Shellfish farming in low nutrient environments

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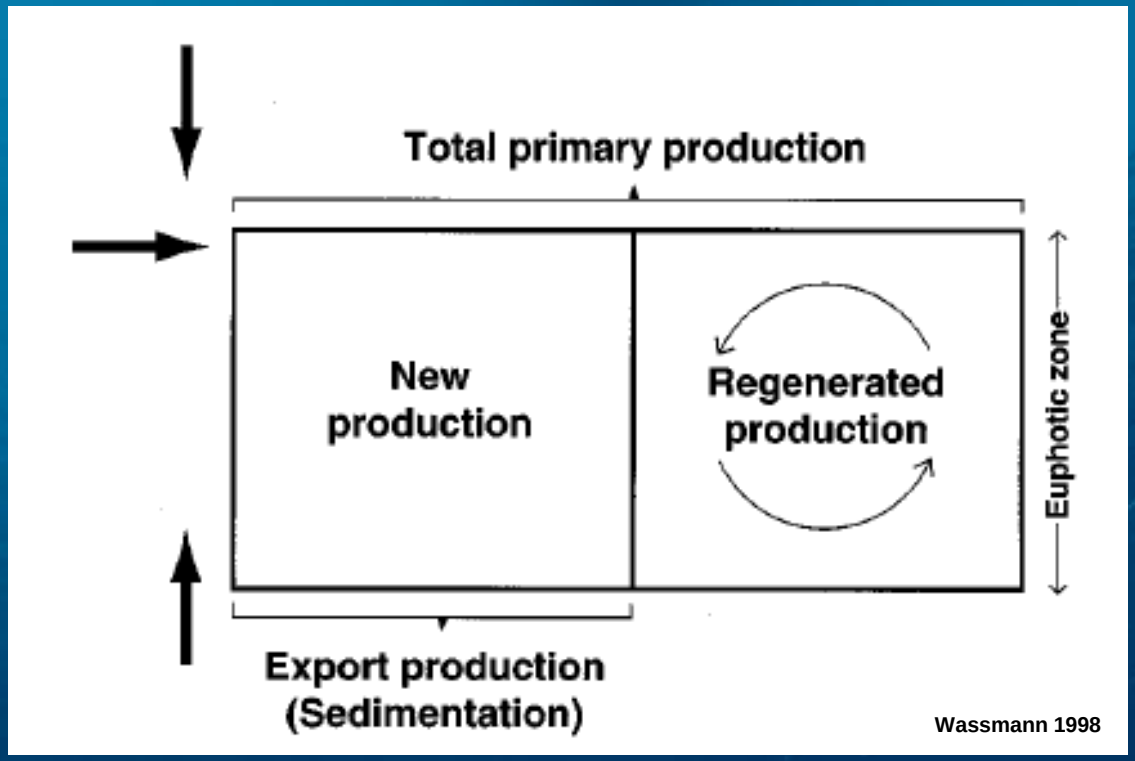
Sources of nutrients for primary production ”catering” shellfish farming

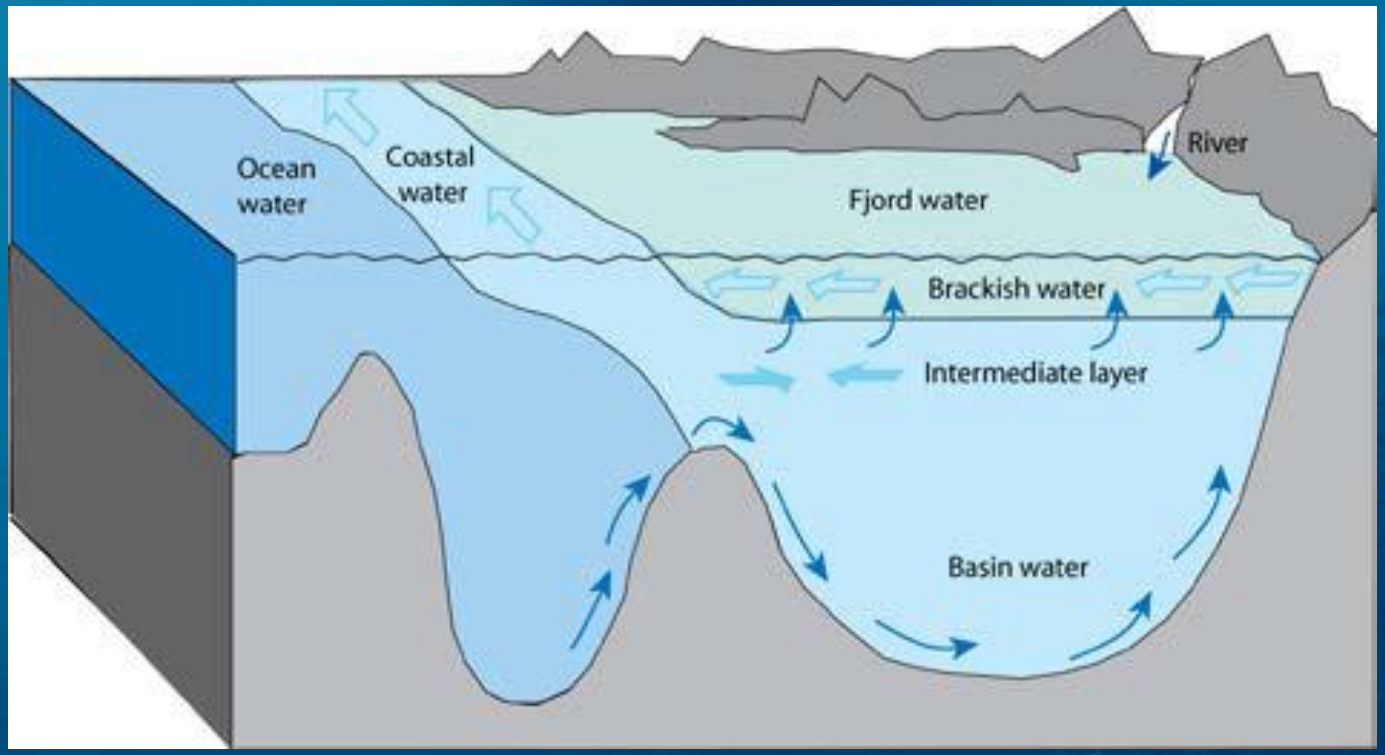
FRESHWATER RUNOFF

ADVECTION



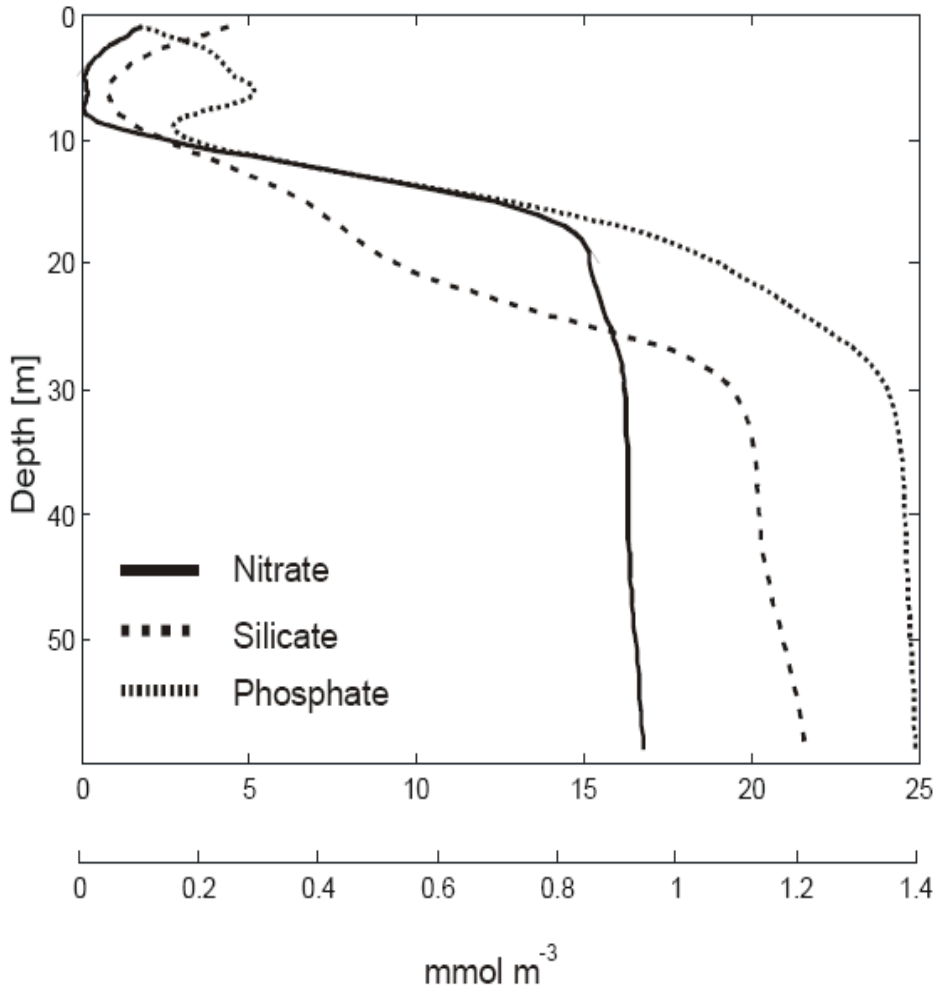
UPWELLED DEEPER WATER

Water exchange patterns in fjords

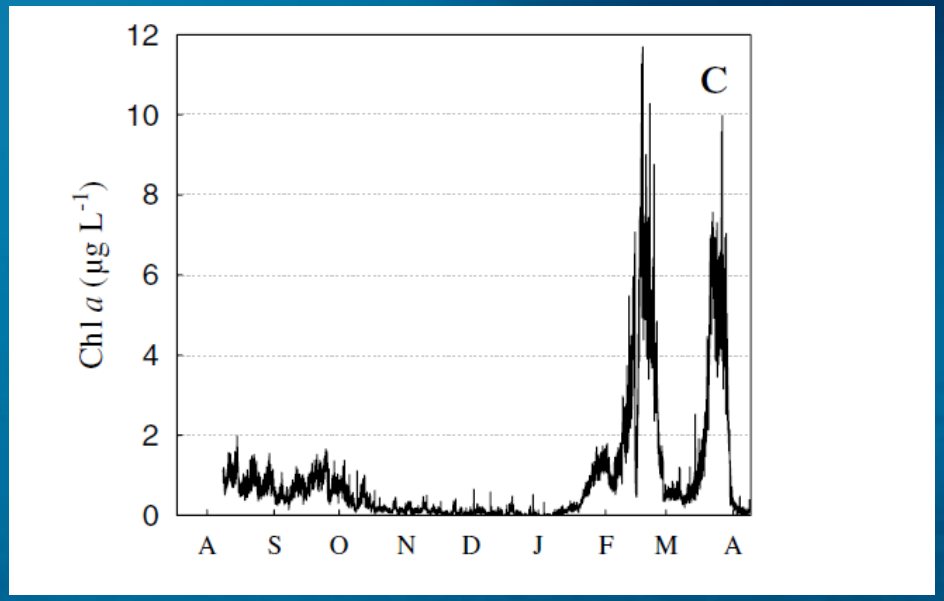


Nutrients

Typical summer situation in fjords



A low seston environment



Chl a concentrations at
5 m depth in Bjørnefjord

- For extended periods after the spring blooms phytopl conc (CHL *a*) is low ~ < 1-2 mg m^{-3}, due to nutrient limitation

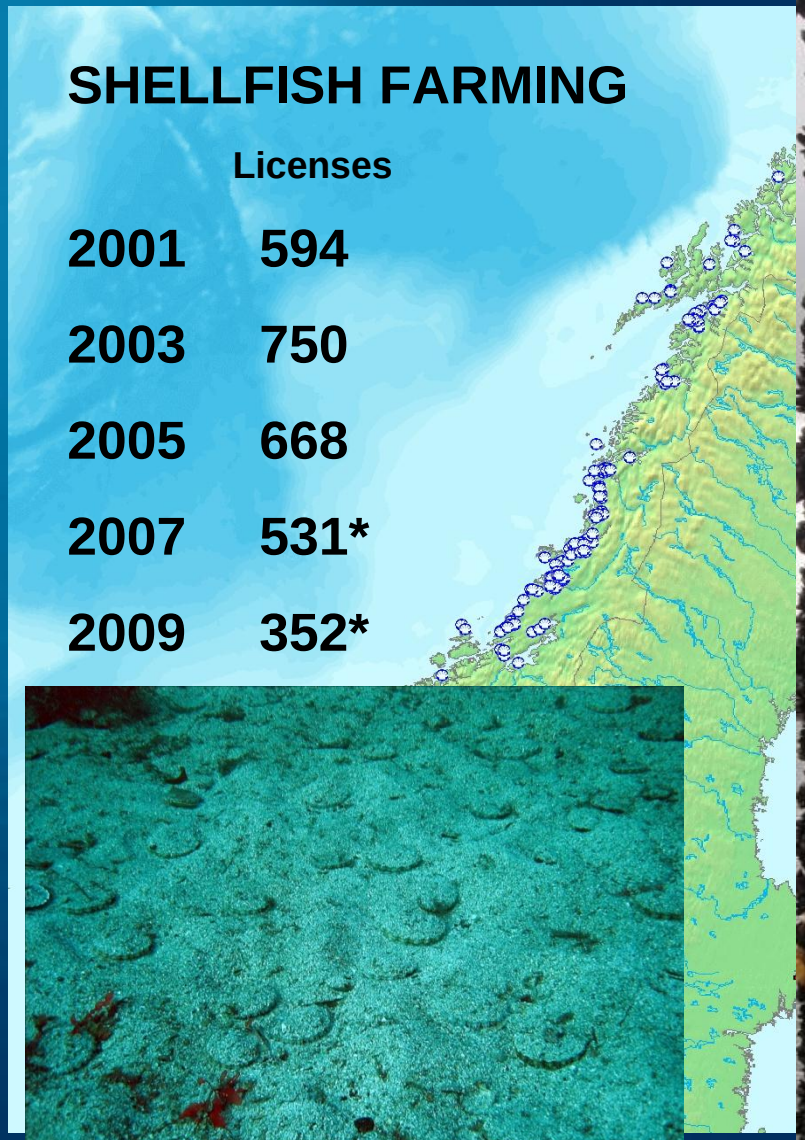
- Resuspension is low and organic content in seston is generally high

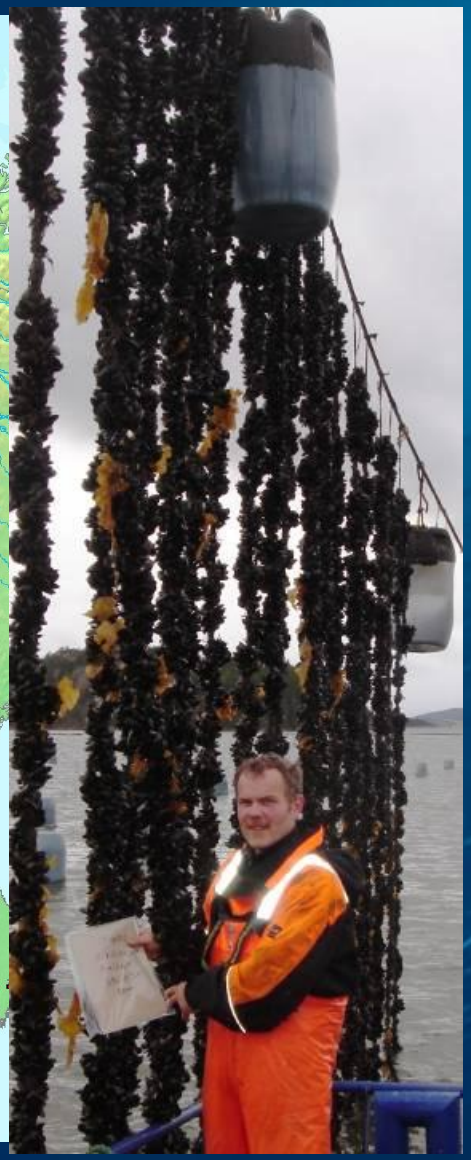
Bivalve feeding in low seston environment

”State of the art” before CANO

- Numerous studies on feeding physiology in meso-eutrophic environments
- Mussels apparently ceased feeding at concentrations below 0.5-0.8 mg Chl *a* m^{-3} (Dolmer 2000; Riisgard et al 2006; and others)
- Risk of negative net energy balance in farming environments? (green lipped mussel ~ 0.9 mg Chl *a* m^{-3}) (Hawkins etal 1999)
- The tropical Pearl oyster increased feeding at low seston concentrations (Pouvreau et al 2000)
- Feeding physiology in low seston environments poorly known.

A contradiction to observations from bivalve growth in Norway





CArrying capacity in NOrwegian Aquaculture (CANO)

Strategic Institute Project (RCN/IMR 2006-20xx)

Clearence rate at low seston concentrations

Strohmeier etal. 2009.

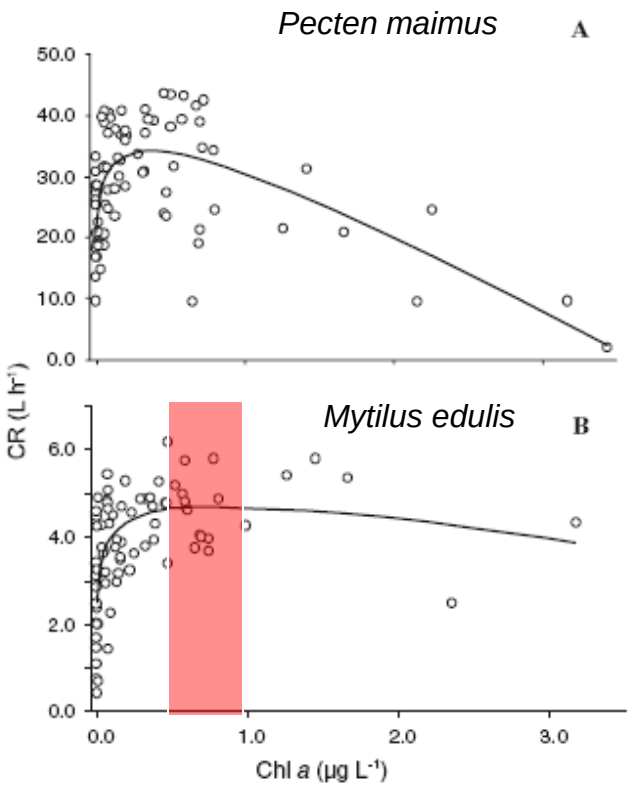
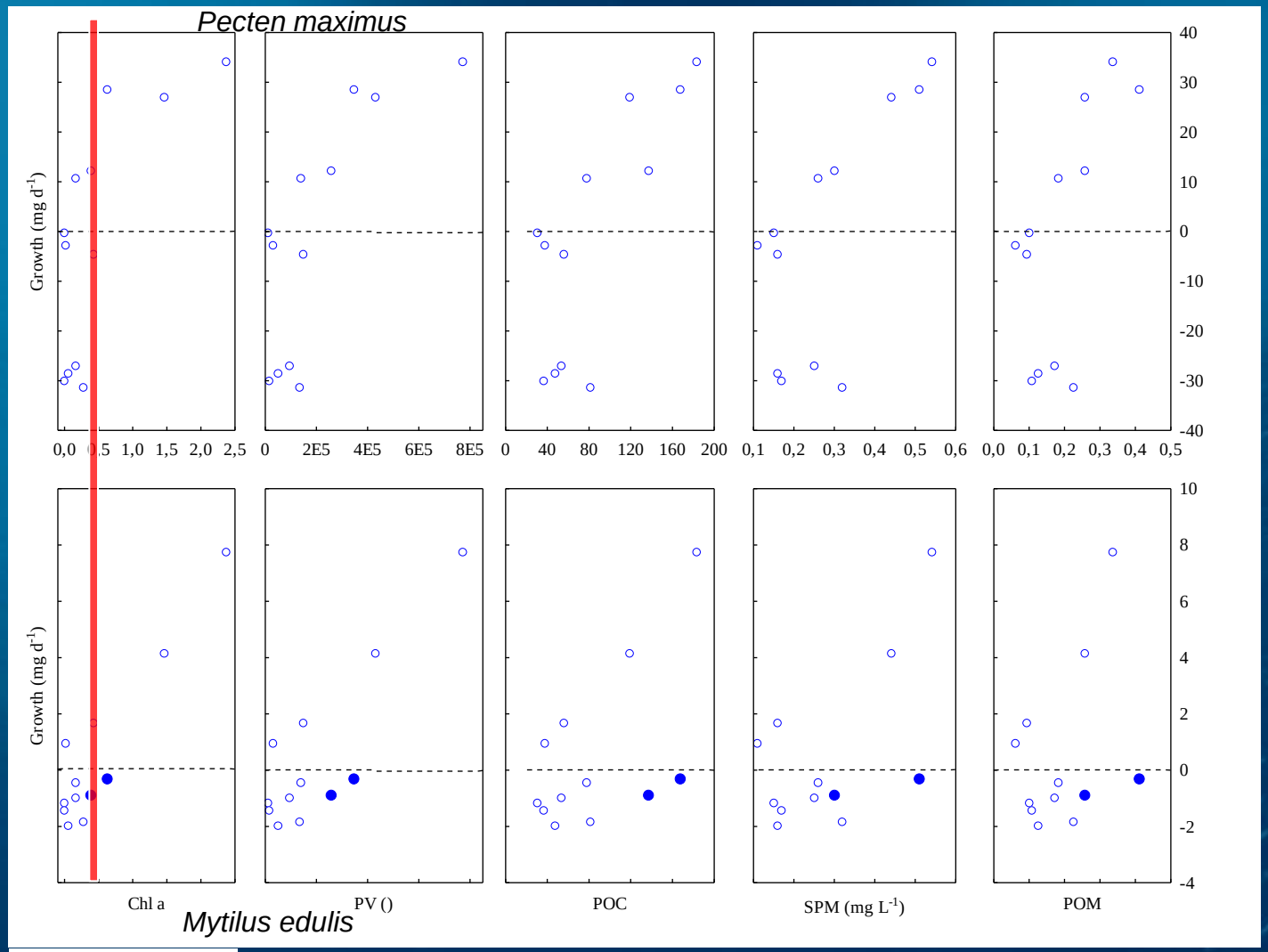


Fig. 5 Mean clearance rate (CR) data for *P. maximus* (a) and *M. edulis* (b) at increasing chlorophyll *a* concentrations. Each point in the figure represents the mean value of 18 individual CR measurements. All data from treatments 1 to 4 are included and equations describing the fitted curves are given in the text

Net energy balance in a low seston environment

Strohmeier 2009

zero NEB



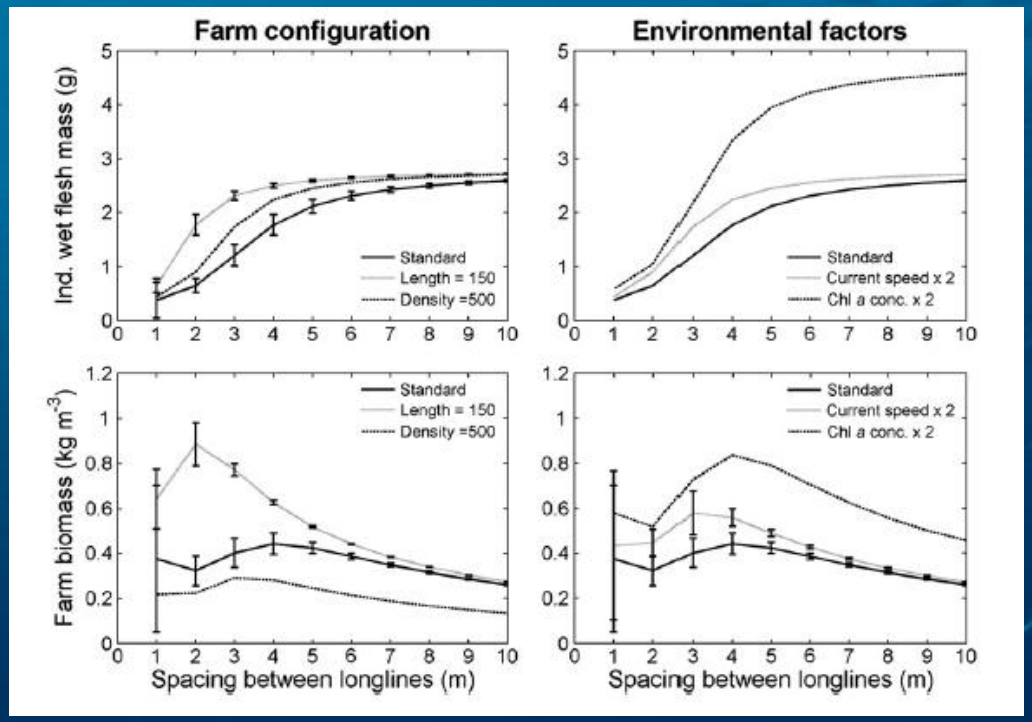
0,4 µg CHL L^{-1}

Seston depletion in longline farms

Coupling DEB-growth model and waterflow reduction model

Modelling growth variation as function of stocking density and farm design

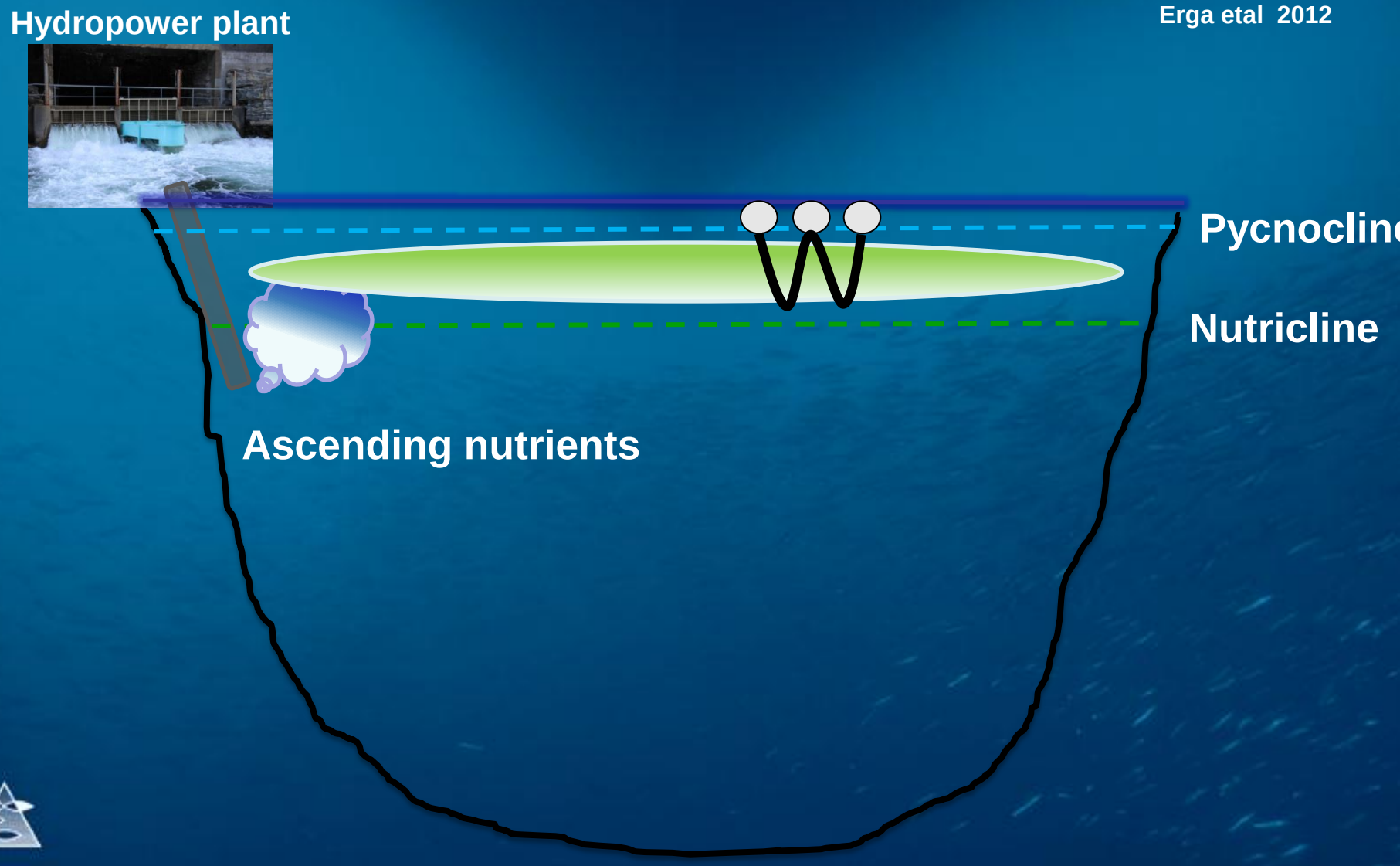
Rosland et al. 2011.



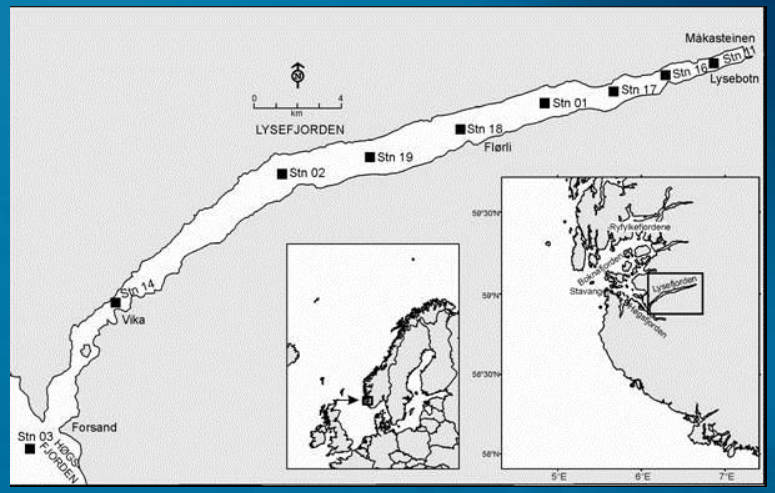
Controlled upwelling of nutrient-rich deeper water in fjords

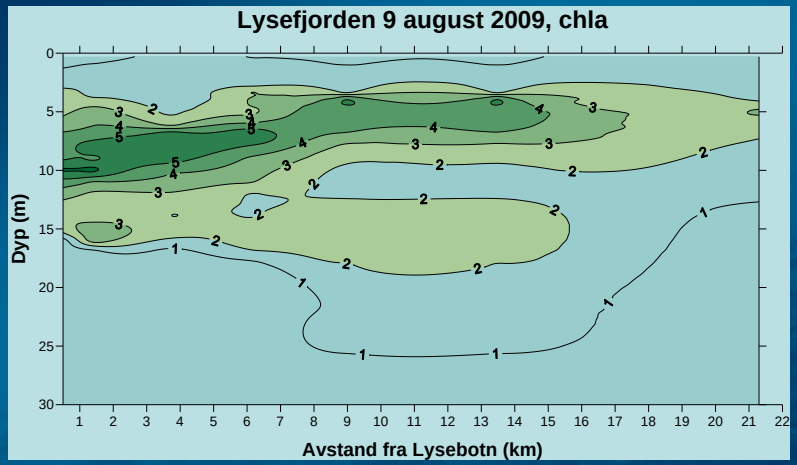
Aure etal. 2007

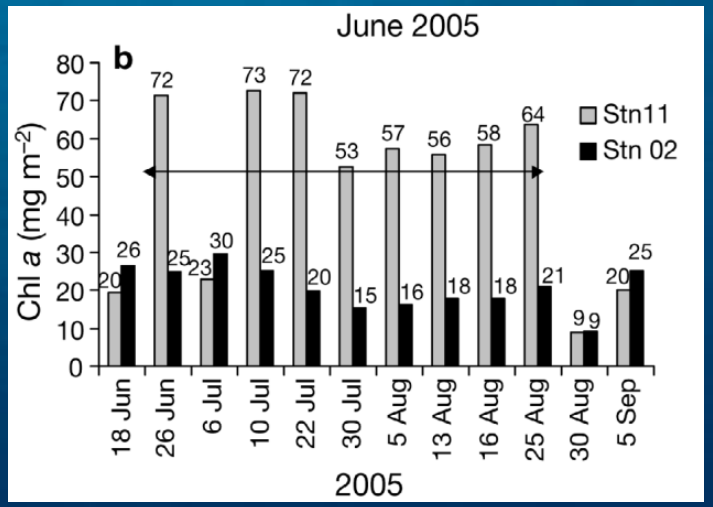
Erga etal 2012

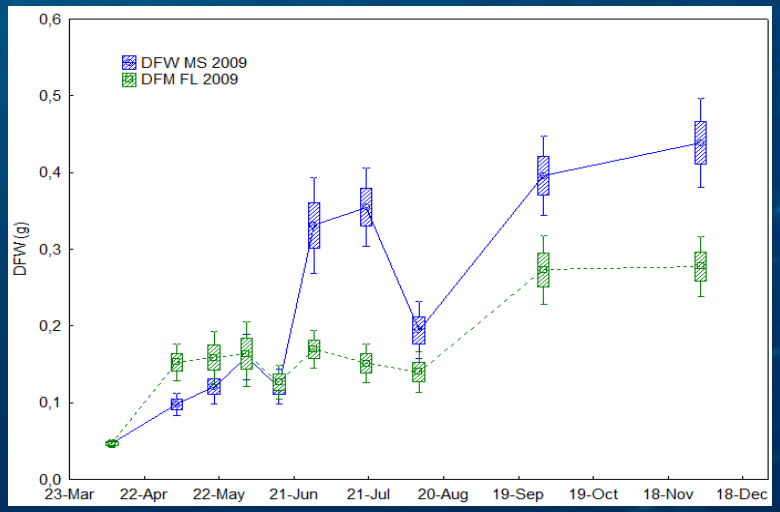


Controlled upwelling in the Lysefjord









How can shellfish farming be maximized in low nutrient environments

- Provide basic eco-physiological knowledge about the bivalves in low nutrient environments
- Adapt biomass ditribution/stocking density to site specific food availability
- Escape from ”oligotrophy” by controlled supply of natural nutrients
- Attend the dissertation this afternoon


TAKK FOR OPPMERKSOMHETEN!!