

RAS-TOOLS

A microbial toolbox for RAS production and innovation.



Sustainable Aquaculture kick-off meeting

25 May 2021

RAS-TOOLS

NORWAY

University of Bergen
Norwegian Veterinary Institute
Erko Settefisk (Industry partner)

WP1, WP7

DENMARK

University of Copenhagen
Aarhus University
Atlantic Sapphire (Industry partner)

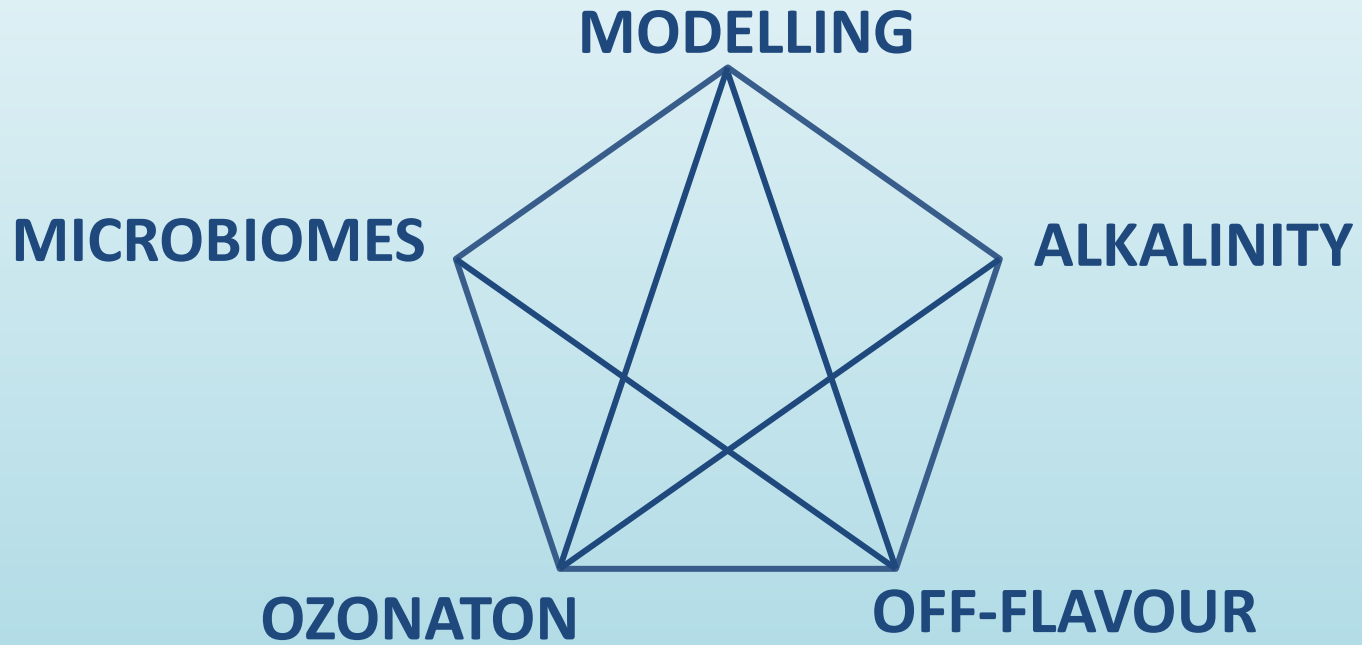
WP5, WP6

FINLAND

Natural Resources Institute Finland (Luke)
Finnforel (Industry partner)

WP2, WP3, WP4

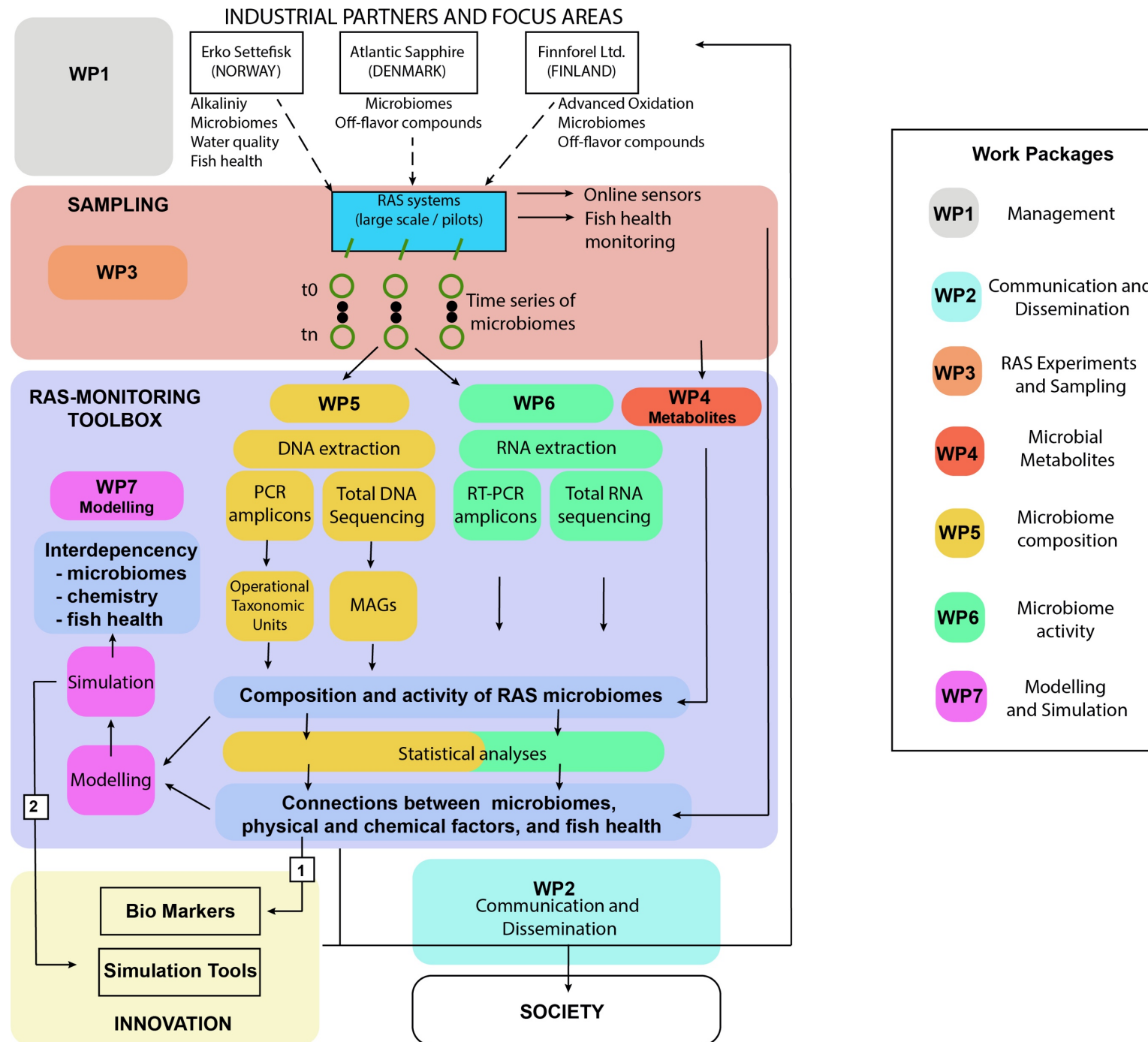




BIOMARKERS

SIMULATION TOOLS





Contributions to RAS-TOOLS from Denmark

Academic partners:

University of Copenhagen (UoC)

Aarhus University (AU)

Industry partner:

Atlantic Sapphire

Workpackages

WP4: Microbial metabolites

WP5: Microbiome composition

WP6: Microbiome activity



WP4: Microbial metabolites [Luke, UoC, AU]

Important questions:

Which fish-spoiling off-flavours occur in water and fish in RAS?
Where and how are they produced?

Specific objectives

- **Screen** for dominant microbial **off-flavours** in seawater RAS by **GC-MS** technology
- **Monitor** short- and long-term **changes** of selected off-flavours in water and fish
- **Identify** important **locations and processes** for production of off-flavours
- Characterize formation of **organic bromo-compounds** formed by **ozonation** of seawater
- Determine **relations** between **off-flavours in water and flesh of salmon** from a marine RAS
- **Relate** water quality **treatments to off-flavours** to improve RAS operations



WP5: Microbiome composition [UoC, UoB, AU, Luke]

Important questions:

Which bacteria occur in different compartments of a salmon RAS?

Which microbial functions are dominant (identification of functional genes)?

Where are off-flavour producing bacteria found?

How does operation of RAS influence microbiomes?

Specific objectives

- Determine **composition and variations in RAS microbiomes** in salmon production
- Characterize how **water quality**, e.g. H_2S , affects the microbiome composition
- Examine how **water treatment**, e.g. ozonation, affects the microbiome composition
- Characterize **dynamics of off-flavour-producing bacteria** in a seawater RAS
- **Provide recommendations** for optimizing microbiome functions



WP6: Microbiome activity (AU, UoC, UoB, Luke)

Important questions:

Which bacterial functions occur in different compartments in RAS?

When are specific genes being expressed in RAS?

Can RNA-based approaches help identify when and where off-flavours are produced?

How does operation of RAS influence activity of the microbiomes?

Specific objectives

- Determine **microbiome activity** in a seawater RAS for salmon production
- Characterize how **different water treatments**, e.g. ozonation, affect metabolic functions
- Determine environmental parameters that may control **expression of off-flavour genes**
- Relate environmental conditions to **activity of sulfate-reducing bacteria** and their production of H₂S



Contributions to RAS-TOOLS from Finland

Academic partners:

Natural Resources Institute Finland (Luke)

Industry partner:

Finnforel

Workpackages

WP2: Communication and dissemination

WP3: RAS experiments and sampling

WP4: Microbial metabolites



Luke Laukaa RAS research platform



Finnforel located in pulp mill area

WP2: Communication and dissemination [All partners]

Important aims:

Generate a project website for external communication

Establish good system for efficient internal communication

Specific objectives

- Communicating the **societal** and **ethical** relevance of developing a sustainable RAS industry
- To generate and disseminate **practical information** important to the RAS farming industry, researchers and diagnostic labs
- Raising **awareness of future prospects** of land based fish-farming
- Gather together **key messages and outcomes** of each WP for communication and steer cooperative communication work of the project



WP3: RAS experiments and sampling [All partners]

Important aims:

- Conduct experimental research at Luke Laukaa RAS research platform and RASLab in Norway
- Sampling and collecting monitoring data from full scale RAS farms (Erko Settefisk, Finnforel, Atlantic Sapphire)

Specific objectives

- To investigate the **effect of advanced oxidation processes** on water quality, fish performance and microbiome in fresh water RAS
- To investigate the **effect of alkalinity** on water quality, fish performance and microbiome in marine RAS
- To reveal important parameters that are affecting the water quality and microbiomes in full scale RAS



Contributions to RAS-TOOLS from Norway

Academic partners:

University of Bergen (UiB)

Norwegian Veterinary Institute (NVI)

Industry partner:

Erko Settefisk

Workpackages

WP1: Management

WP7: Modelling



RASLab



Erko Settefisk



WP7: Modelling[All partners]

Important questions:

**Is modelling a fruitful approach for a better understanding of RAS dynamics?
What are optimal alkalinity levels in marine RAS systems?**

Specific objectives

- Model effects of changing alkalinity levels on RAS system dynamics.
- Compare modelling results with results from controlled experiments (pilot scale RAS) and monitoring of industrial scale RAS.



Main aquaculture-related events we may partparticipate in (2022-2023)

- 2022 Aquaculture Europe (Italy)
- 2022 Smolt production in the future (Norway)
- 2023 Aquaculture Europe
- 2023 NordicRAS



Web page (under construction)

<https://rastools.w.uib.no/>



WP LEADERS

WP1 - Management	Håkon Dahle	hakon.dahle@uib.no
WP2 - Communication and dissemination	Petra Lindholm-Lehto	petra.lindholm-lehto@luke.fi
WP3 - RAS experiments and sampling	Jani T Pulkkinen	jani.t.pulkkinen@luke.fi
WP4 - Microbial metabolites	Petra Lindholm-Lehto	petra.lindholm-lehto@luke.fi
WP5 - Microbiome composition	Niels O G Jørgensen & Mikael Agerlin Petersen	nogj@plen.ku.dk map@food.ku.dk
WP6 - Microbiome activity	Peter Stougaard	pst@envs.au.dk
WP7 - Modelling	Susanna Röblitz	susanna.roblitz@uib.no

