

DTU



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Hvordan kan biologisk vækst forlænge levetiden på maritime strukturer?

DTU Sustain

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Interaktionen mellem beton og det marine miljø

Klorid transport
ved
tilstedeværelsen
af ruer 2023-
2024

Feltprøver i
Rungsted
2021-2022

Living Port
Project,
Spanien 2022
- 2024

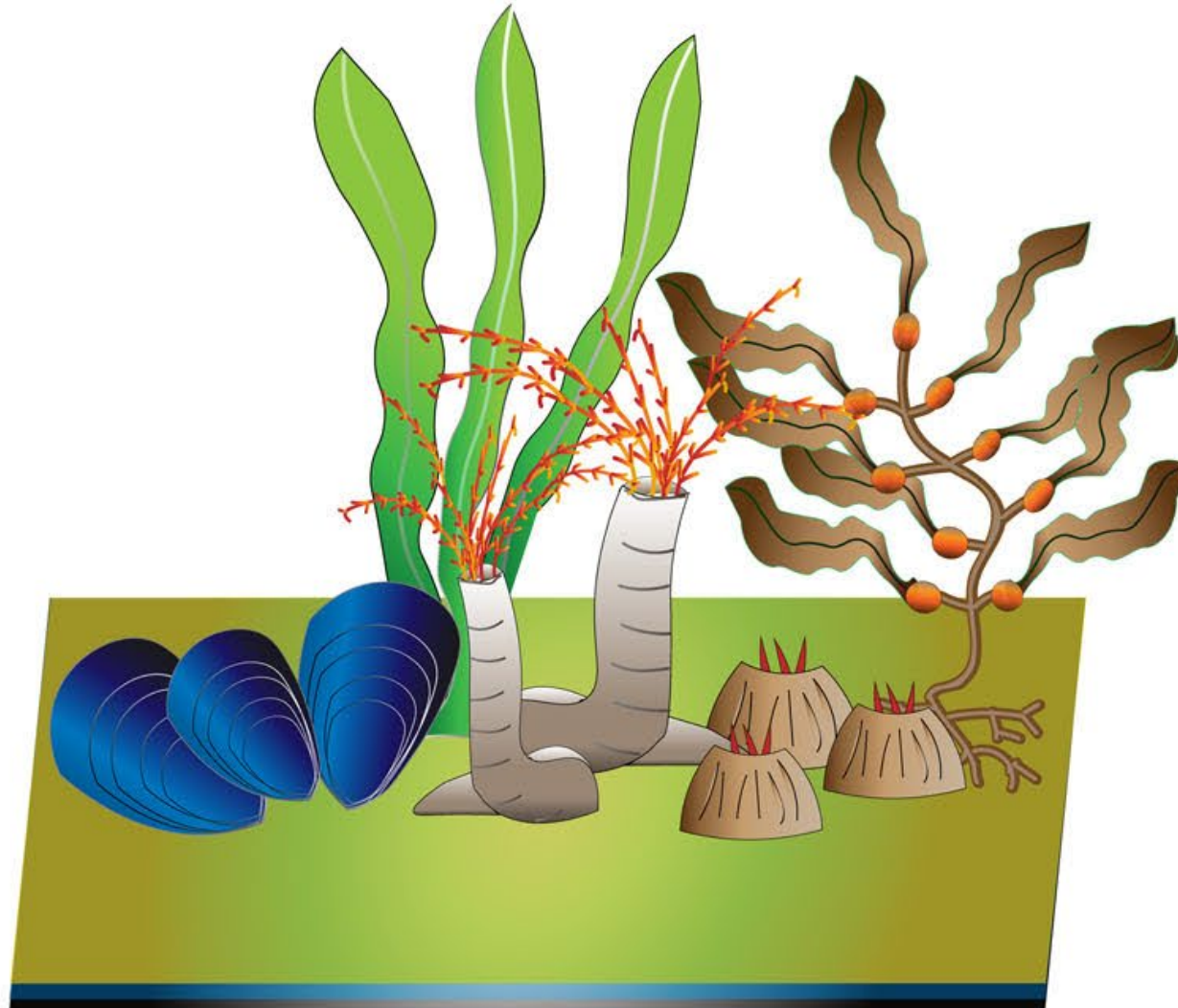
Superflex,
København
2022 - 2023

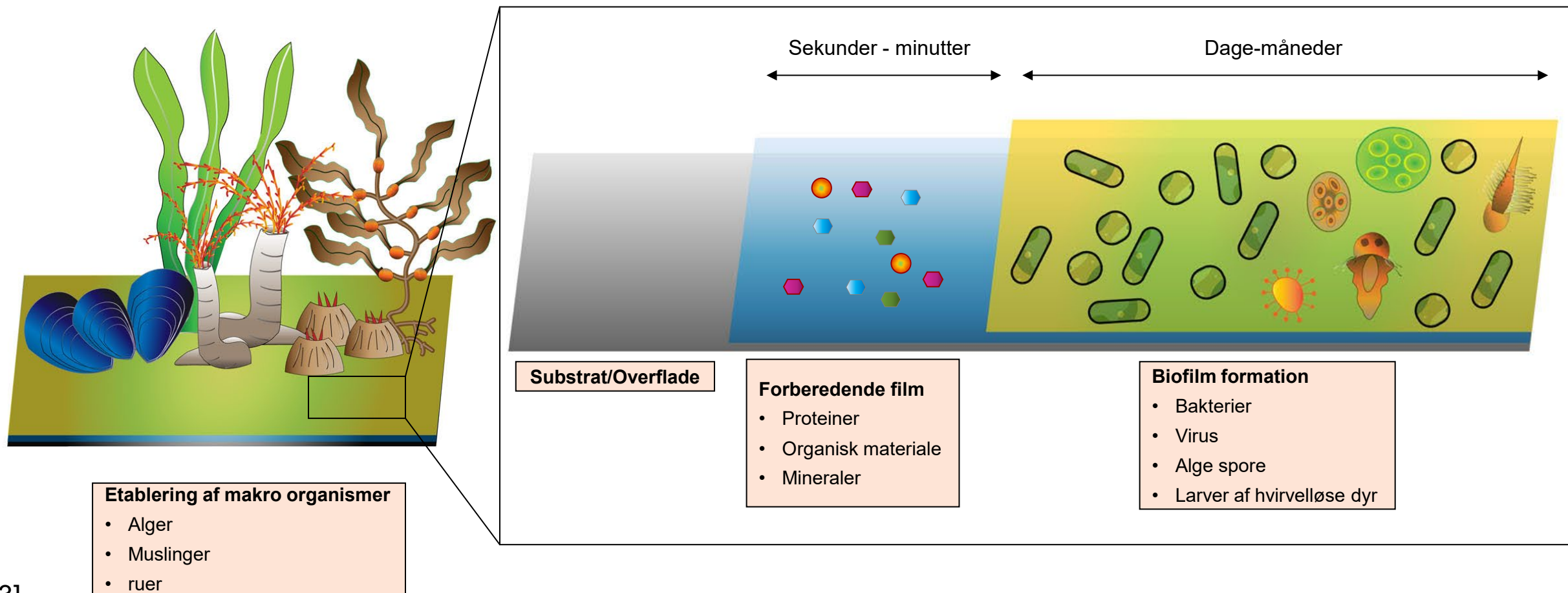
The background is a collage of four images. On the left is a close-up of a concrete structure heavily encrusted with barnacles. In the top center is an underwater view of a concrete pile covered in green and brown marine growth. In the bottom center is another underwater view of a concrete pile with similar growth. On the right is a vertical concrete structure with peeling white paint, set against a blue sky and sea.

Hvordan biologisk bevoksning har en positiv indflydelse på betonens holdbarhed i det marine miljø?

[1]

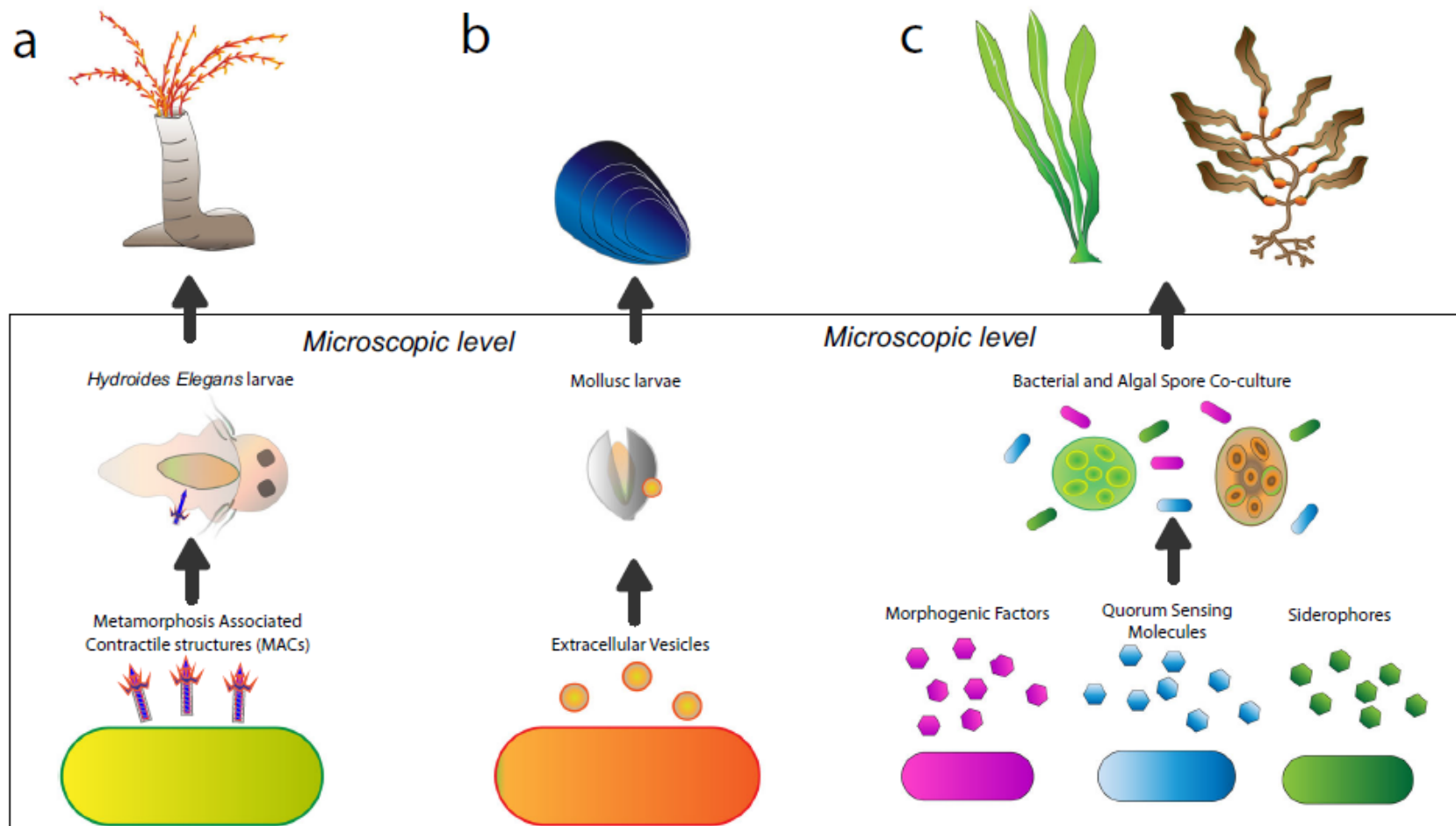
[2]



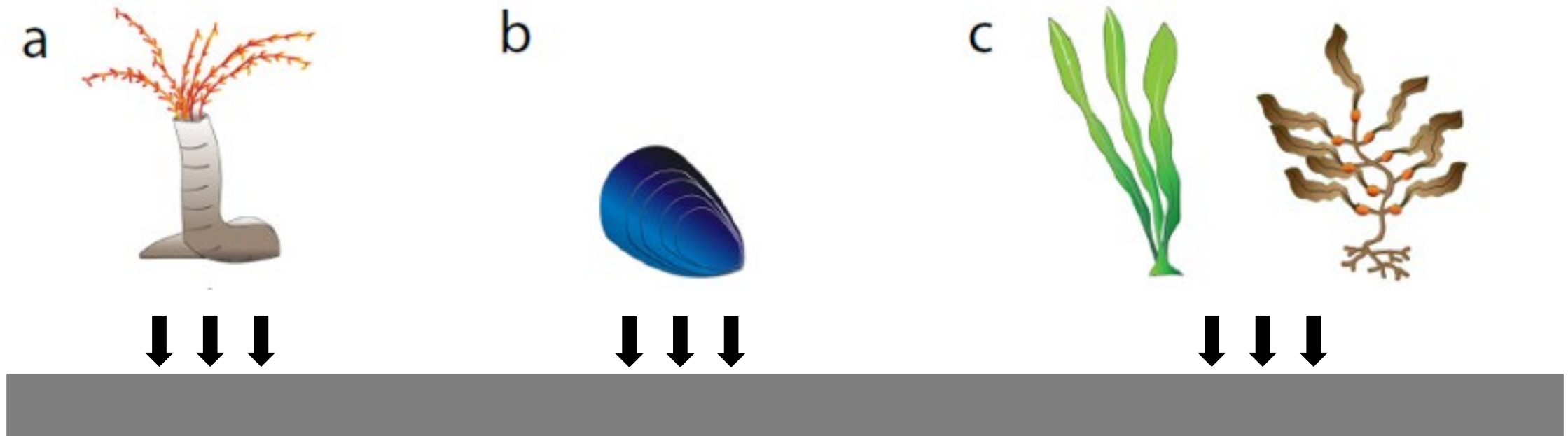


Makroskopisk

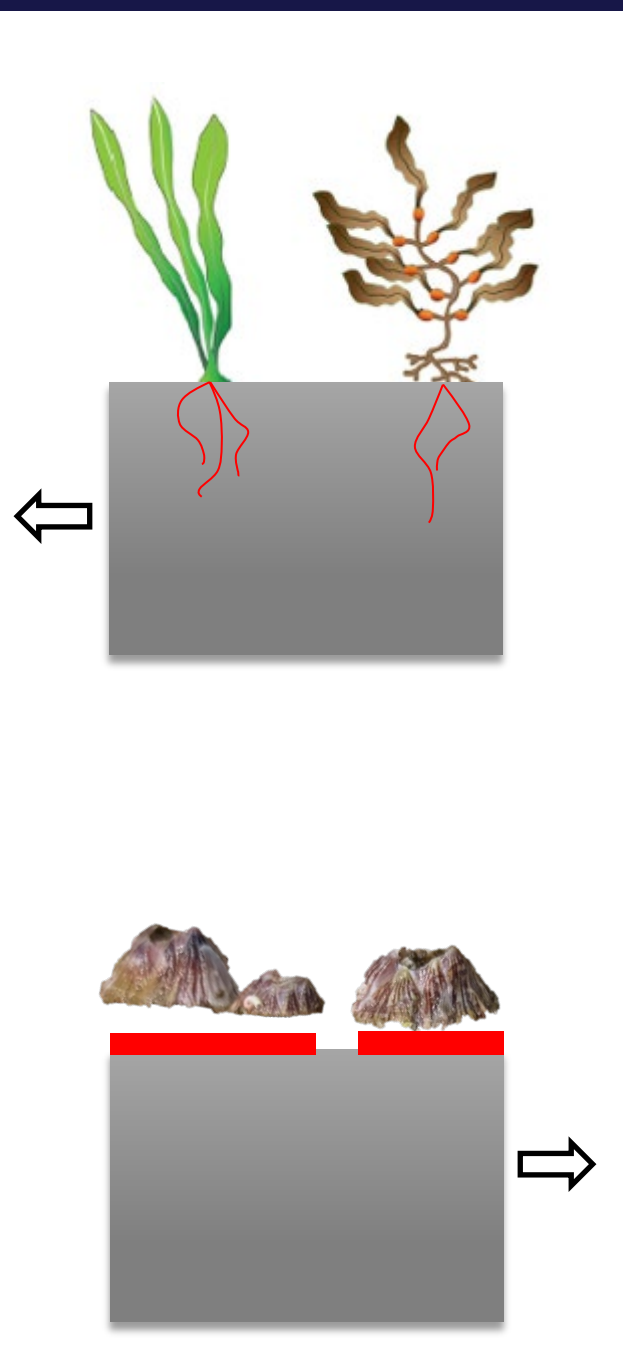
Mikroskopisk



Hvordan påvirker det holdbarheden af beton?



Hvordan sætter de forskellige organismer sig fast?

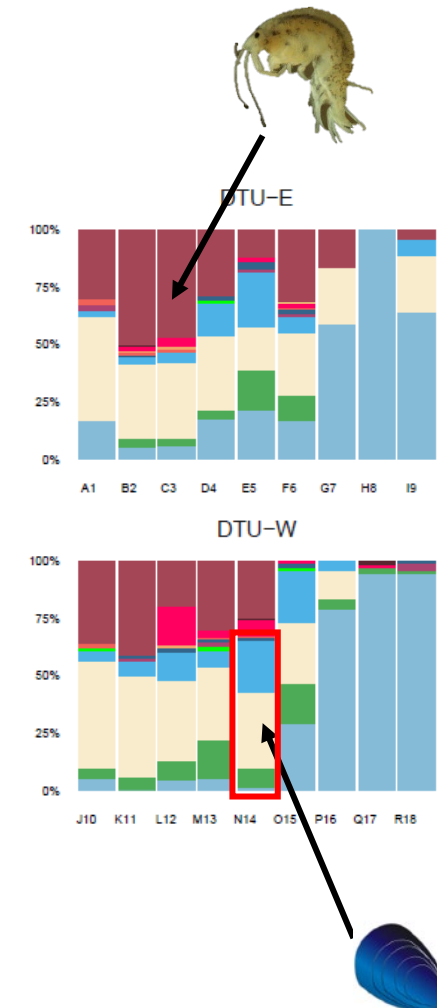
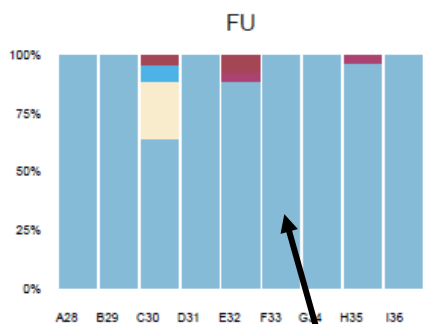
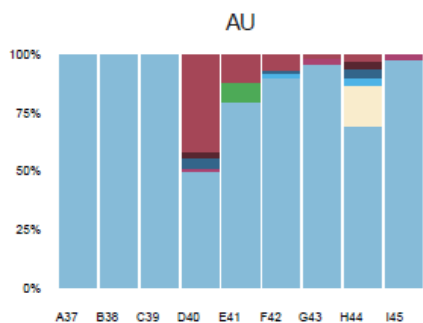




Bevoksning på beton – Felteksponering, Rødby

5 år

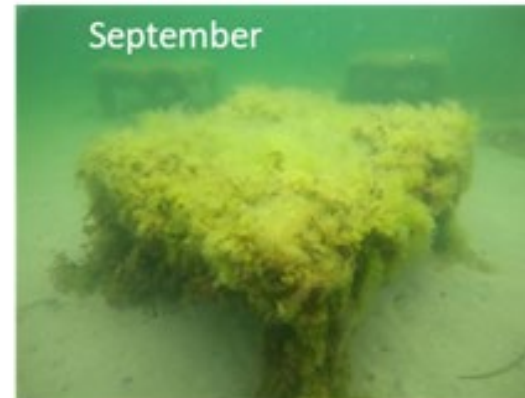
10 år



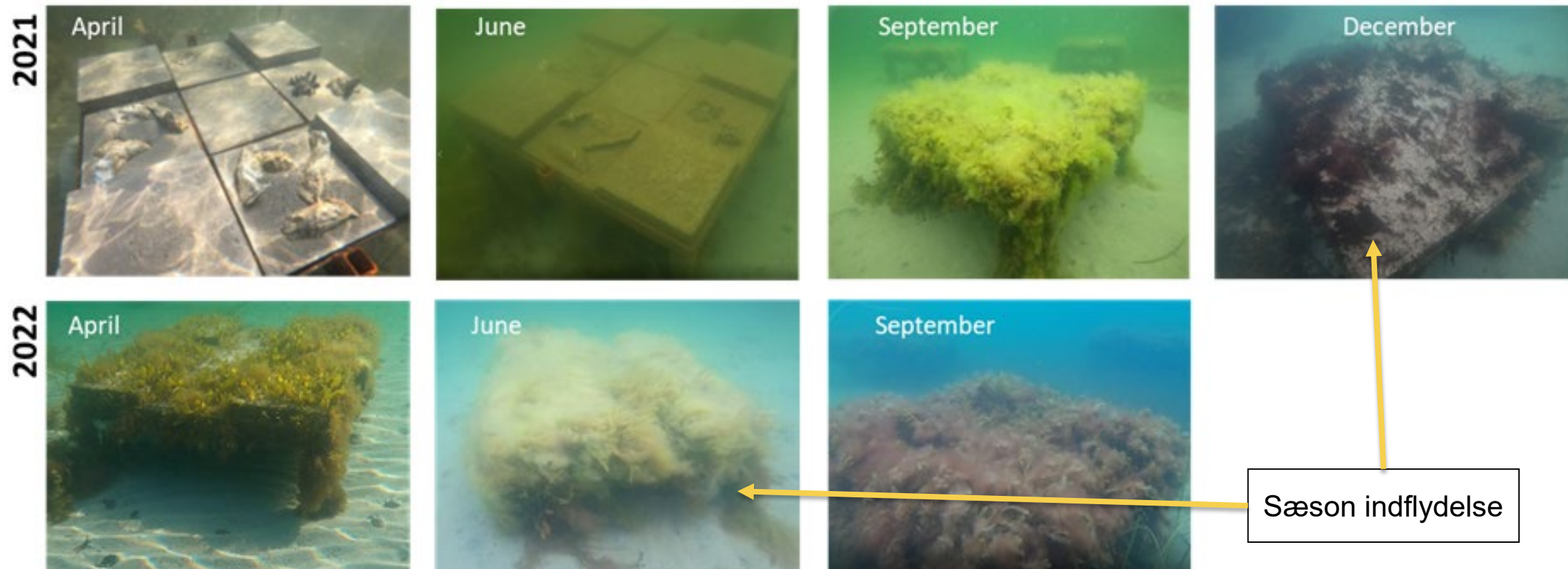
Portland cement

Felt Prøver – Rungsted

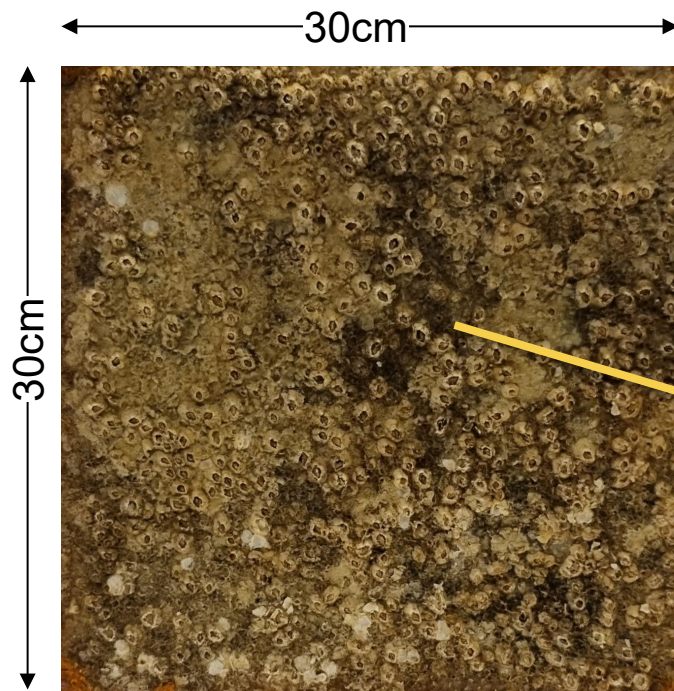
2021



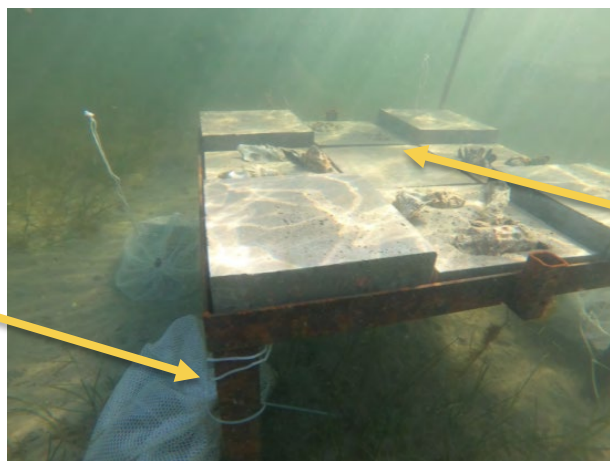
Felt Prøver – Rungsted



Felt Prøver – Rungsted



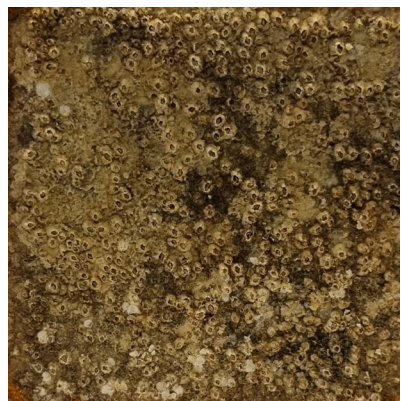
Undersiden
Beskyttende?



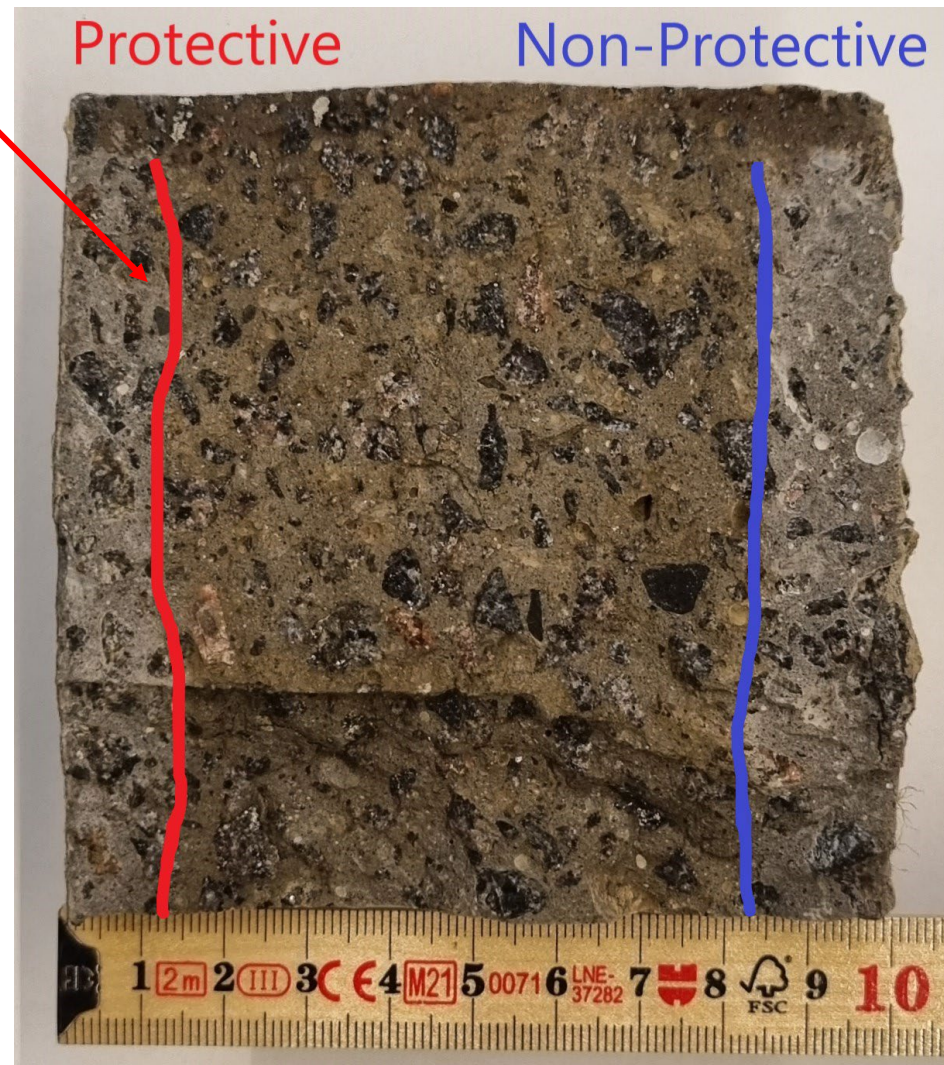
Oversiden
Ikke-beskyttende?

Felt Prøver – Rungsted

AgNO₃ Indikator



Undersiden
Beskyttende?



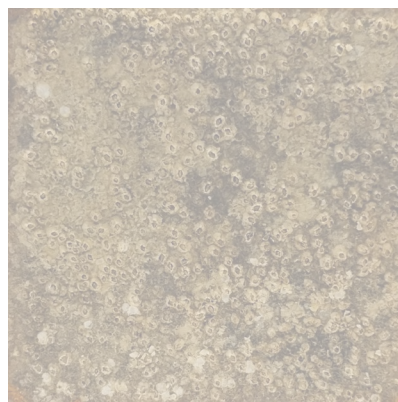
Oversiden
Ikke-beskyttende?

Felt Prøver – Rungsted

AgNO₃ Indikator

Protective

Non-Protective

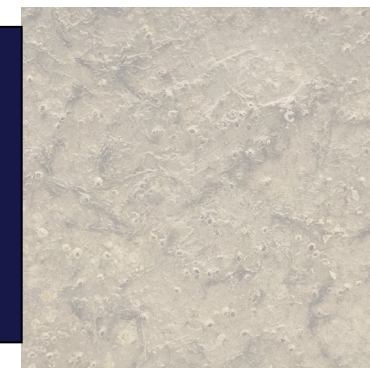


Undersiden

Beskyttende?



Ruer har en beskyttende effekt mod
klorid indtrængning

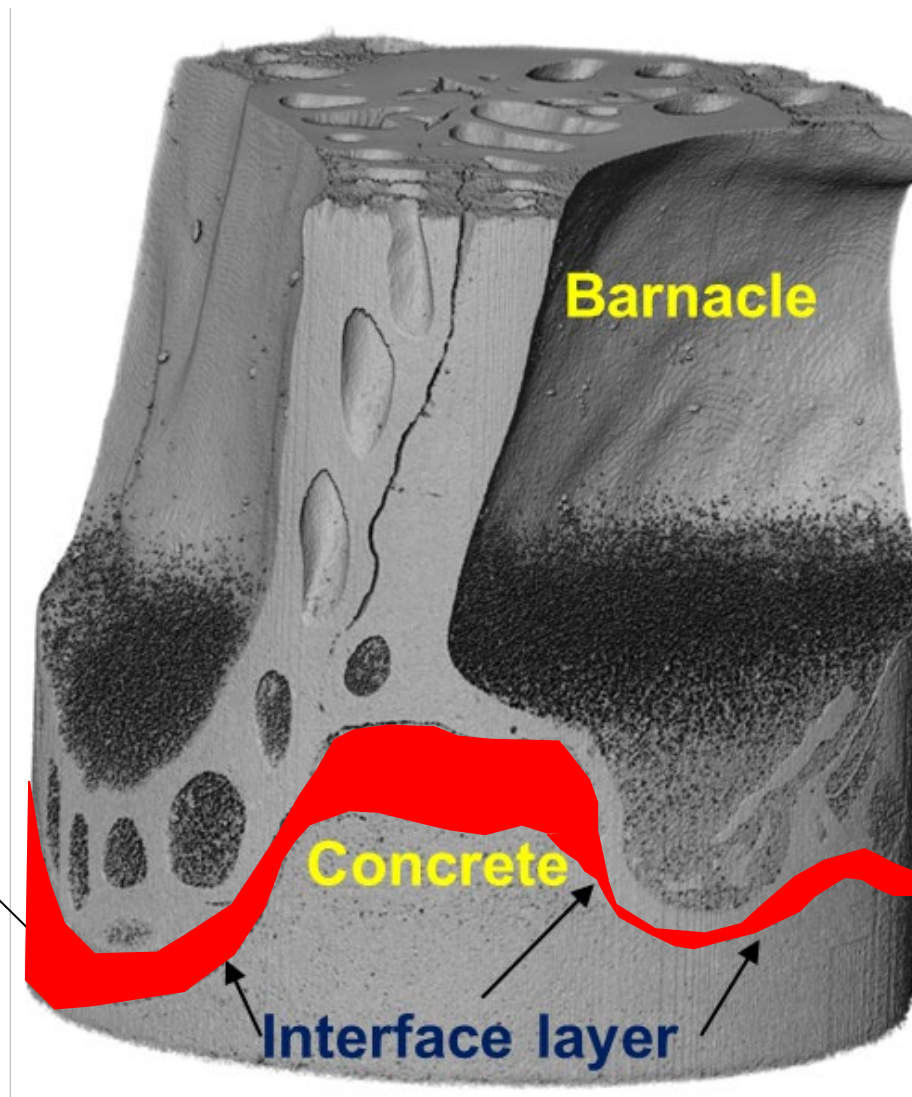
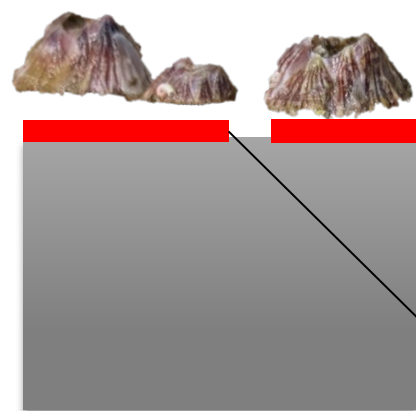


Oversiden

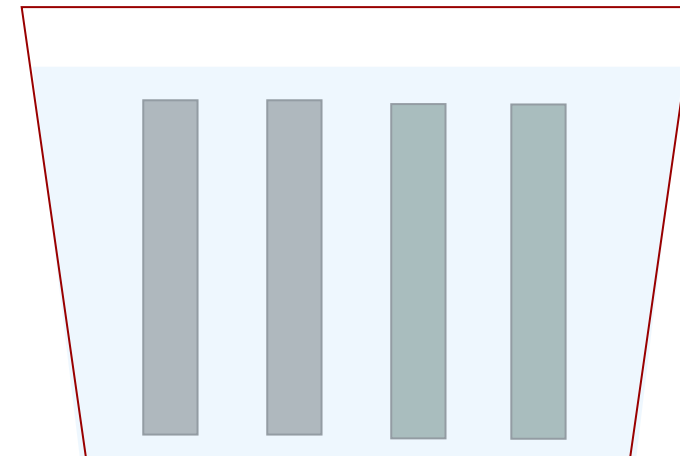
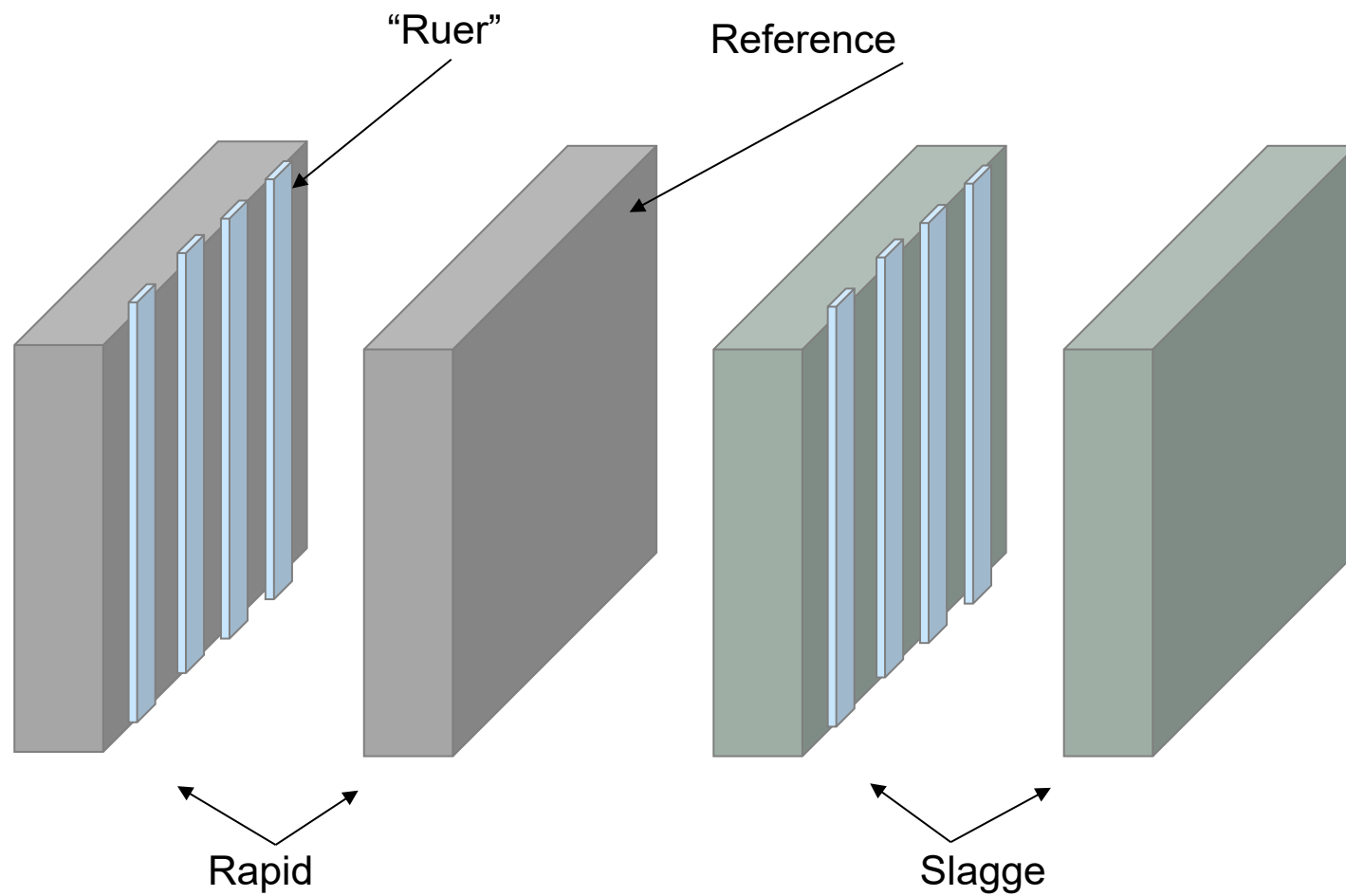
Ikke-beskyttende?



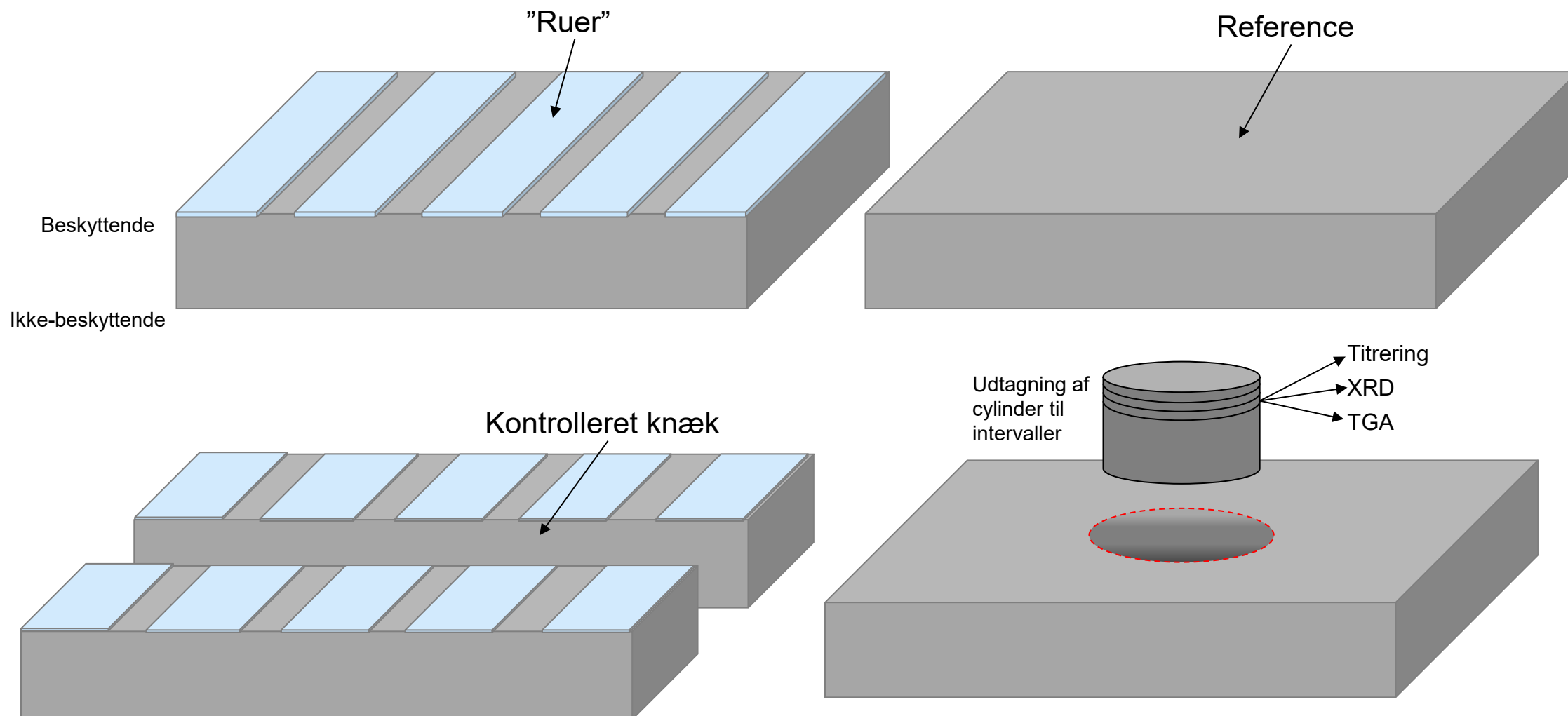
Kontaktfladen Mellem Beton og Ruer



Method: X-ray Computed Tomography (XCT)



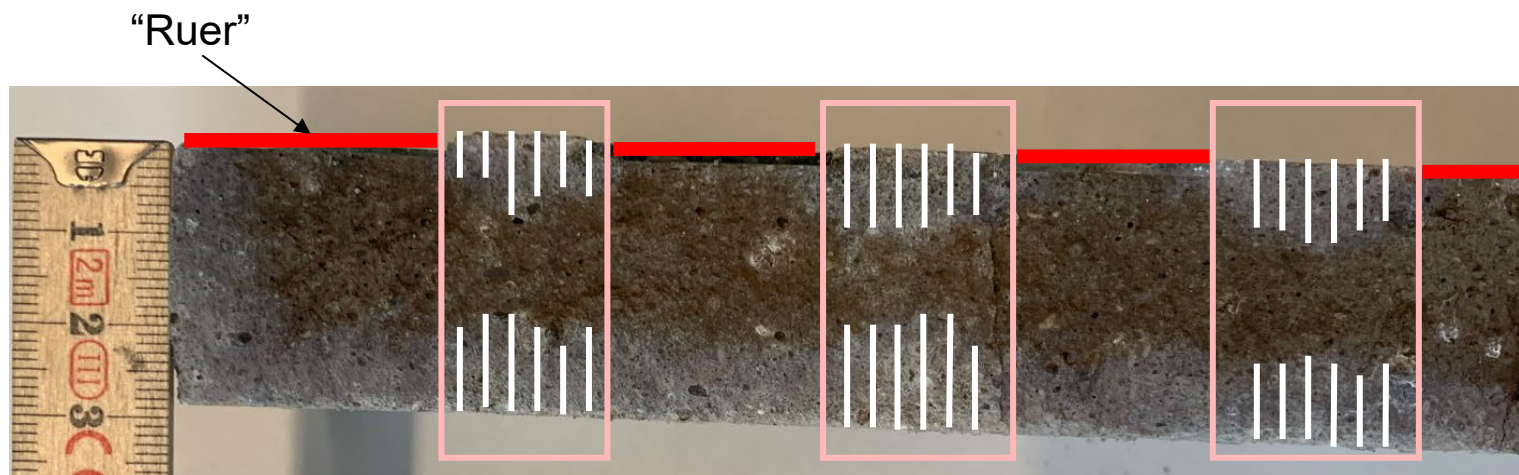
Eksperimentielt - Set-up



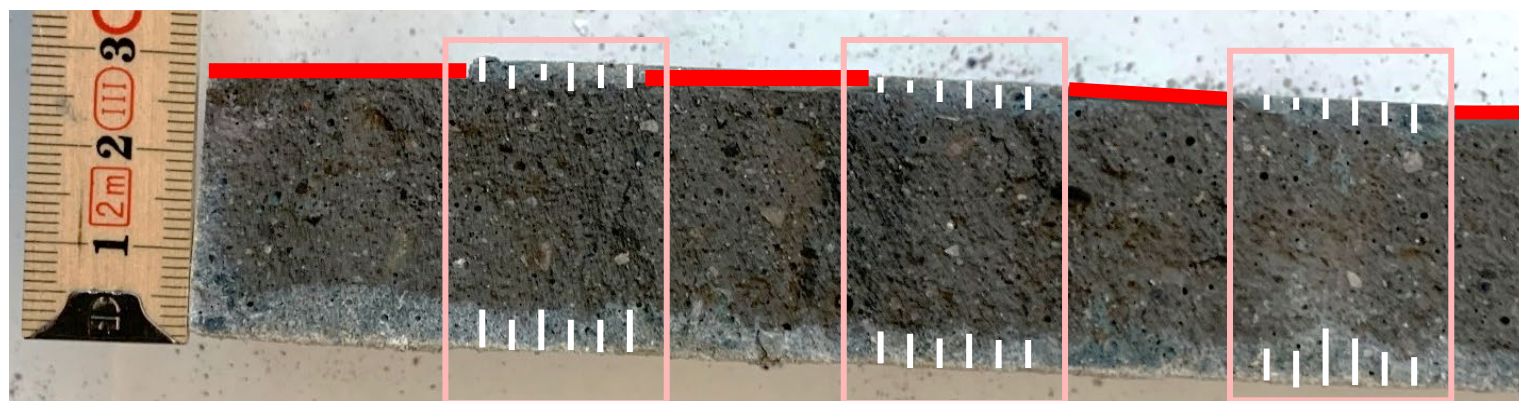
Eksperimentielt – Resultater

NaCl
Opløsning
AgNO₃
indicator

Rapid

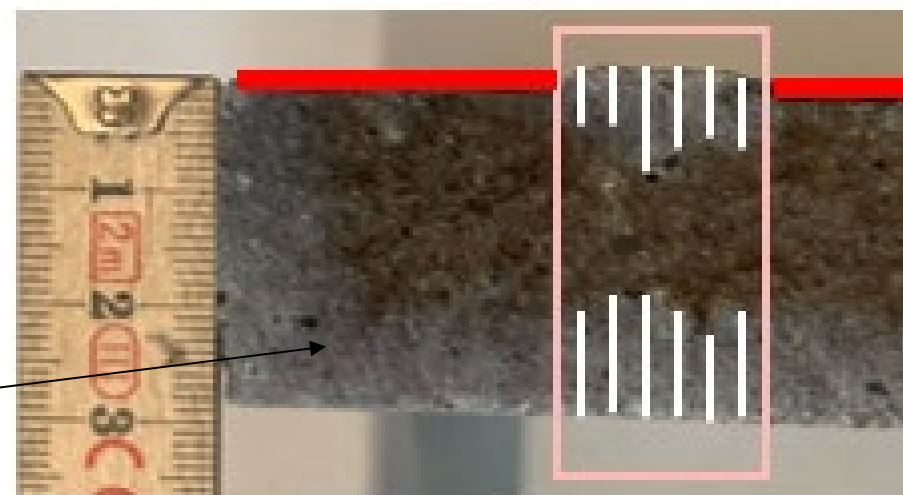
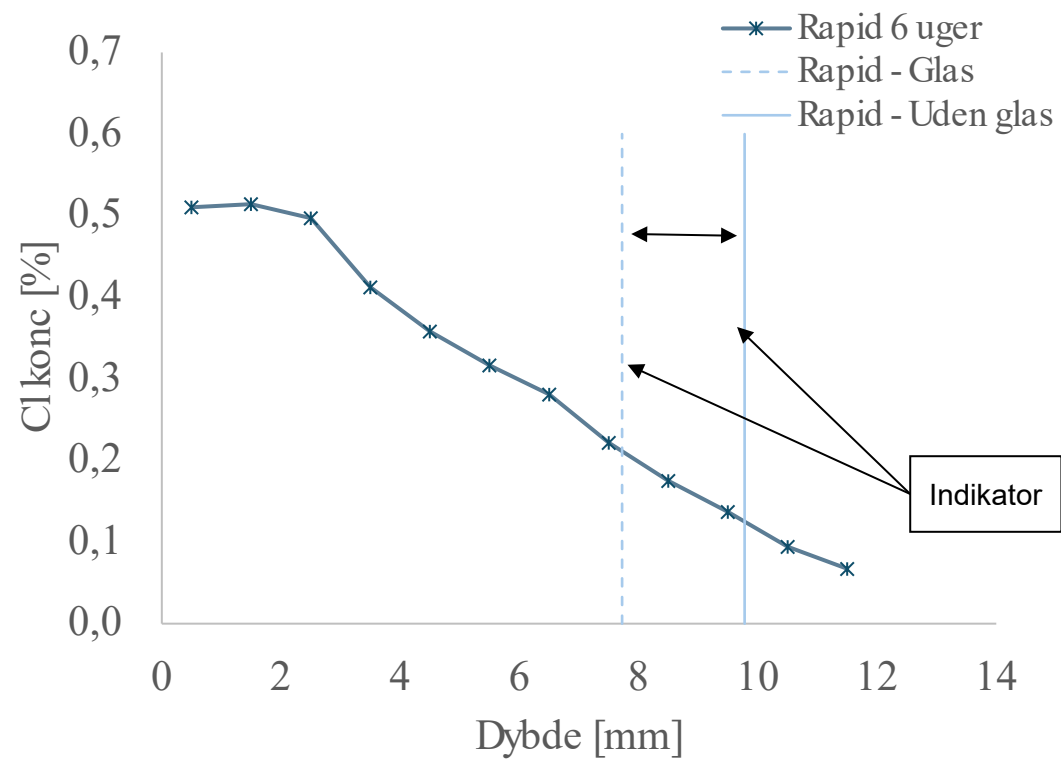


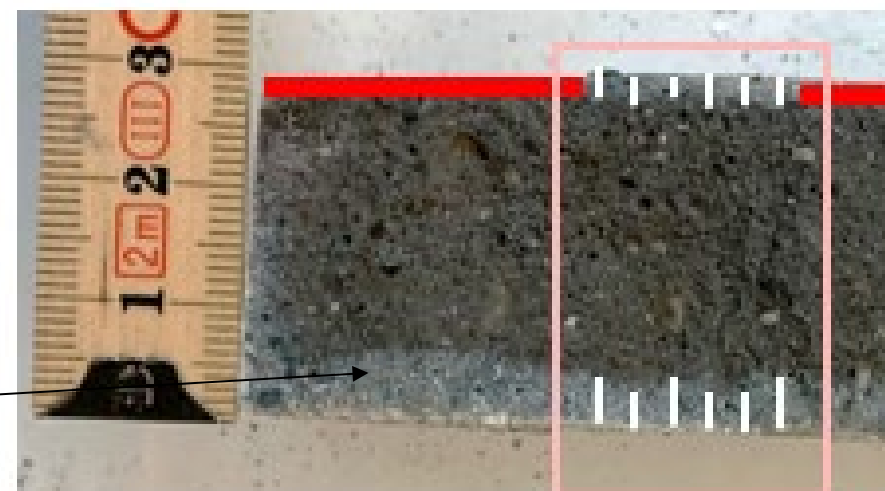
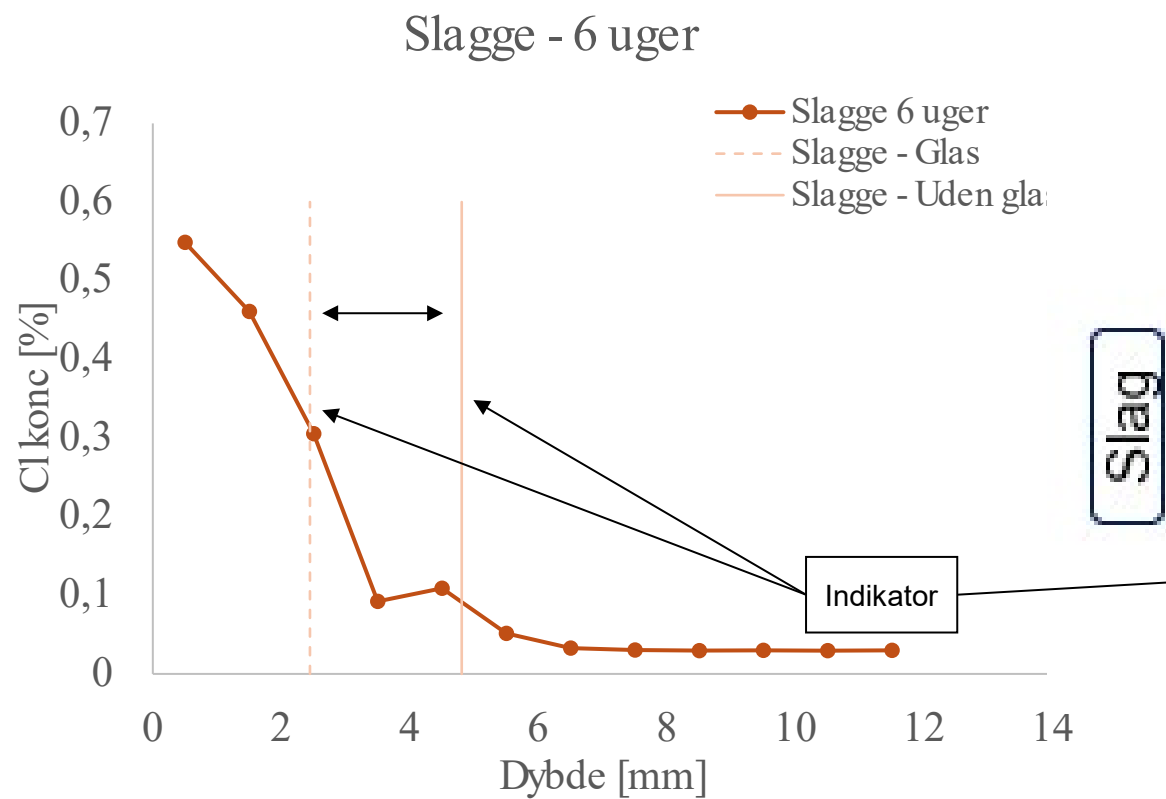
Slag



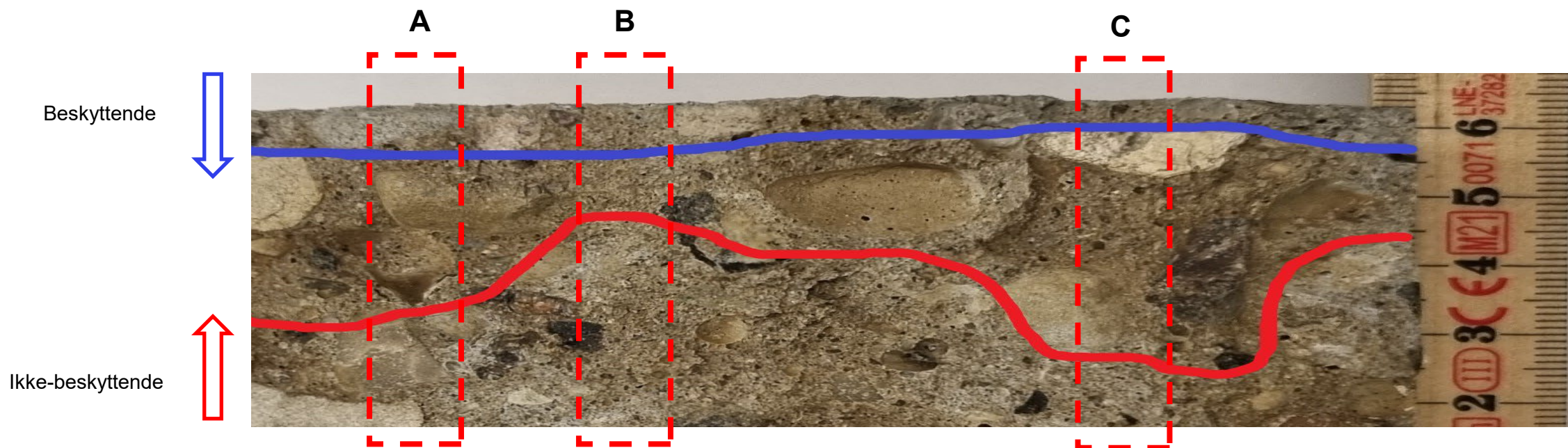
6 uger

Rapid - 6 uger

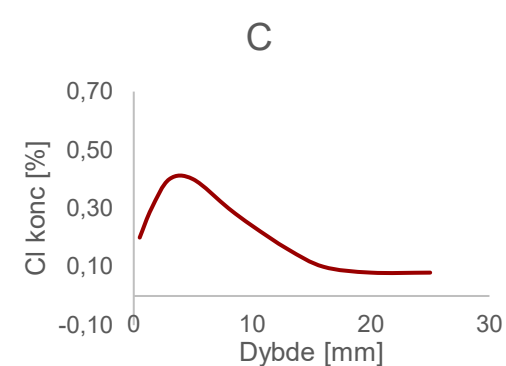
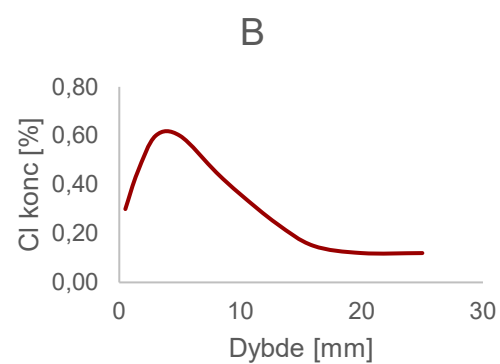
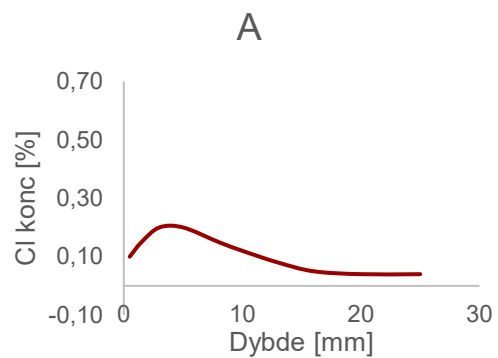




Hvad betyder det?



Potentielle klorid
profiler fra den Ikke-
beskyttende side



Ruer skaber en tæt kontaktflade der giver en beskyttende effekt mod klorid indtrængning, potentielt forlænger betons levetid i det marine miljø



Udvide tilgang til design af marin infrastruktur



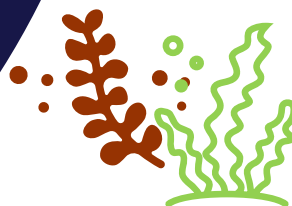
Udbygning af biologisk viden om marine flora og fauna interaktion med beton



Kemiske og fysiske udfordringer i tidevandszoner



Tid før betydelig bevoksning opnås



Lokal forskel i økosystemer

Anerkendelser

- Charilaos Paraskevoulakos – *data for kontakthflade mellem beton og ruer*
- EConcrete – *Living Ports Project in Vigo, Spain*

Referencer

[1] Lars Hestbæk

[2] proserve – Marine construction engineers – Concrete encasement Marine Pile Repairs,
<https://proserveltd.co.uk/resource/concrete-encasement-marine-pile-repairs/>

[3] P. Vuong et al., Understanding biofouling and contaminant accretion on submerged marine structures, 2023,
<https://doi.org/10.1038/s41529-023-00370-5>

- **Projektarbejde fra DTU**

[4] Joseph Parkinson – *The ecological value of concrete in marine environment – The influence of surface topographies on colonising marine biota in littoral zones, Kandidat speciale, 2021*

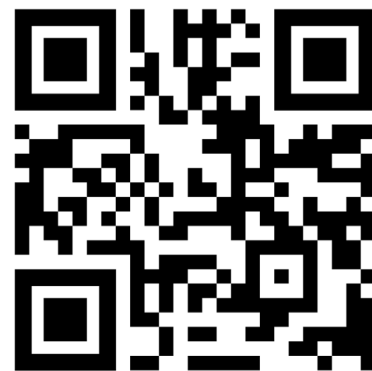
[5] Katarina Kolding Schlage – *Understanding the potential of surface layers for reducing transport processes – With a special focus on chloride ingress – in cementitious binders, Kandidat speciale 2023*

[6] Mai Nørgaard Fugl – *Nature inclusive concrete designs for surface texturing and its effect on mineralogical changes and biological growth in maritime environments, Kandidat speciale 2021*

Tak for jeres opmærksomhed



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