protists – mixotrophs – minimum model

MIXsTRUCT - Impact of **MIXotrophs** on the **sTRUCTure** of the marine pelagic food web

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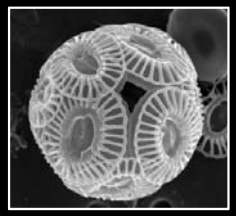
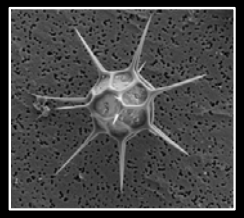
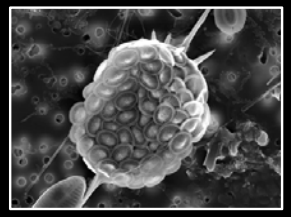
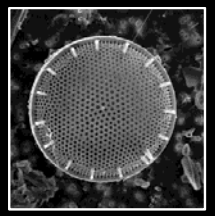
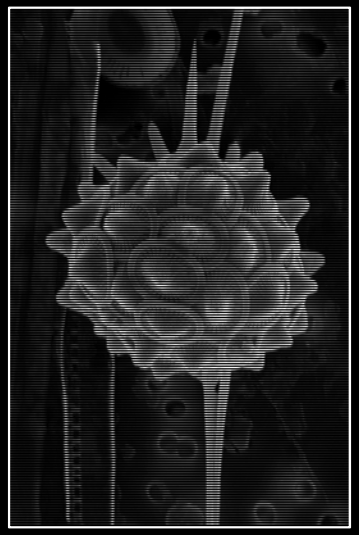
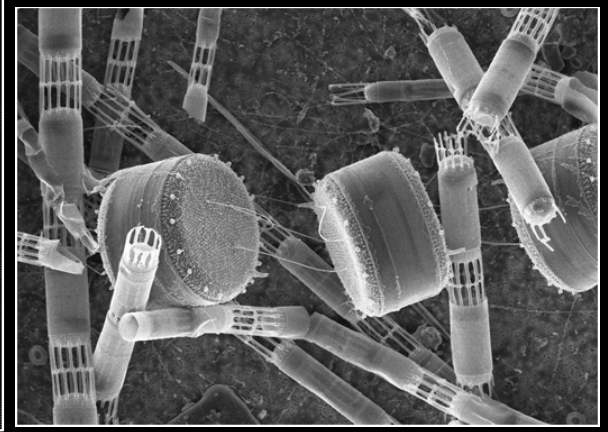
Protists





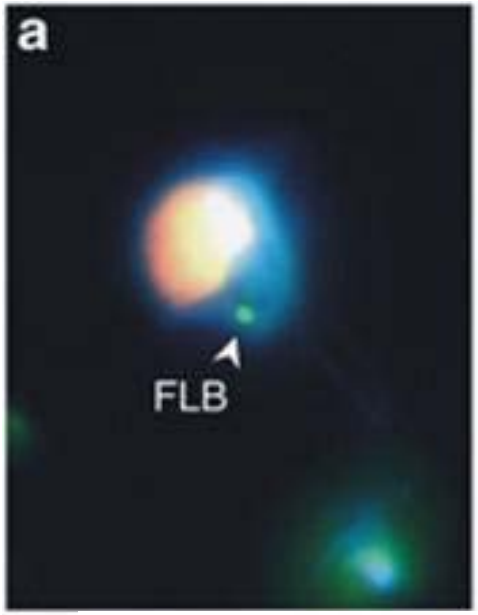



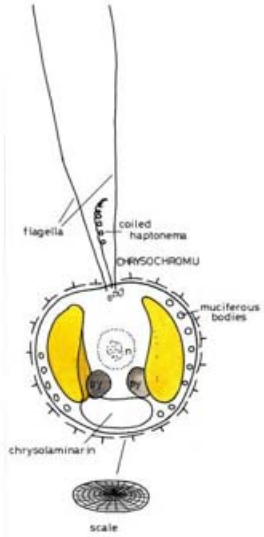

Mixotrophs

Combining **phototrophy and phagotrophy;**

Phototrophic flagellates that graze upon bacteria for extra mineral nutrients or for extra carbon



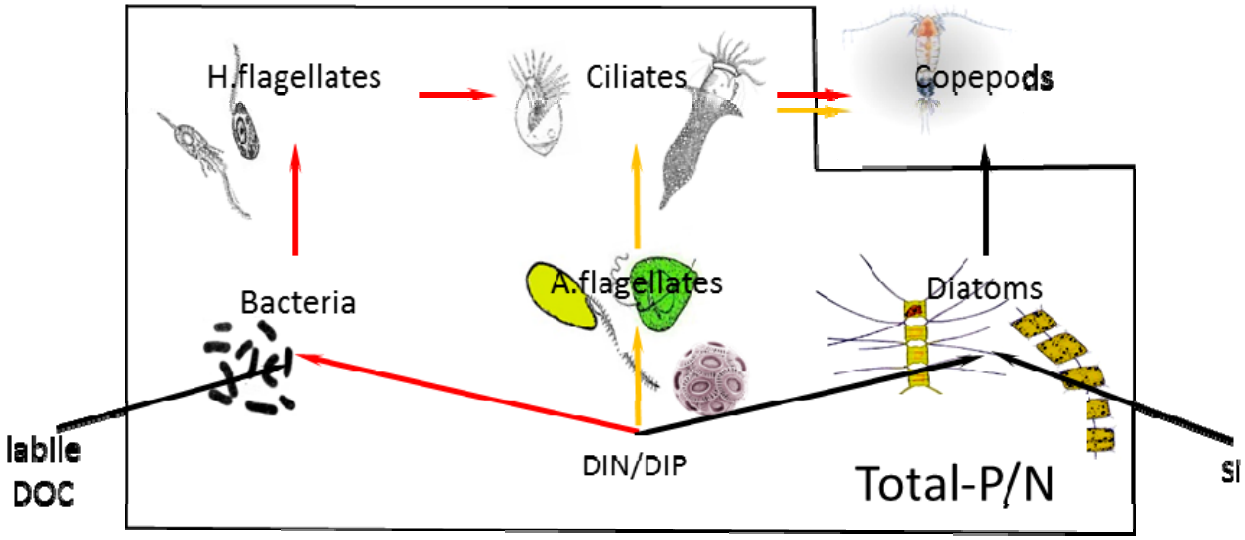
Unrein et al 2014



Minimum model

Thingstad et al 2007; See also poster Bratbak et al.

- Mathematically formulated description of how the microbial food web function
- Linking food web structure to ecosystem functioning & diversity
- Gives 3 alternative pathways for nutrients through the food web
- Consequence - various pathways:
  - CO_2 sequestration
  - Bioremediation
  - HABs



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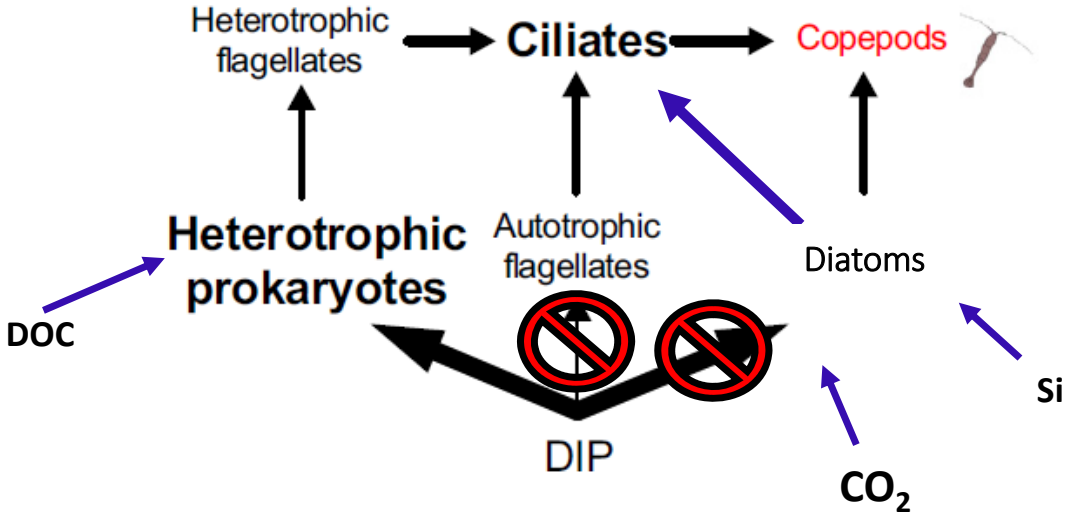
- Controlling different pathways:
  - Predator level (Larsen et al 2015)



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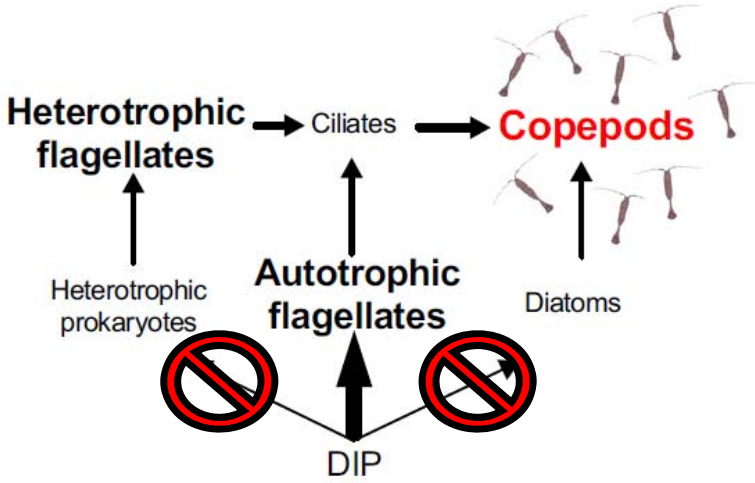

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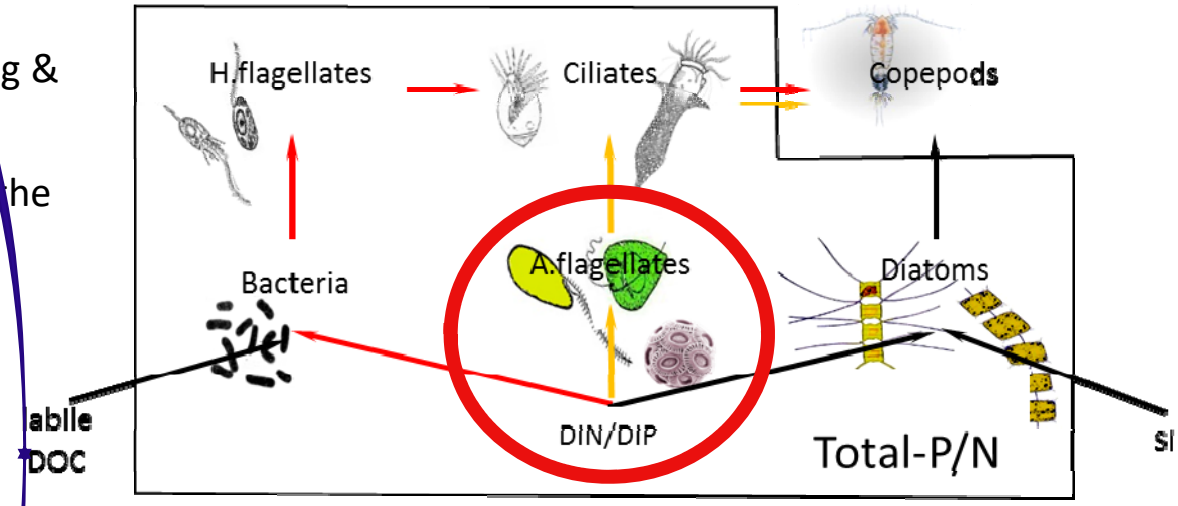
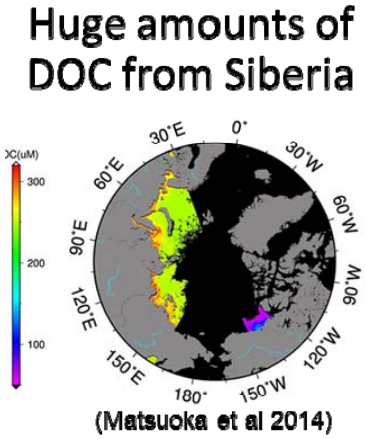
  - Predator level (Larsen et al 2015)
  - Bacteria community rearrangement (Tsagaraki et al 2018)
  - Virus-host interactions (Sandaa et al 2017, Thingstad et al in prep.)

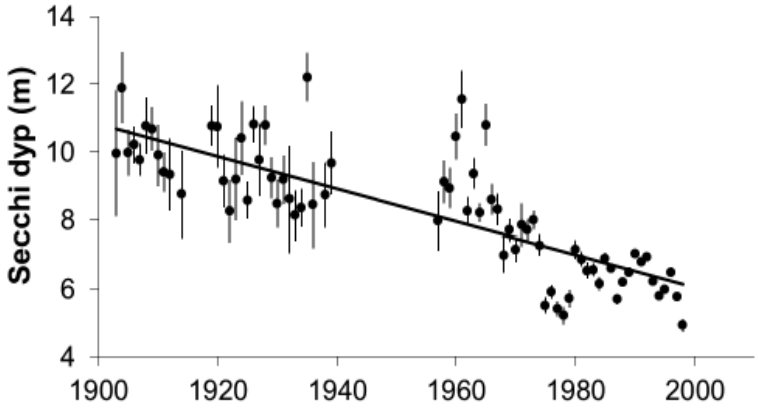
Mixotrophy - does it matter?



Mixotrophy

- Will the increasing DOC loads in the marine system favor mixotrophy?
- How does mixotrophy affect structure, carbon flow and the efficiency of marine microbial food webs?





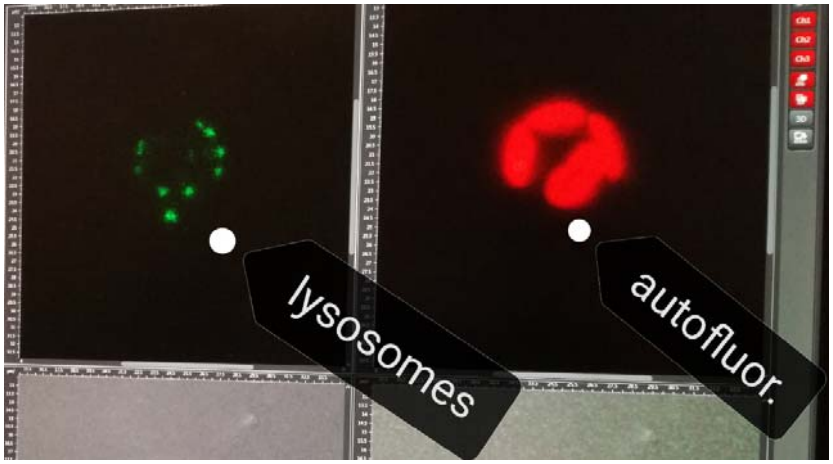
Endringer i siktedyp i Østersjøen og Nordsjøen. Reduksjonen tilsvarer 4.8 m over 100 år og er basert på omtrent 40 000 målinger. Utfyllende analyse av disse målingene er gitt i Dupont og Aksnes (2013).

Minimum model and mixotrophs

- Need to characterize trade-off between being generalist (mixotroph) or specialist (auto- or phagotrophic) for mathematical formulation

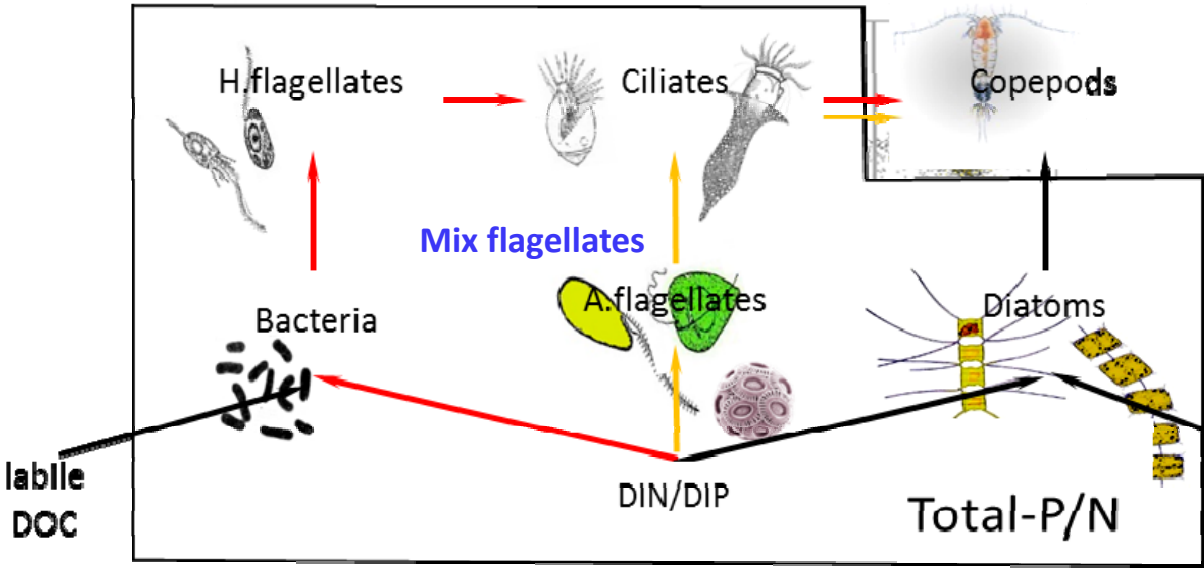
- **Identification**and **quantification** of mixotrophic **activity** *in situ*

- Minimum model conceptual reflections:
  - Ciliates: Do not distinguish between A. flagellates and H. flagellates – i.e. top down control equal
  - Dynamic differences between H and A – bottom-up controlled
  - Mixtrophs: Dynamic something in between? (almost as HNF if only slightly photosynthetic; almost A flag if eating few bacteria)
  - Use this experimentally – compare the dynamic to give estimates of fraction of mixotrophy



Prymnesium sp autofluorescence

Prymnesium sp + Lysotracker green



To *understand* the system well enough to *predict* which pathway that will dominate

(Pree, Larsen et al 20??)