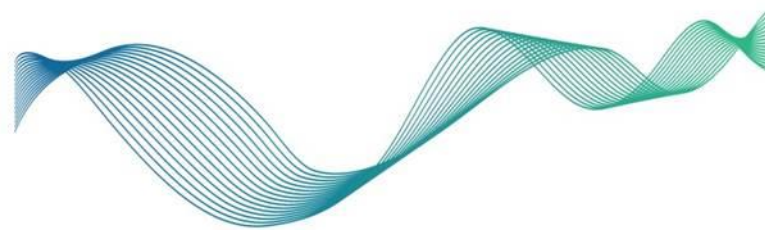


MarineBiotech



MicroMBT

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

UiT The Arctic University of Norway, Norway
Nofima, Norway
Umeå University, Sweden
ITQB

Prof. Peik Haugen (Coordinator)
Dr. Ragnhild D. Whitaker
Prof. Fredrik Almqvist/ Prof. Henrik Antti
Dr. Elin Moe/ Prof. Miguel Texeira/ Prof.
Ricardo Louro

ERA-MBT 1st Transnational Joint Call: Biorefinery processes

21st November 2017



Marine Biotechnology ERA-NET (ERA-MBT) is funded under the European Commission's Seventh Framework Programme. Grant Agreement Number 604814
December 2013 - November 2017

THE CONSORTIUM



| PRINCIPAL INVESTIGATOR | INSTITUTION | COUNTRY |
|---------------------------------------|-----------------|---------|
| Peik Haugen | UiT | NO |
| Ragnhild D. Whitaker | Nofima | NO |
| Fredrik Almqvist/Henrik Antti | Umeå University | SE |
| Elin Moe/Miguel Texeira/Ricardo Louro | ITQB | PT |
| | | |

Project period: Jan 2016 to Dec 2018

Aims and objectives

Harvested

Cultured



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



<http://www.an.no>

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

Aims and objectives

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

0.91 mill tons of available co-streams (0.69 mill tons used)

67% [457,579 tons]:

- Ensilage (314,415) 46%, Fishmeal and oil (143,164) 21%



9% [64,628 tons]

- Human consumption (Liver, caviar, oil, heads, tongue)



20% [137,310 tons]

- Oil/Protein from aquaculture



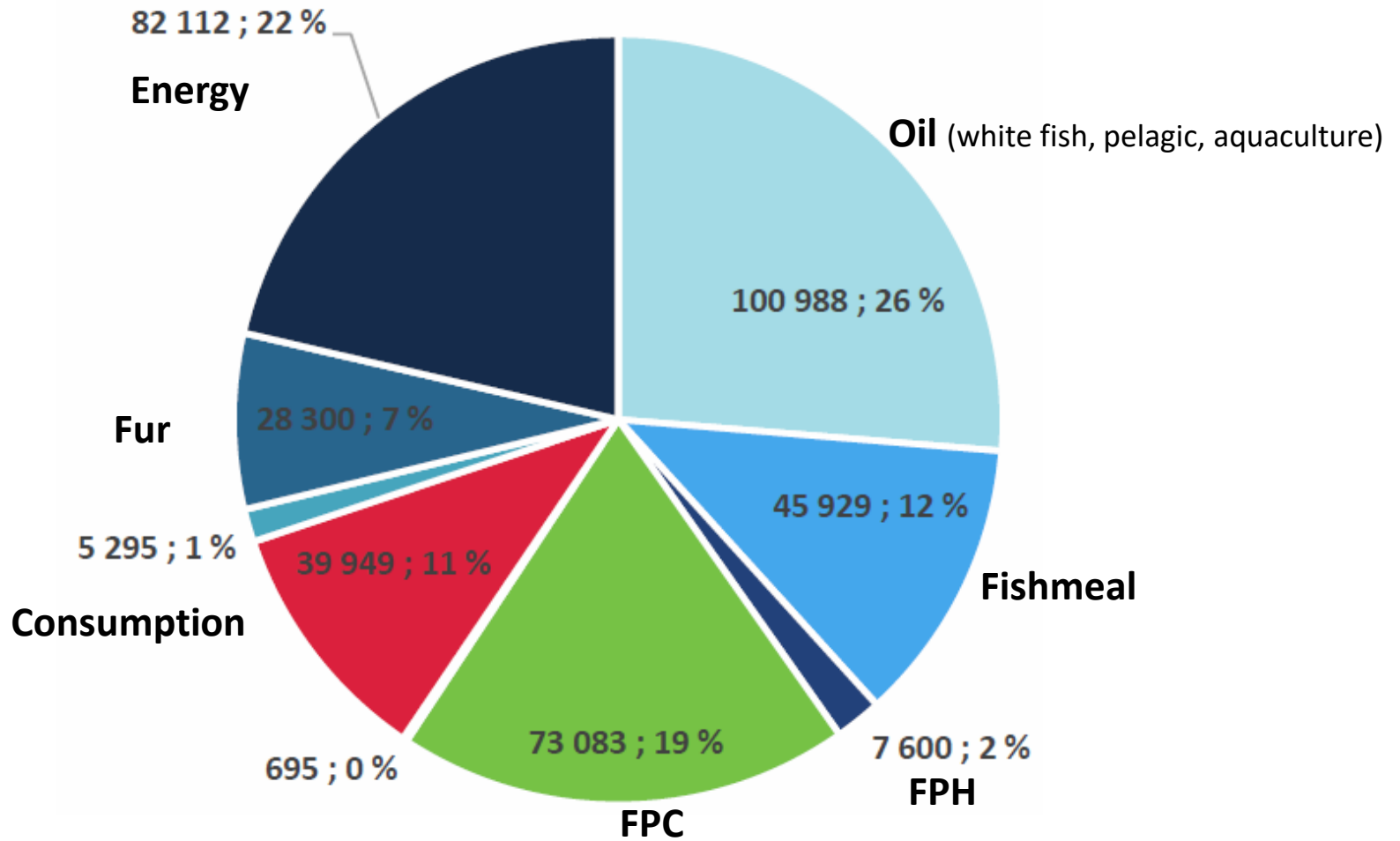
180,000 tons

- Dumped (cod)



from: «Analyse marint restråstoff», Richardsen et al. 2017 (SINTEF)

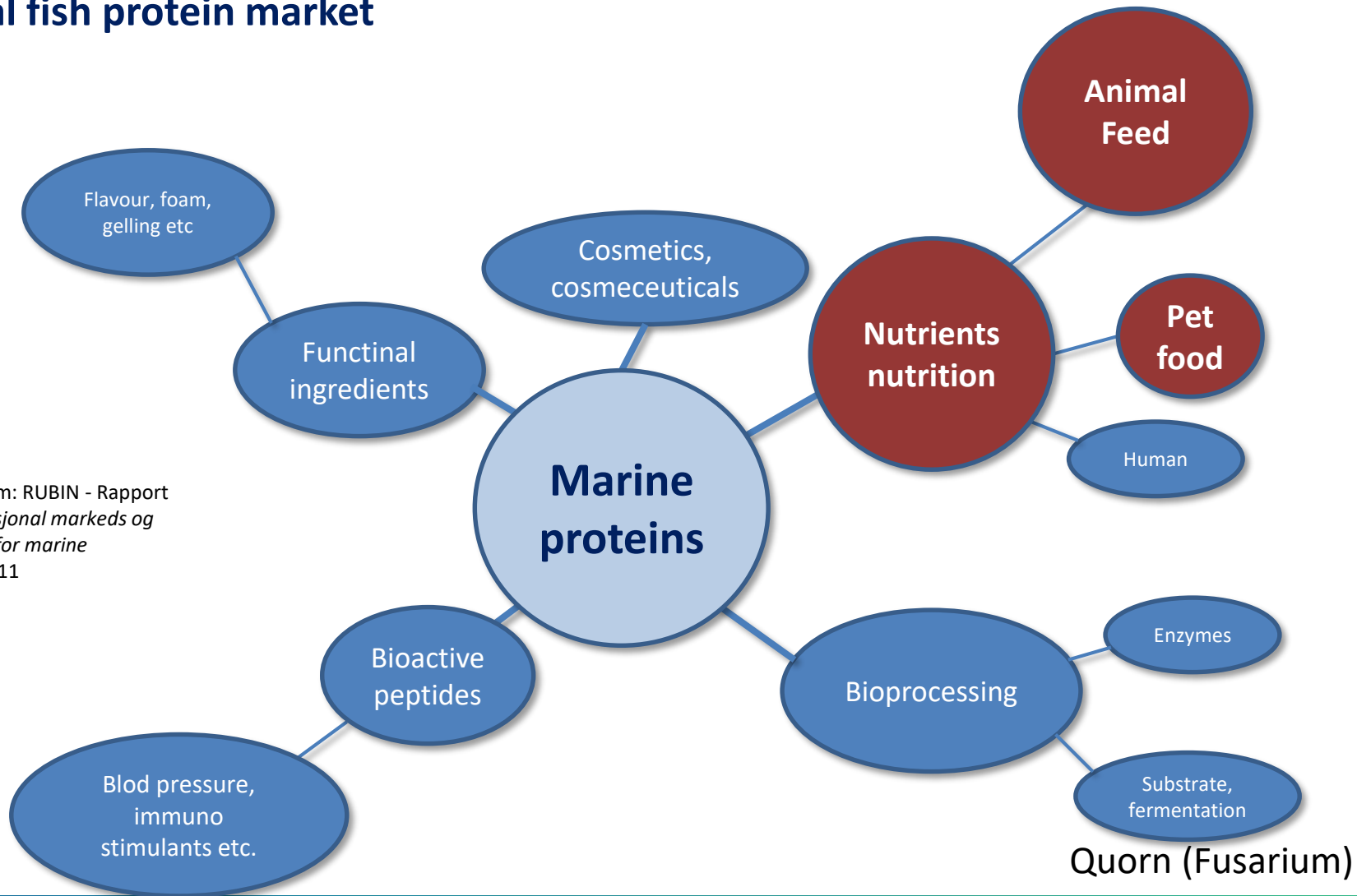
Aims and objectives



from: «Analyse marint restråstoff», Richardsen et al. 2017 (SINTEF)

Aims and objectives

The global fish protein market



Reproduced from: RUBIN - Rapport nr. 210. *Internasjonal markeds og industrianalyse for marine ingredienser*. 2011

Quorn (Fusarium)

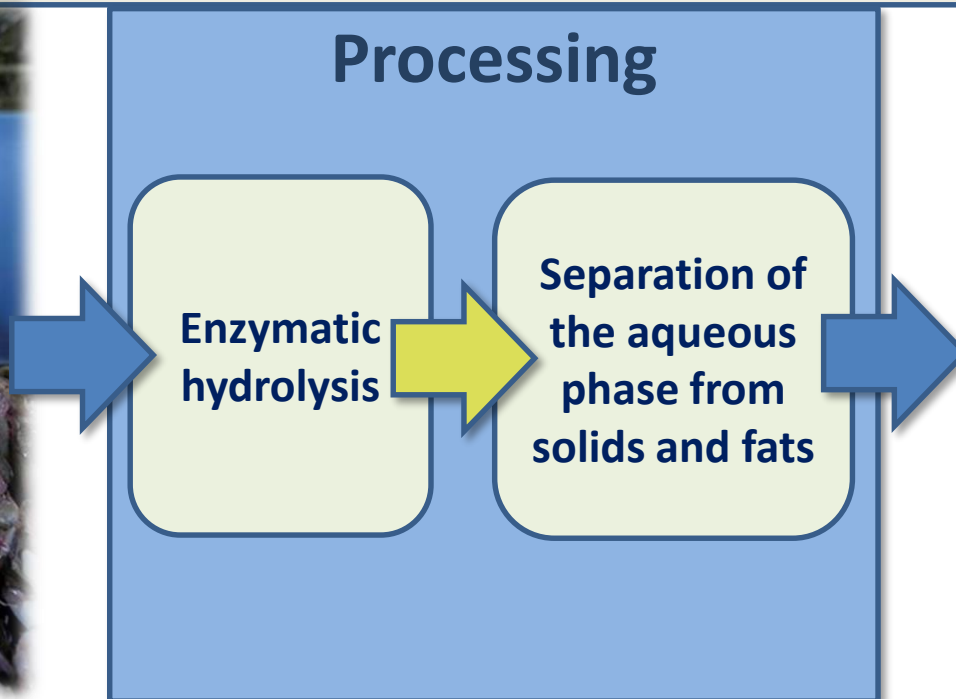
Aims and objectives

Biotech: A national test plant for bioprocessing



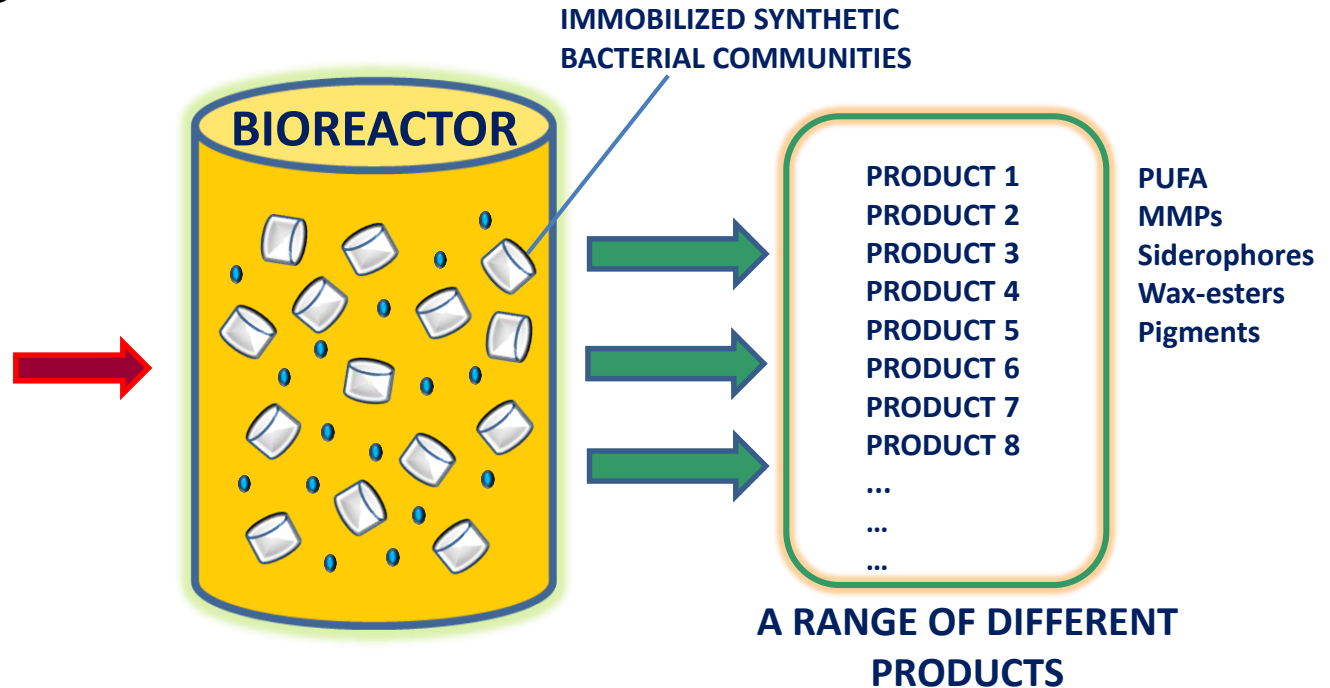
Marine biomass

Hydrolysates



Aims and objectives

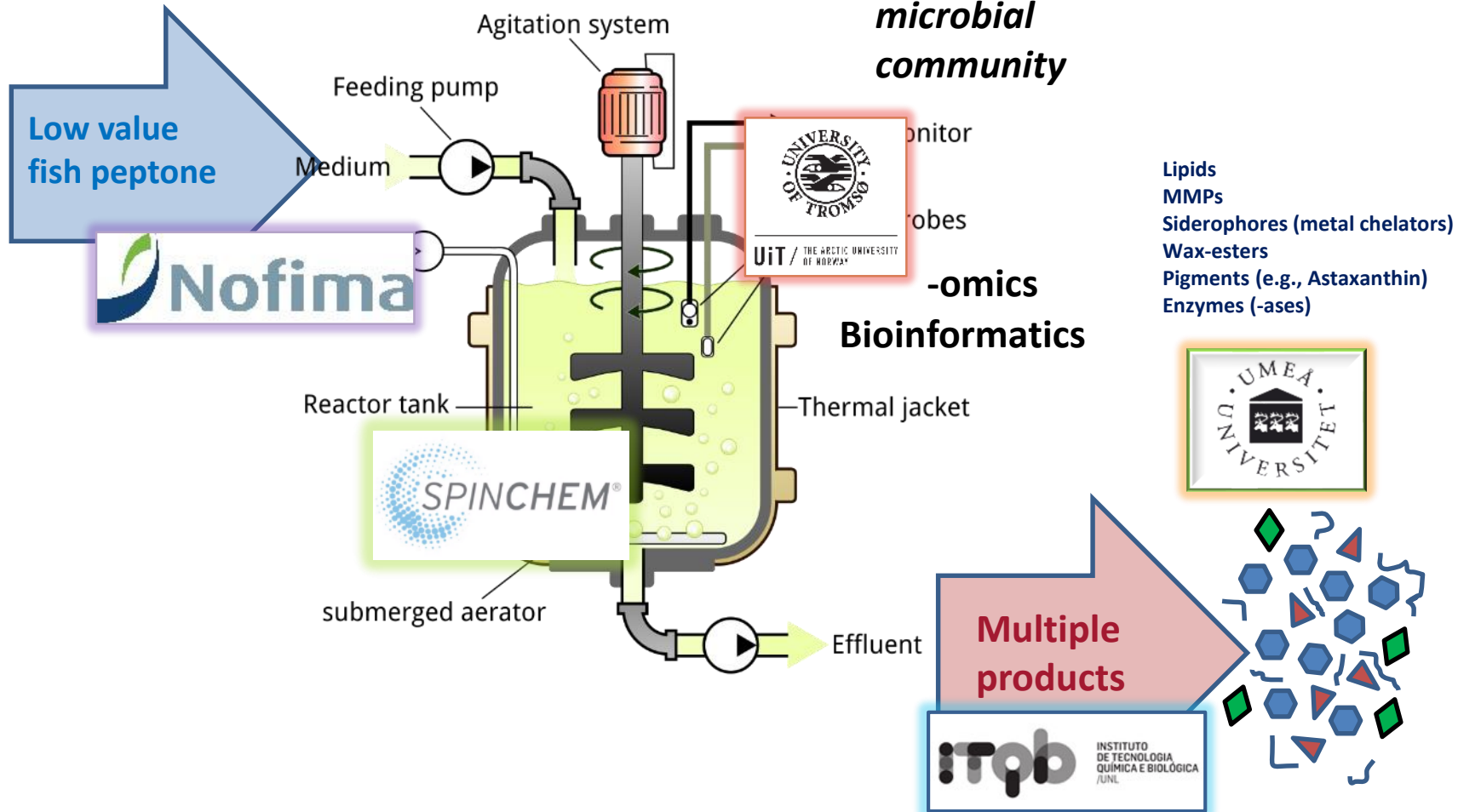
Hydrolysates



The *MicroMBT* main objective:

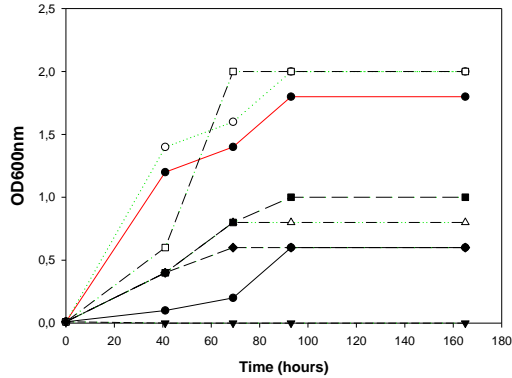
To develop a sustainable biorefinery process by using synthetic microbial communities and Moving Bed Technology to transform low cost marine rest raw materials to high value compounds

Aims and objectives

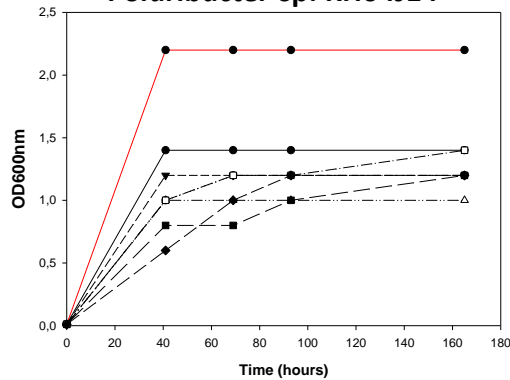


Progress

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



Salmon



Cod



Sandeels



Shrimp

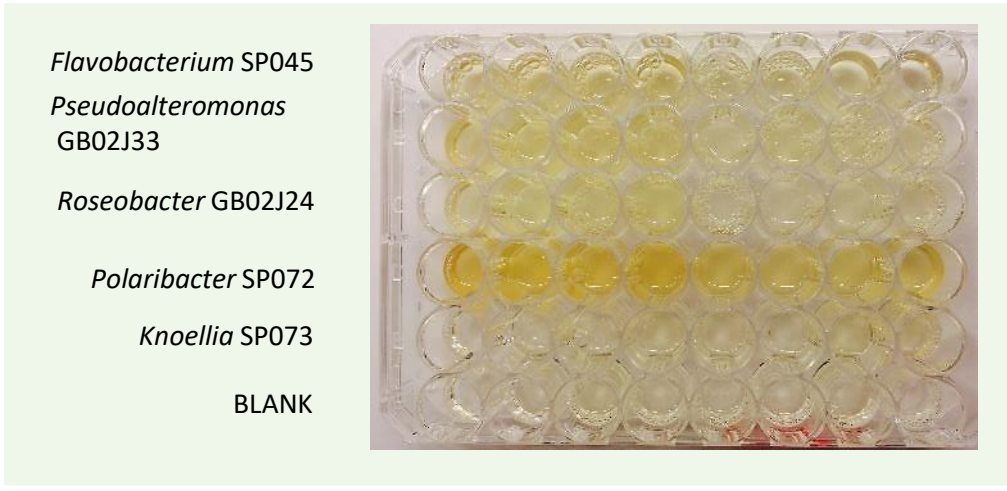


Herring

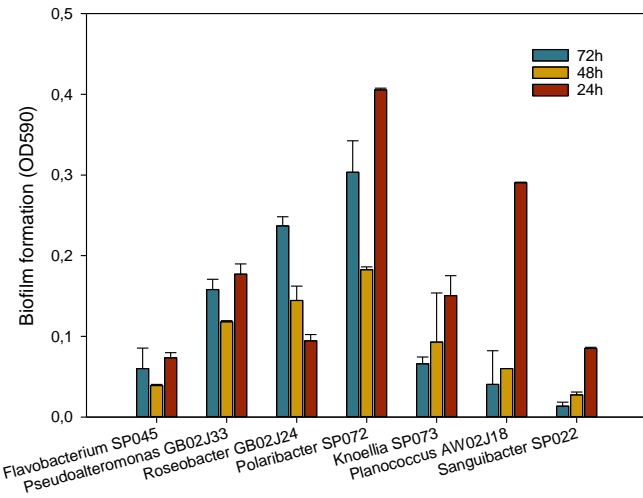


Progress

Modified «Calgary» device



Wash



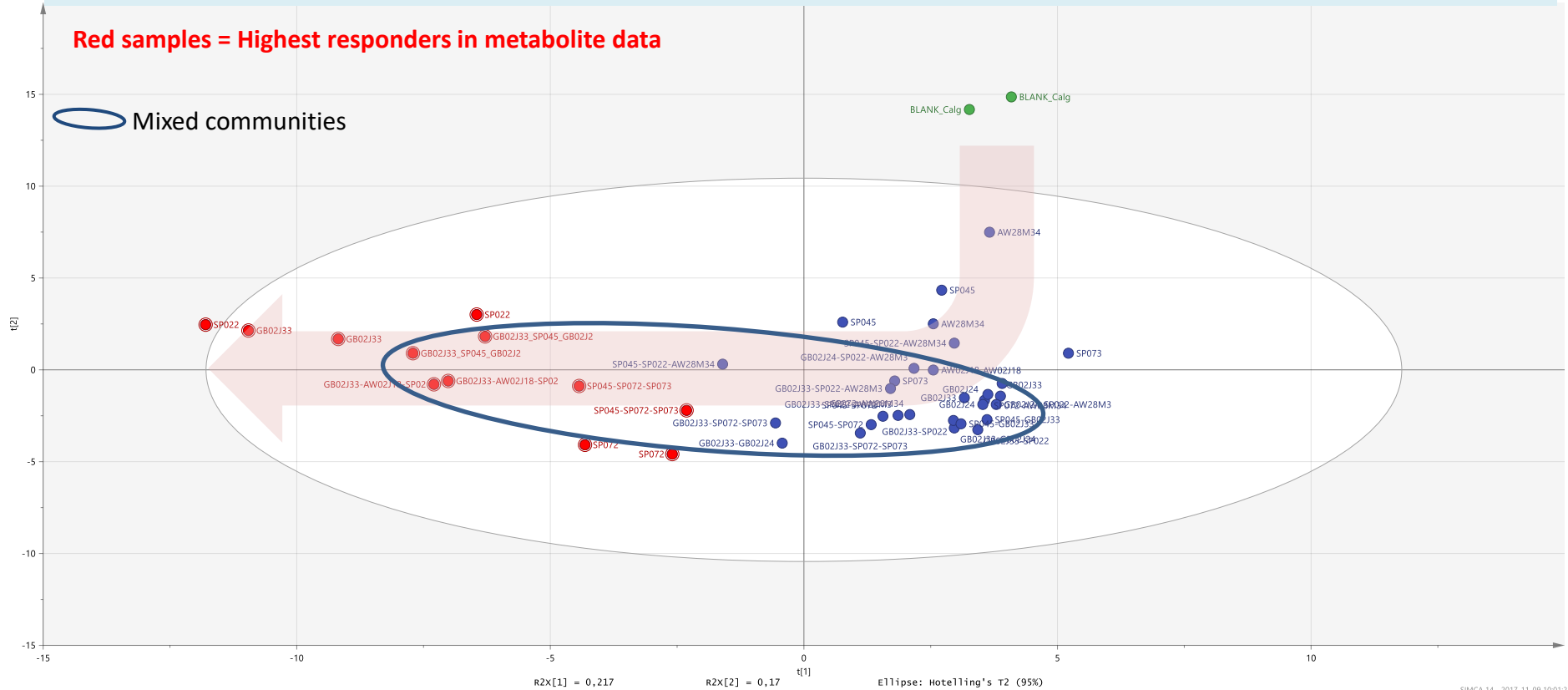
Progress

PCA scores, i.e. multivariate sample distribution

1
2

Red samples = Highest responders in metabolite data

Mixed communities

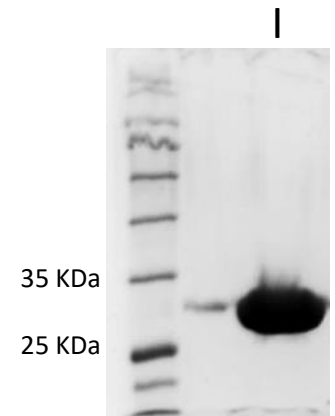
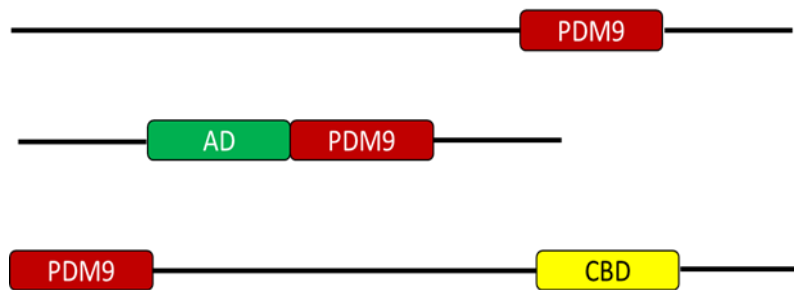


SIMCA 14 - 2017-11-09 10:01:23 (UTC+1)

Progress

Marine collagenases

- *collagenase I*
- *collagenase II*
- *collagenase III*



Potential impacts and perspectives

Research-related impacts:

- Improved knowledge on:
 - How to use *mixed microbial communities* in bioreactors
 - Fish protein hydrolysates as growth medium
 - Marine Collagenases (Matrix metalloproteinases, MMPs)
 - Metabolomics: Analytical, and bioinformatic predictions
- Project partners have built close links that hopefully can be maintained in future collaborations.



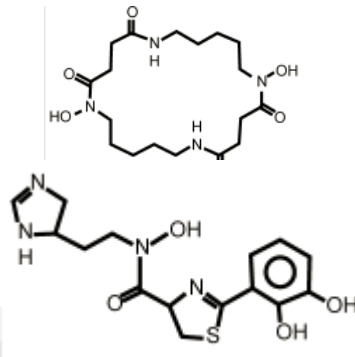
Potential impacts and perspectives

Innovation-related:

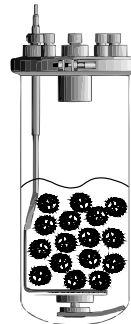
- Promote knowledge on marine biotechnology and innovation
- Potential products:
 - Growth medium for microorganisms based on marine proteins
 - Collagenases for improved processing of co-streams (fish skin)
 - Siderophores (Bisucaberin, Anguibactin, piscibacin, etc)
 - New use of bioreactors (MBBR and RBR)



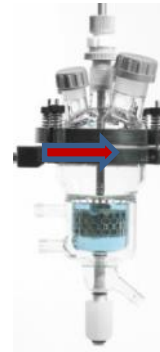
Marine protein



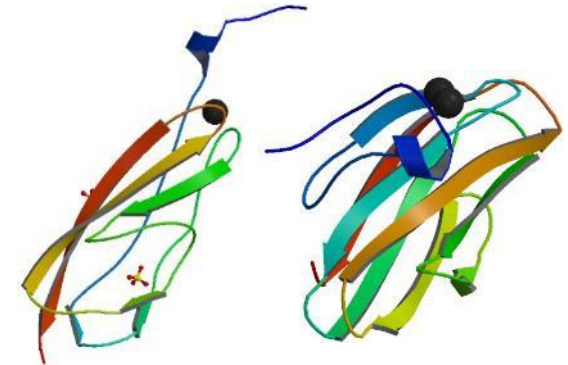
Siderophores



MBBR



RBR



Marine collagenases

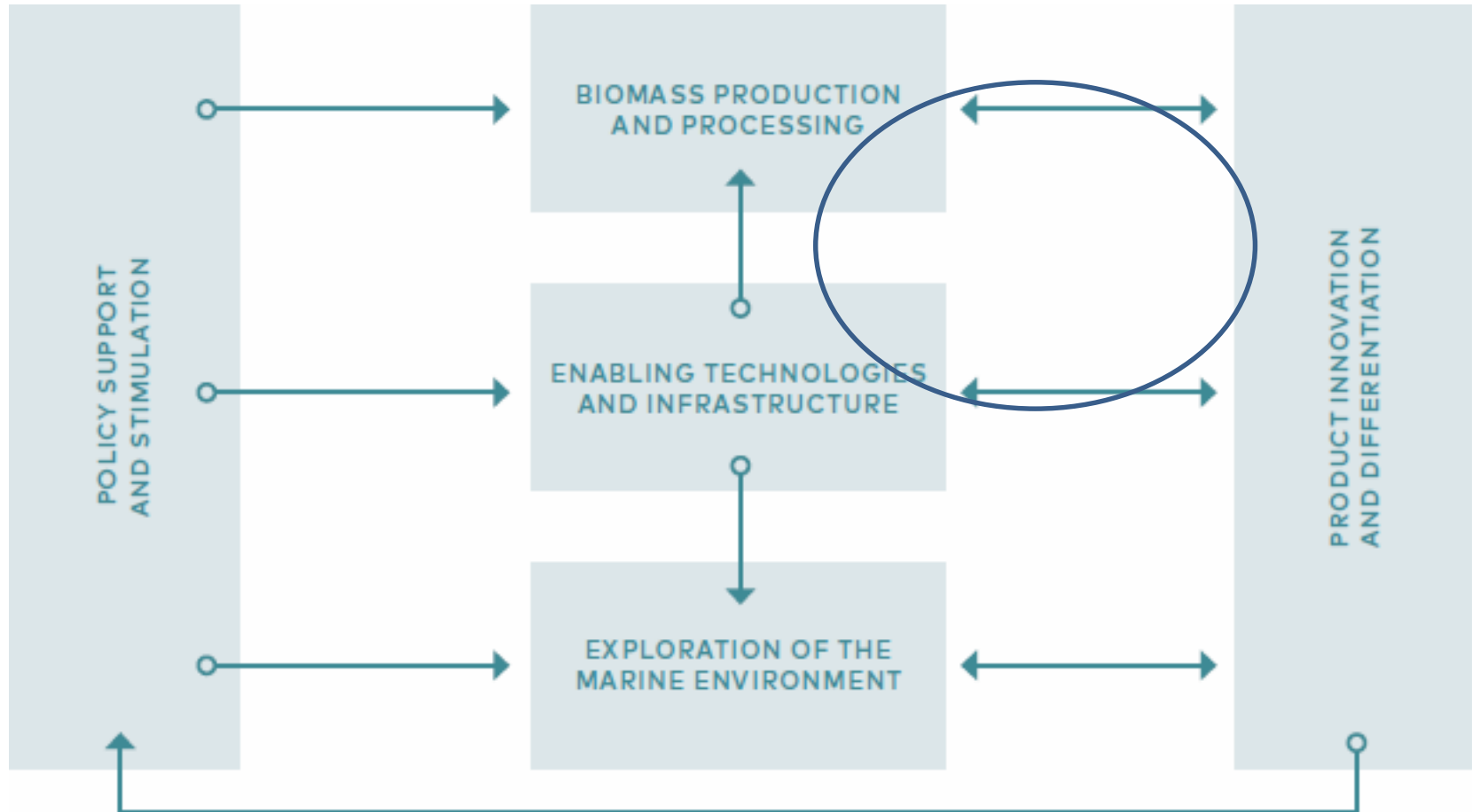
Potential impacts and perspectives



Societal-related:

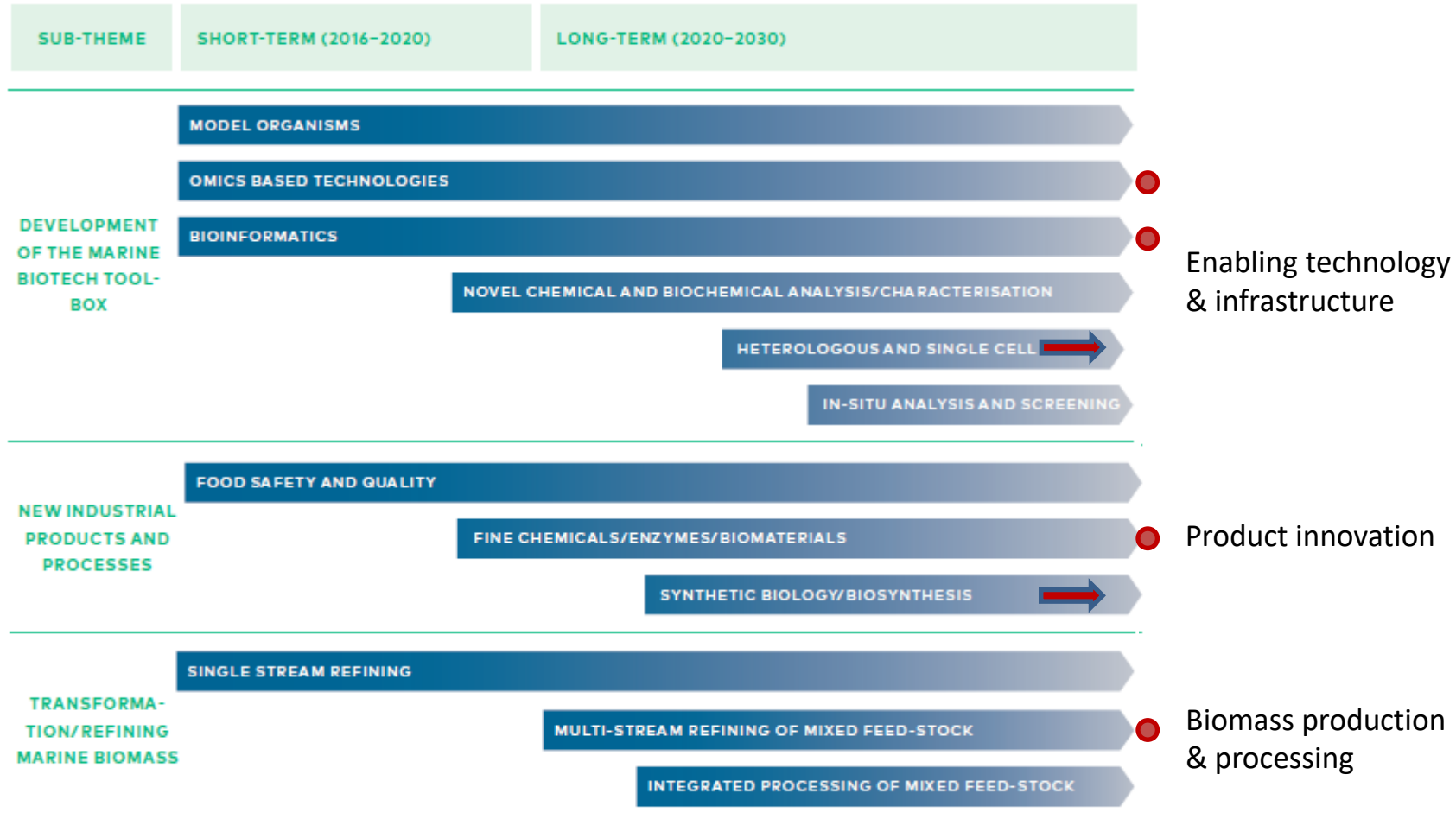
- Exchange of knowledge between academia-industry
- Diversify products of companies, secure jobs
- More sustainable use of marine resources
- Added value from marine bioresources

Future directions

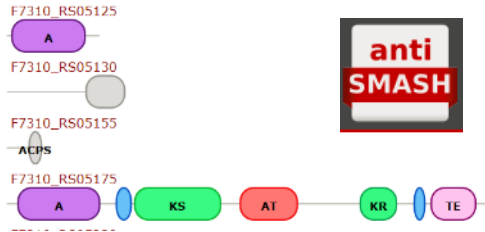


The five thematic areas of the strategic research and innovation roadmap

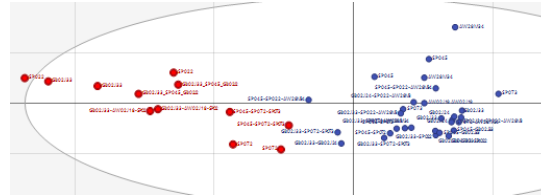
Potential impacts and perspectives



Future directions



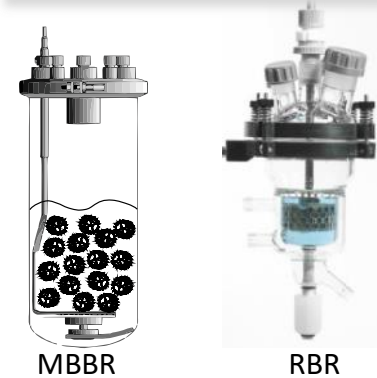
Bioinformatics



metabolomics

Omics-technologies

Bioreactor technology



Biomass production and processing



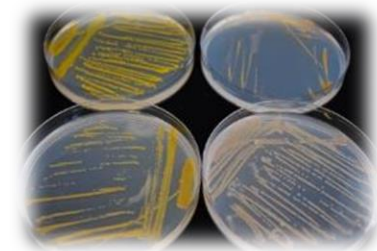
MicroMBT

Omics-technologies

Genomics, metagenomics



Microbiology & Culture collections



Thanks for listening.....