores?

Session 5, Poster 303





92% of diatoms
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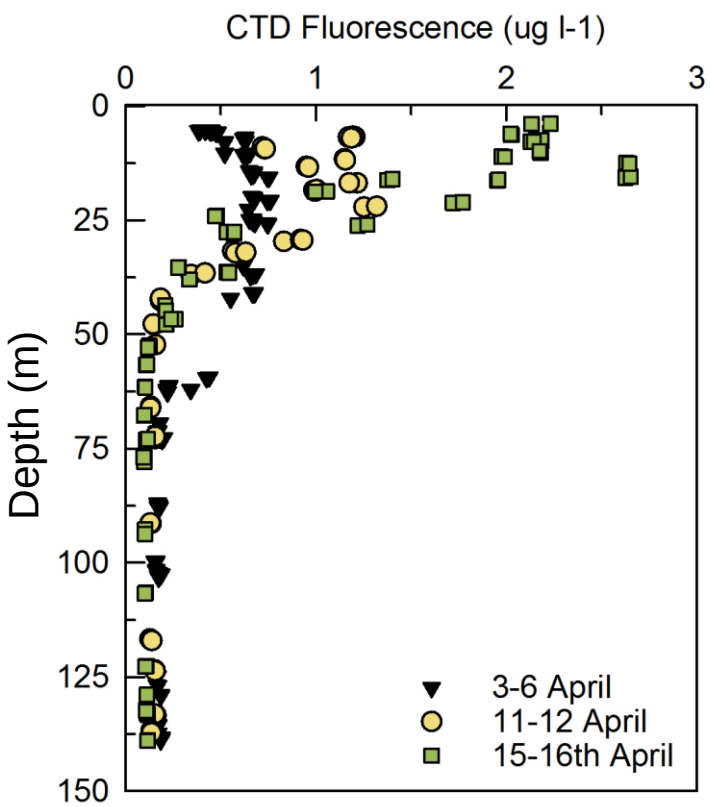
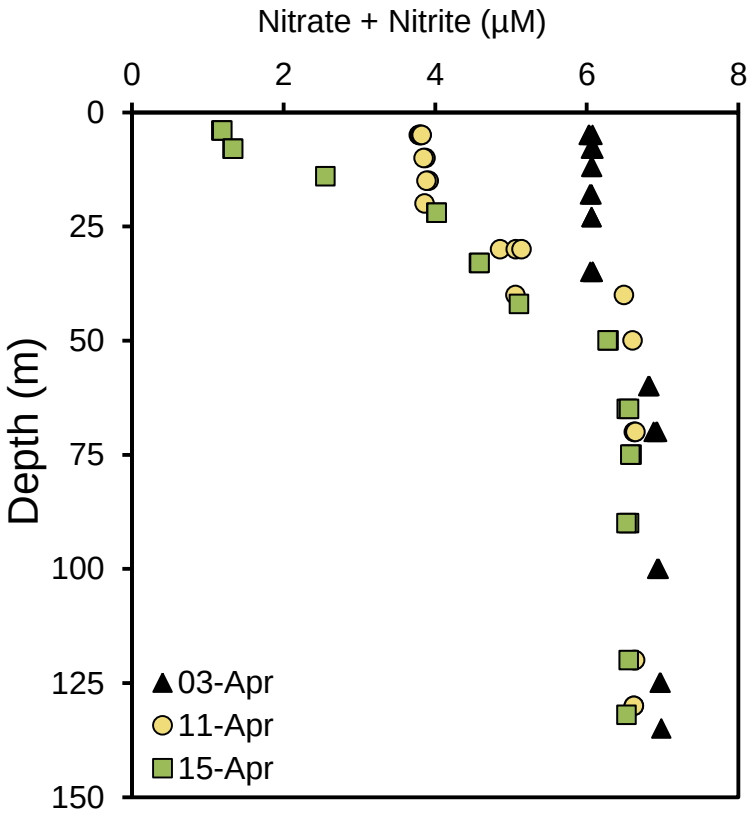
Chlorophyll profiles

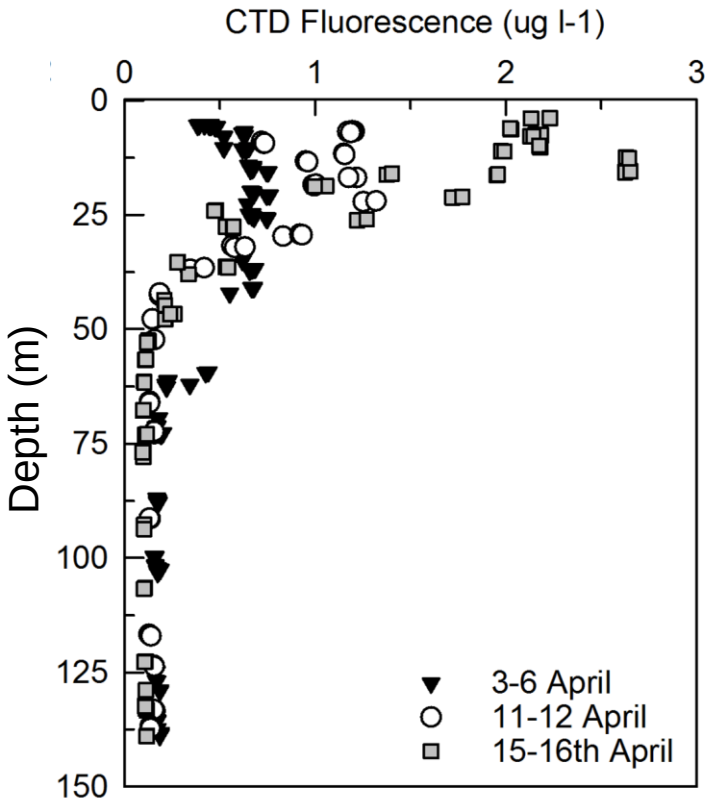
April



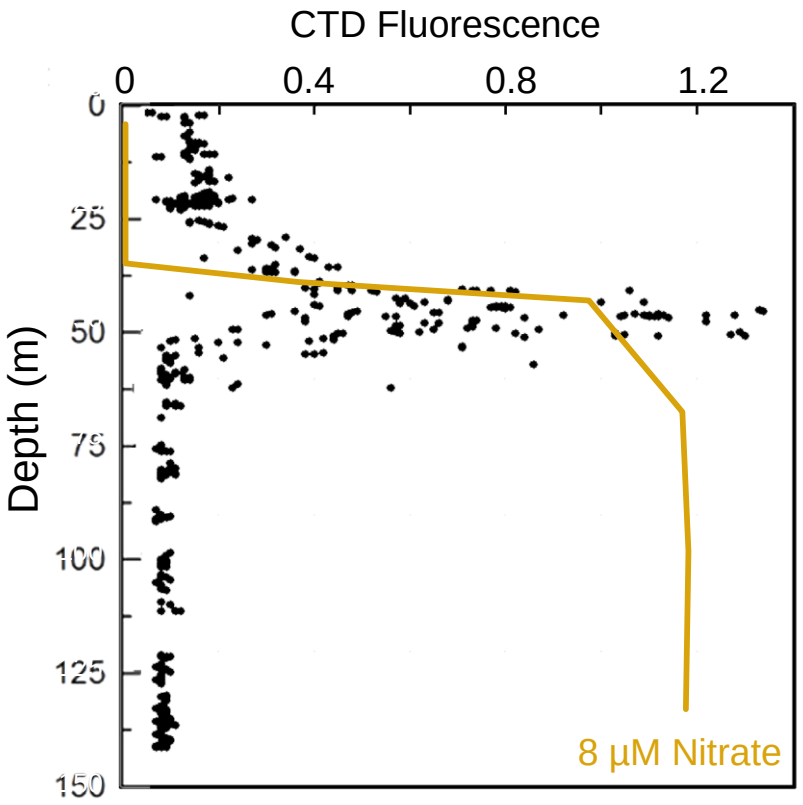


Chlorophyll profiles

April

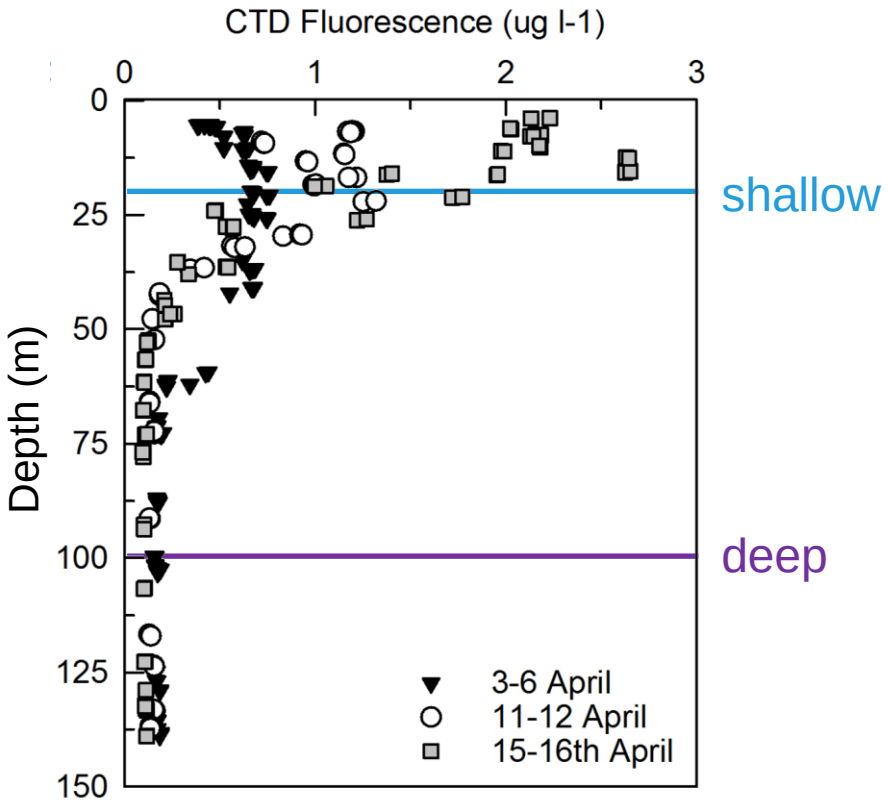


July



Chlorophyll profiles

April



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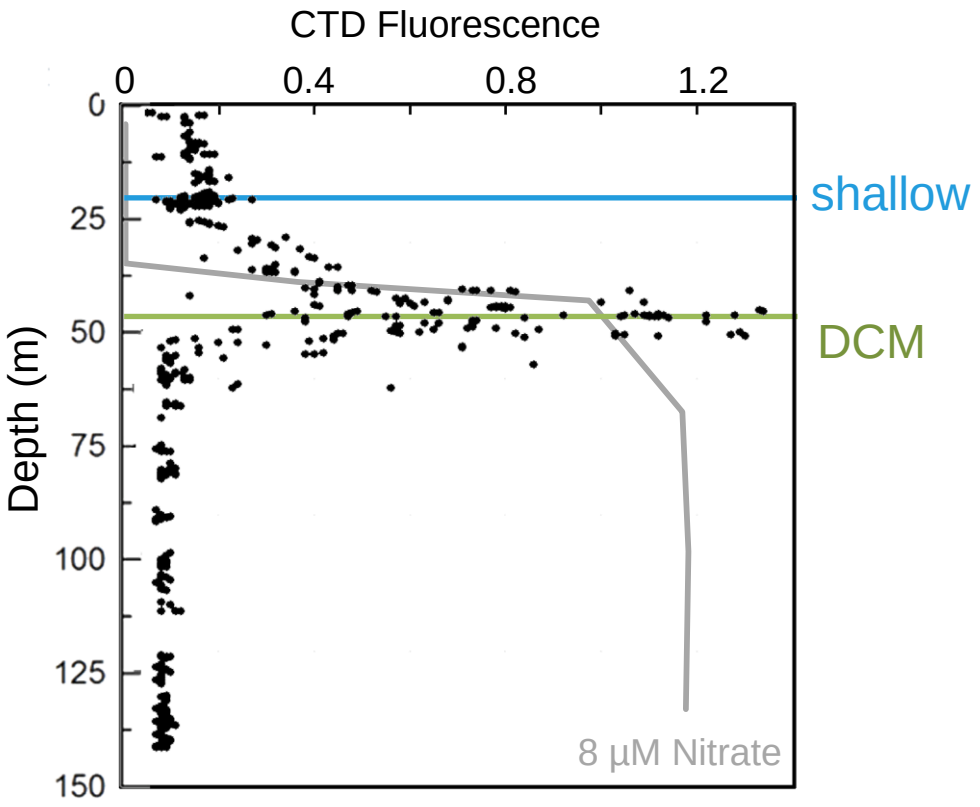
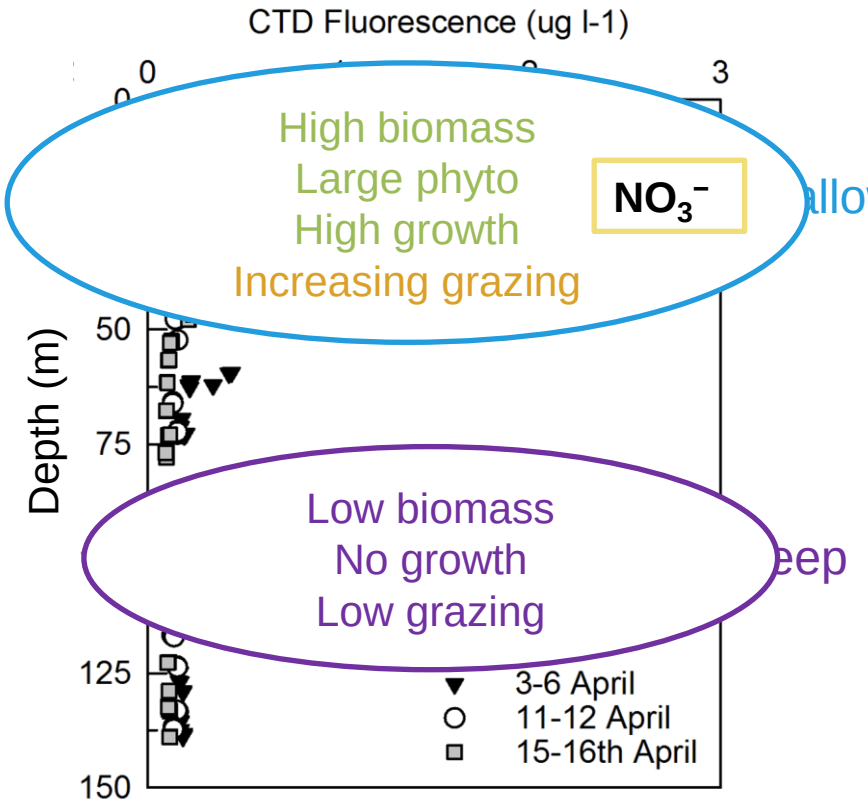


Expectations

April



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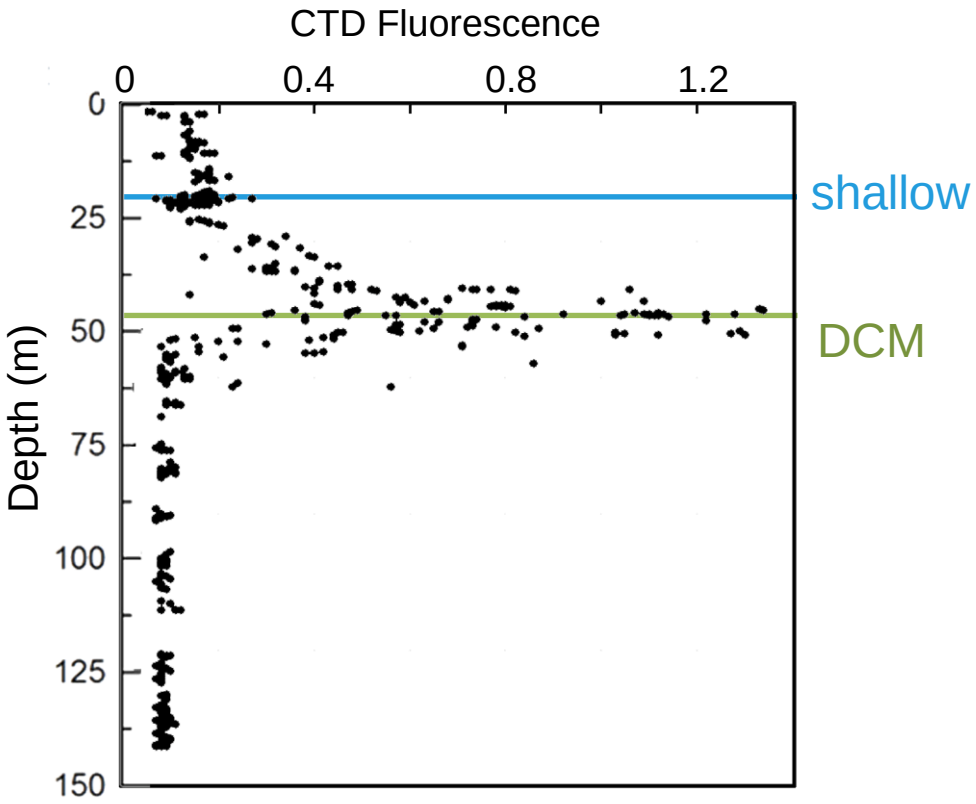

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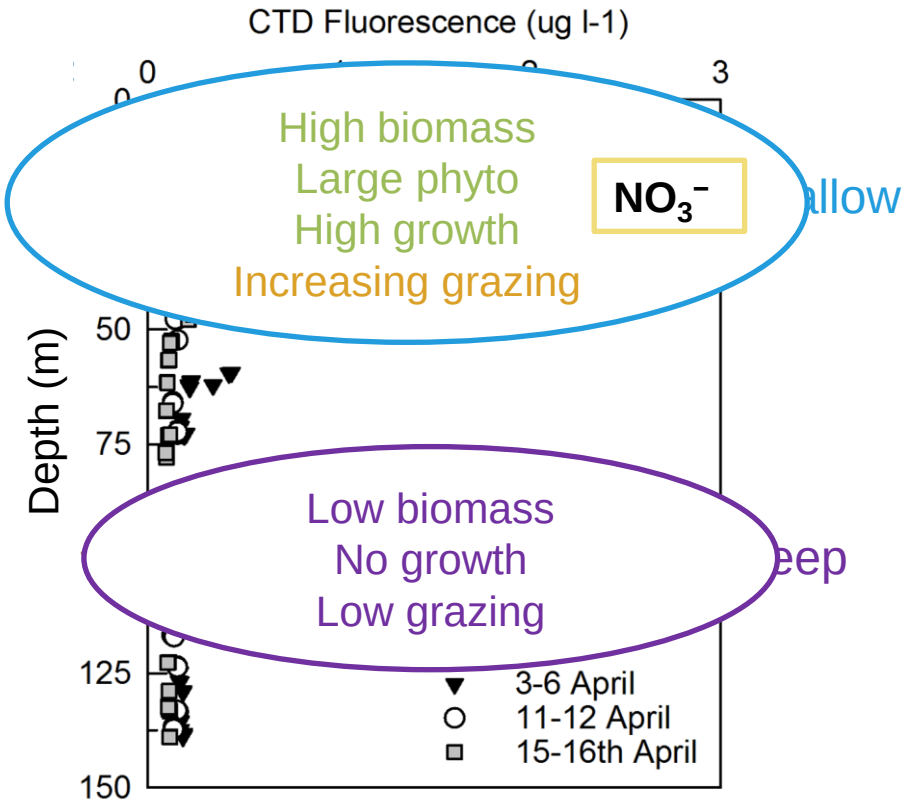

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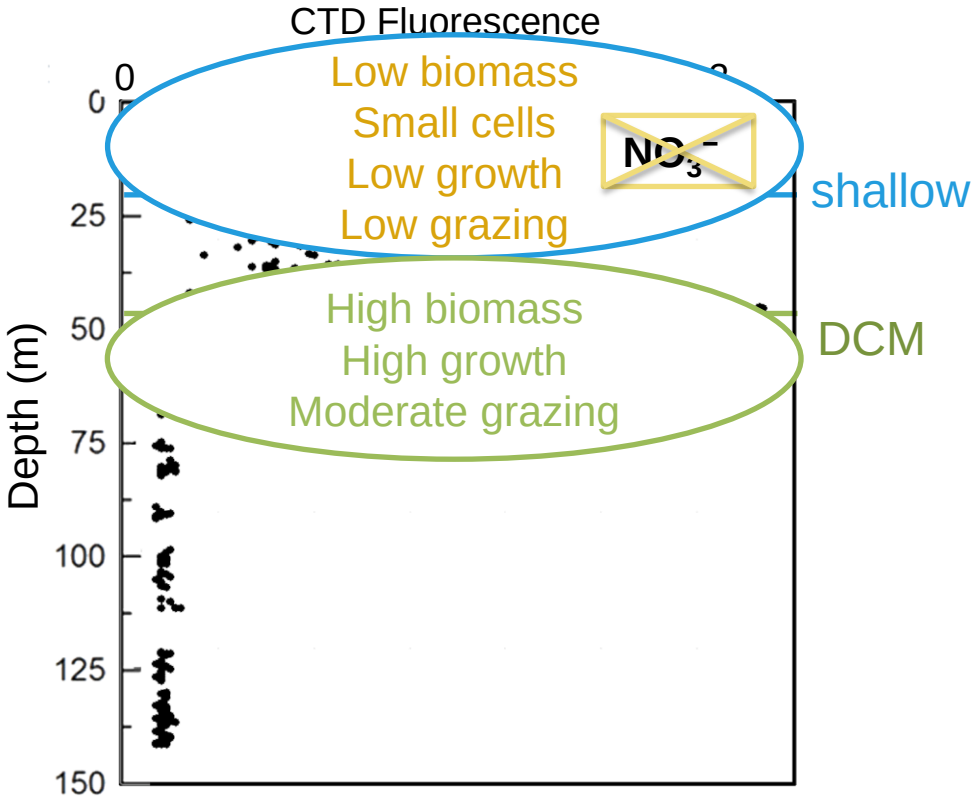

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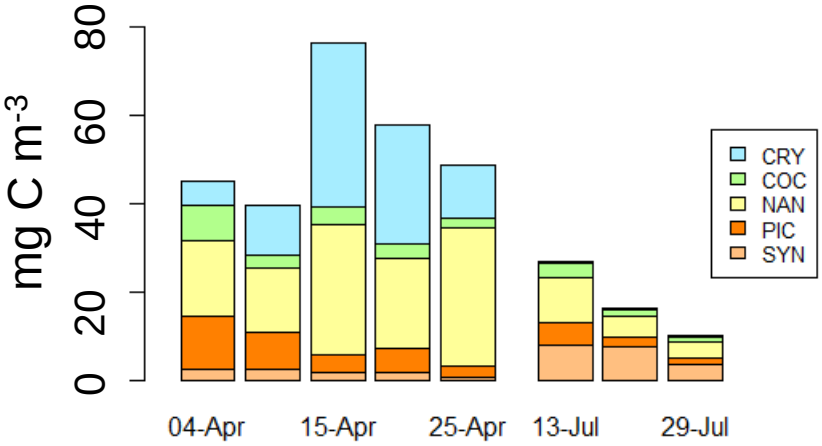
What was there?

Biomass based on initial samples

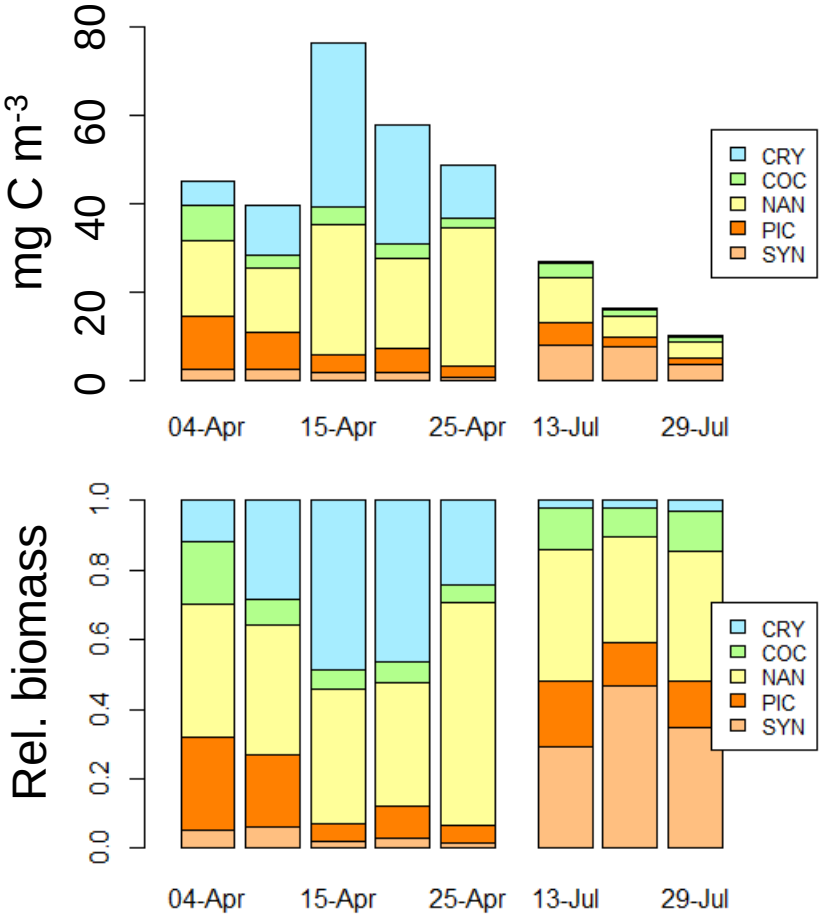
Pico/nano biomass

Shallow



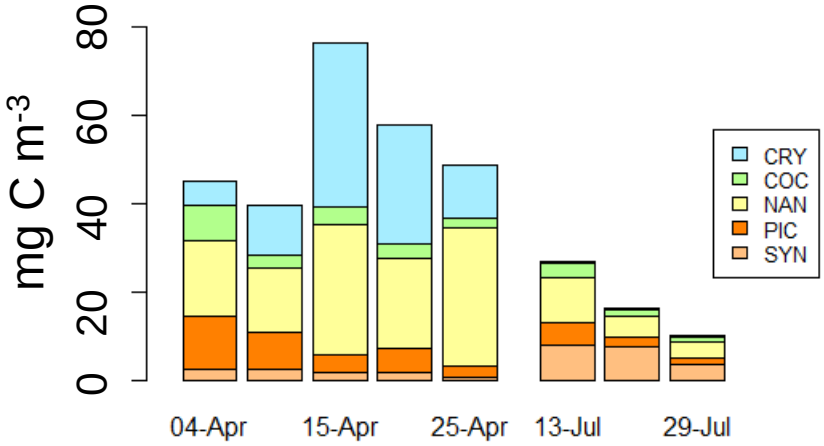
Pico/nano biomass

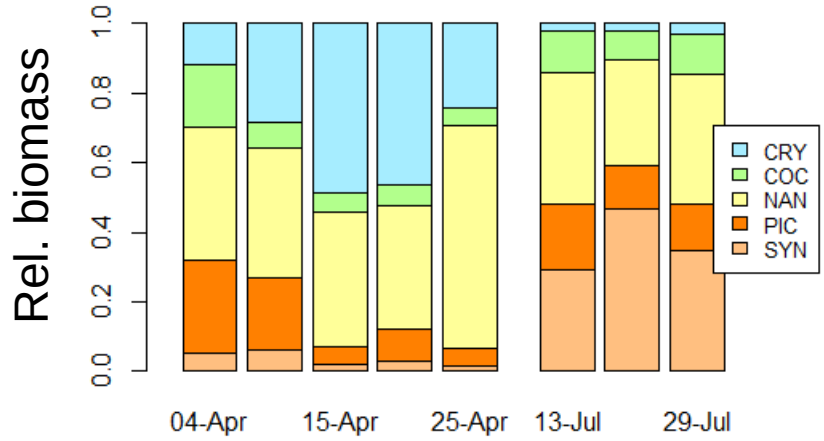
Shallow



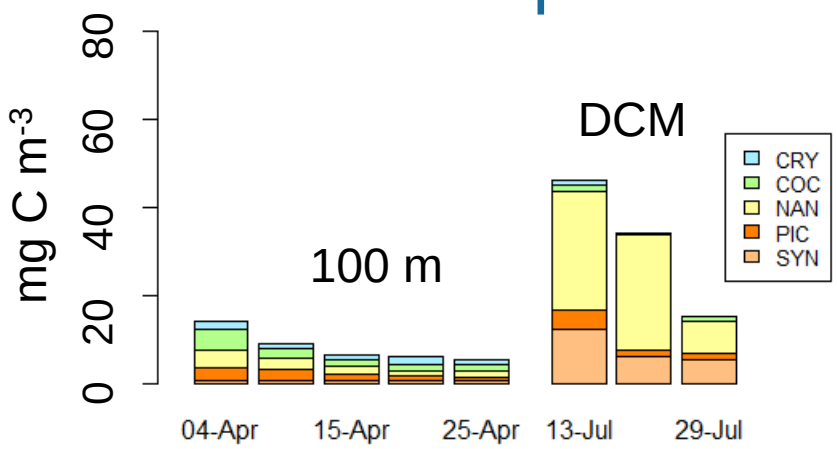
Pico/nano biomass

Shallow



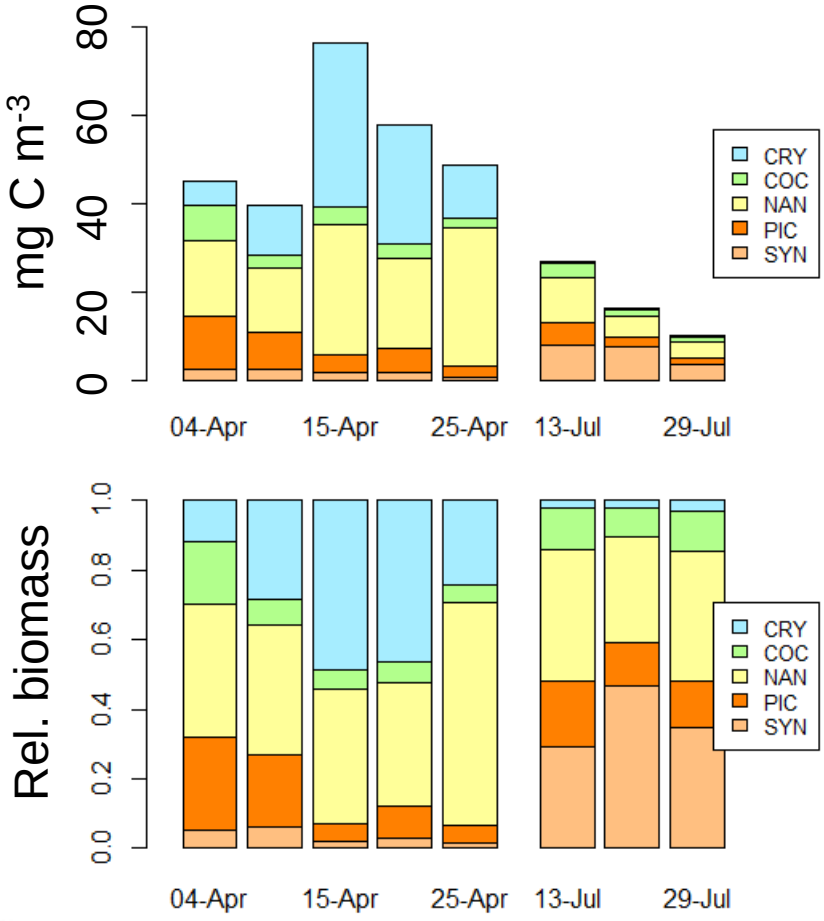


Deep



Pico/nano biomass

Shallow



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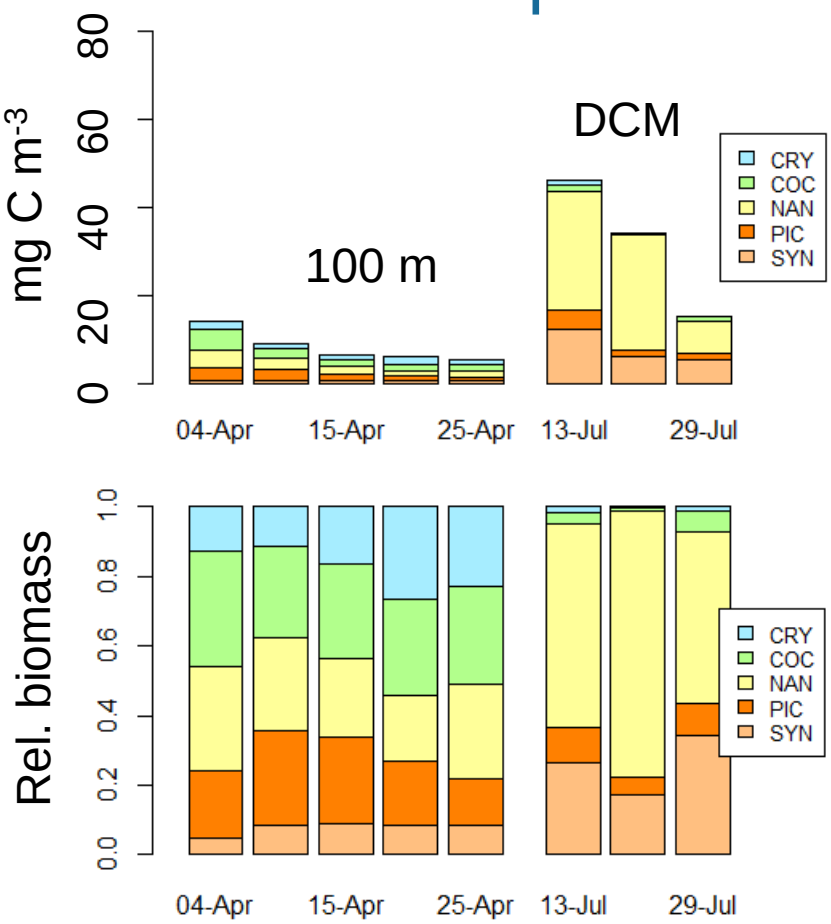
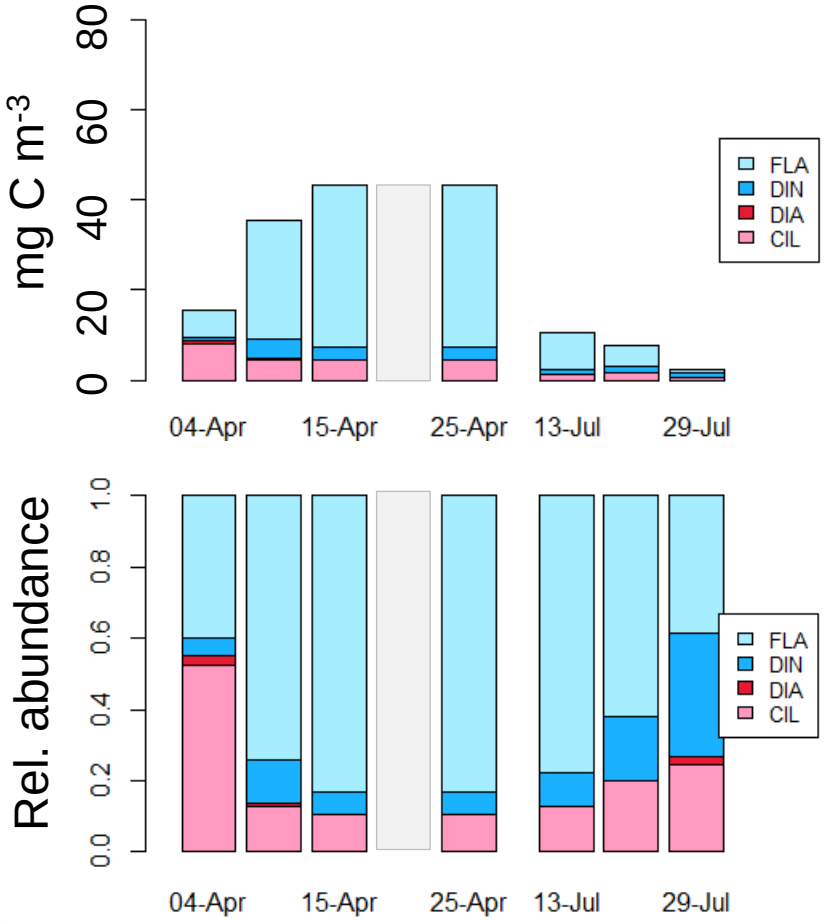


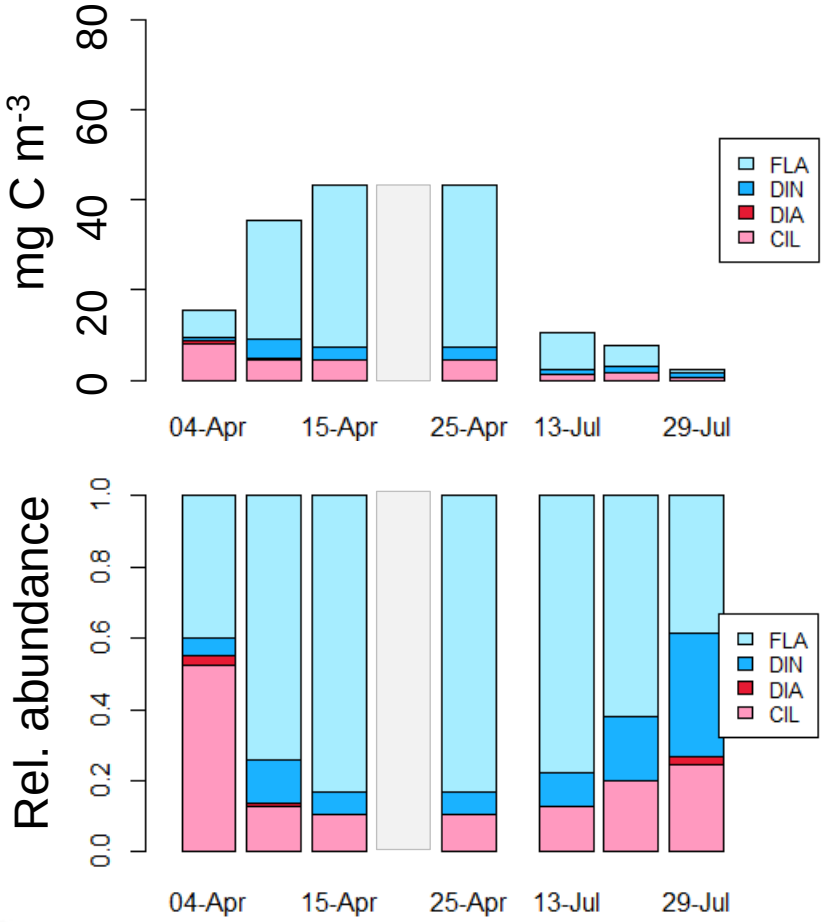
Micro biomass

Shallow



Micro biomass

Shallow



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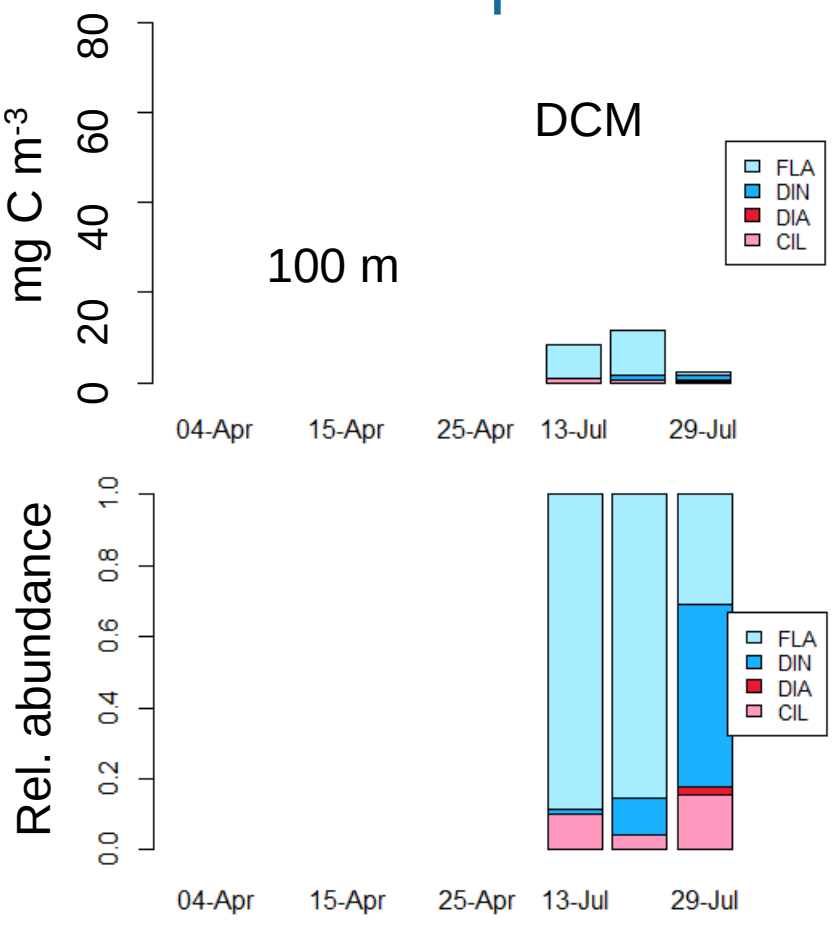

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Growth and grazing rates of pico/nano plankton

Based on dilution series

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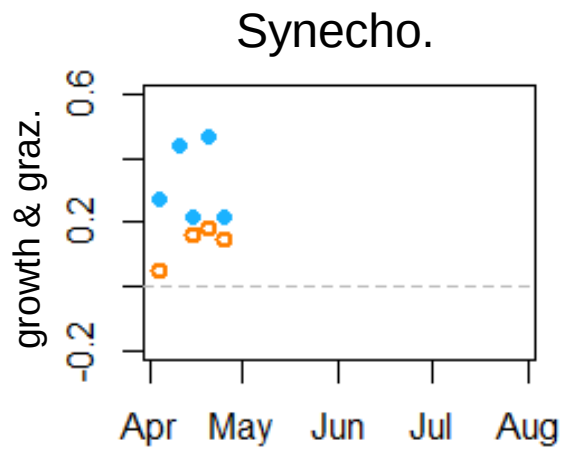
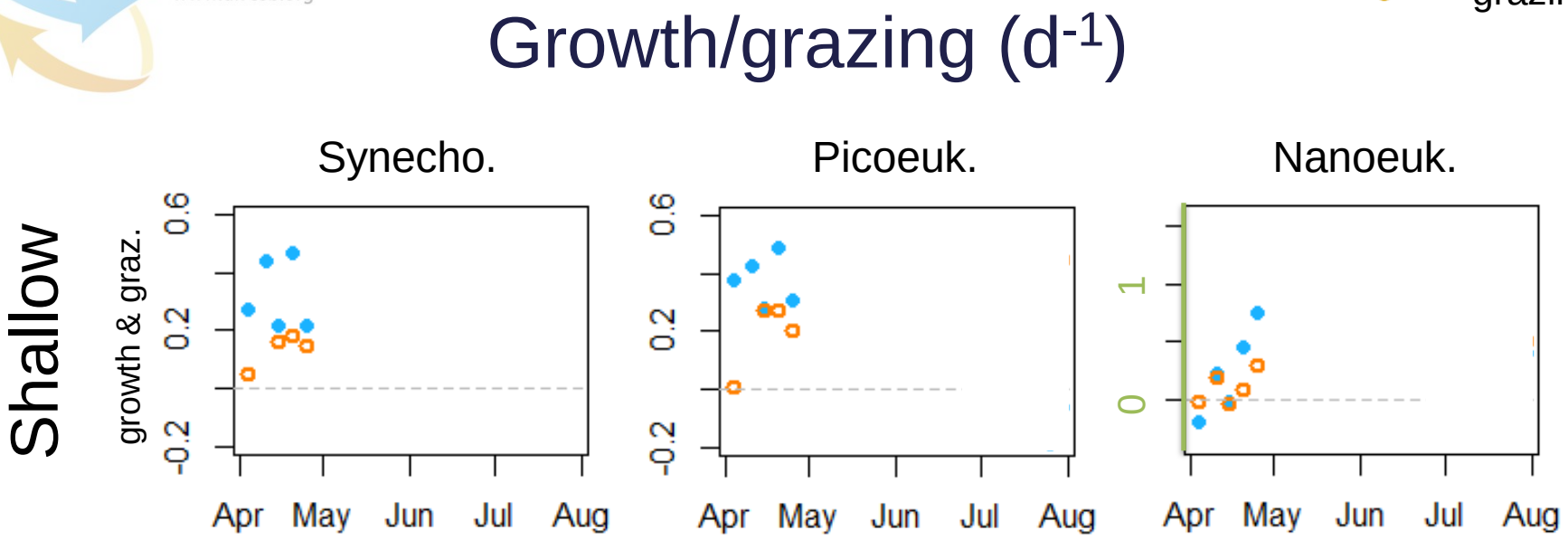
growth
grazing

Growth/grazing (d^{-1})

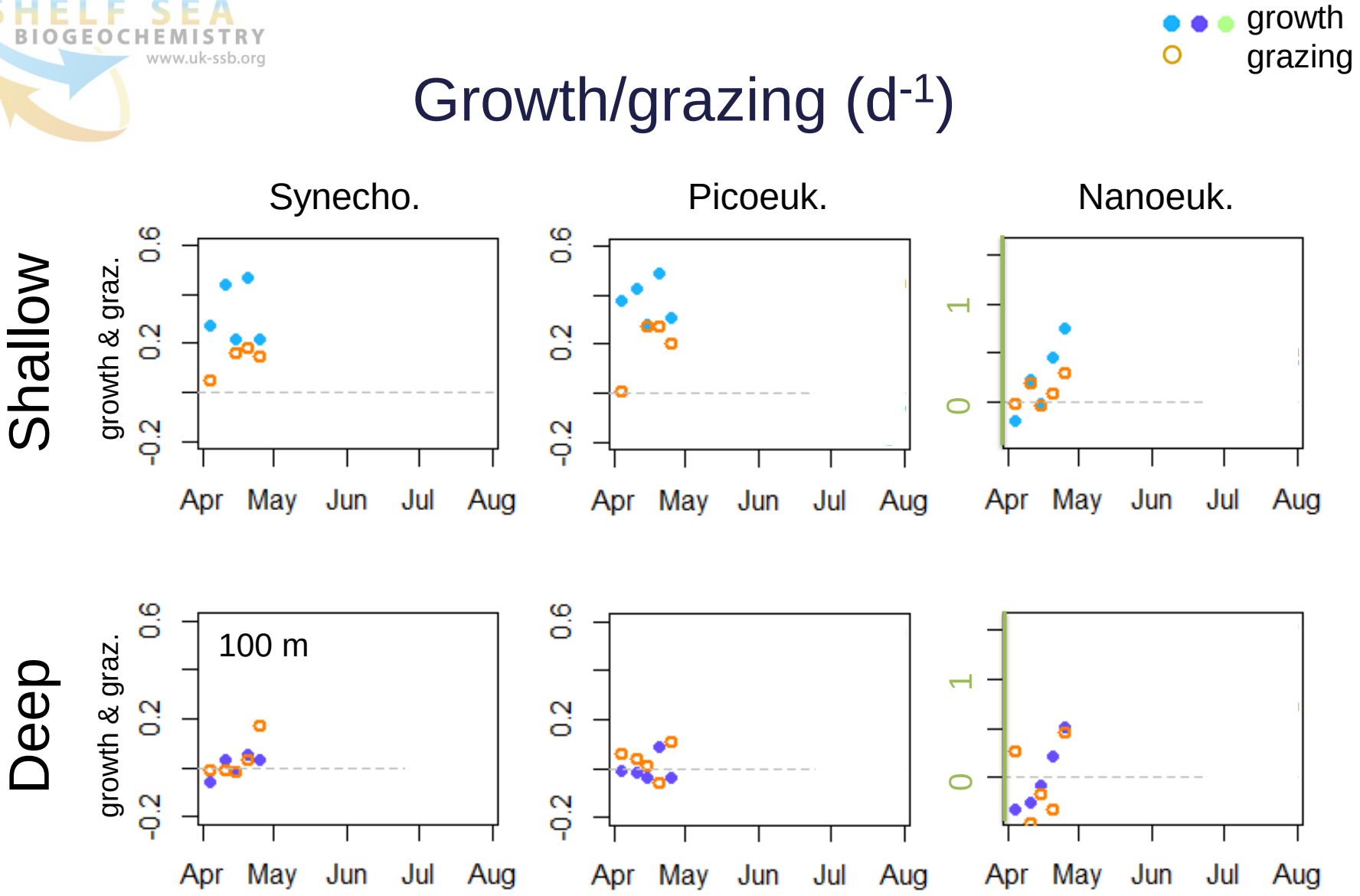
Shallow



Growth/grazing (d^{-1})



Growth/grazing (d^{-1})



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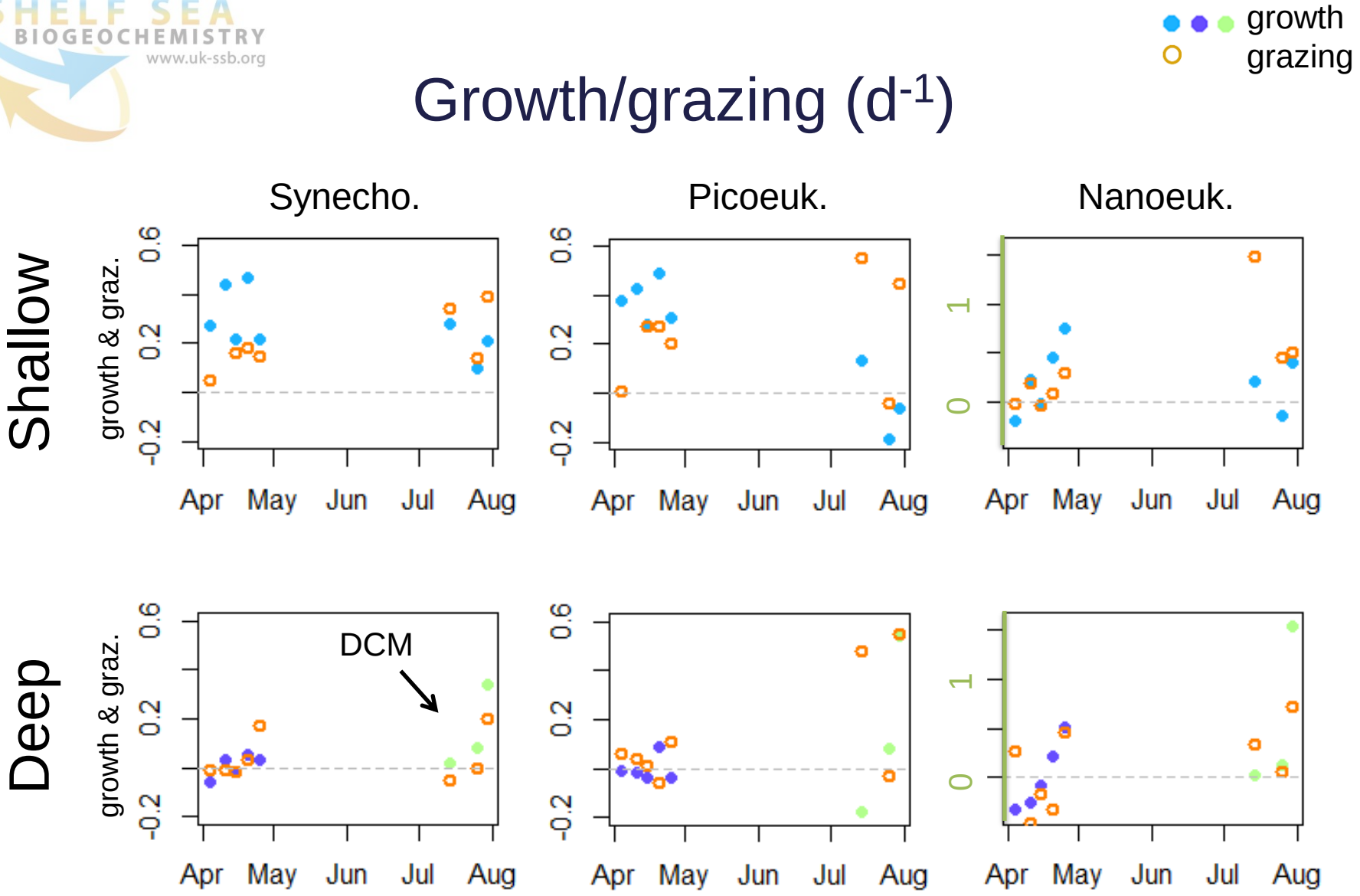
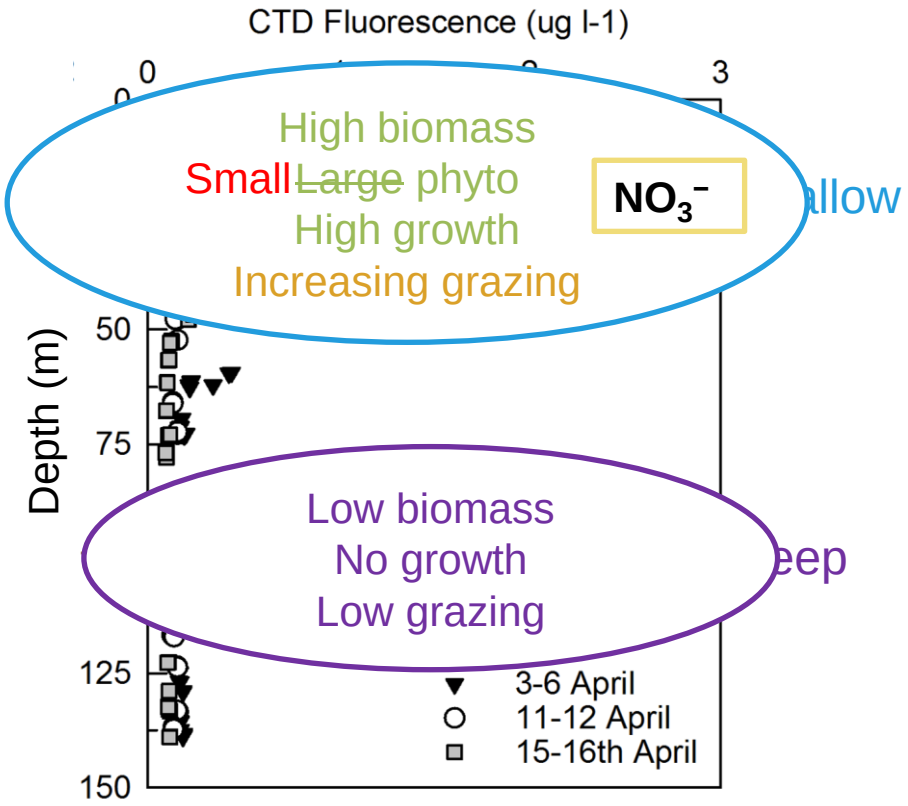
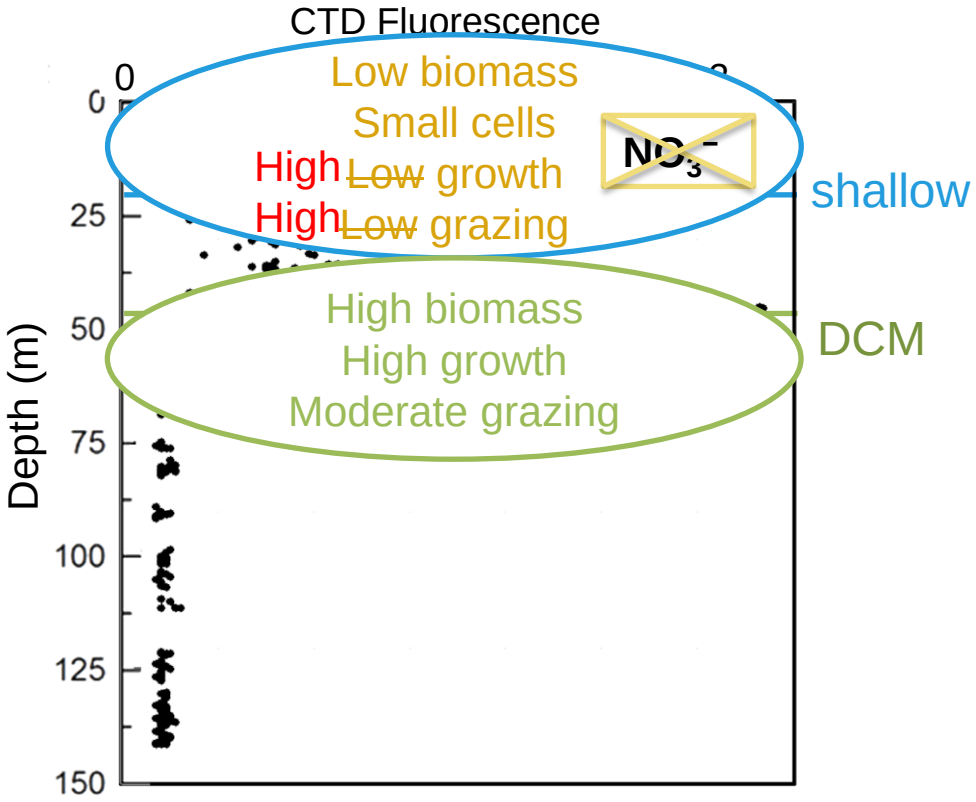


Expectations

April

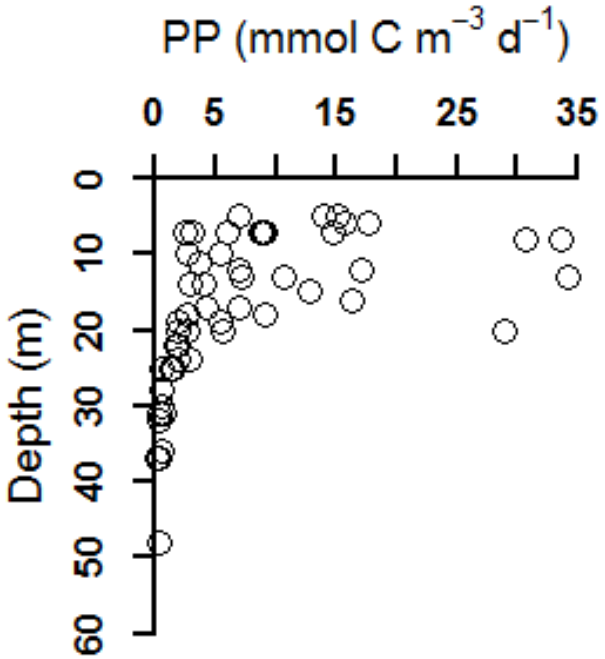


July



Primary production at CCS

April



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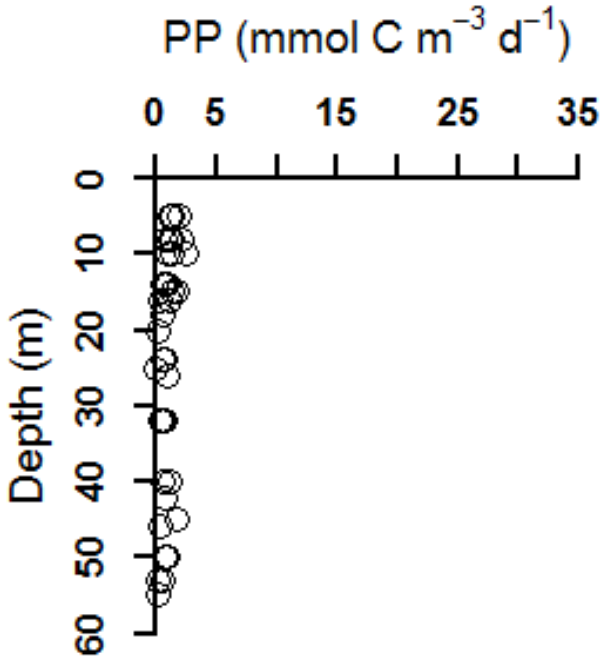

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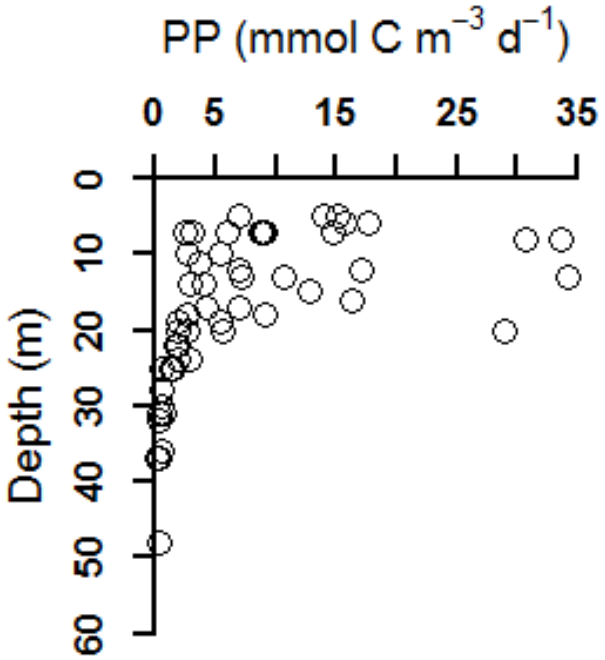

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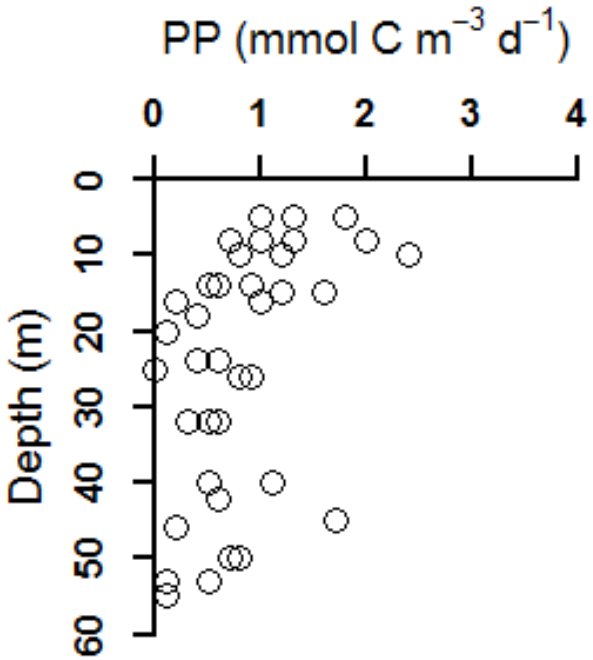

Primary production at CCS

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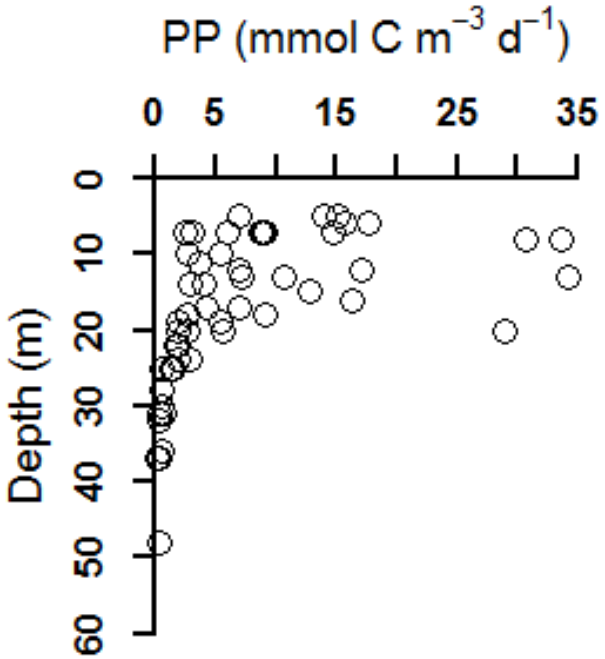
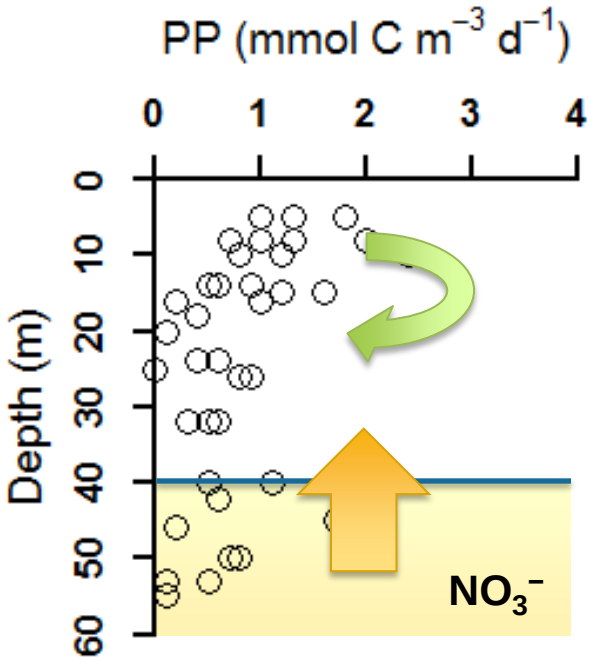


July



Recycled production

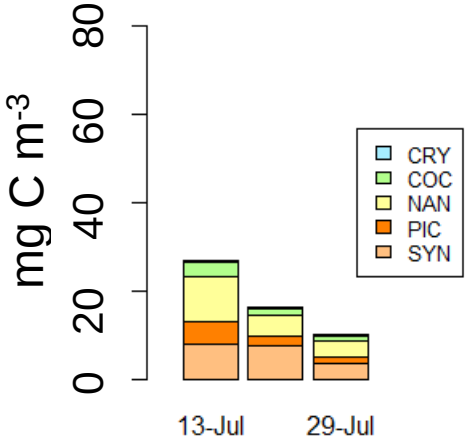
New production

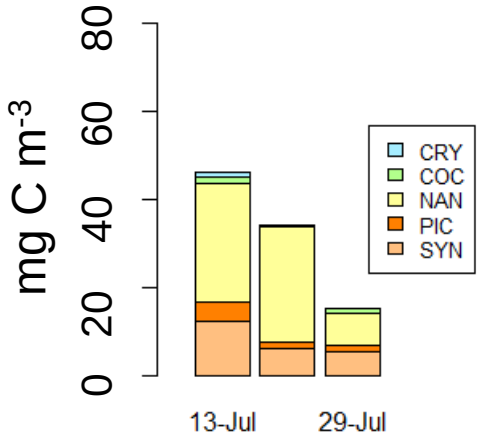
Biomass in July

Shallow

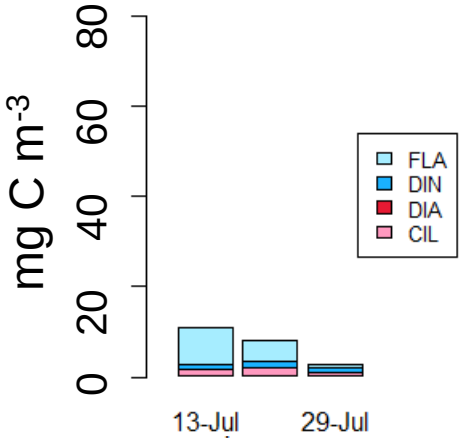
DCM

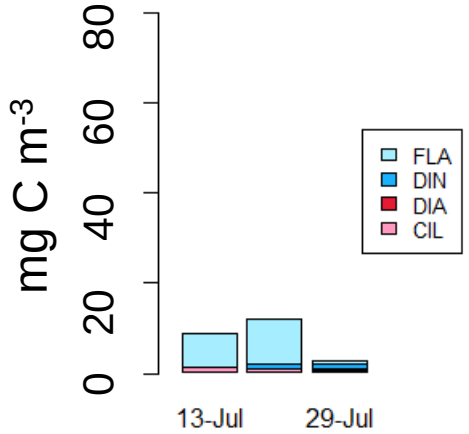
pico/ nano



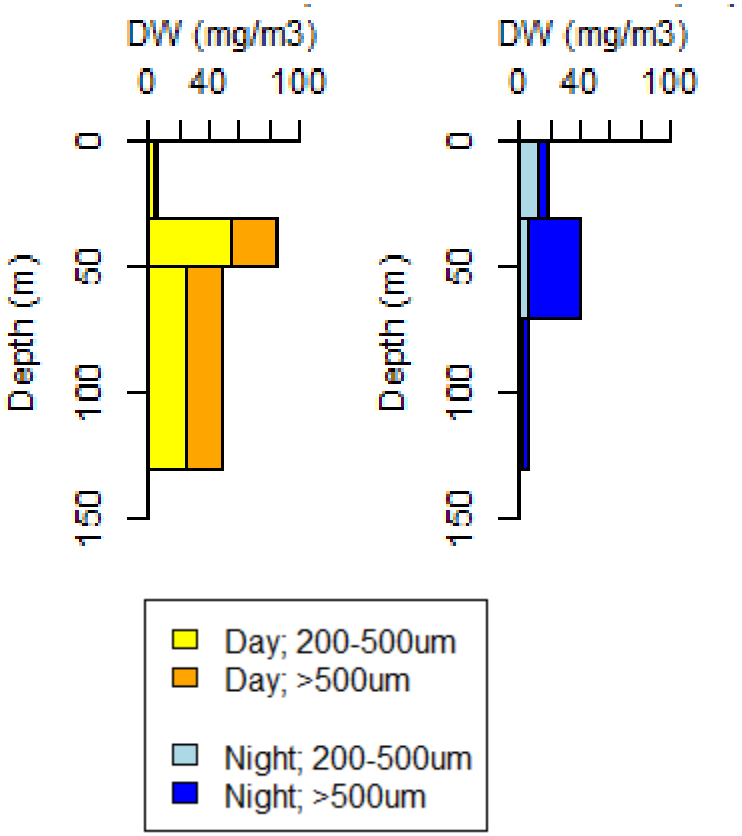


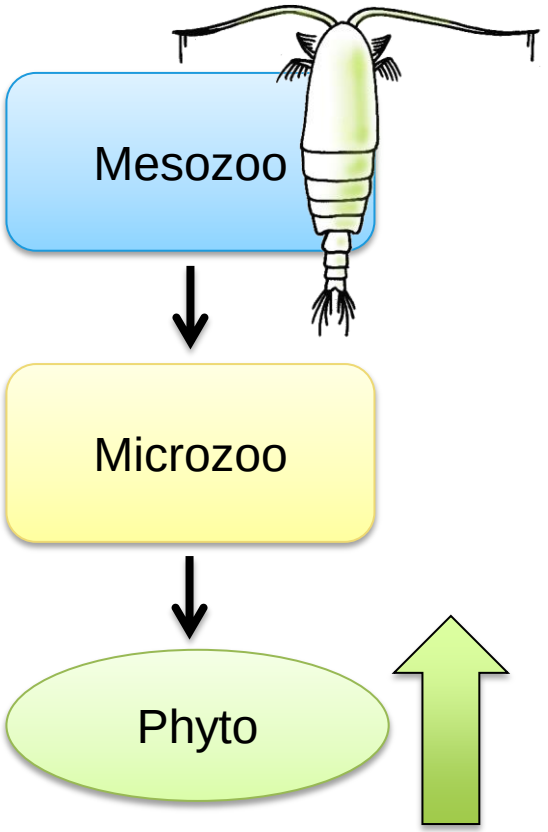
micro





Mesozooplankton?





A big ‘thank you’ to the amazing teams during cruises DY029 & DY033!

NERC for funding

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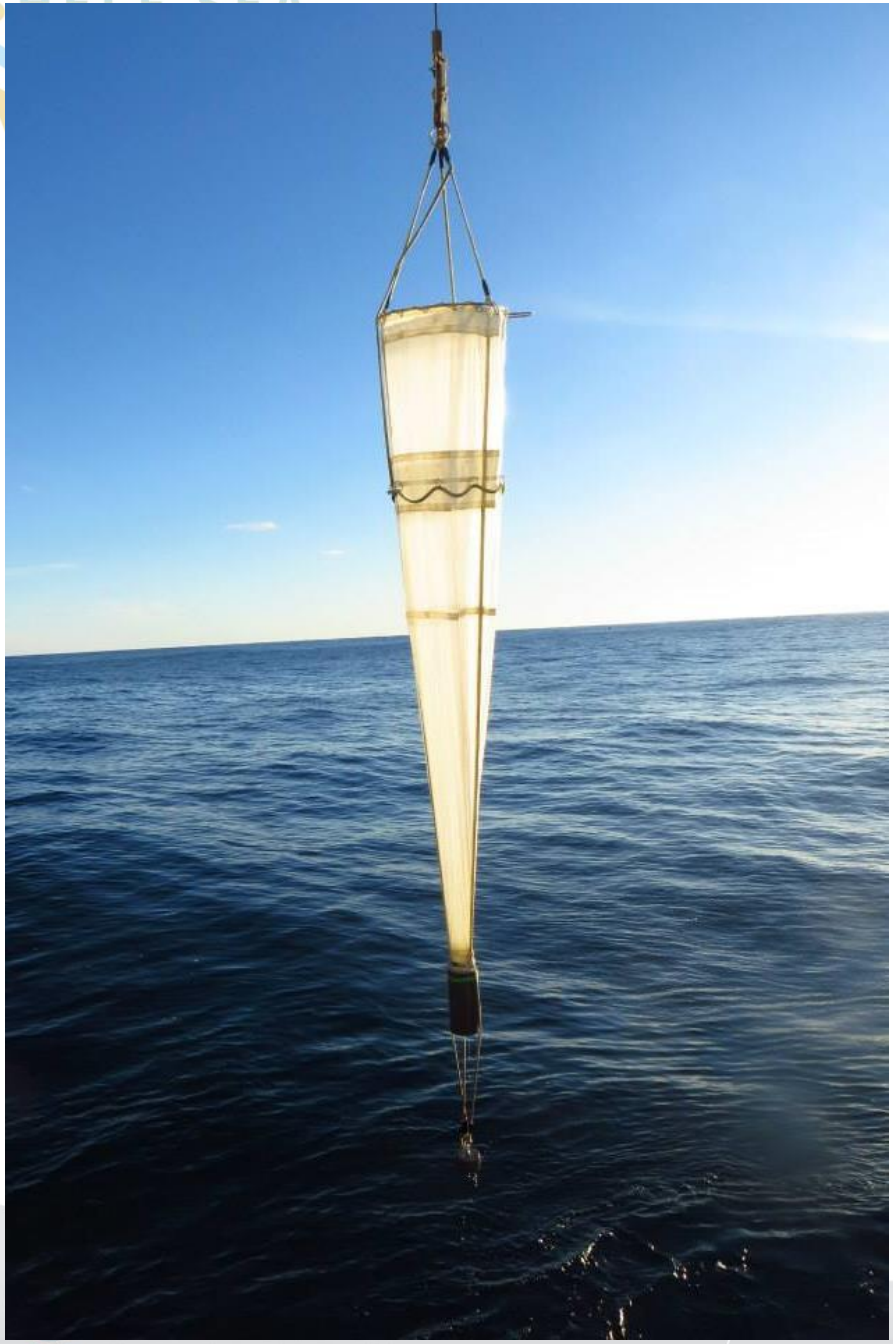

Mesozooplankton

Day and night time nets

Three size-fractions:

1. 63-200 µm
2. 200-500 µm
3. >500 µm

Depth horizons:

1. above thermocline
2. deep chlorophyll maximum (DCM; in July only)
3. 3. below thermocline

Food removal experiments