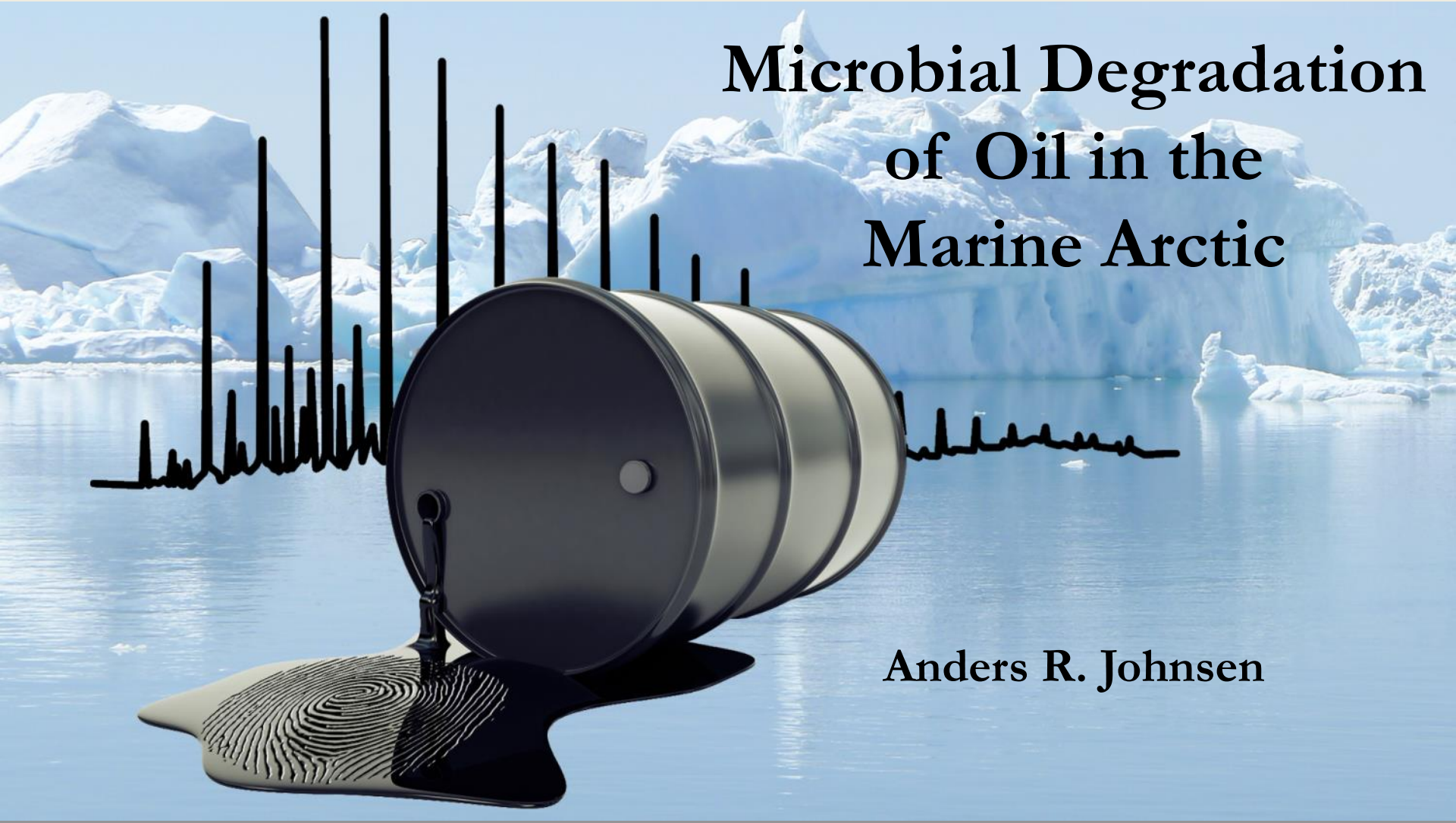
GEUS



Microbial Degradation of Oil in the Marine Arctic

Anders R. Johnsen

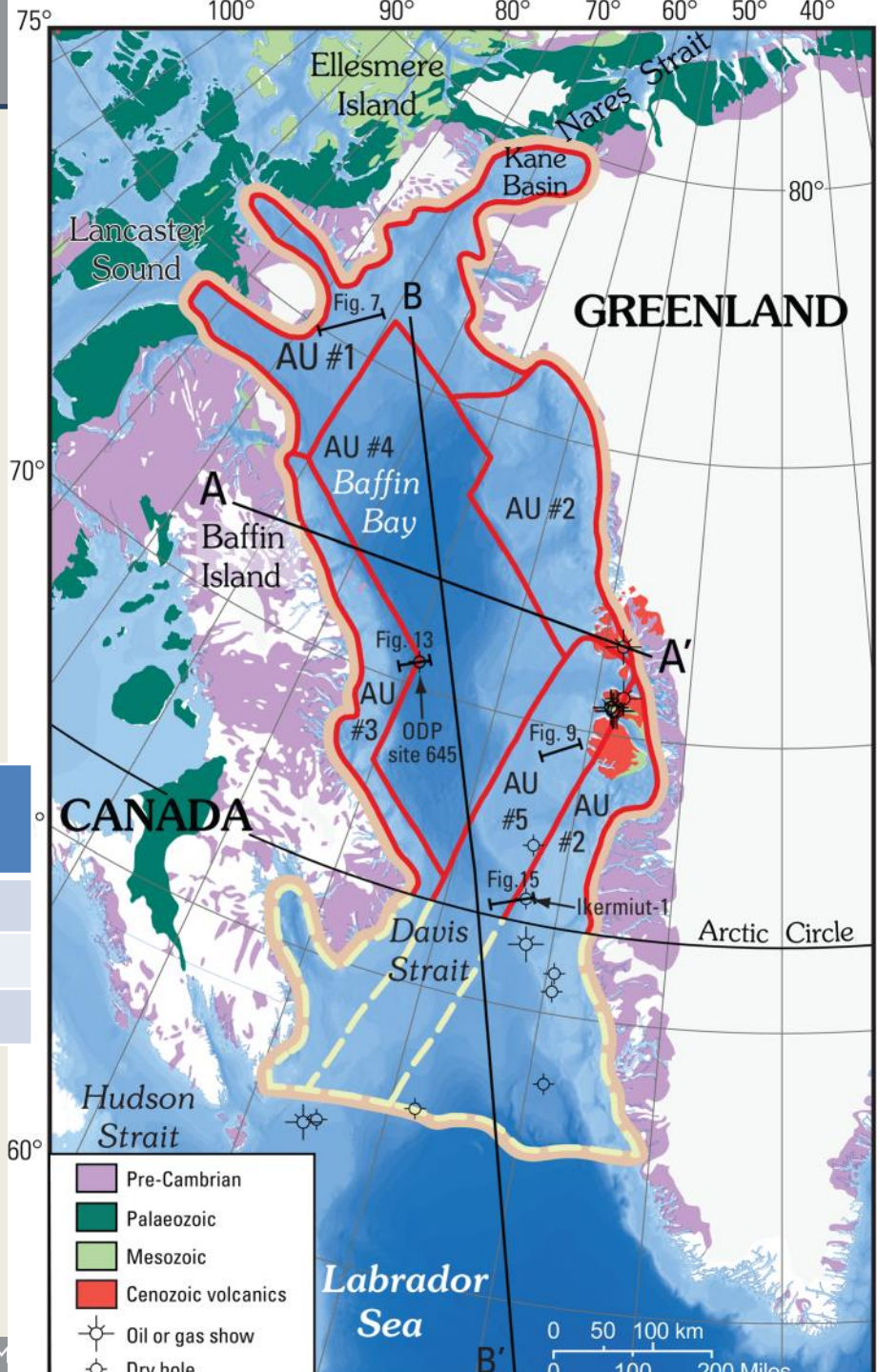
Petroleum potential of the West Greenland-East Canada Provinces

Technically recoverable ressource estimate

	Total	North of Arctic circle
Oil (10^9 barrels)	10.7	7.3
NGL (10^9 barrels)	1.7	1.1
Gas (10^{12} cubic feet)	75	52

Oil is a complex mixture!!!

Reference:
Schenk., 2012
doi: 10.1144/M35.41



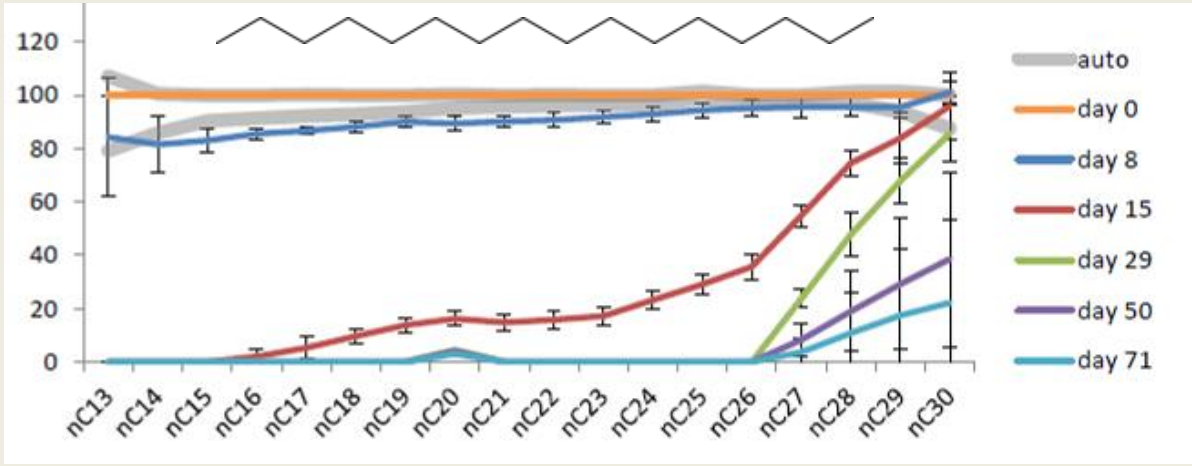
Are the natural microbes able to deal with oil pollution?

Microcosms

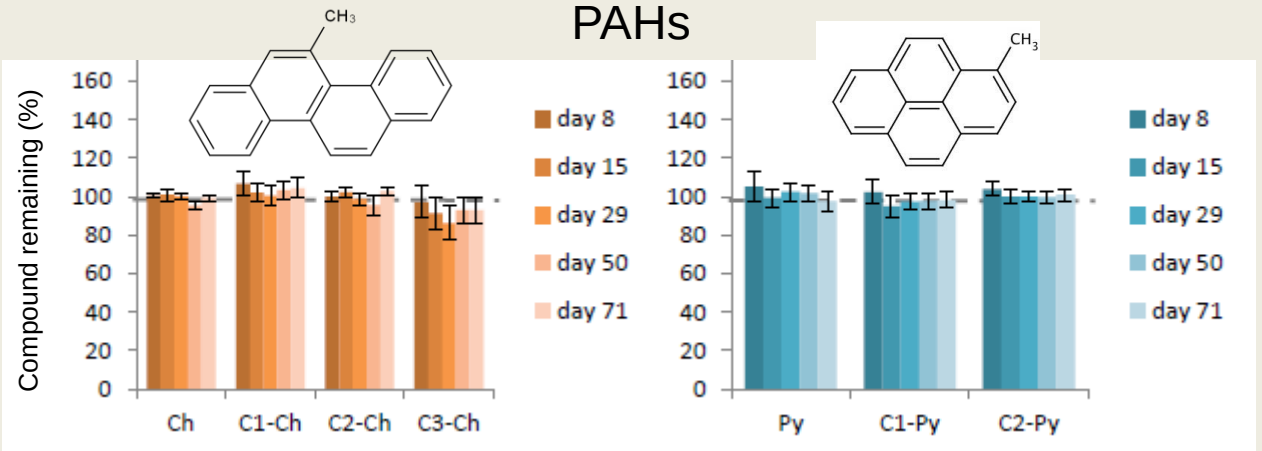
Subsurface water
From 150 m

Changes in oil composition over time

Alkanes



PAHs



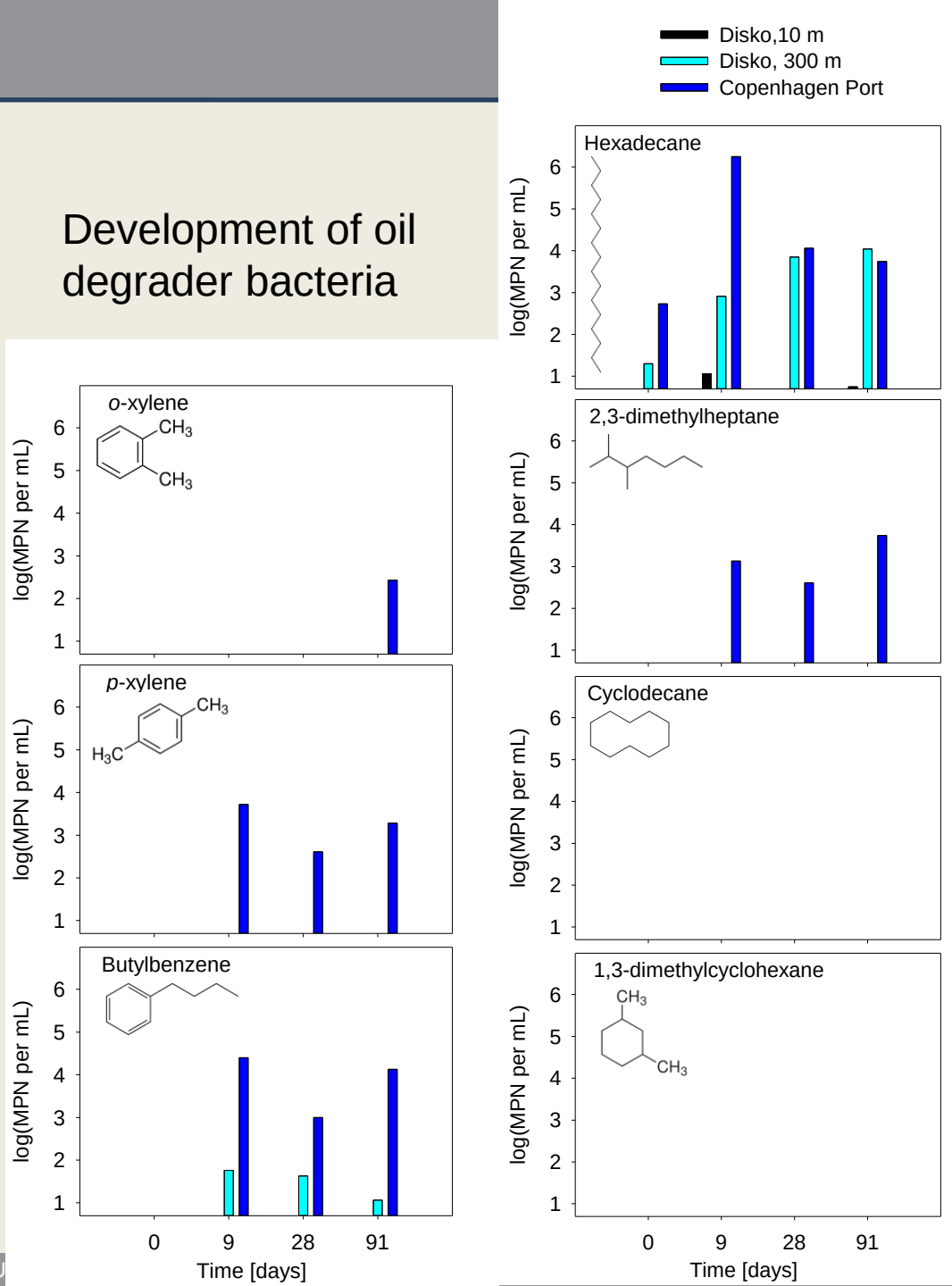
Reference:
Kristensen et al., 2015
Doi:10.1016/j.jhazmat.2015.06.046

Microcosm studies

Water from Disko Bay (GL)

- Biodegradation of *n*-alkanes
- No biodegradation of PAHs
- Few types of degrader bacteria
- Narrow substrate spectra

Development of oil degrader bacteria

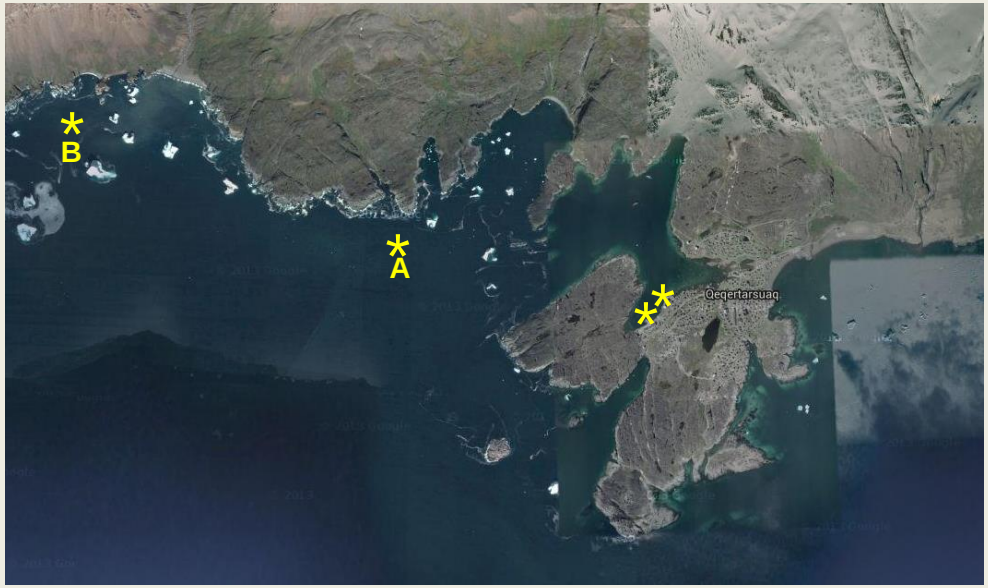


Fishing for oil degraders in the Disko Bay, Western Greenland

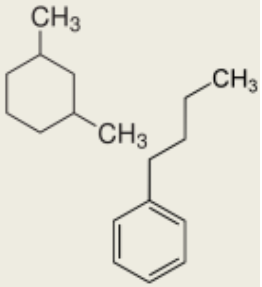
Incubation of degrader traps under natural conditions in the marine environment.

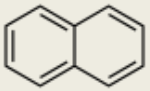
1. Activated carbon pellets loaded with pure compounds or crude oil.
2. Incubated in-situ in the Disko Bay
3. Retrieved after 1-16 weeks exposure.

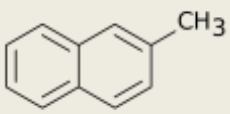
Analyses:
MPN enumeration of specific oil degraders

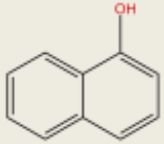


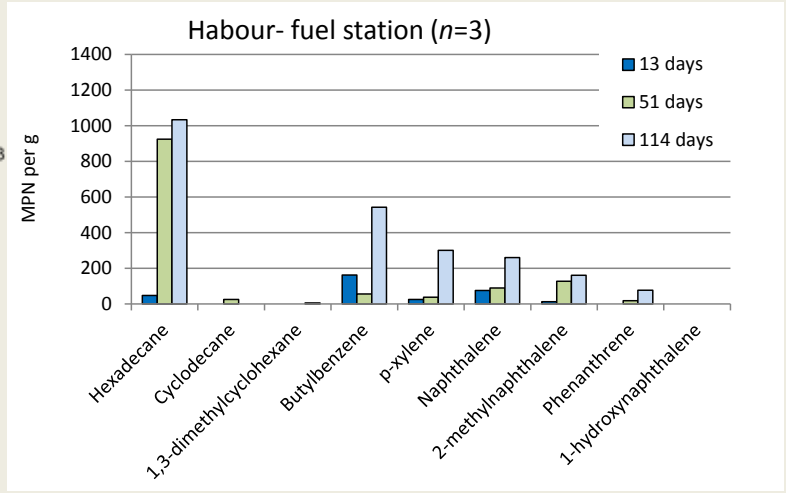
Degrader - traps Disko, crude oil

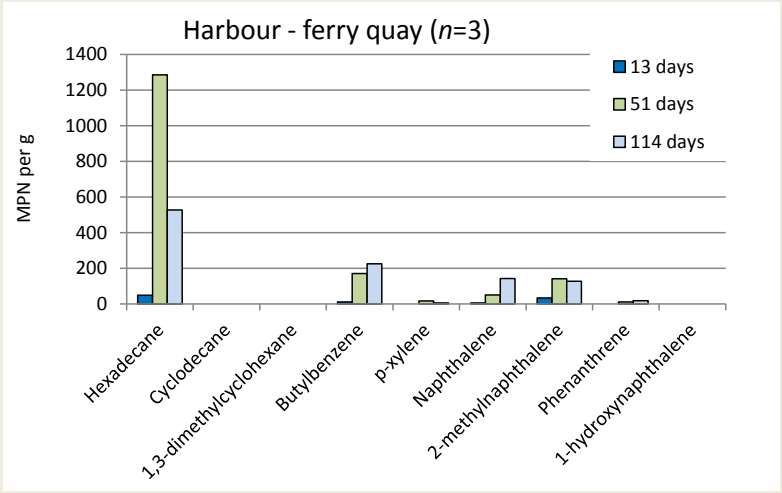


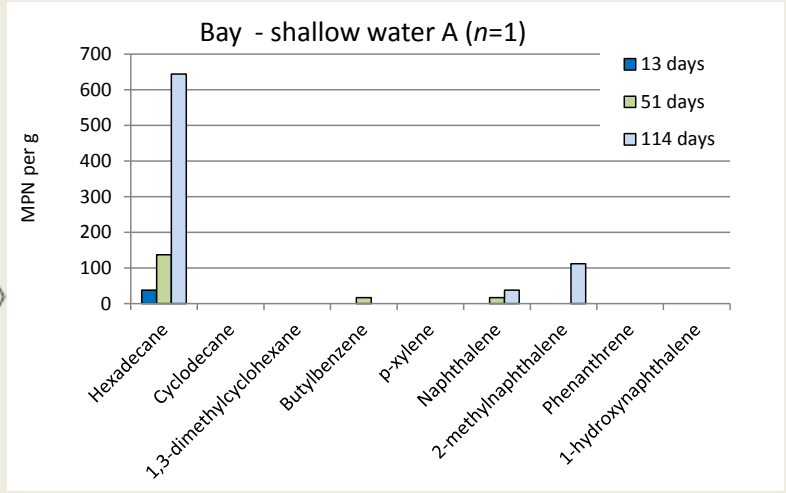


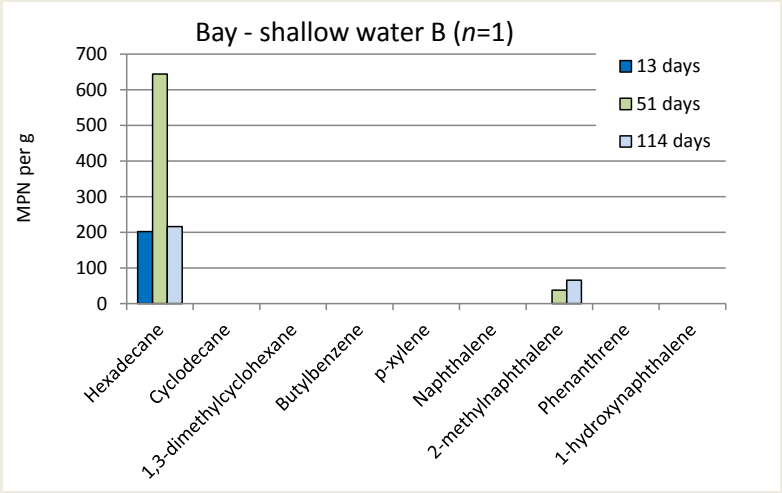












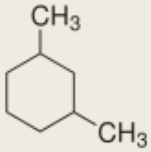
Degrader traps - Disko, selected oil components

Degrader traps loaded with specific oil compounds that did not show degraders in microcosms.

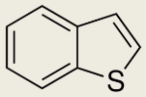
Incubated in-situ at Disko for 16 weeks.

No detection of degraders of these compounds (<16 cells/g)

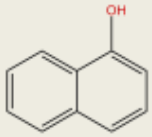
Cyclodecan



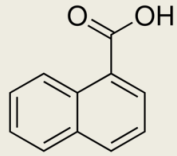
1,3-dimethylcyclohexane



Benzothiophene



1-hydroxynaphthalene



Naphthoic acid

Conclusions

The oil degradation potential in the water column of the pristine Disko Bay area is more limited than generally recognized.

Degrader bacteria from pre-exposed environments may show a much broader substrate range and thus higher degradation potential.

Thanks to….

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