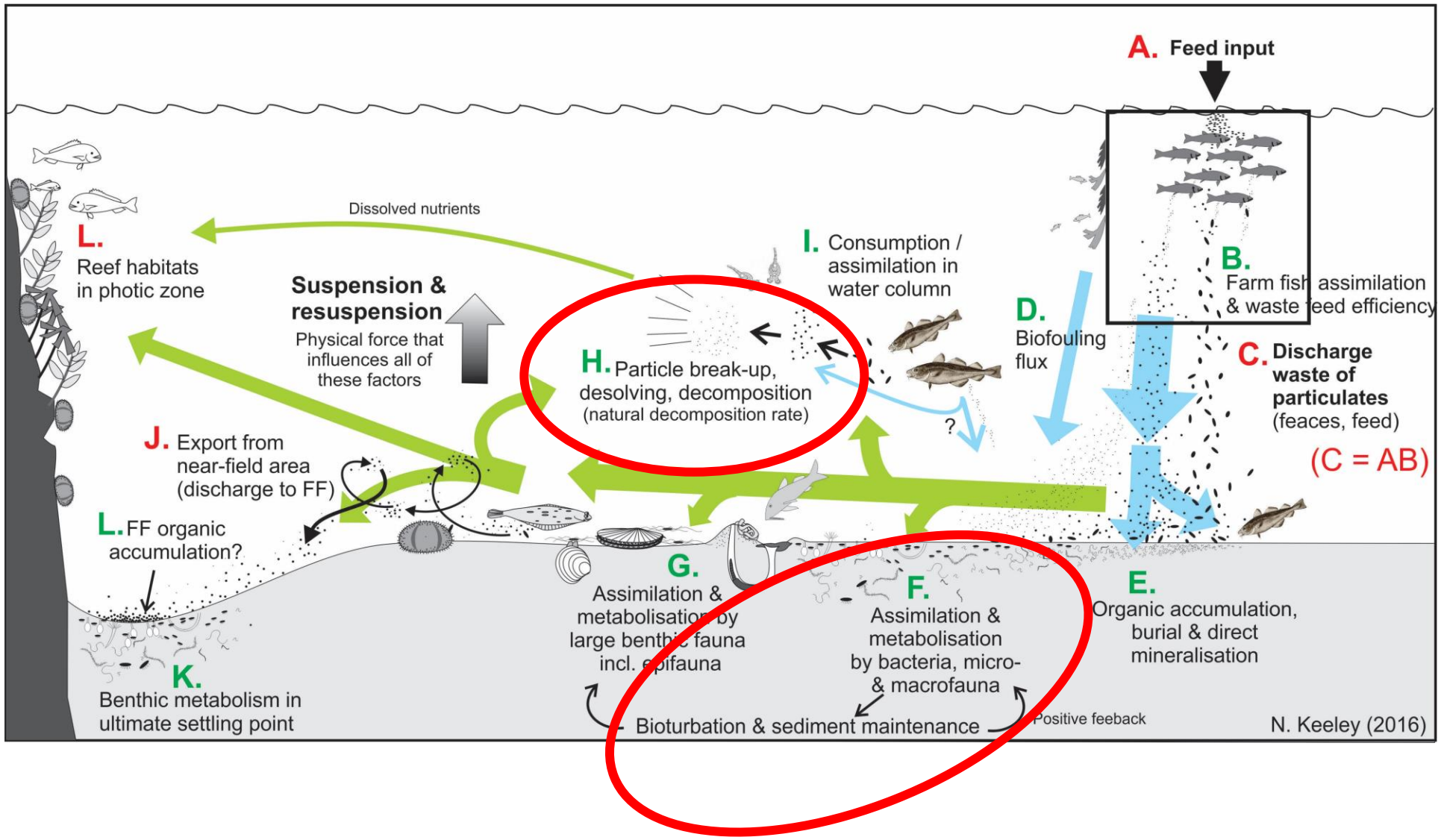
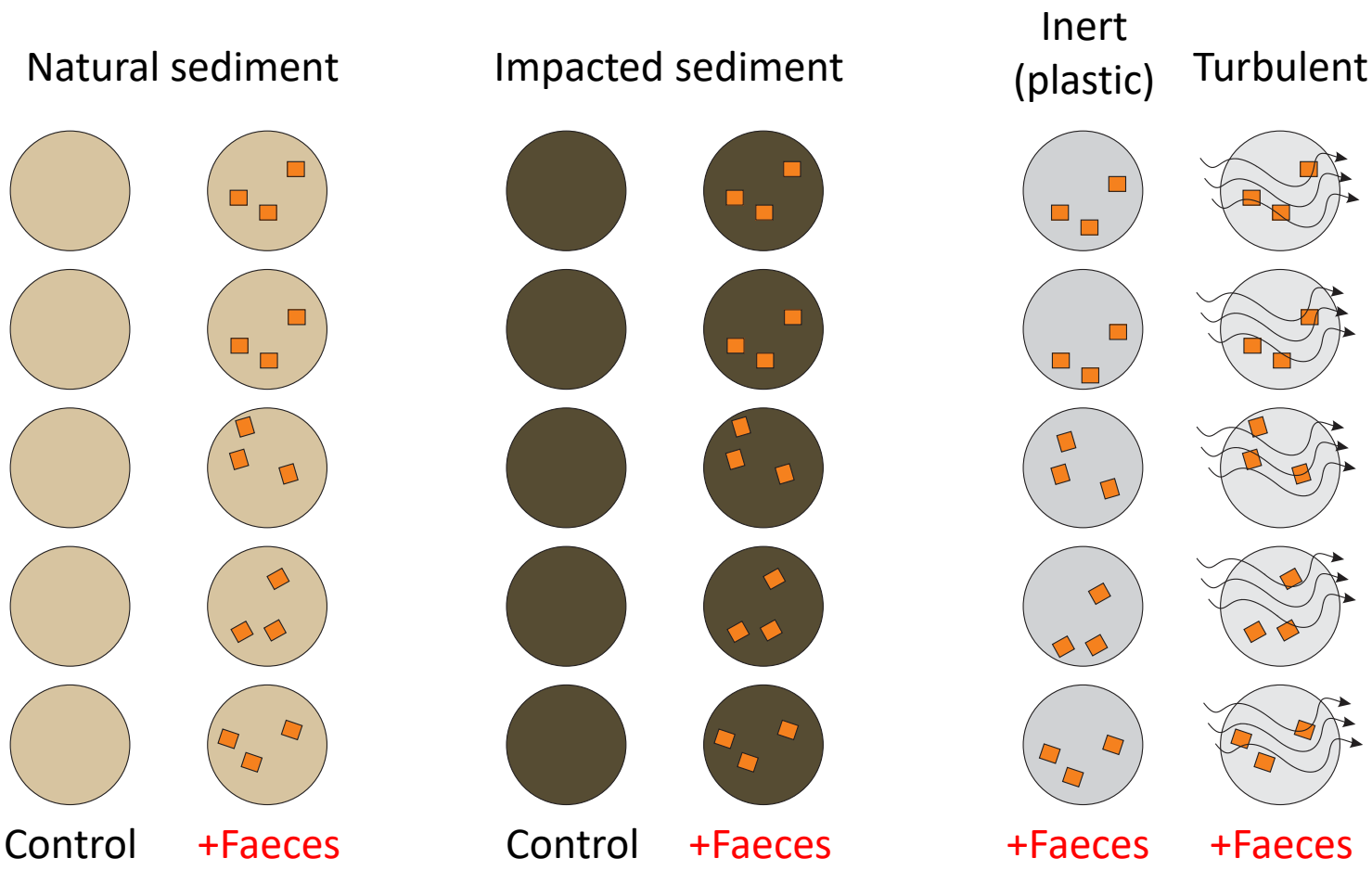
Salmon feces decay & microbial pathway study

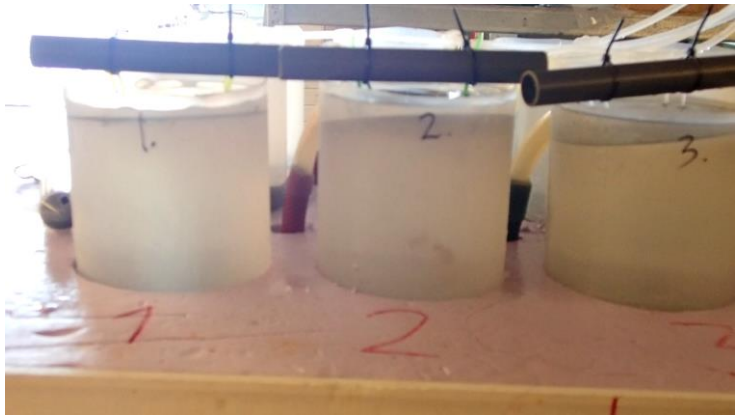
Akvaplan niva

Research group
Benthic resources and processes


A. Feed input
B. Farm fish assimilation & waste feed efficiency
C. Discharge waste of particulates (feaces, feed)
(C = AB)
D. Biofouling flux
E. Organic accumulation, burial & direct mineralisation
F. Assimilation & metabolisation by bacteria, micro- & macrofauna
G. Assimilation & metabolisation by large benthic fauna incl. epifauna
H. Particle break-up, desolving, decomposition (natural decomposition rate)
I. Consumption / assimilation in water column
J. Export from near-field area (discharge to FF)
K. Benthic metabolism in ultimate settling point
L. Reef habitats in photic zone
L. FF organic accumulation?
Dissolved nutrients
Suspension & resuspension
Physical force that influences all of these factors
?
Bioturbation & sediment maintenance
Positive feeback
N. Keeley (2016)

Experimental Set-Up



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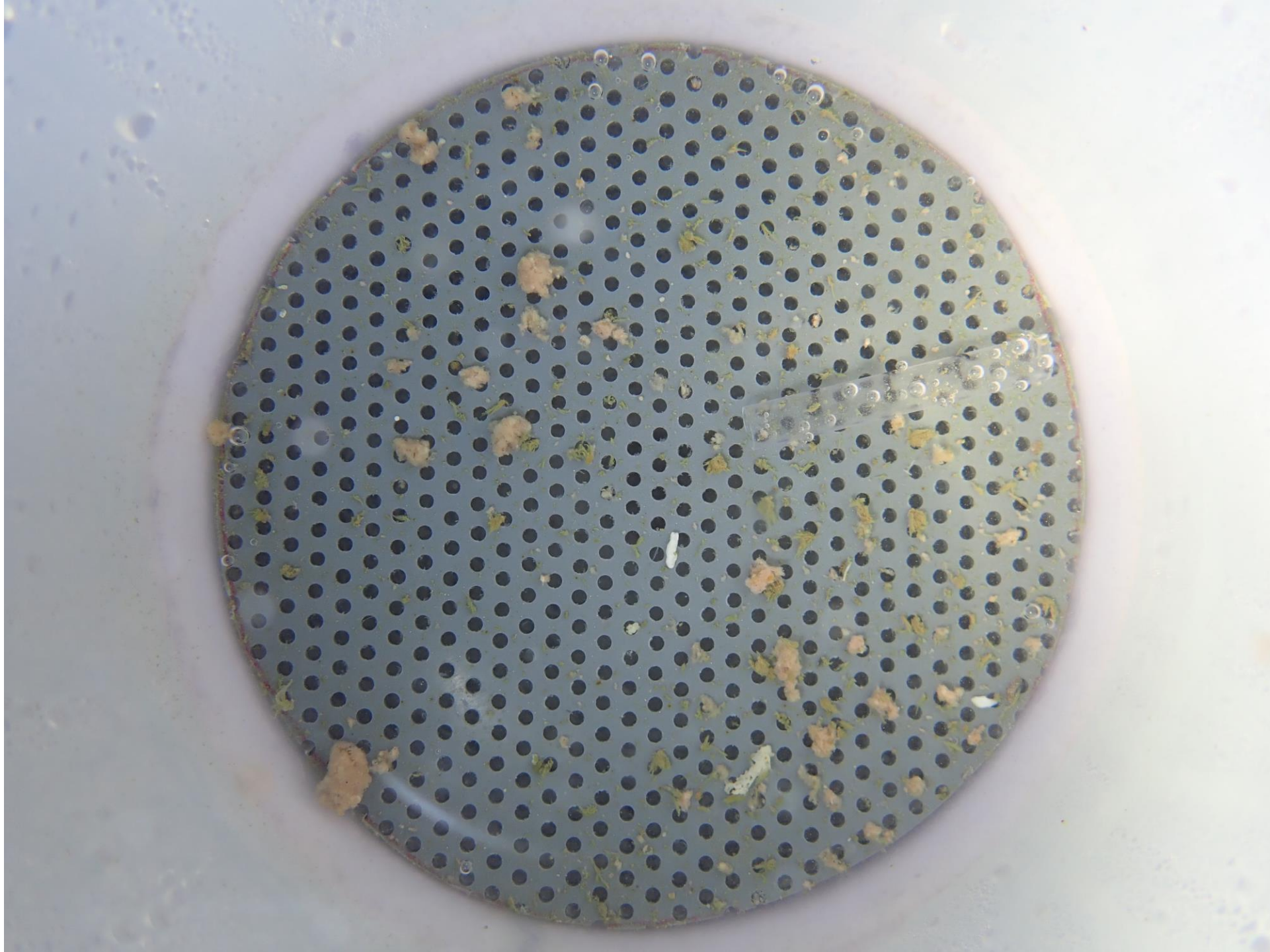
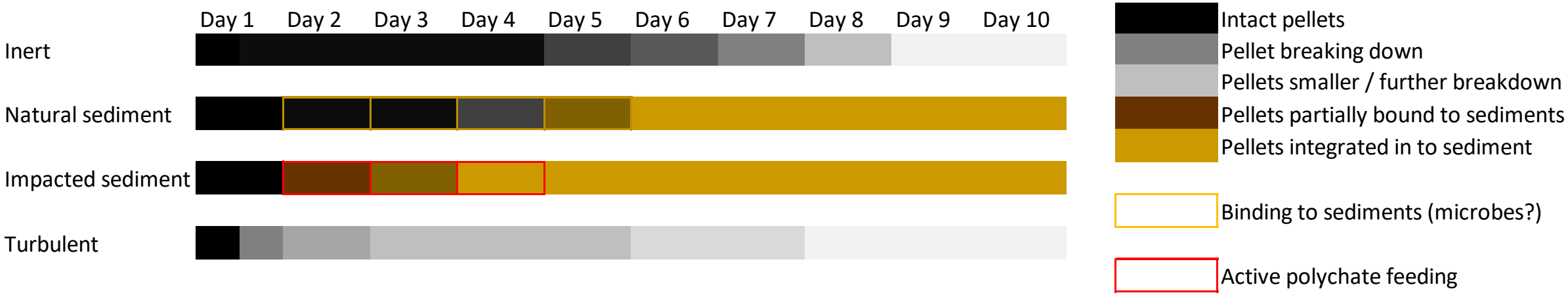
Excrement + Impacted Sediment

Excrement + Unimpacted Sediment



Preliminary results

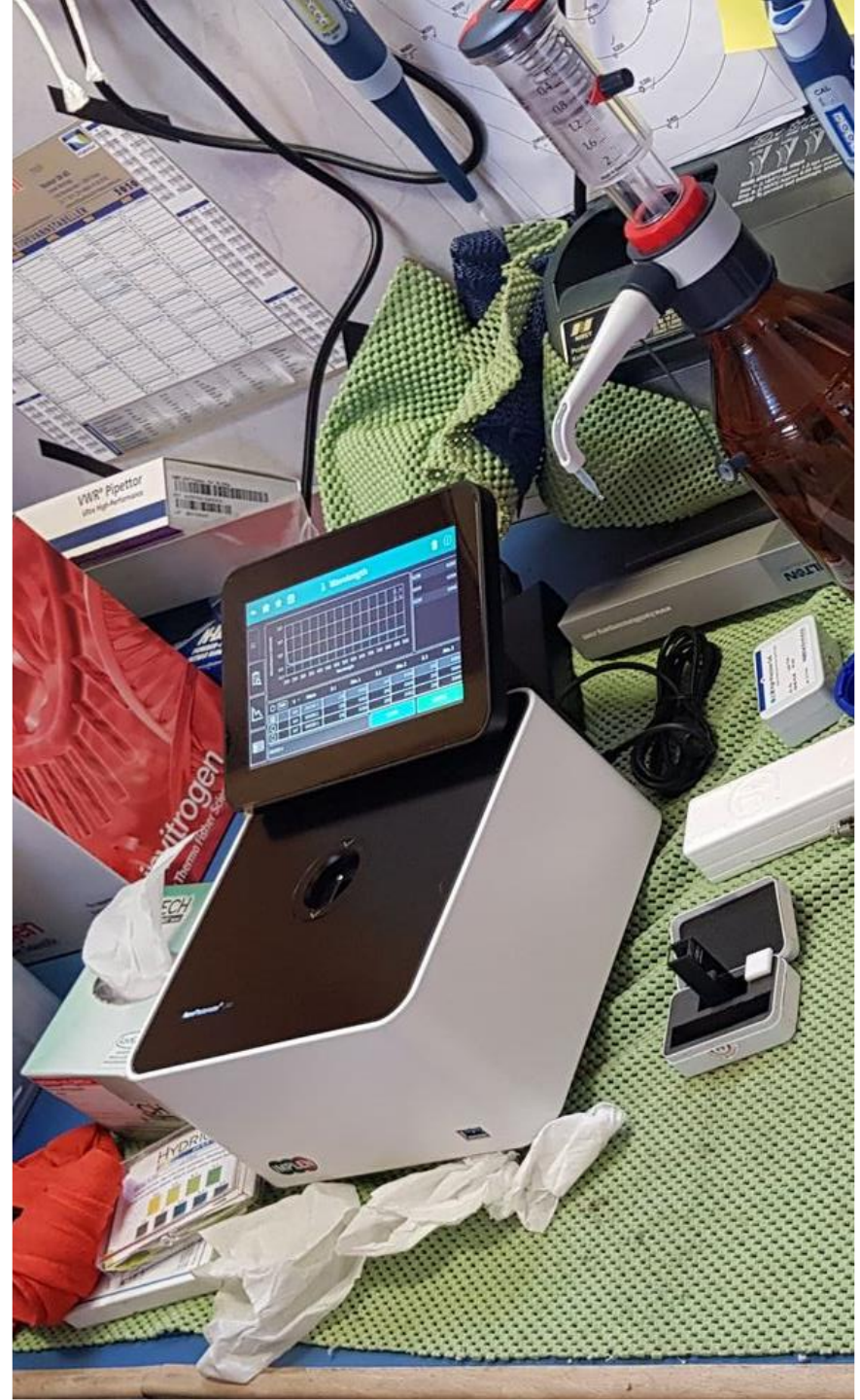


Inert (control): Slow gradual breakdown – easily resuspended.

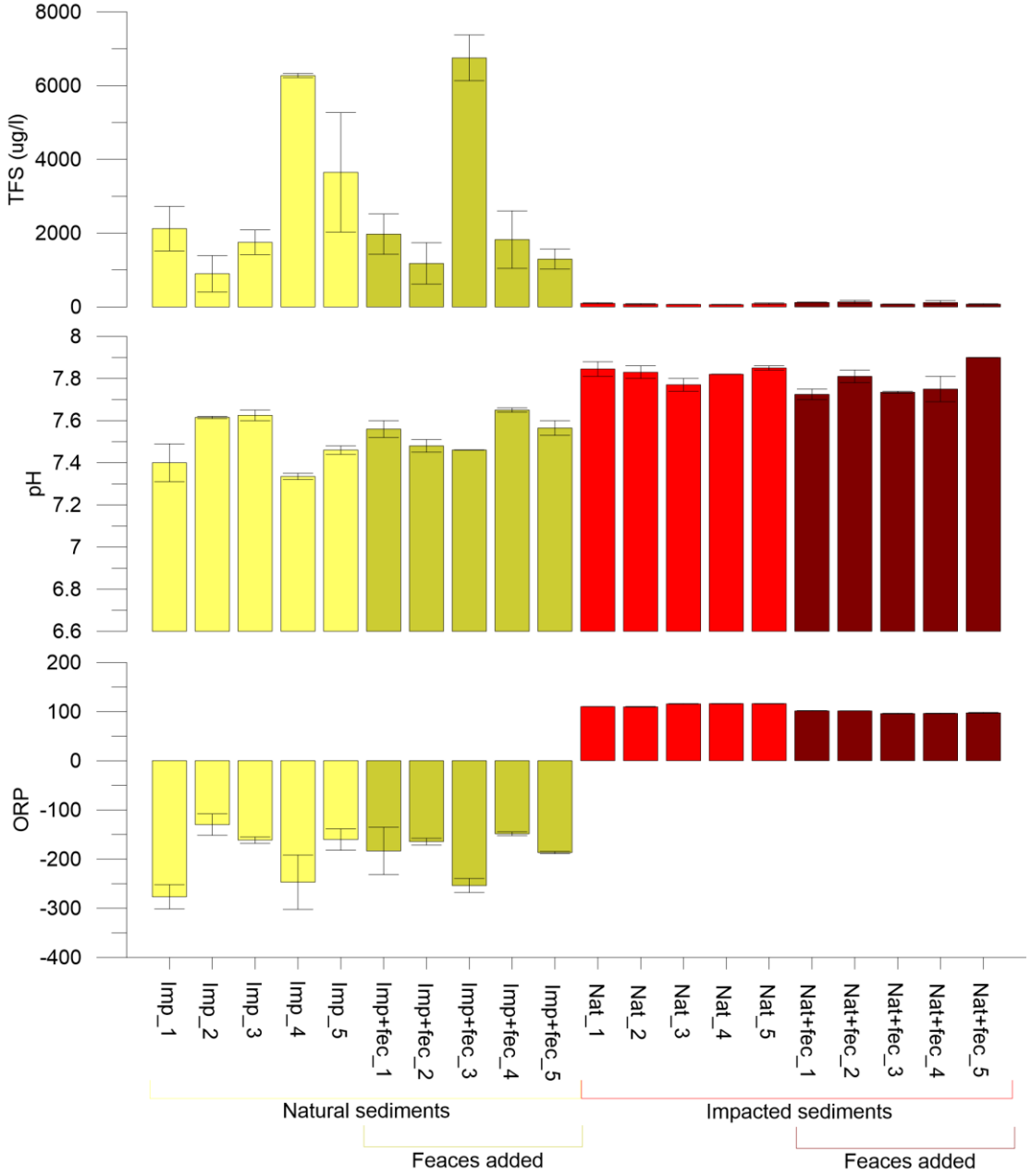
Natural sed: Slow gradual breakdown for 4 days with moderate binding to sediments. After 5 days, particles notably bound and integrated into sediment.

Impacted sed: Particles falling apart after 24 hrs, polycheate worms evident actively feeding around and through pellets. Pellets disintegrated in small flakes by day 3.

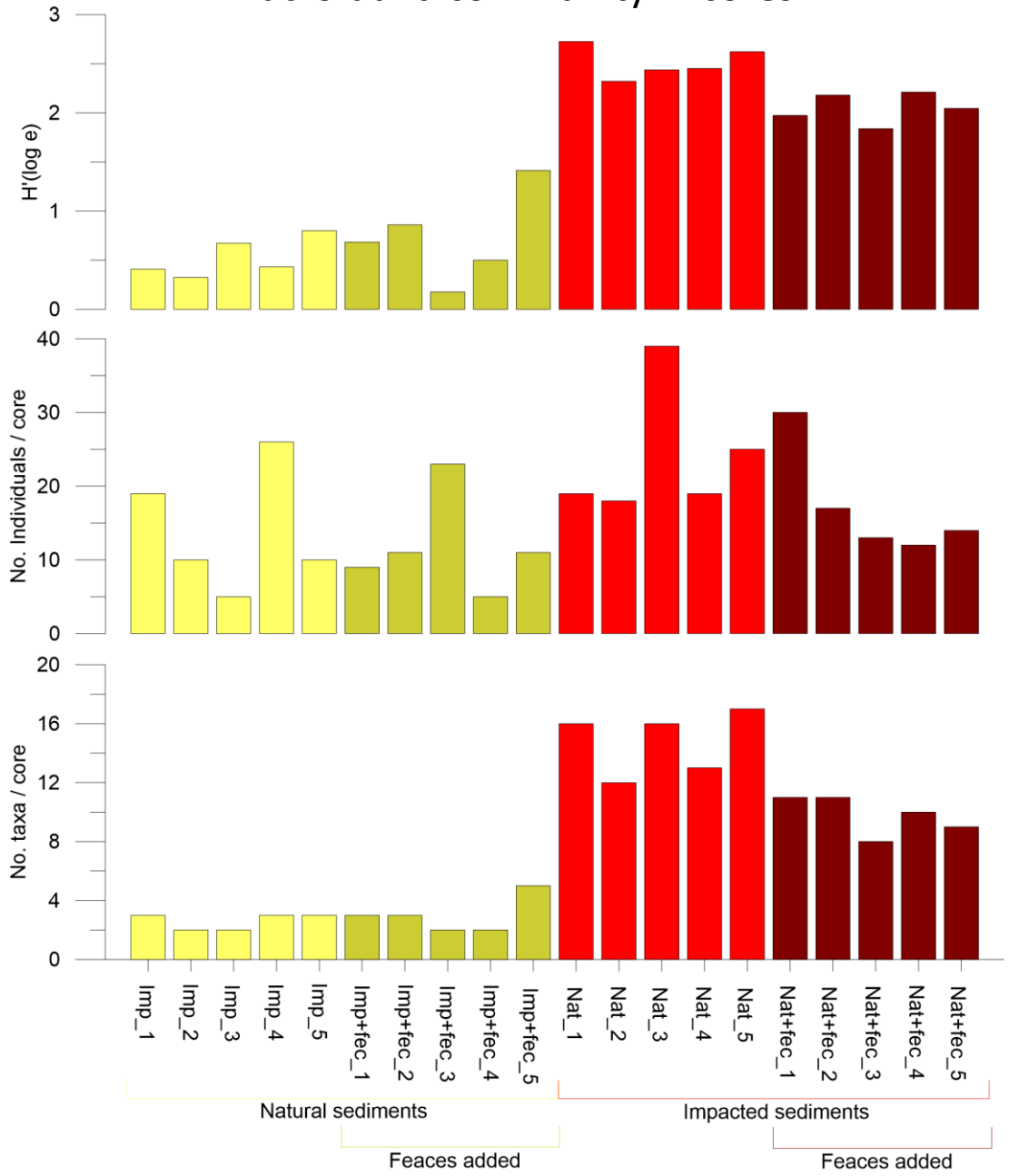
Turbulent: Big particles rapidly break up into smaller ones (few hours) but these persist for several days.



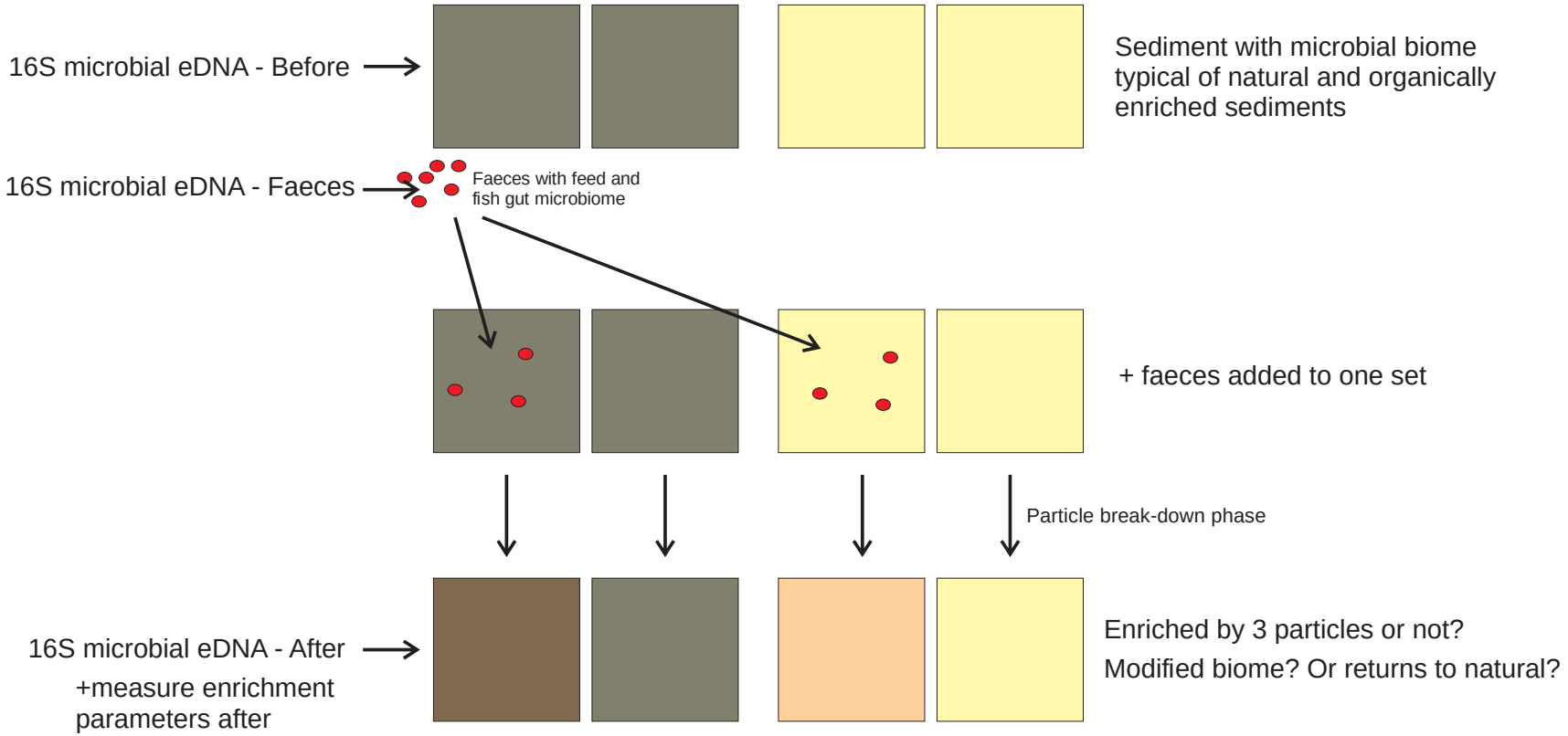
Sediment geochemistry or cores



Macrofauna community in cores



Microbial pathway experiment



Questions:

- Are the changes we have been observing in sediments due to organic enrichment processes or the inoculation pressure from fish faeces? i.e., Can we see the same microbes in the sediment as were in the feed?

Bigger questions for the future then might be:

- If so, what does this mean? How much does it require to induce a change? How permanent is the change?

Preliminary findings

1. **Whole faeces (upon which most models are based) appear scarce in reality…**
2. **Particles breakdown much more rapidly on impacted sediments than natural sediments. The role of opportunistic polychaetes is significant in this.**
3. **Different microbes also likely to have played a role?**
4. **Natural particle breakdown is gradual, into smaller and smaller particles over days.**
5. **In turbulent waters (suspention), particles turn from whole faeces to small particles within hours – big implications for modelling.**
6. **Microbial inoculation versus enrichment processes? We wait and see…**

SustainAqua:

Sustainable aquaculture in the North – identifying thresholds, indicators and tools for future growth

Thank you!

Forskningsrådet

Akvaplan niva

HAVFORSKNINGS INSTITUTTET

NORGES GEOLOGISKE UNDERSØKELSE - NGU -

CAWTHRON INSTITUTE

Picture: Nigel Keeley