

MicroMBT:

Discovery and training of microbial biocatalysts for biomass conversion using Moving Bed Technology (MBT)

**Marine Biotechnology ERA-NET Stakeholder meeting
13 - 14 October 2016, Brussels**

by Peik haugen

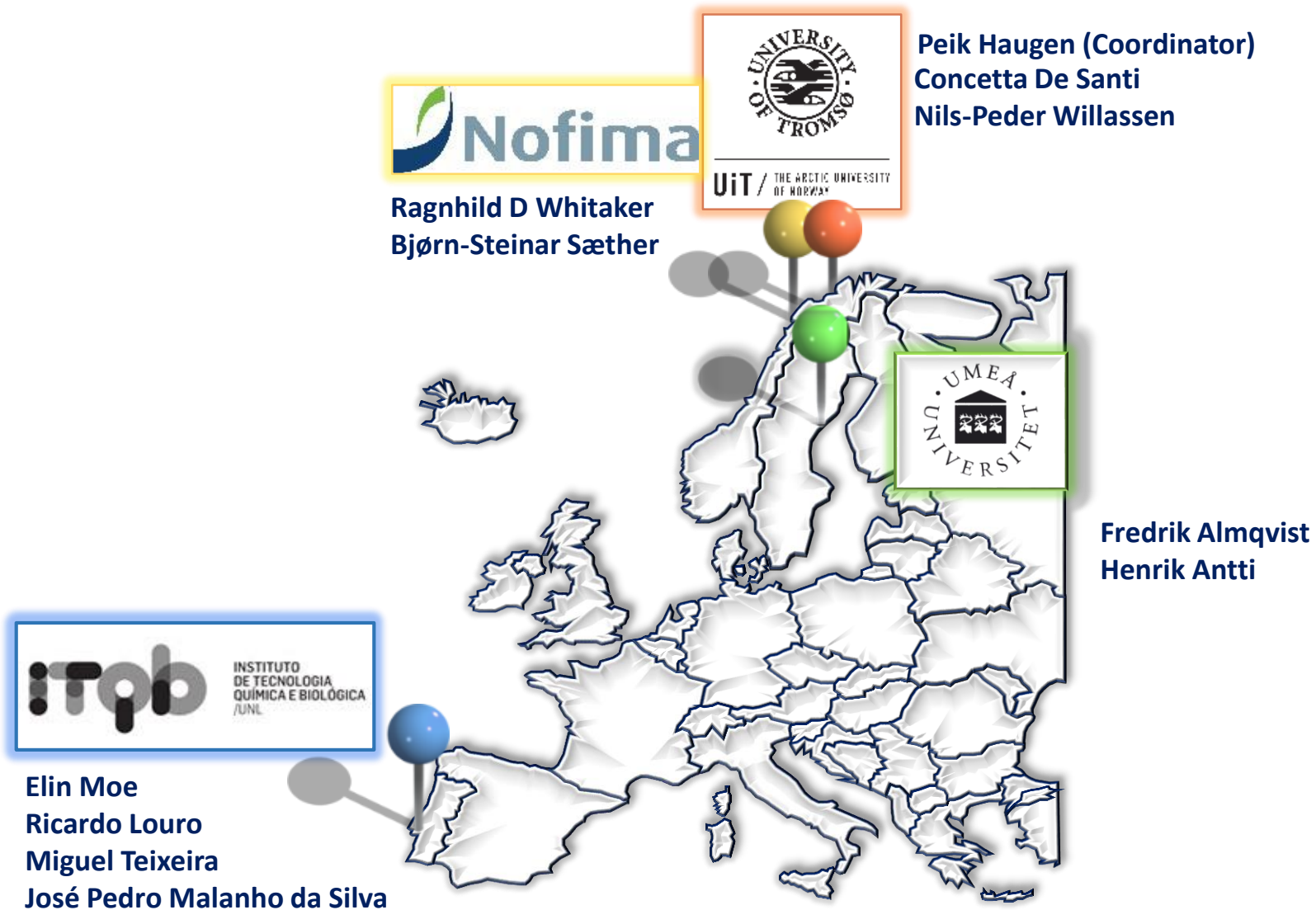
MicroMBT

Funded by the *Marine Biotechnology ERA-NET*

3-year duration

An action under the European Commission's Seventh Framework Programme

CONSORTIUM



Ragnhild D Whitaker
Bjørn-Steinar Sæther



Peik Haugen (Coordinator)
Concetta De Santi
Nils-Peder Willassen



Fredrik Almqvist
Henrik Antti



Elin Moe
Ricardo Louro
Miguel Teixeira
José Pedro Malanho da Silva

BACKGROUND (The need)

White fish (Wild catch)



From: <http://www.fiskebat.no/>

BACKGROUND (The need)

Available cheap biomasses (avg. ~0.2€/kg)

940,000 tons in total (716,000 used) – 2011 (Norway alone)

Approx. half [530,000 tons]:

- Ensilage (270,000)
- Fishmeal (260,000)



160,000 tons

- Oil/consumption

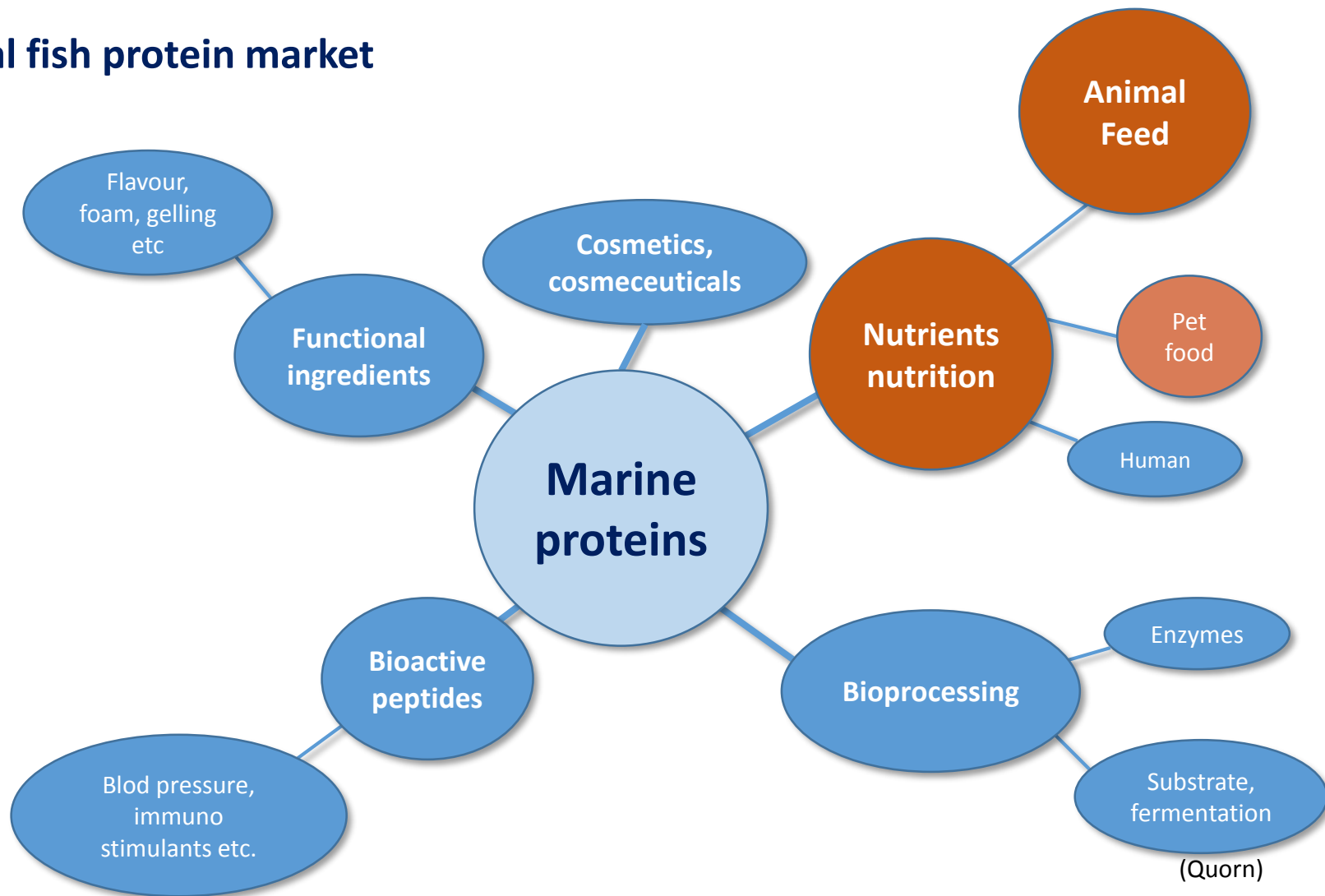
180,000 tons

- Waste/Dumped (cod)



BACKGROUND (The need)

The global fish protein market



BACKGROUND (The need)

Bioteq: A national test plant for bioprocessing



Marine biomass



0.1€/kg

Processing

Enzymatic hydrolysis

Separation of the aqueous phase from solids and fats

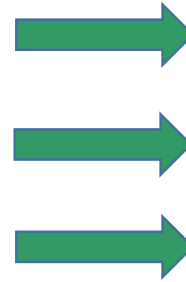
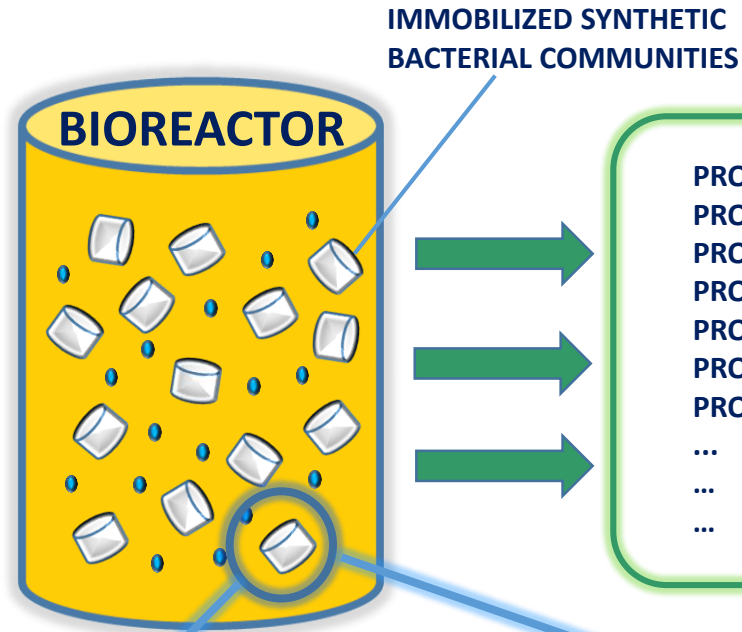
Hydrolysates



3€/kg

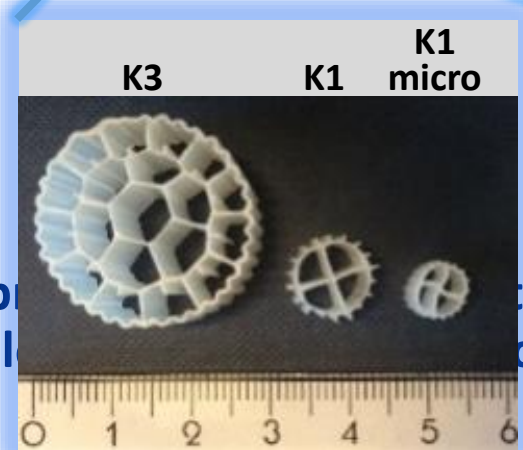
OUR SOLUTION (The idea)

Hydrolysates



- PRODUCT 1
- PRODUCT 2
- PRODUCT 3
- PRODUCT 4
- PRODUCT 5
- PRODUCT 6
- PRODUCT 7
- ...
- ...
- ...

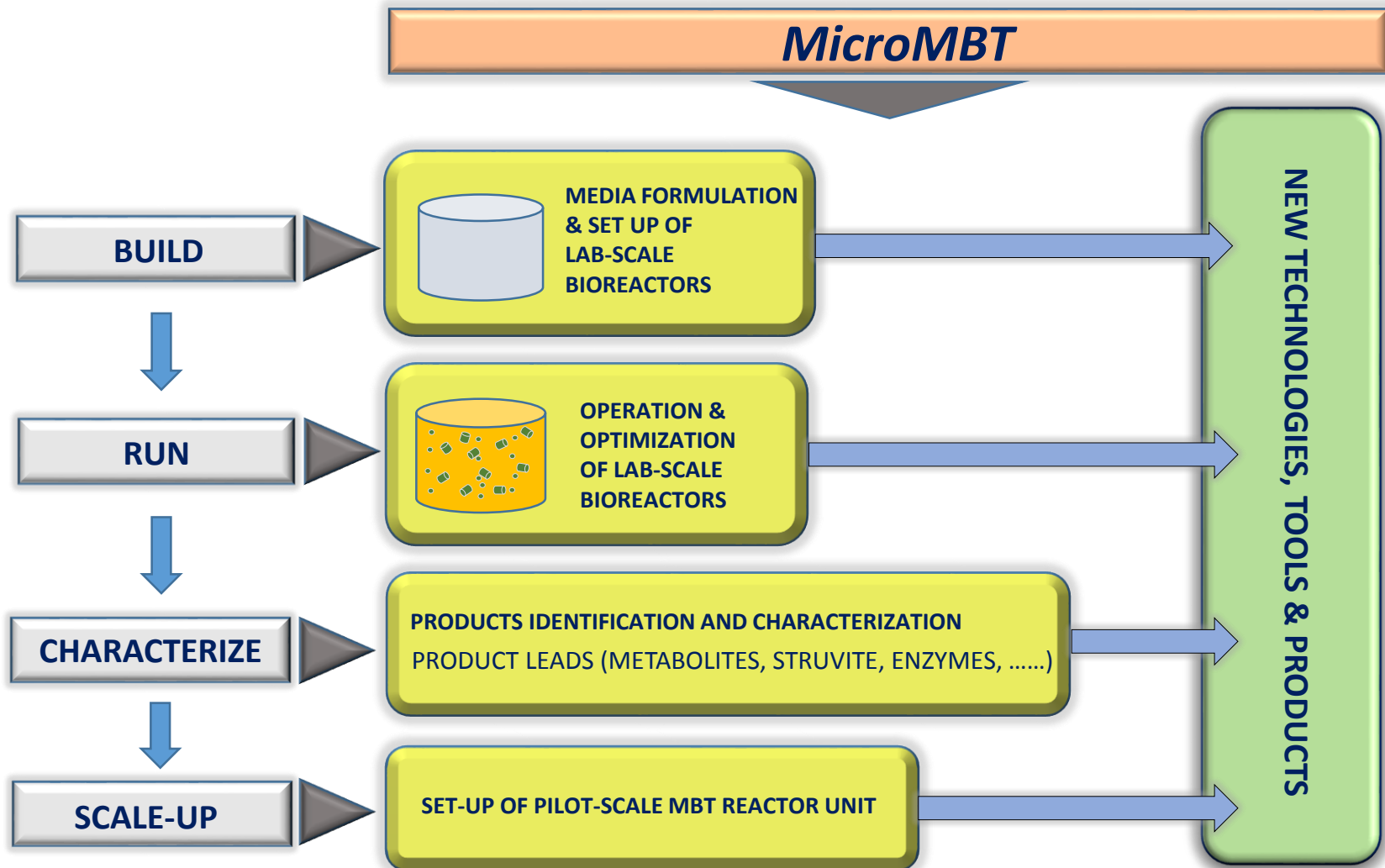
- PUFA
- MMPs
- Siderophores
- Wax-esters
- Astaxanthin
- Other pigments



The *MicroMBT* main objective:
To develop a sustainable biorefinery platform using synthetic microbial communities and Moving Bed Technology to convert marine raw materials to high value compounds

... synthetic microbial
... most marine raw

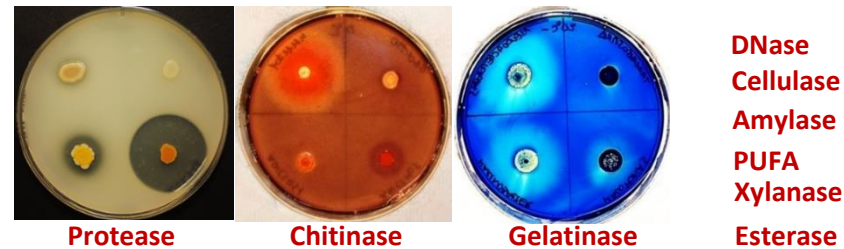
WORK PLAN



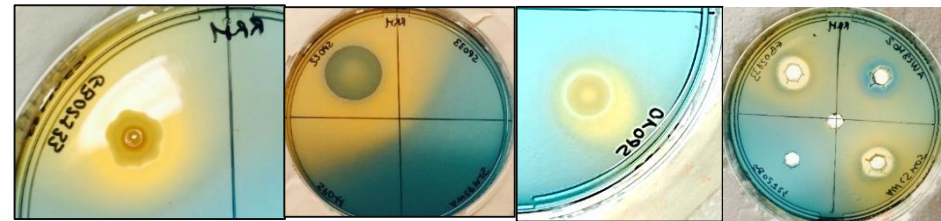
SCIENCE & TECHNOLOGY (How will we do it)

Arctic/sub-Arctic microorganisms

- In-house collection of approx. 2000 marine bacterial isolates
- Taxonomically classified based on the 16S rRNA gene
- Selected 100 isolates:
 - Complete genomes
 - Functional screening of 9 activities
 - Secondary metabolite potential predicted

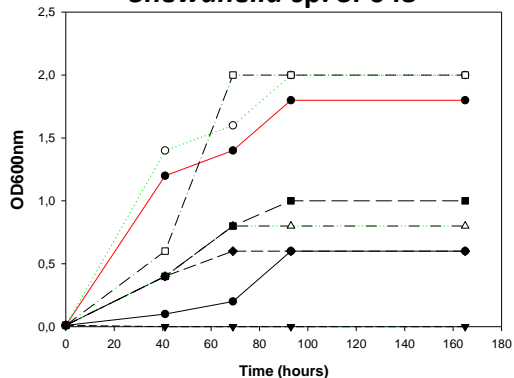


Siderophore
production

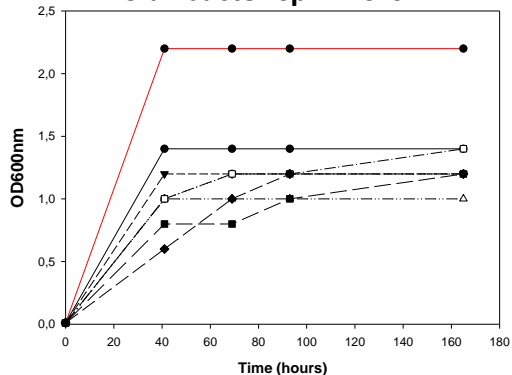


SCIENCE & TECHNOLOGY (How will we do it)

Shewanella sp. SP043



Polaribacter sp. KH04J14



- Marine Broth
- ASW 3% pH 8_6g/L COD SKIN
- ASW 3% pH 8_6g/L SALMON (P)
- ▼ ASW 3% pH 8_6g/L SALMON (A)
- △ ASW 3% pH 8_6g/L SANDEELS
- ASW 3% pH8_6g/L SPRAT
- ASW 3% pH8_6g/L HERRING
- ◆ ASW 3% pH8_6g/L SHRIMPS

Hydrolysates from marine biomass



Sprat



Cod



Shrimp



Herring



Salmon



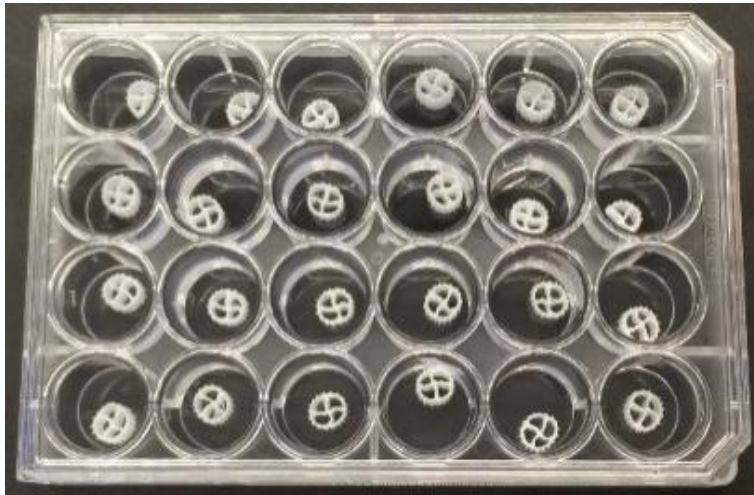
Sandeels



SCIENCE & TECHNOLOGY (How will we do it)

Synthetic microbial communities

Kaldnes K1/ 24 wells polystyrene plate



A: fresh beads
B: Used beads
C: Stained fresh (left) or used (right) beads

Pall Micro24 reactor w/K1 micro beads



SUMMARY

- We are developing a new method to convert cheap marine rest materials to a range of valuable products
- We have a library of Arctic bacteria with potential to produce valuable compounds
- Marine hydrolysates are used to formulate growth media for marine Arctic bacteria
- We are currently identifying communities of bacteria that can form robust and stable biofilms in a moving bed biofilm reactor
- Spent media are analyzed for products at UmU/the Swedish Metabolomics Center

Hydrolysate



LIPIDS/Oil

- Omega-3
- Wax esters

ENZYMES

- -ases

SEC METABOLITES

- Siderophores
- Pigments



Thank you for listening !

