Kathy Dunlop

Research group
Benthic resources and processes

Forskningsrådet

Akvaplan niva

NORGES GEOLOGISKE UNDERSØKELSE
- NGU -

CAWTHRON INSTITUTE

Spatial response of hard bottom epifauna to organic enrichment from salmon aquaculture in northern Norway

Kathy Dunlop, Astrid Harendza, Raymond Bannister and Nigel Keeley

1. Introduction

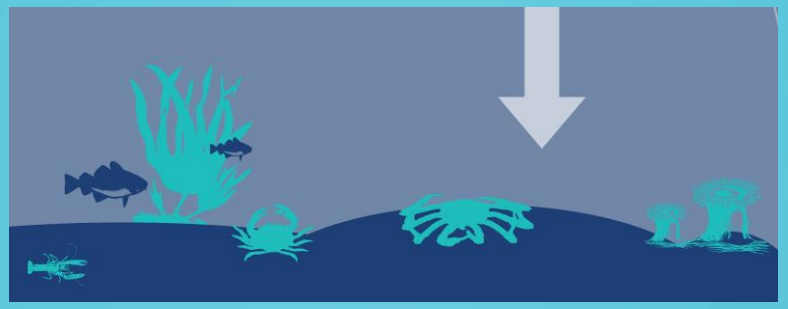
Previous knowledge on the effects of organic enrichment from waste (uneaten food and faeces) released from open sea-cage salmonid farms on epifaunal communities.

Wilding, T. A. et al. (2012). Salmon farm impacts on muddy-sediment megabenthic assemblages on the west coast of Scotland. *Aquaculture Environment Interactions*, *2*(2), 145-156.

Kutti, T. et al. (2015). Metabolic responses of the deep-water sponge Geodia barretti to suspended bottom sediment, simulated mine tailings and drill cuttings. *Journal of experimental marine biology and ecology*, *473*, 64-72.

Keeley, N. et al. (2020). Mixed-habitat assimilation of organic waste in coastal environments–It's all about synergy!. *Science of The Total Environment*, *699*, 134281.

2. Introduction



* Generally limited information regarding the response of epifauna to organic enrichment from fin fish farms.

* Reponses include tolerance to sedimentation and organic waste, impacts on reproduction, larval settlement and function

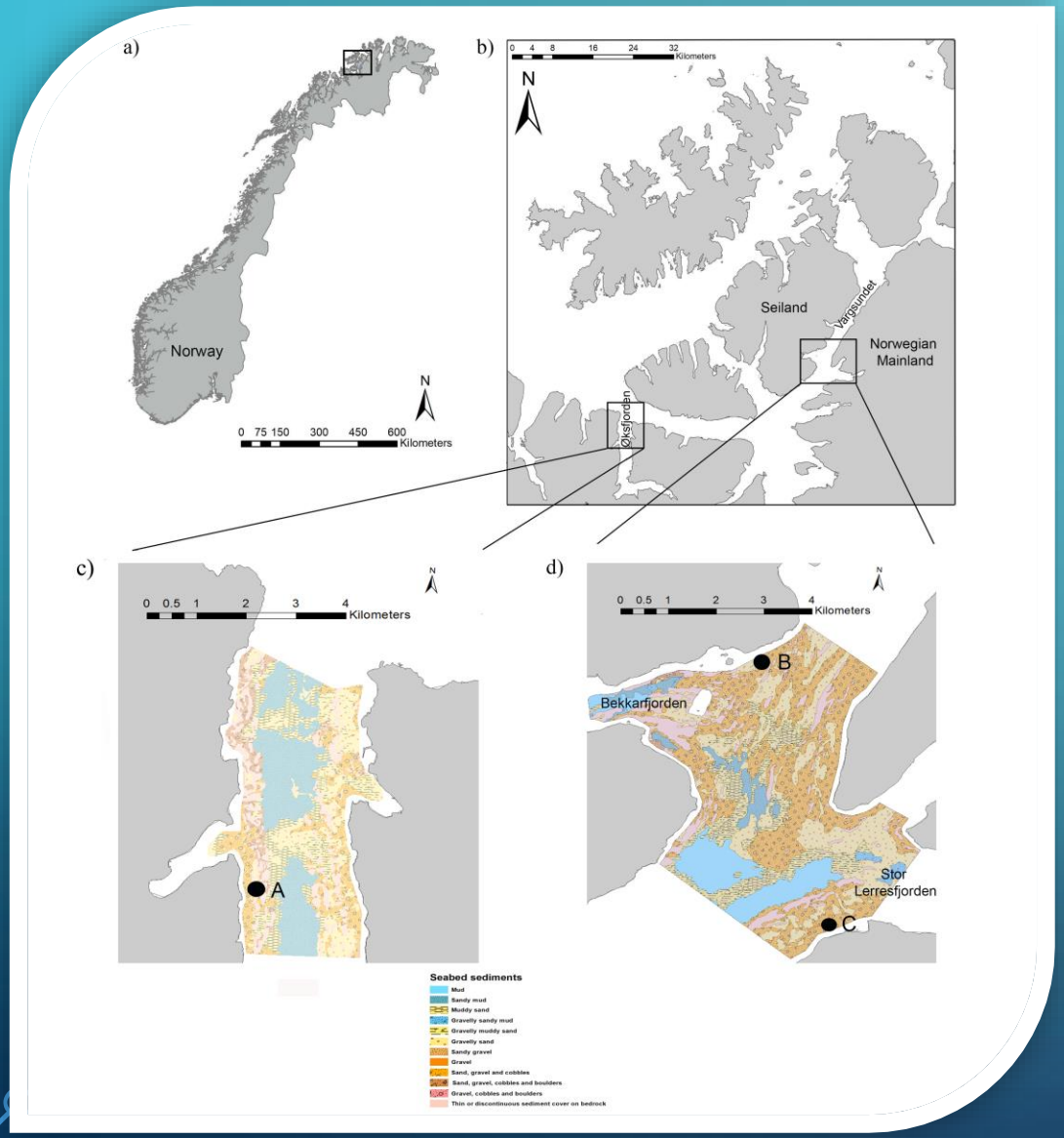
* Currently not possible to use hard and mixed bottom epifaunal communities as biological indicators in environmental monitoring as soft sediment communities.

3. Objective and Hypothesis

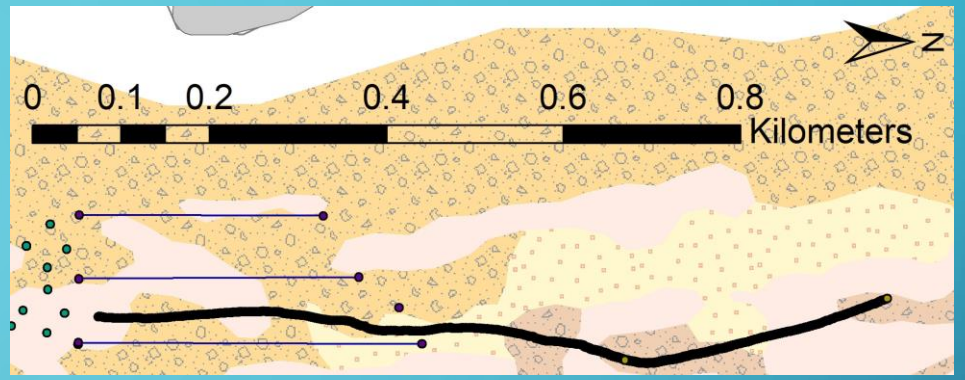
* Objective: Analyse the spatial distribution, density and structure of epifaunal communities in relation to their proximity to farms and the associated organic enrichment gradient.

* Hypothesis: Increased bio-deposition from fish farming will alter the distribution and composition of epifauna communities in hard-and-mixed bottom habitats.

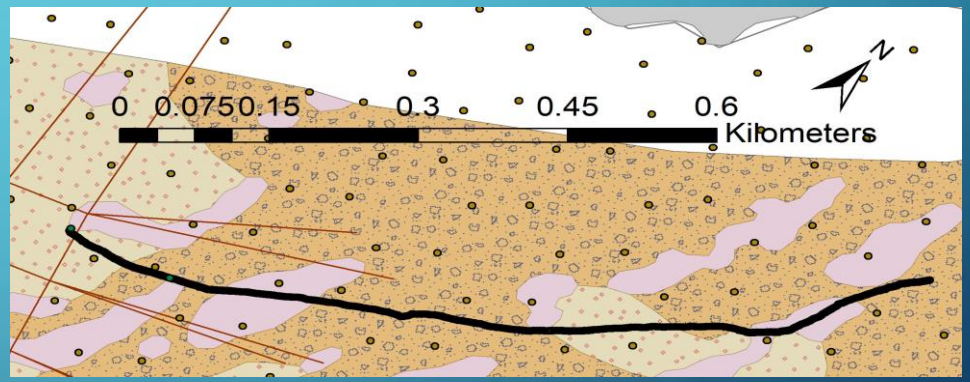
4. Methods



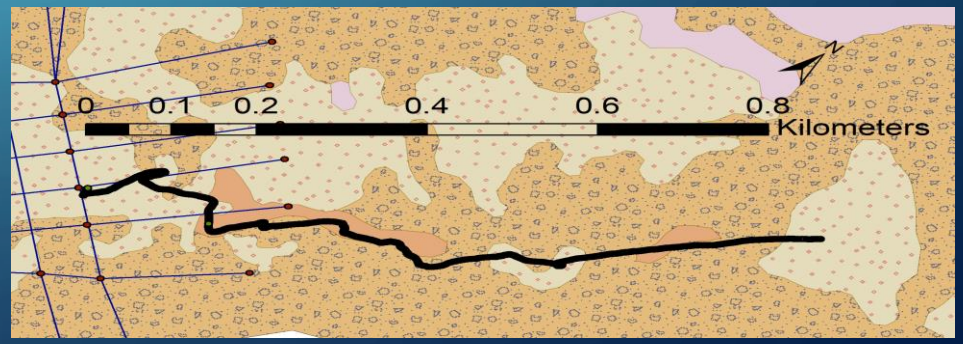
Farm A



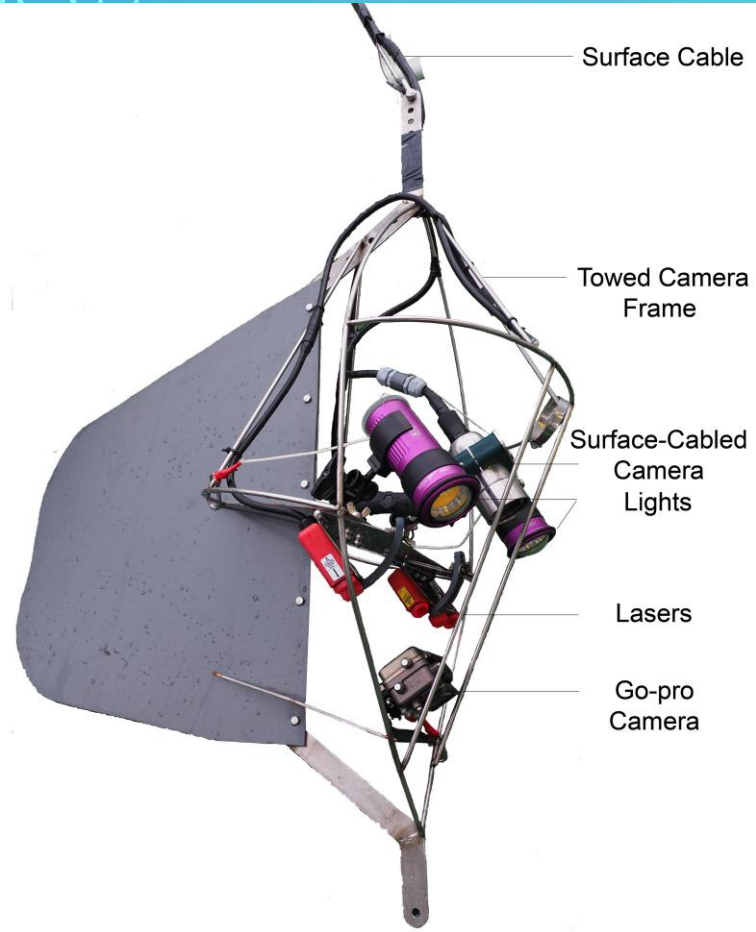
Farm B

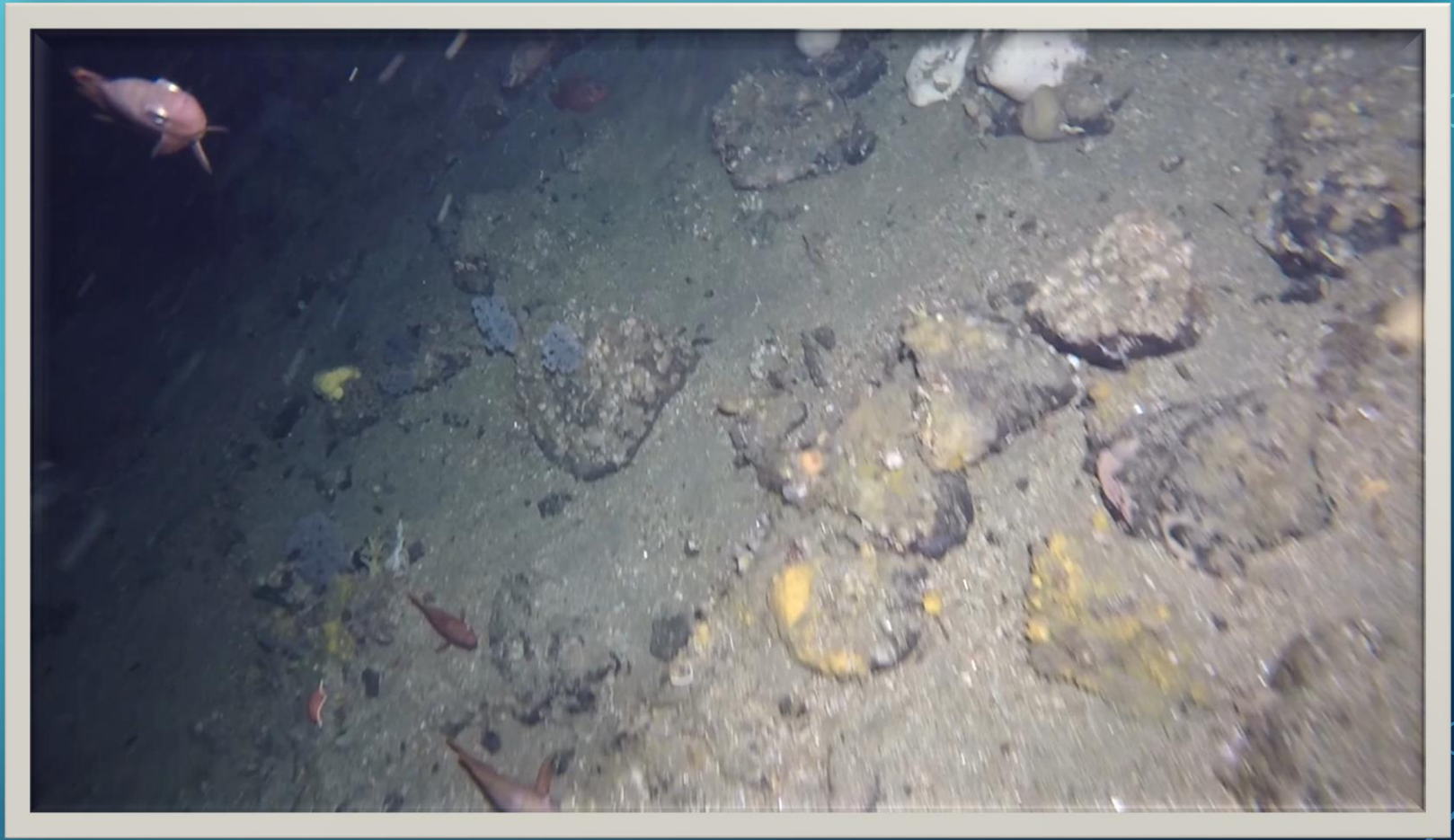


Farm C



5. Methods

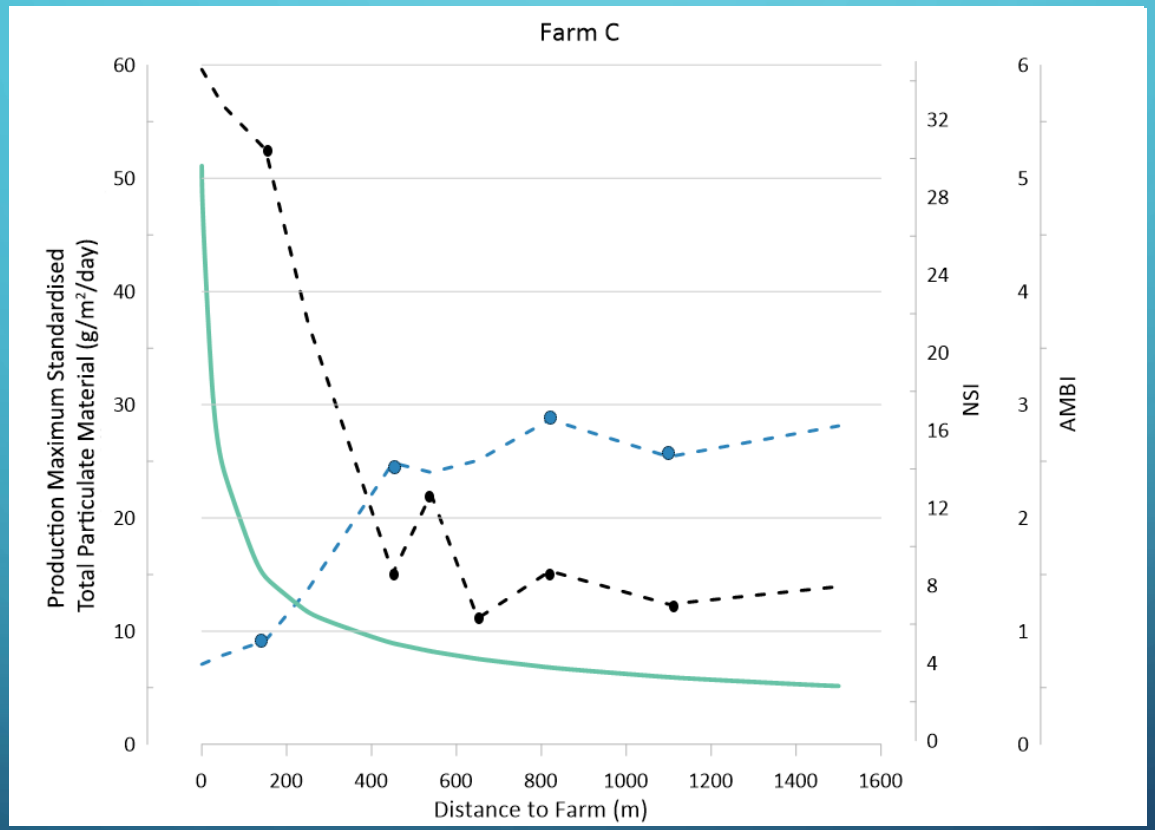

Surface Cable
Towed Camera Frame
Surface-Cabled Camera Lights
Lasers
Go-pro Camera



6. Results

Distance to Farm

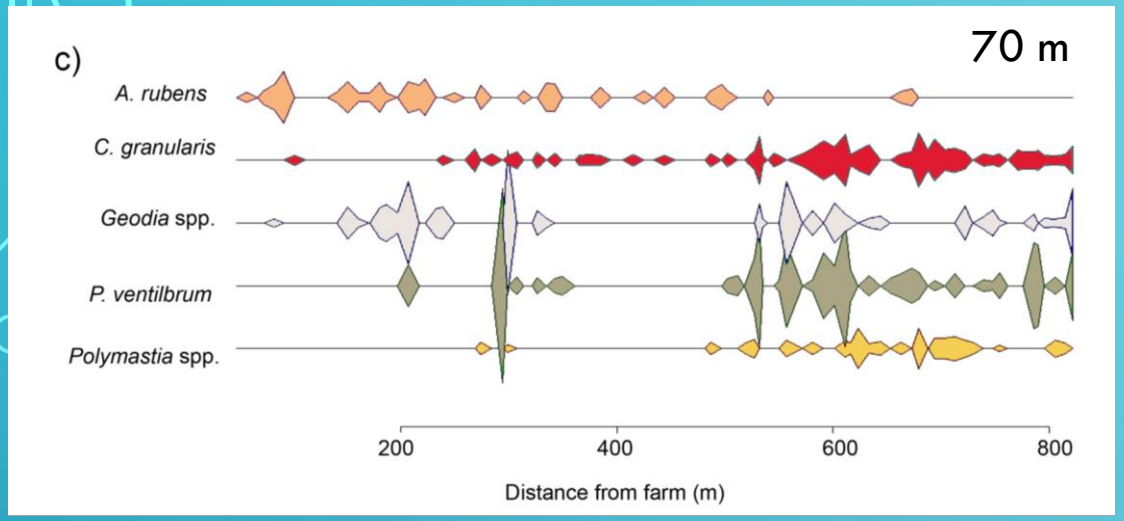
Farm total particulate material, the Norwegian Sensitivity Index (NSI) and A Marine Biotic Index (AMBI)

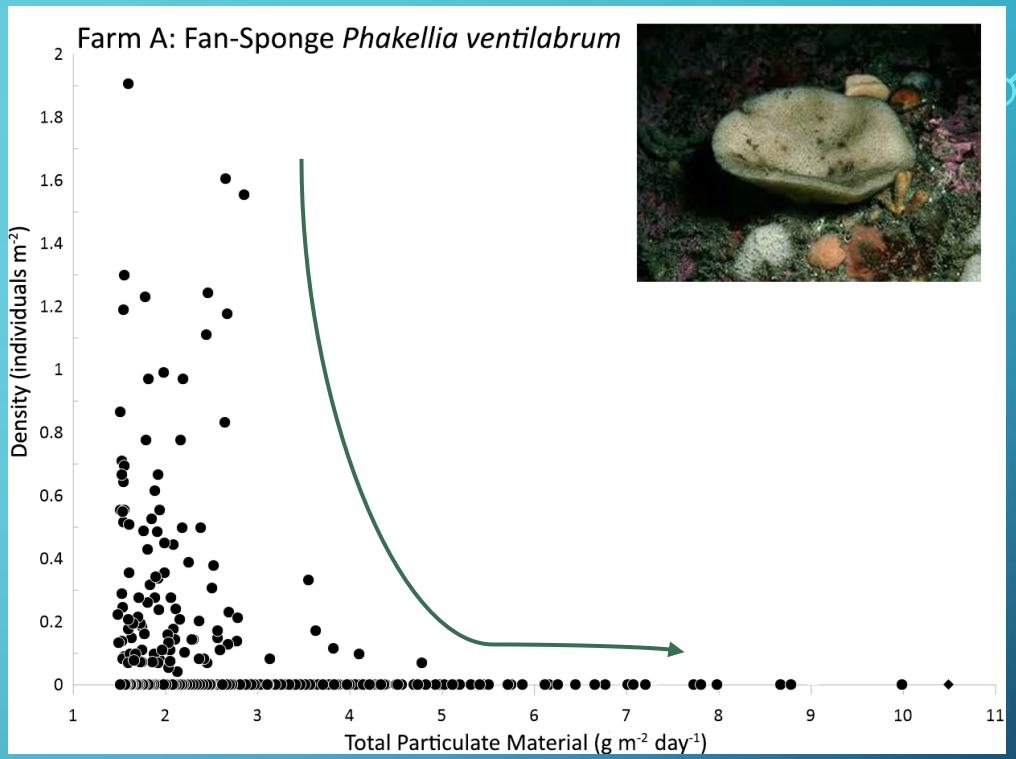


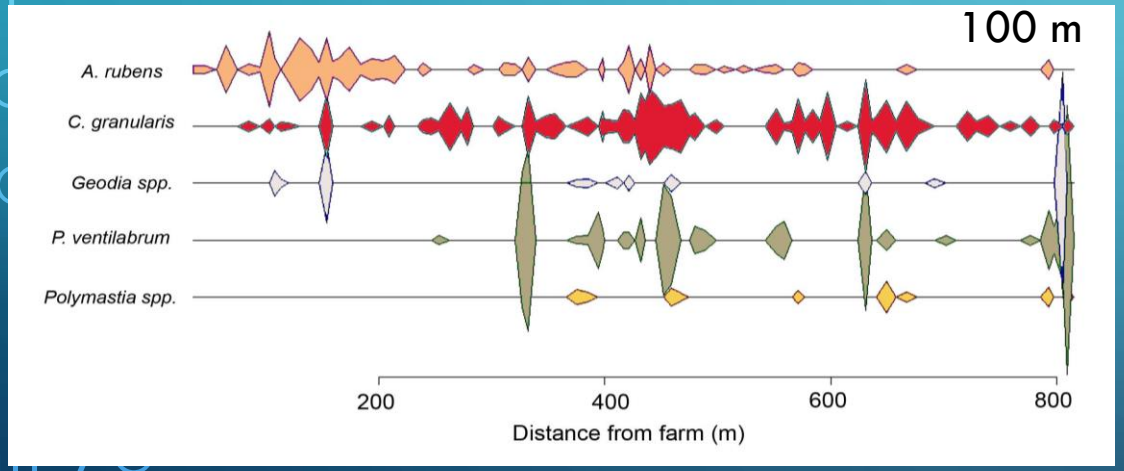
Borja, A., Franco, J., Perez, V., 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. Marine Pollution Bulletin 40, 1100-1114.

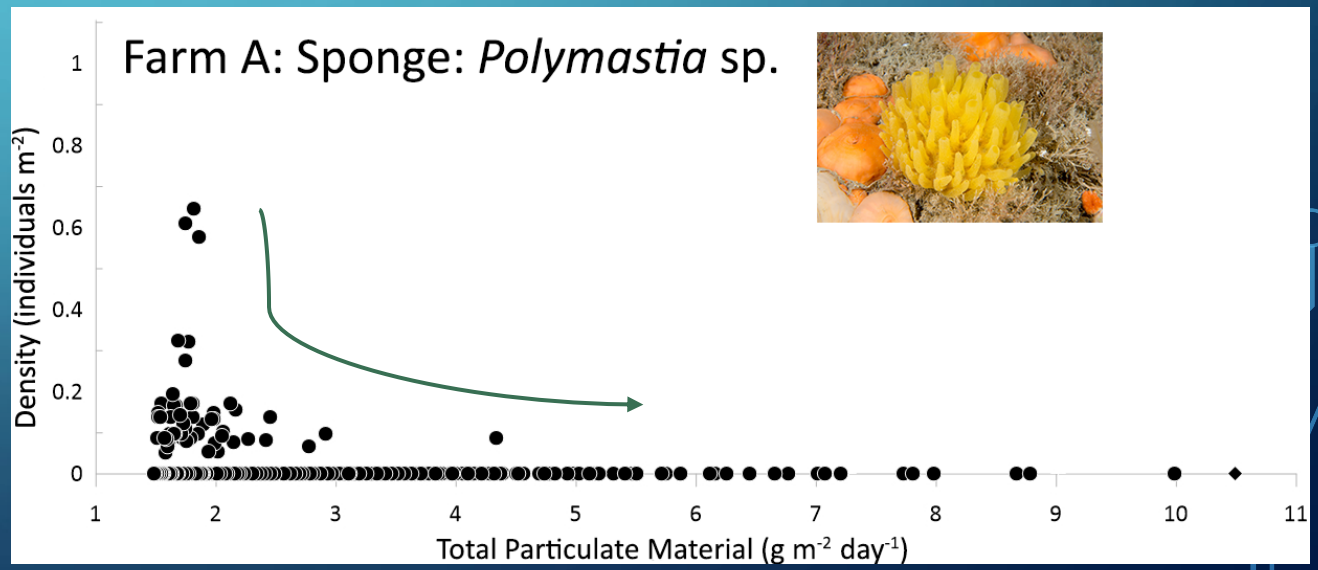
Rygg, B., Norling, K., 2013. Norwegian Sensitivity Index (NSI) for marine macroinvertebrates, and an update of Indicator Species Index (ISI). Norsk institutt for vannforskning.

7. Results - Farm A

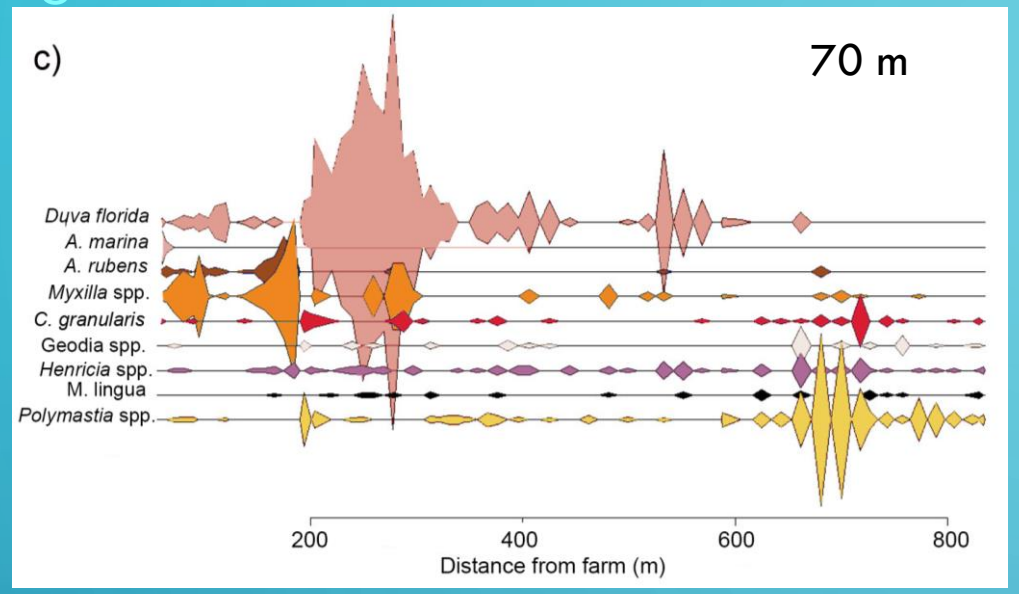


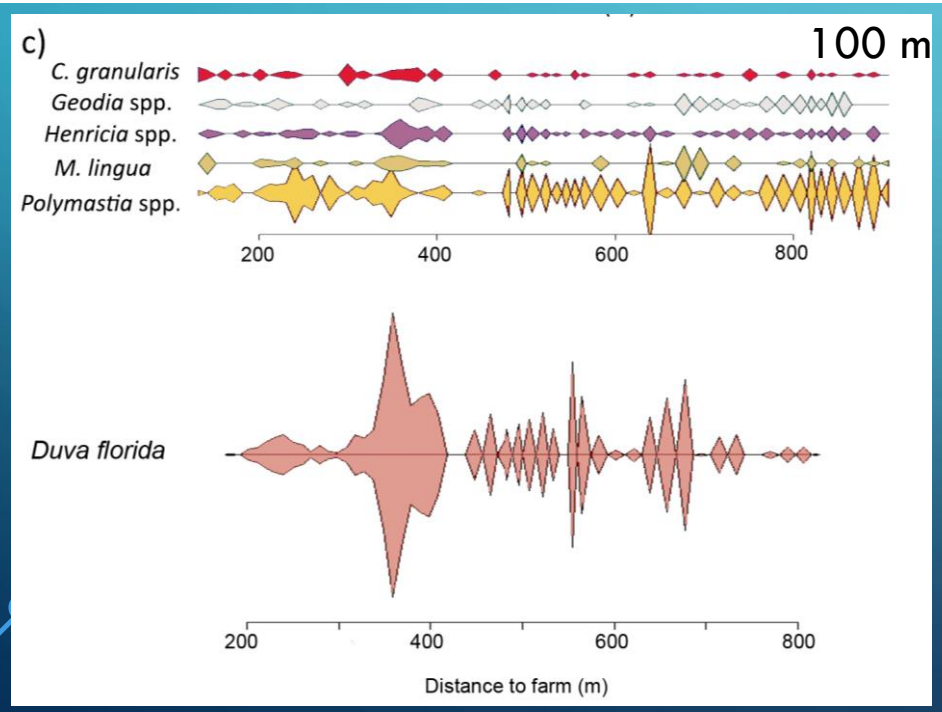


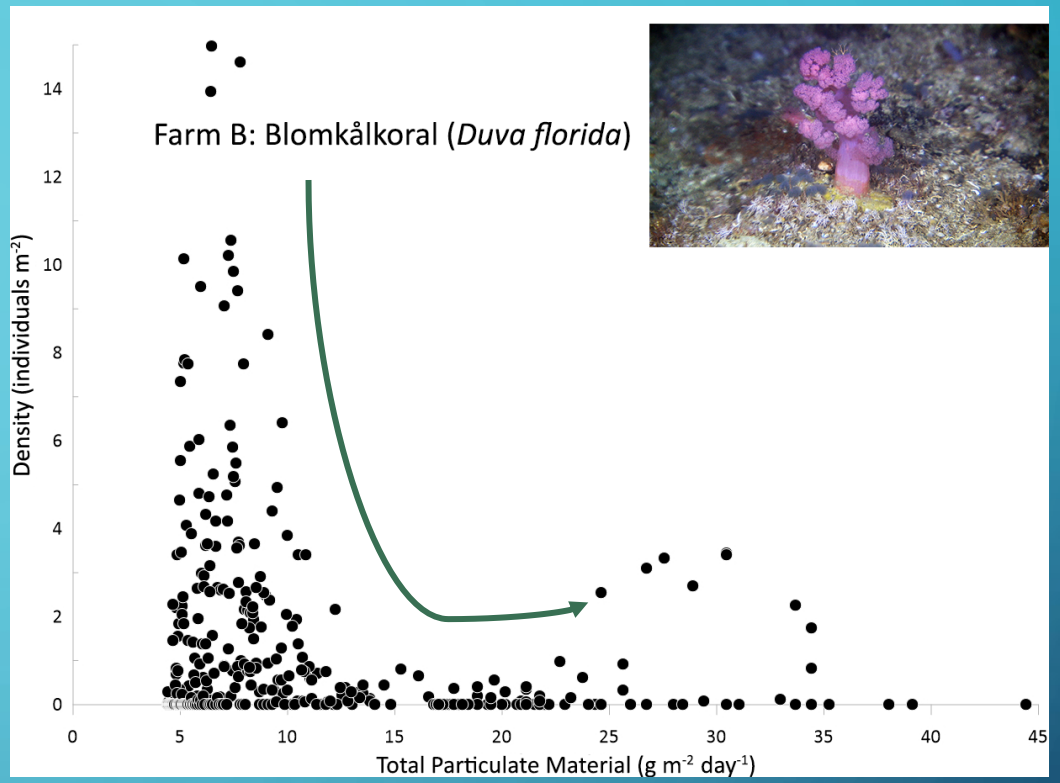


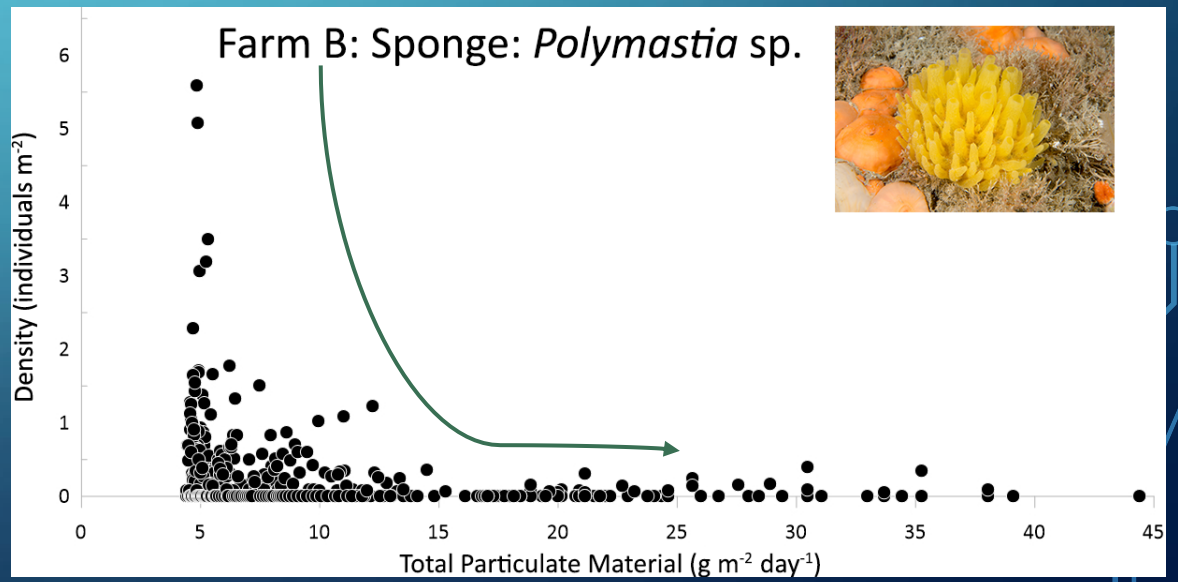


8. Results - Farm B

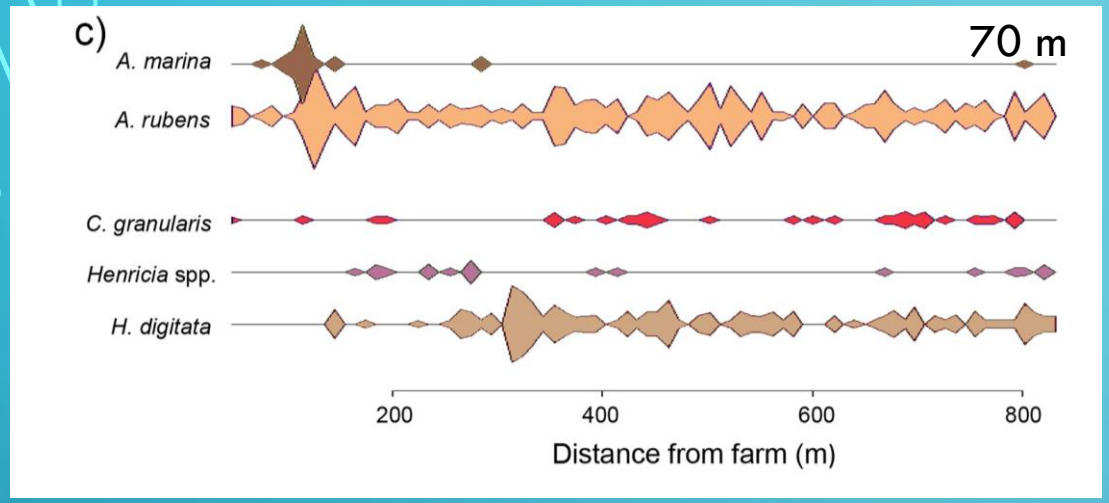


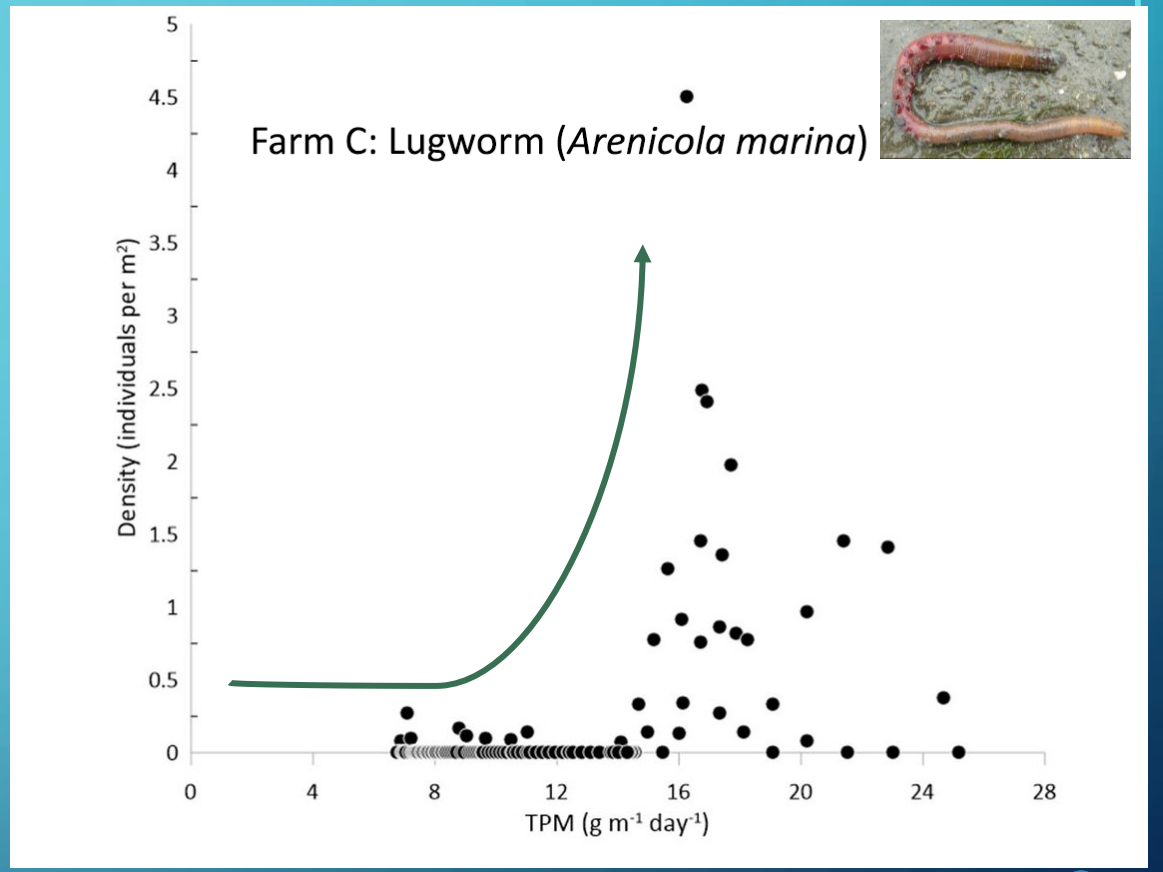


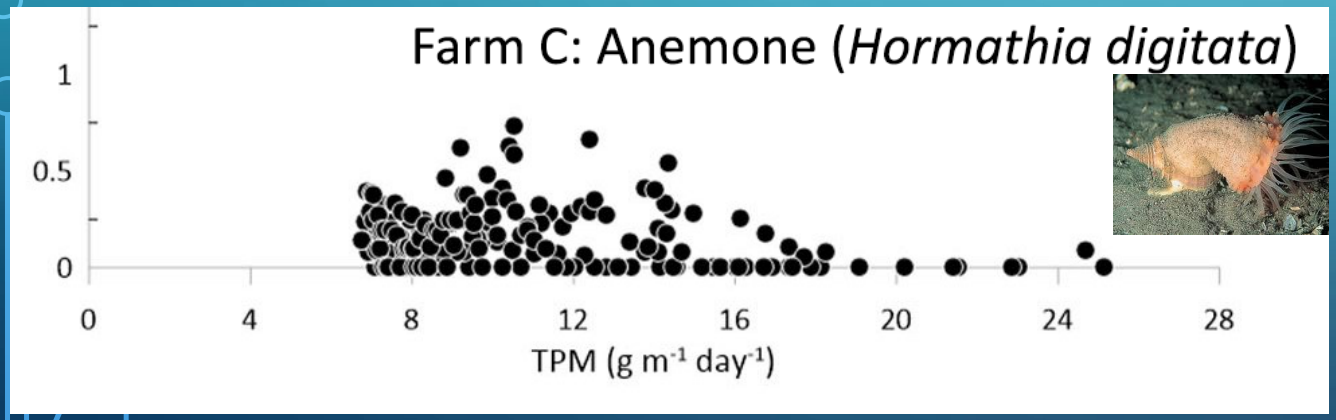




9. Results - Farm C

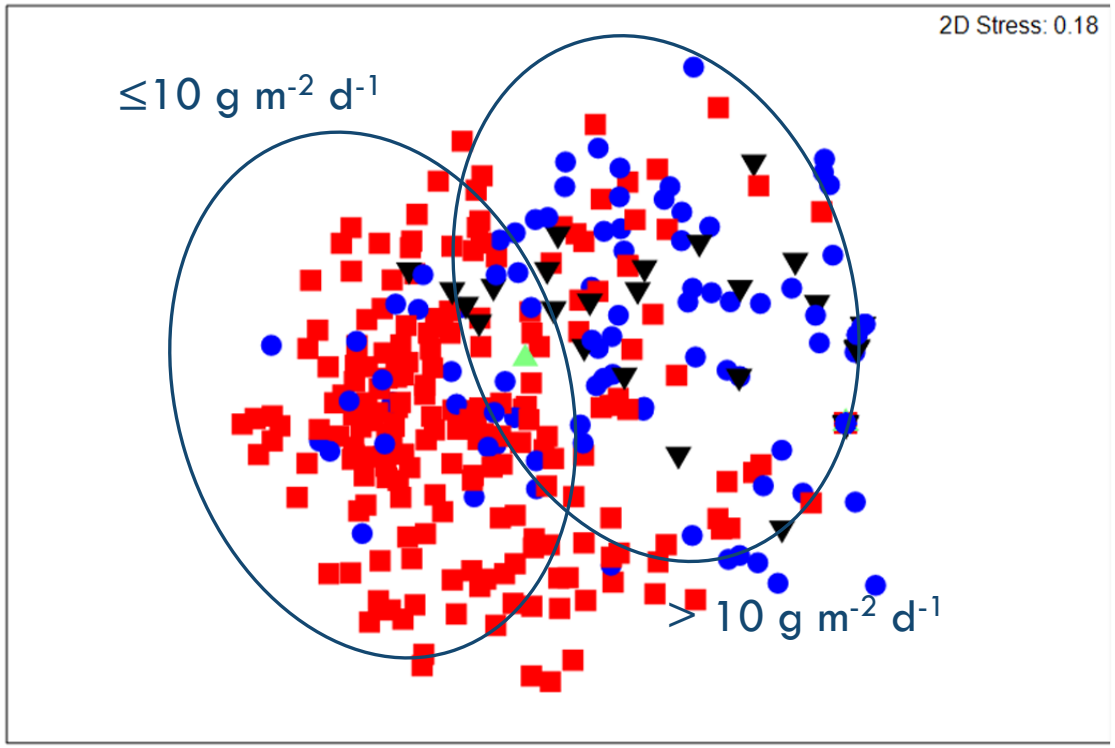






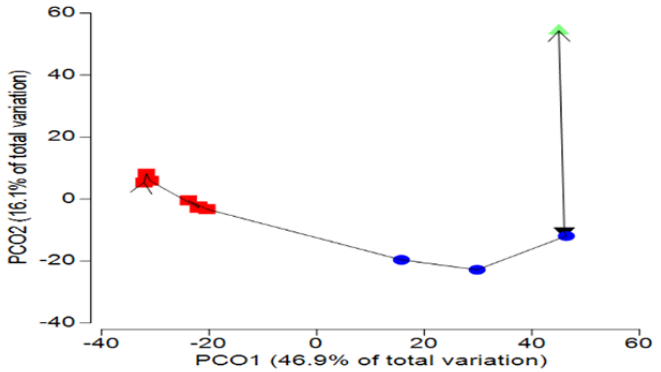
Extra Results - Farm B

b) Farm B

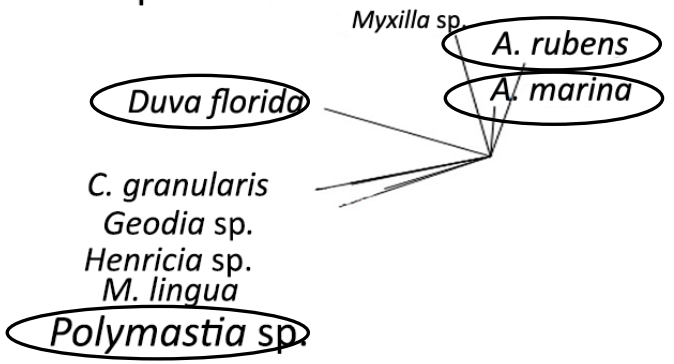


TPM (g m^{-2} d^{-1})
- 0 - 10
- 10 - 20
- 20 - 30
- > 30

Infauna



Epifauna



10. RESULTS SUMMARY

- Changes in epifaunal community composition along the enrichment gradient.
- Taxa were either enhanced, depressed or unaffected by the processes of sedimentation and organic enrichment.
- Enhanced taxa use organic waste as an attractive food source.
- Identified epifaunal taxa that are vulnerable/ sensitive to farm enrichment.

11. Take Home Messages – Implications for monitoring.

* Indentifying sensitivities in some key taxa - useful for baseline surveys.

* Cost effective methods to quantitatively assess epifauna response.

* General trends in changes in epifaunal community composition along an enrichment gradient are consistent with macrofauna.

* BUT developing a numerical index would require more information on a greater range of taxa.

* Visual assessments useful in combination with other methods to assess environmental impacts (eDNA).

Tusen takk for oppmerksomhet

katherine.mary.dunlop@hi.no

Research group
Benthic resources and processes