Unlocking Precision Microbiome Management

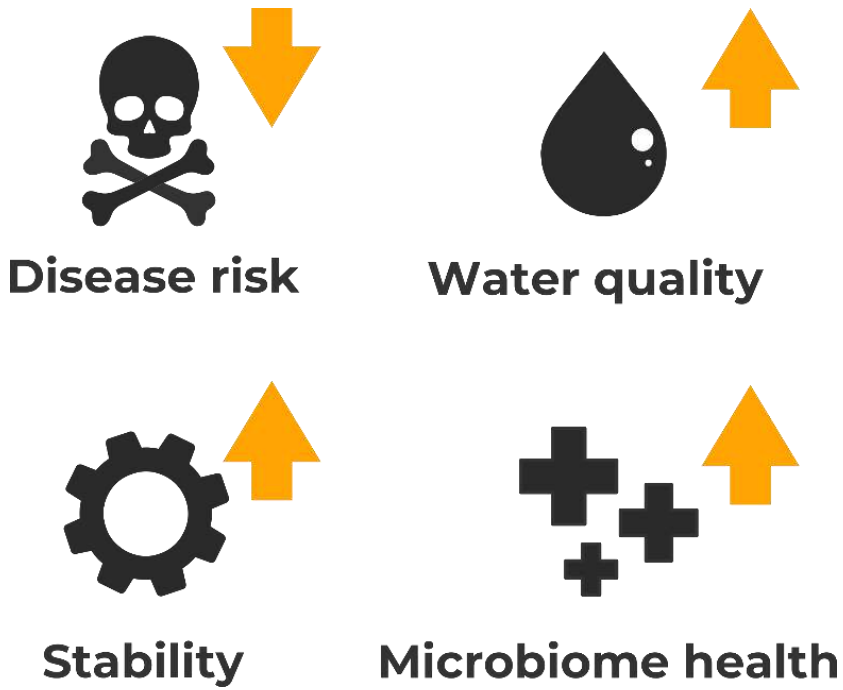
WAS APC-AIC webinar 28-07-2021

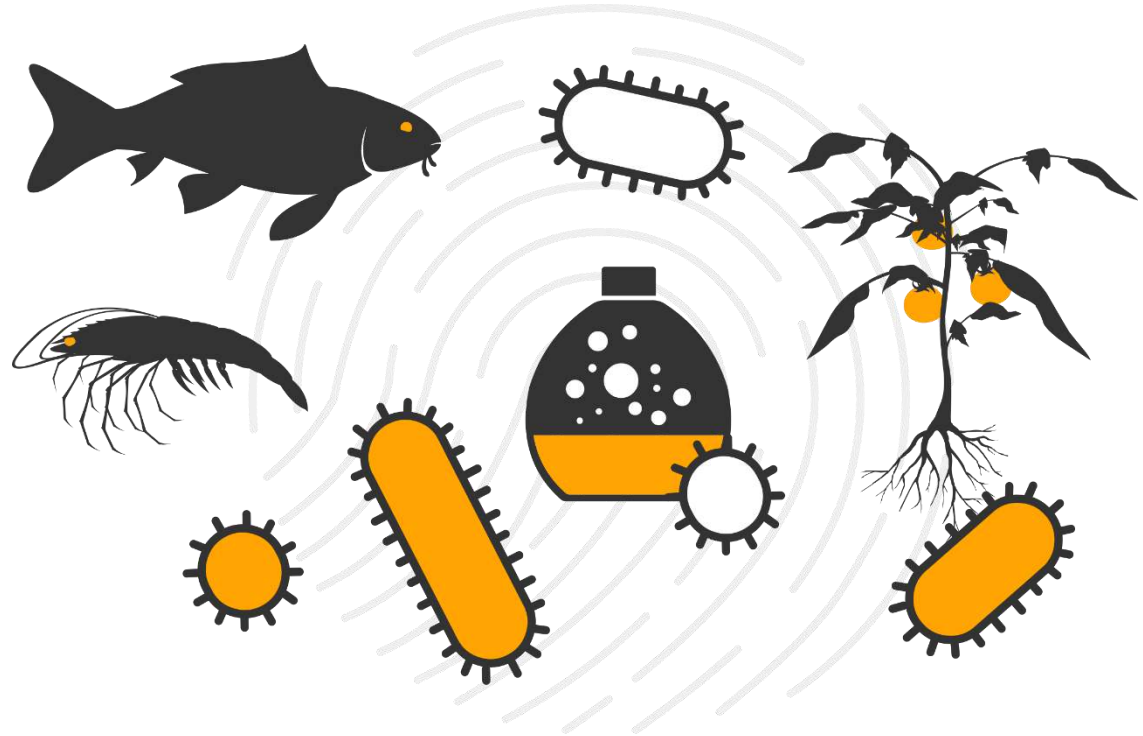
Ruben Props, PhD

Microbiome Management at Your Fingertips.

GHENT UNIVERSITY

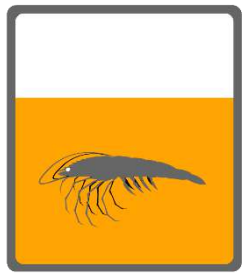
CMET



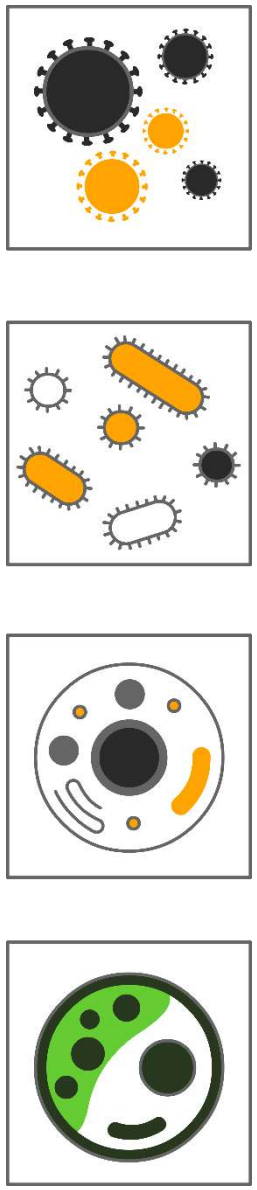


THE MICROBIOME IN A POND

MICROBES ARE THE DOMINANT LIFEFORM

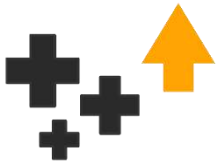


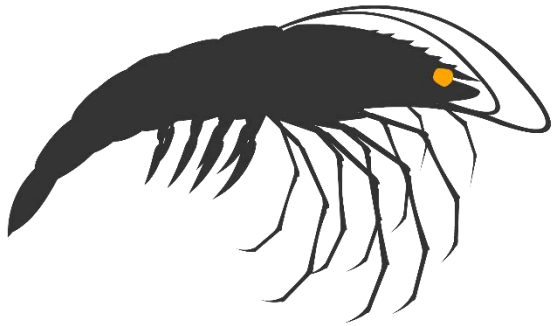
0.25 ha
150 PL/m²



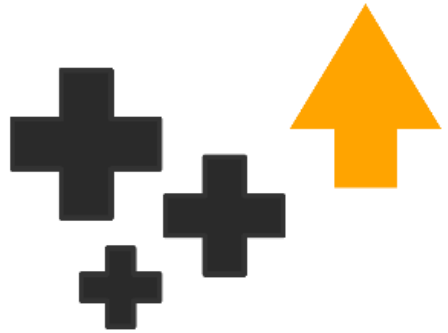
~3.2 x 10^{16} cells per pond

Microbial community
~3 million planets of human population



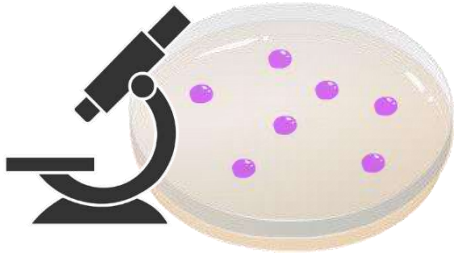


375,000 PL per pond

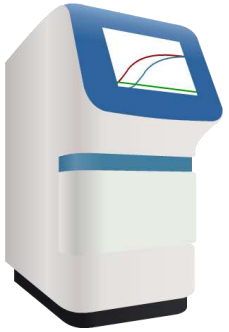


HOW WE MEASURE TODAY

Agar plating
(TCBS, etc)



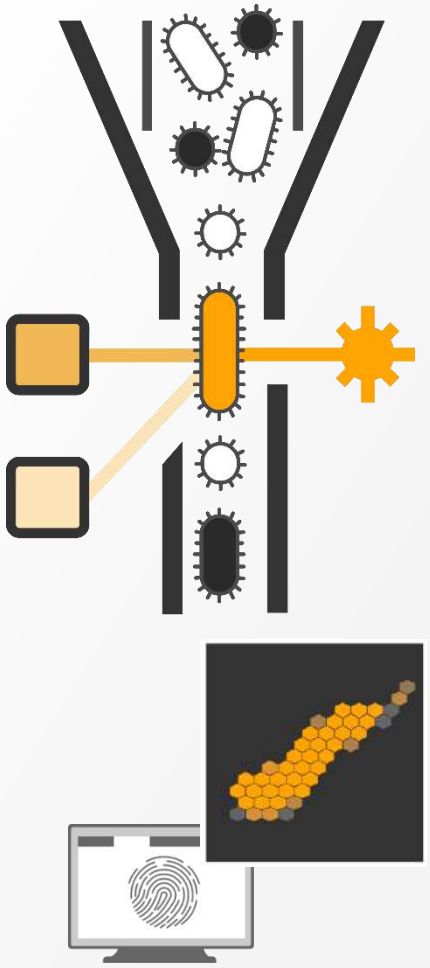
Molecular diagnostics
(qPCR)



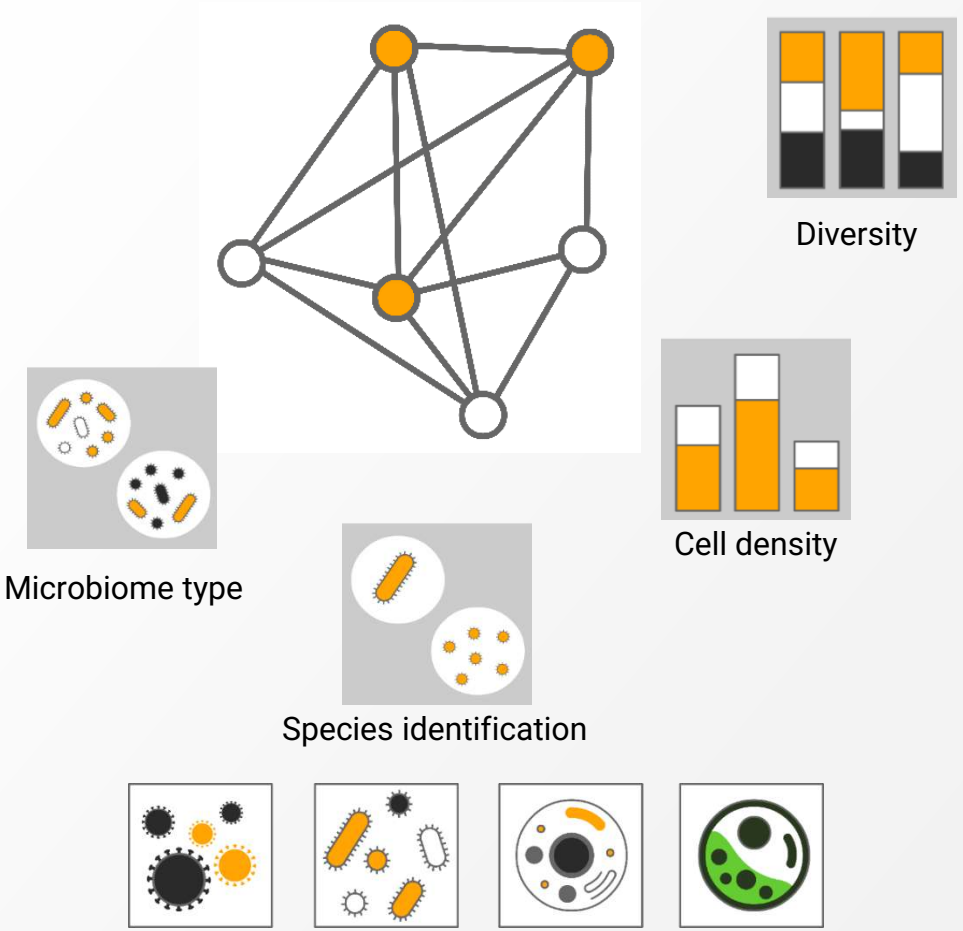
- → Miss > 99.9 % of microbes
- → Focus exclusively on (opportunistic) pathogens
- → Missing important insights
- → Erroneous conclusions (dogmas)
- → Mismatch with management

THE KYTOS APPROACH

Fingerprinting of Microbial Communities



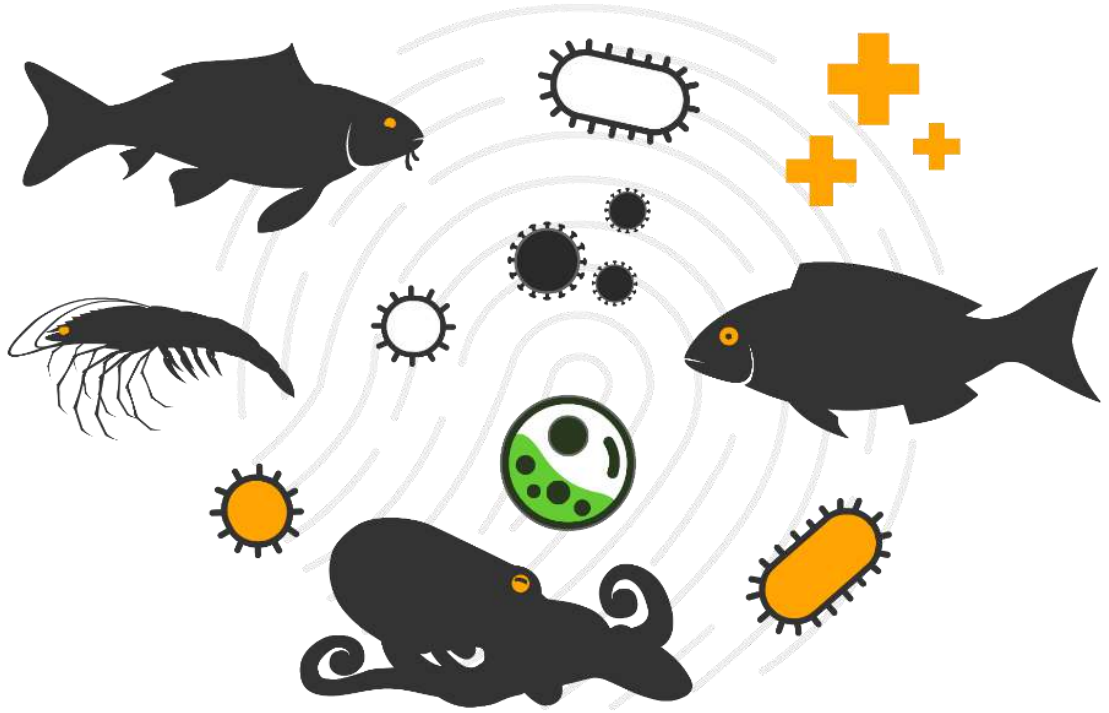
Supervised Learning to extract Health Information



Early Detection of Microbial Threats and Opportunities

THE ADVANTAGES OF OUR FINGERPRINTING

- Characterization of all cells
- Accurate profiling of dynamics
- Up to 1,000,000 data points per sample
- Meaningful health insights for farmers
- Actionable insights



HOW WE MANAGE TODAY

+1 week

+1 week

+1 week

>50% MORTALITY
2 WEEK RESPONSE TIME

- Poor microbiome management
- Shrimp mortality induced

- Mortality observed
- Diagnostic tests initiated

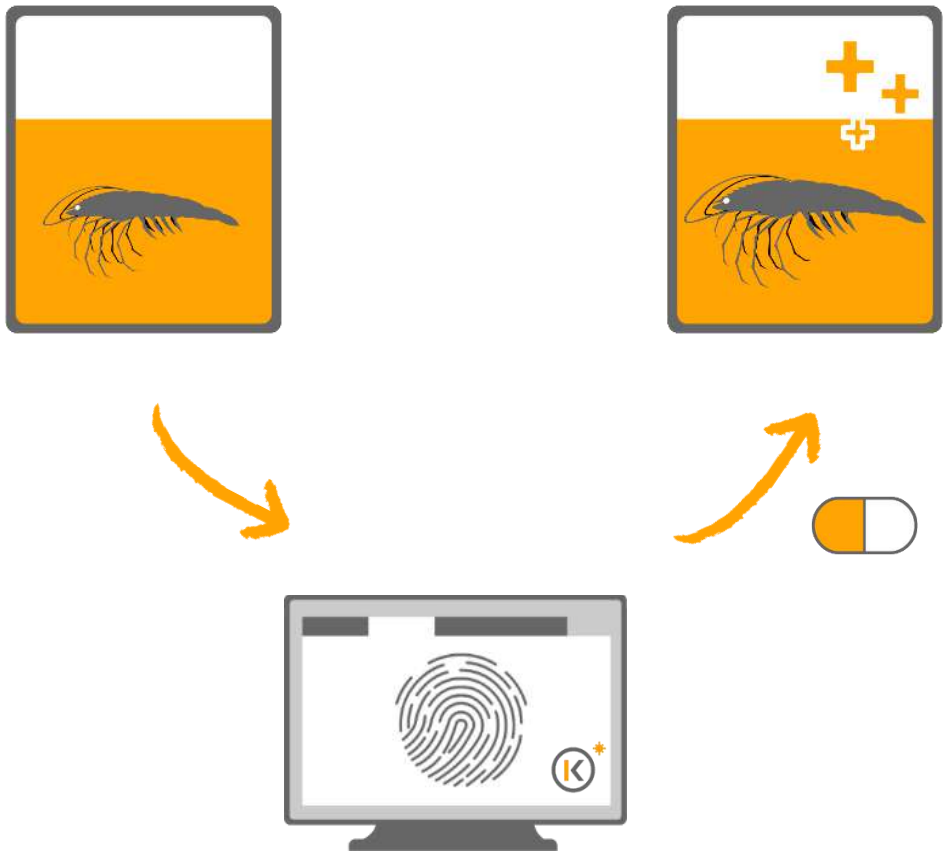
- Farmer-devised treatments
- Sanitizers and biocontrol products

FARMERS MISS TIMELY INSIGHTS

"BLIND"

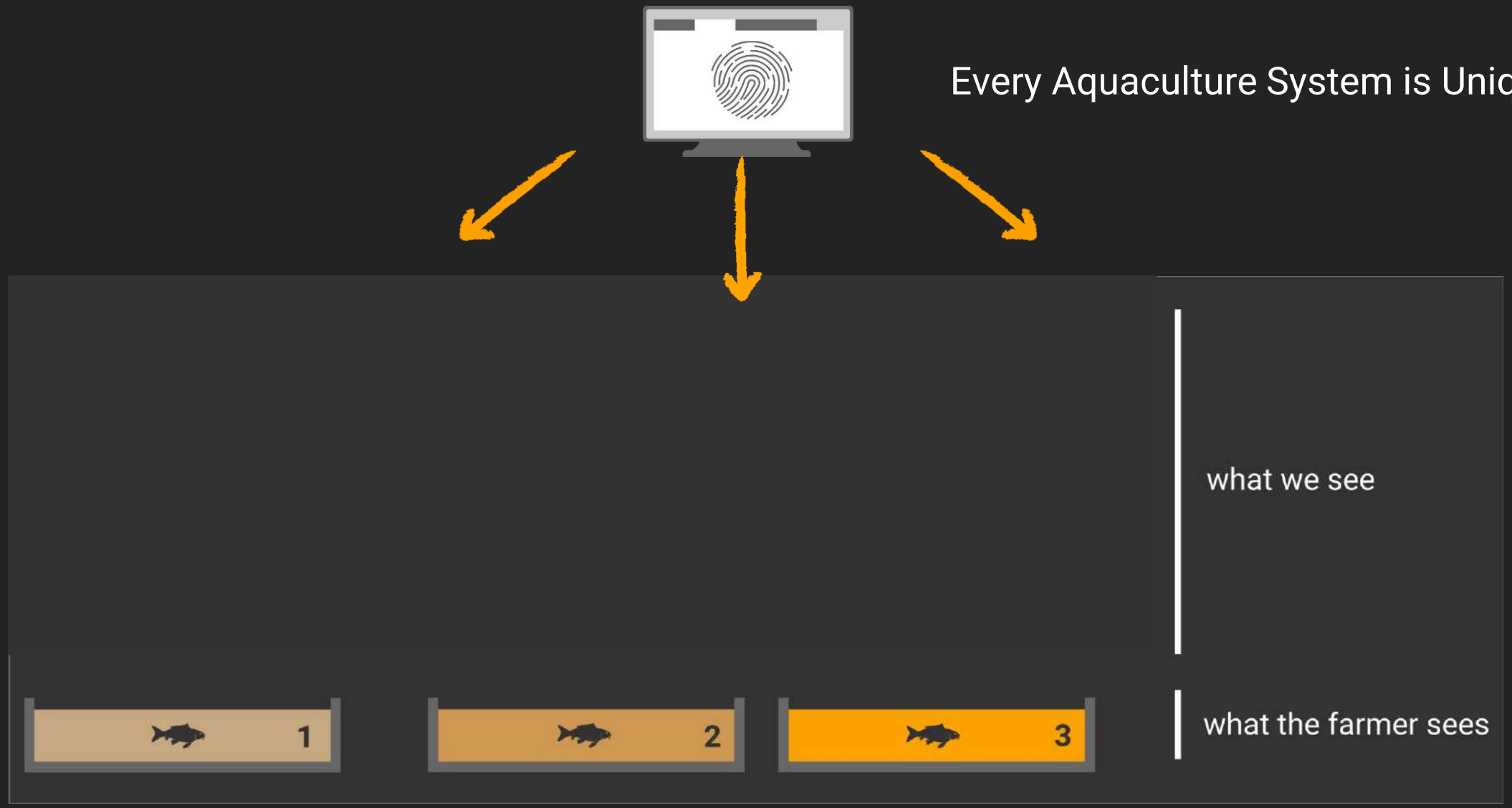
MITIGATION

HOW WE (SHOULD) MANAGE TOMORROW



- ✓ Routine screening of microbial fingerprints
  e.g. quantifying trophic status of ponds
- ✓ A holistic approach to microbiome management
  e.g. algae, bacteria
- ✓ Couple fingerprints to farming practices
  e.g. product use, stocking density

A NEED FOR ARTIFICIAL INTELLIGENCE



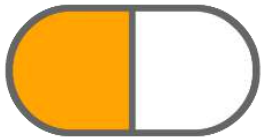
How to make a difference …

AQUA PHARMA

THREE EXAMPLES

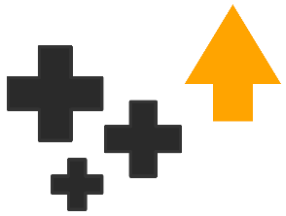
Steering farming practices

Quantifying Heterotroph/Autotroph balance



Identifying the right moment for product dosing

Dosing biocontrol products

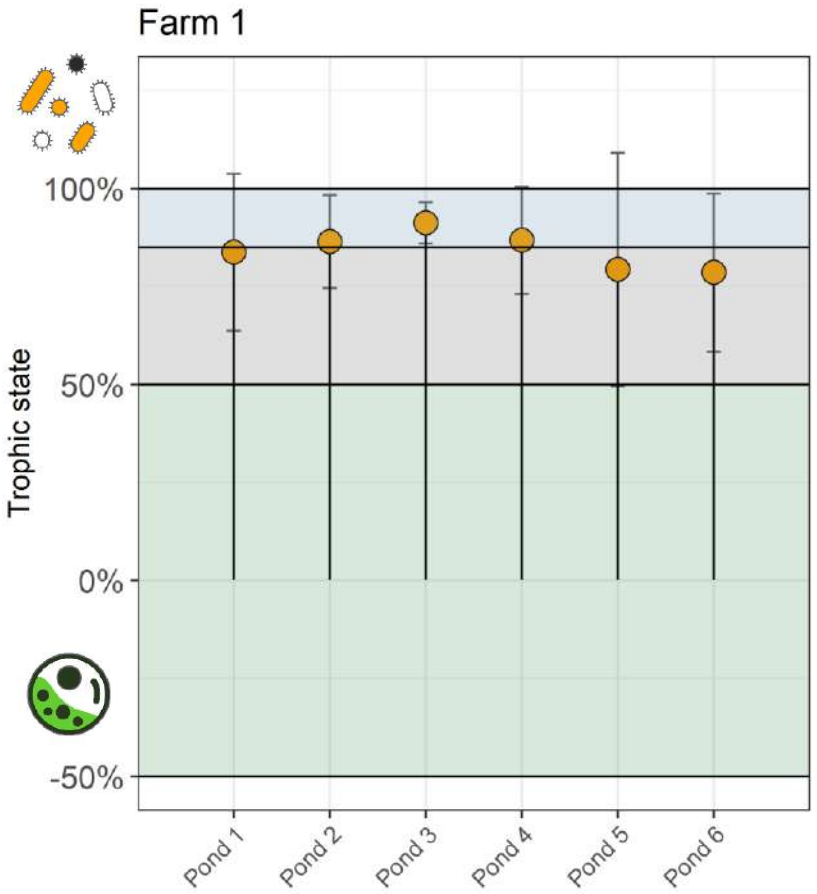


Predicting pond performance

Survival at harvest

Helping farmers steer the microbiome in their pond

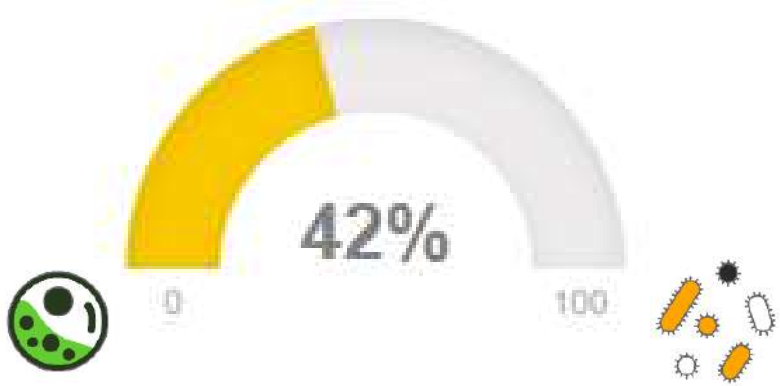
Heterotrophic farm
(~biofloc?)



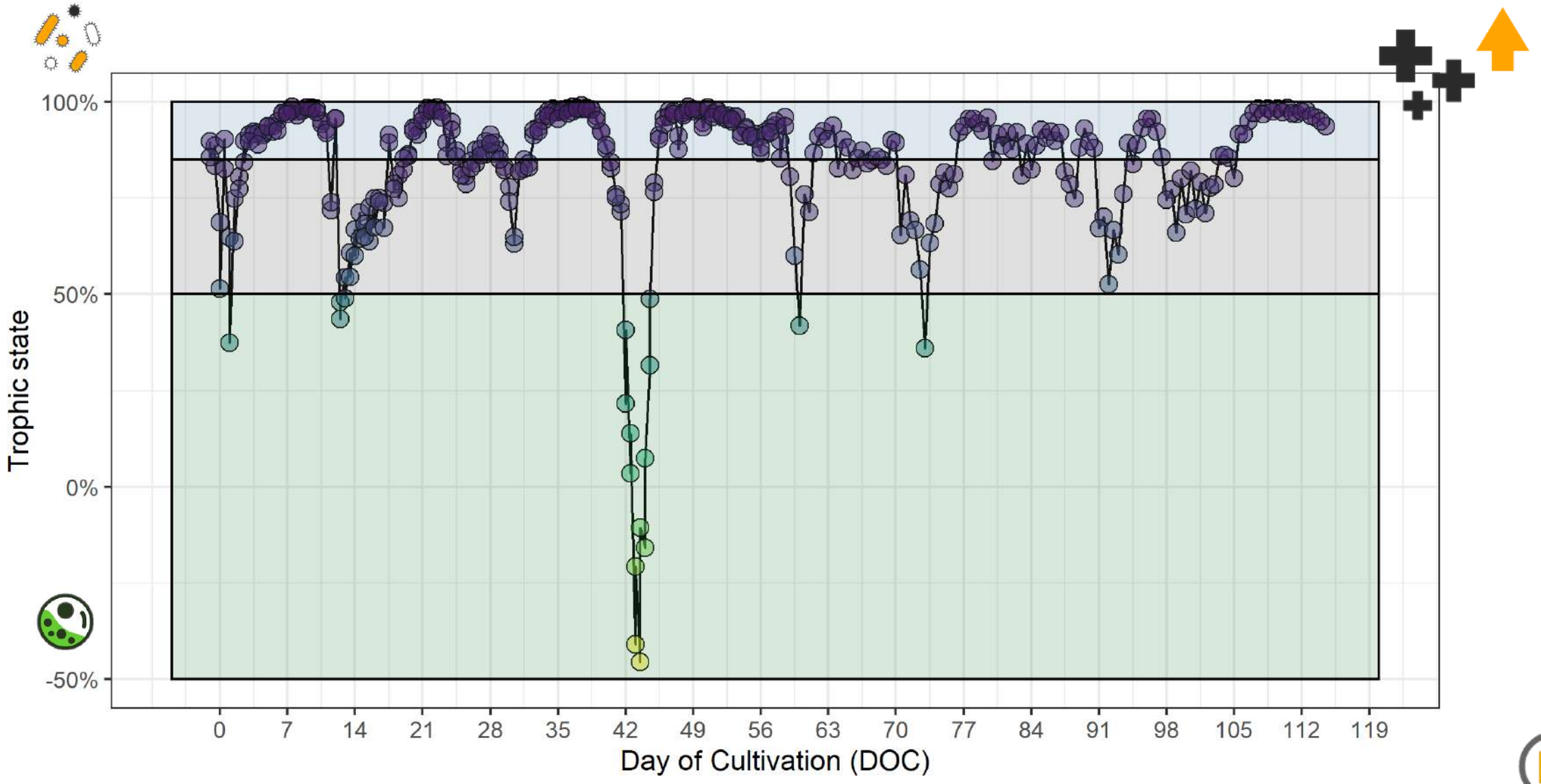
Heterotrophic zone

Mixotrophic zone

Autotrophic zone



Helping farmers steer the microbiome in their pond



Microbiome health

Helping farmers know what's best for their pond

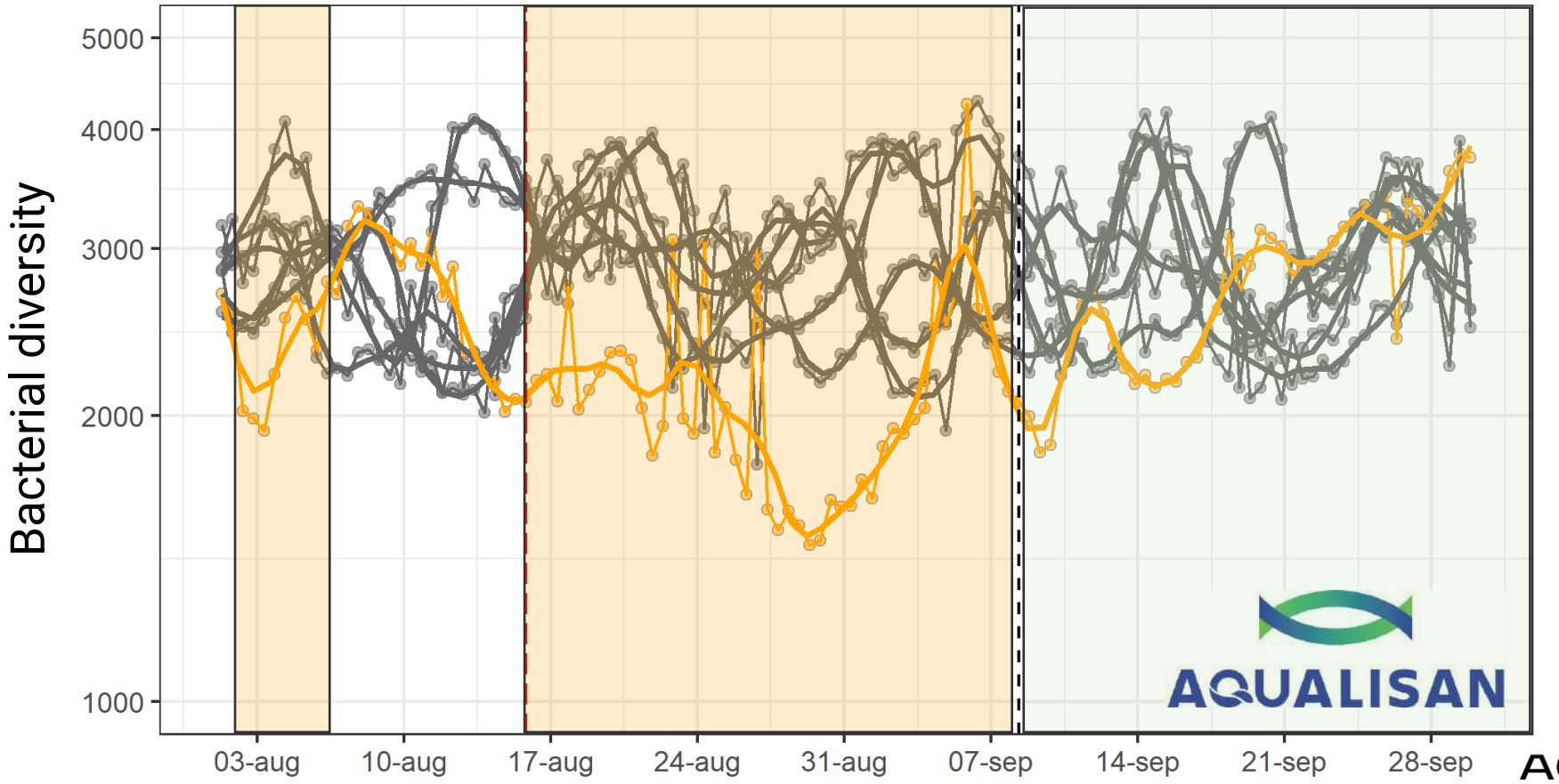
First deviation observed at stocking

- Decreased diversity
- Uncontrolled growth

Farmer's first observation of mortality at 07/09

~1 month

Emergency protocol initiated
Recovery of microbiome health



Healthier ponds
Unhealthy pond

AQUA PHARMA

Microbiome health

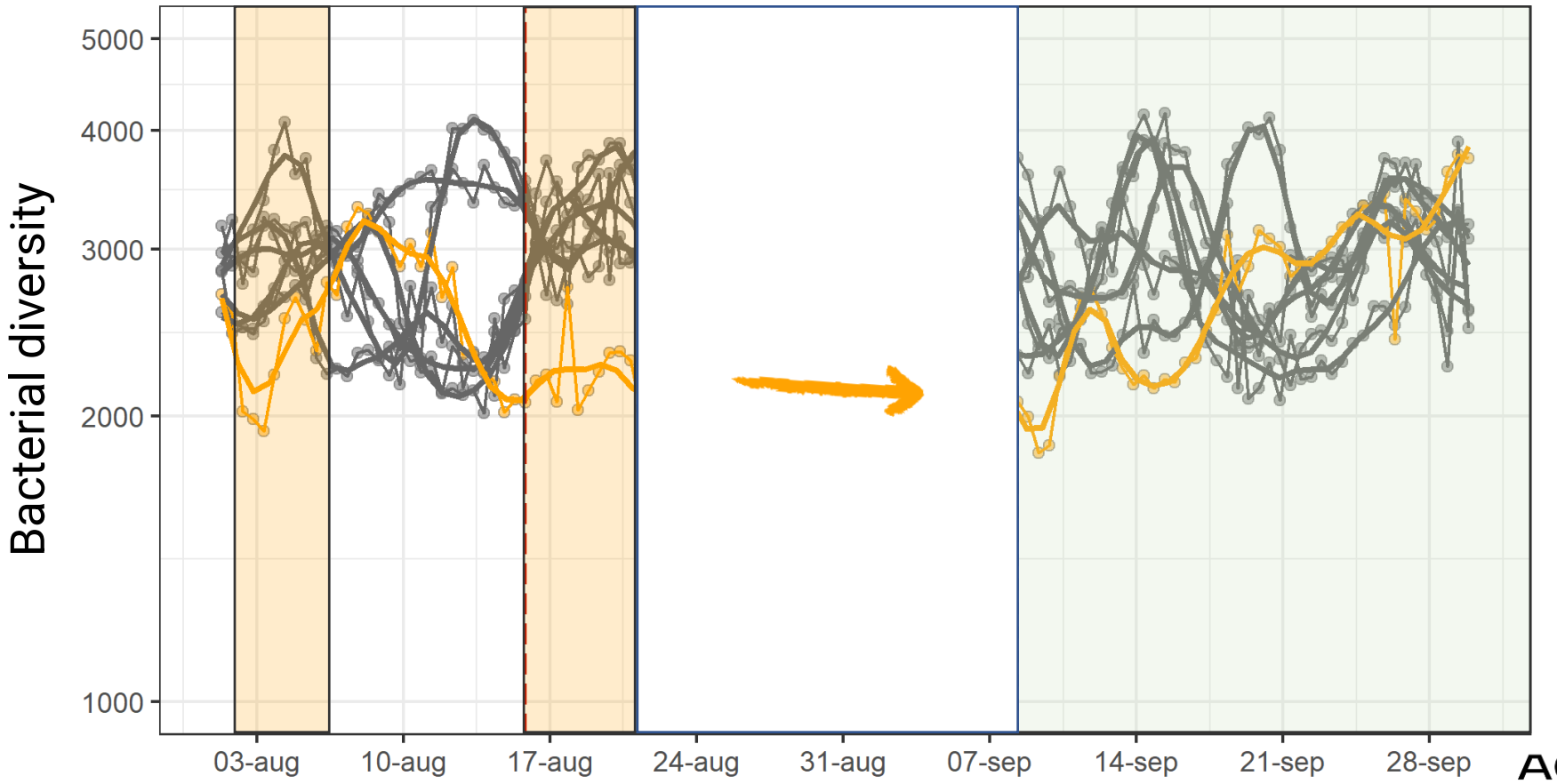
Helping farmers know what's best for their pond

Sanitizer + Probiotic

Sanitizer

Probiotic

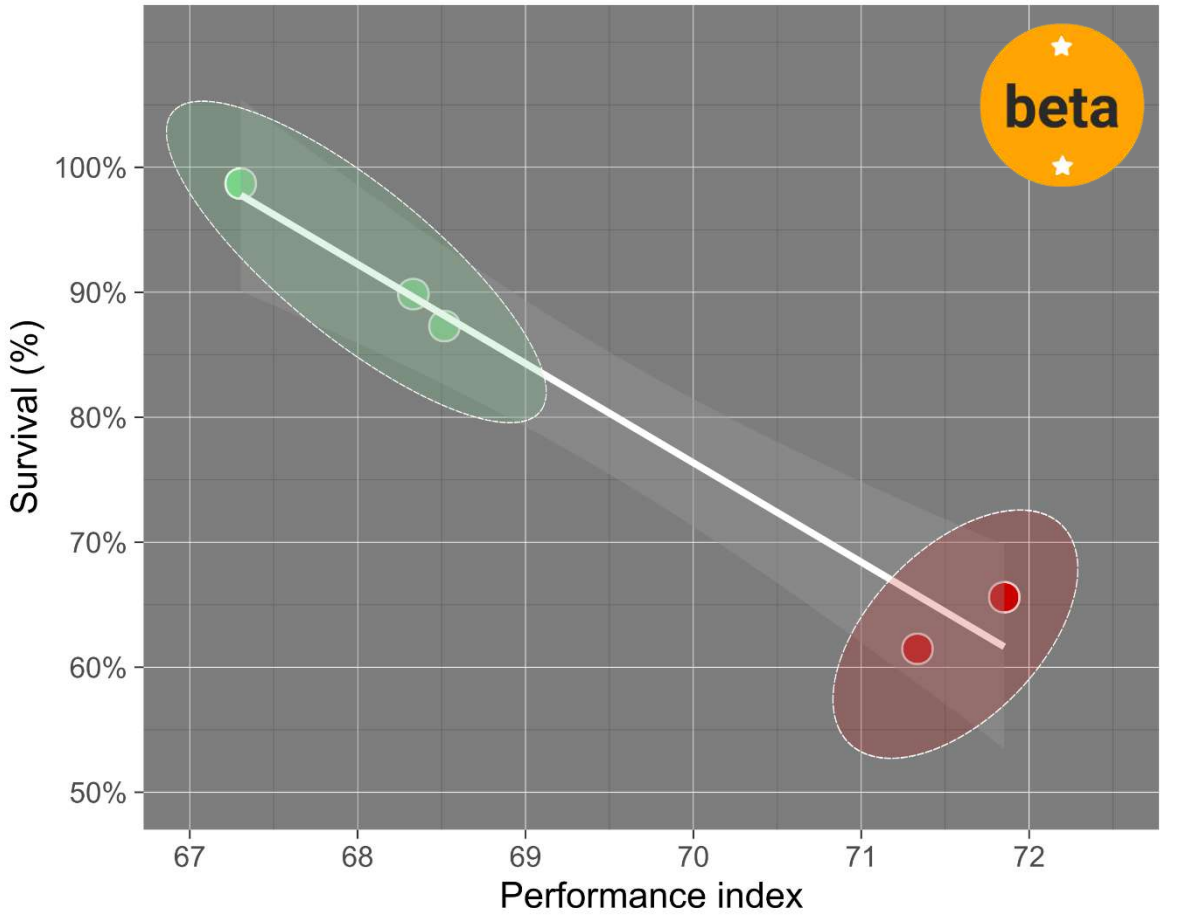
SEATRU



AQUA PHARMA

Stability

Helping farmers get the most out of their pond



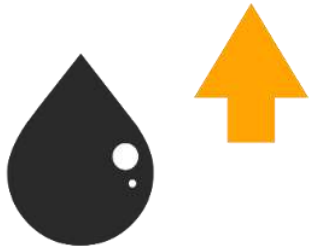
Measure microbiome for 2 months

Predict shrimp survival after 4 months

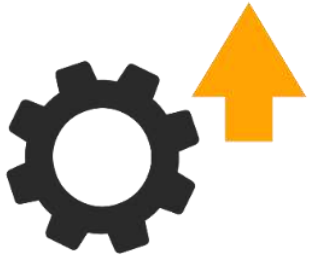
* Data from 5 individual commercial ponds

We are only scratching the surface…

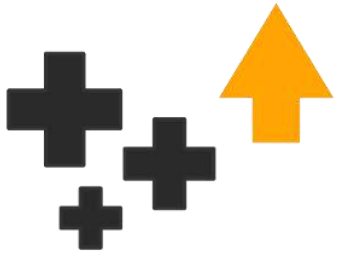
Disease risk



Water quality

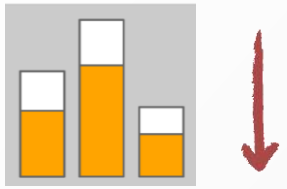


Stability



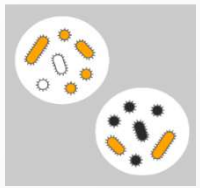
Microbiome health

Microbiome Health Indicators

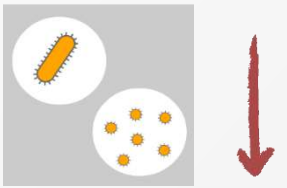


Cell density

Diversity

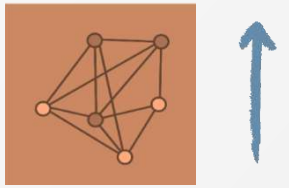


Good/Bad type



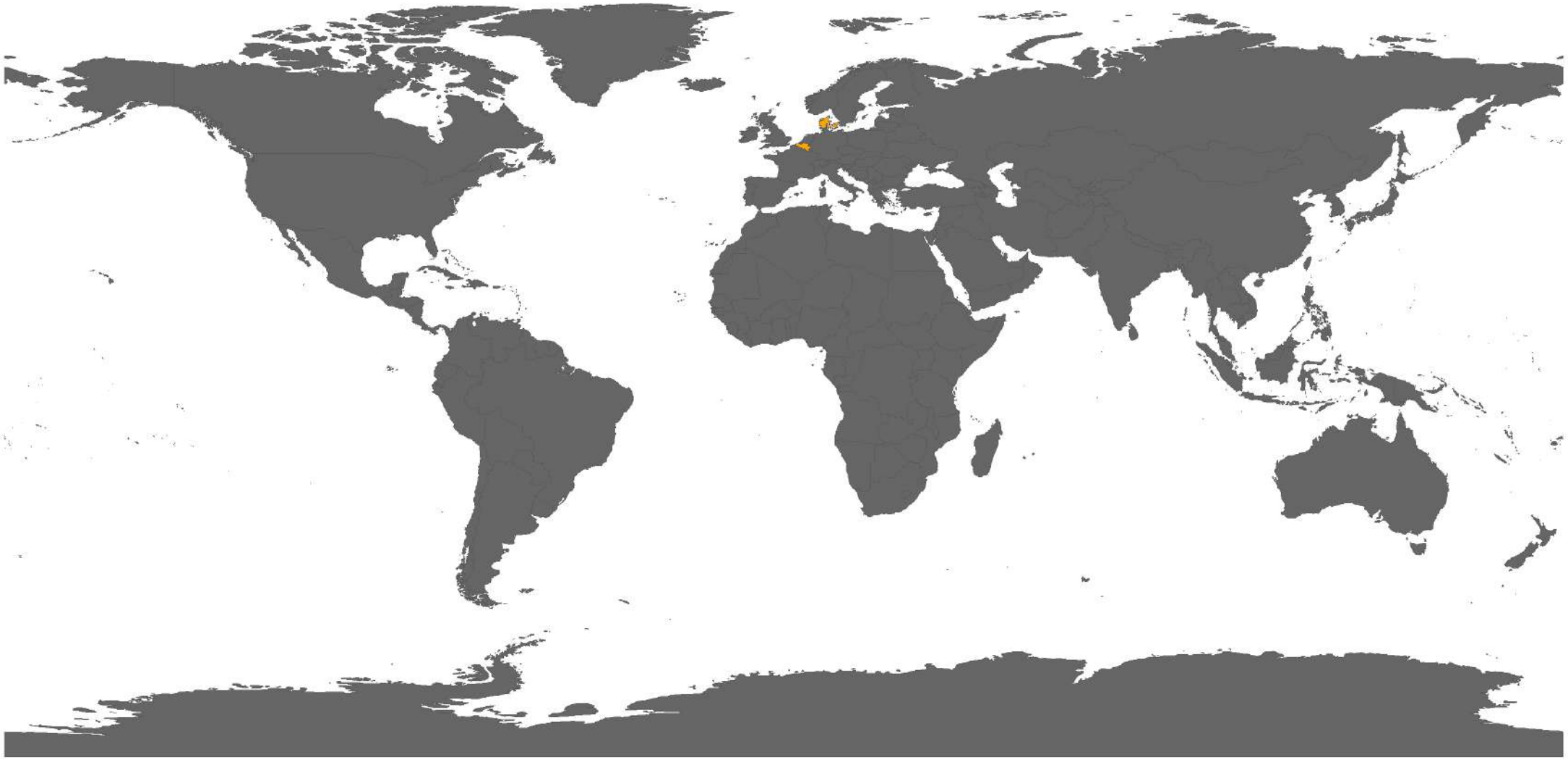
Cell size

Health Index



Performance index

WE ARE EXPANDING OUR ACTIVITIES WORLDWIDE



Meet us at AQUA NOR

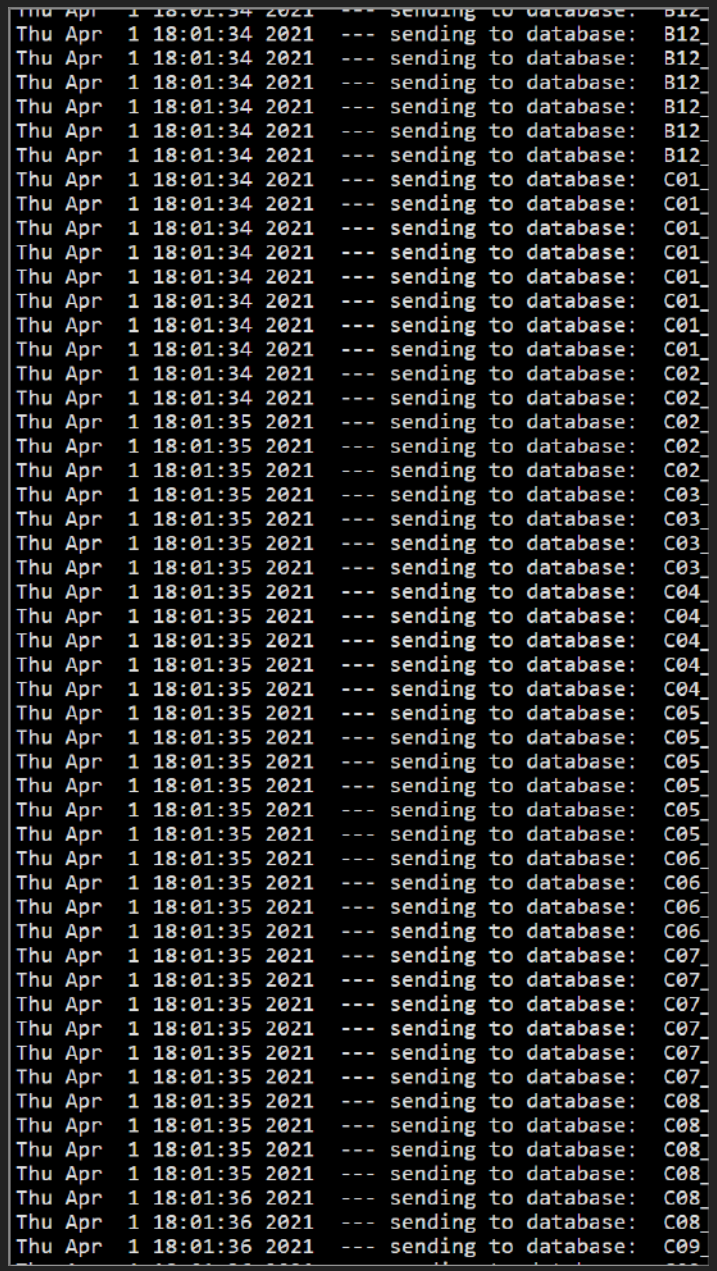
SEATRU

PRECISION MICROBIOME MANAGEMENT SOLUTIONS

a data intelligence platform with KYTOS

AQUA PHARMA

Feel free to contact us at info@kytos.be for more information.

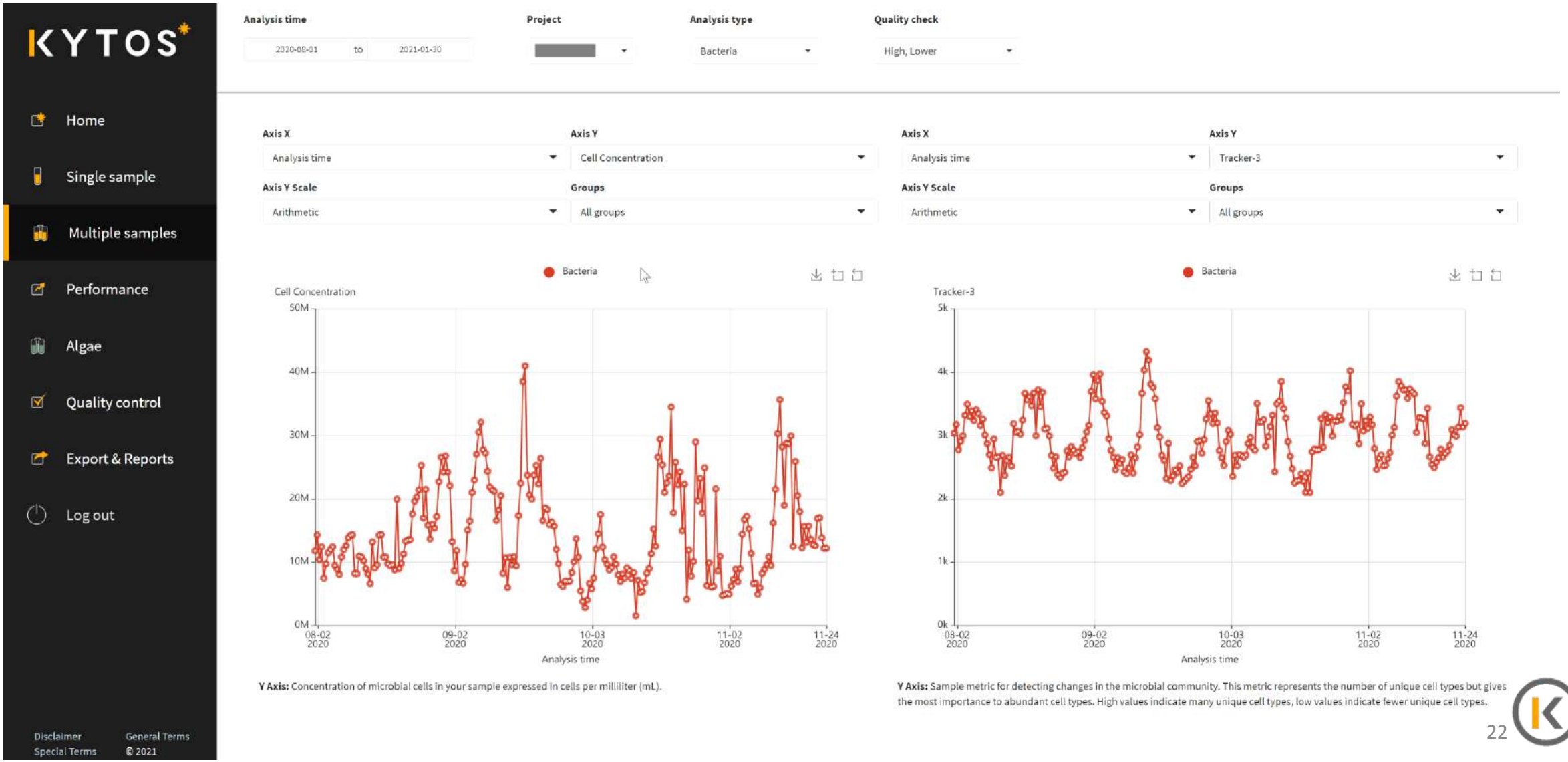


GHENT UNIVERSITY

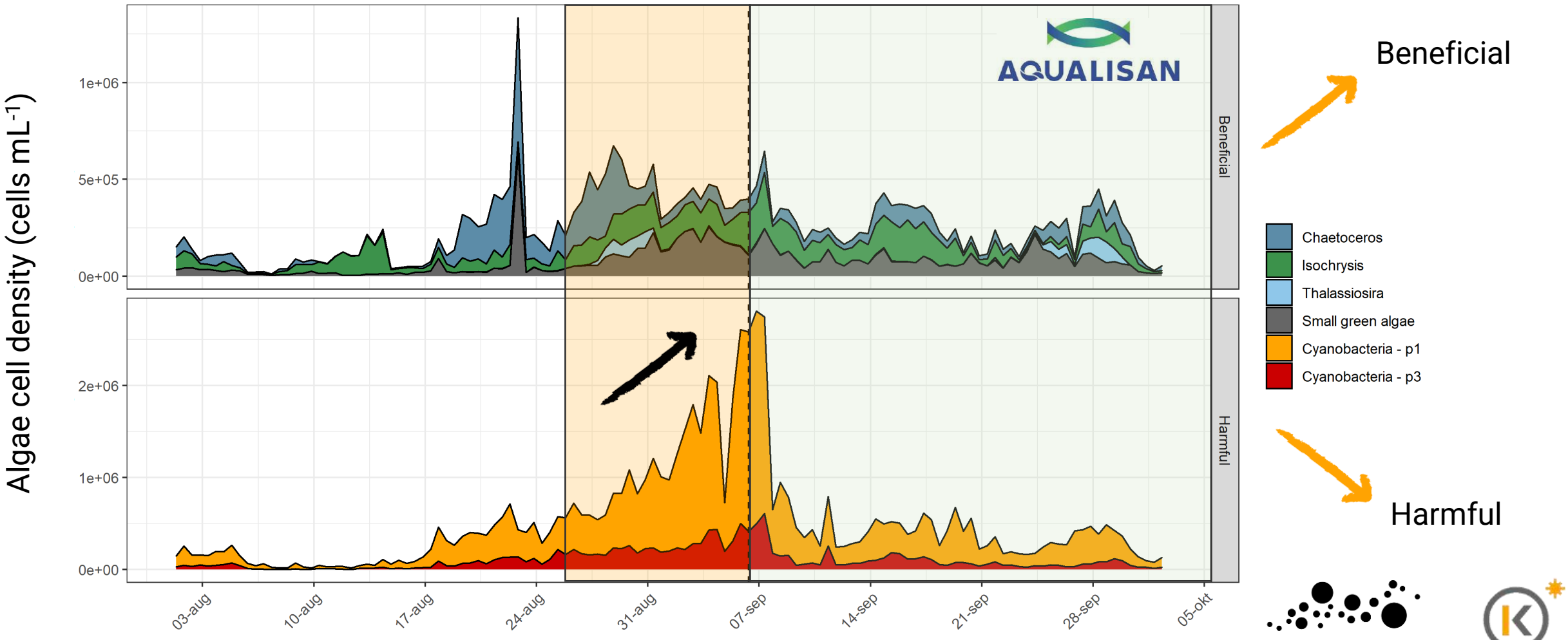
COUPURE LINKS 653A
B-9000 GENT
BELGIUM

PHONE: +32 485 022 896
INFO@KYTOS.BE

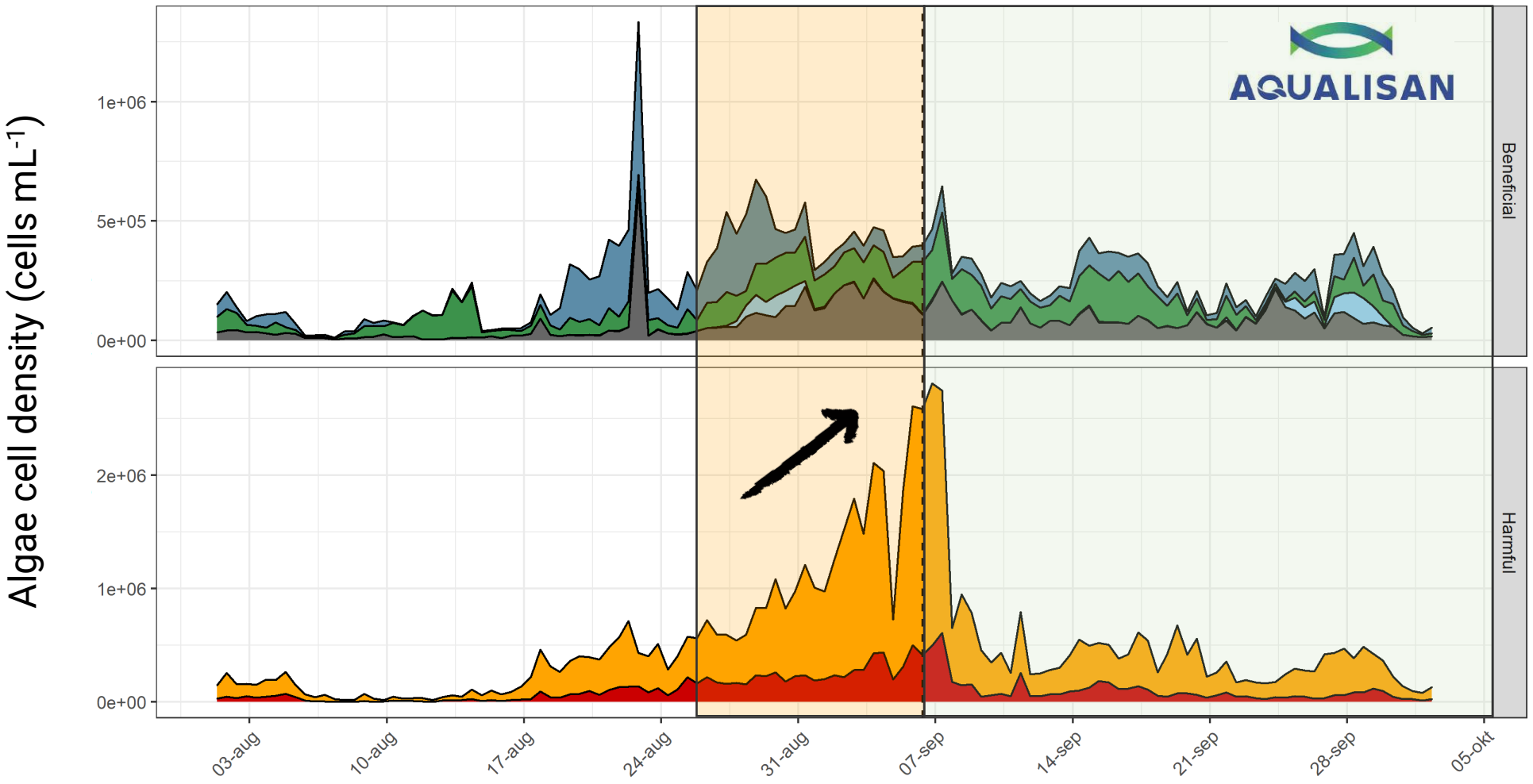
EMPOWERING AQUACULTURE PRACTITIONERS



Case study 3: **observing** algae problems



Case study 2: **managing** algae problems

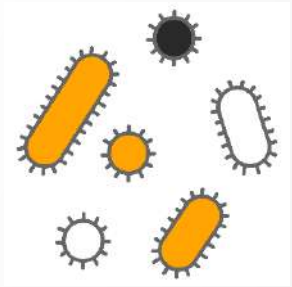


AQUA PHARMA

Big Data from a **Small Sample**

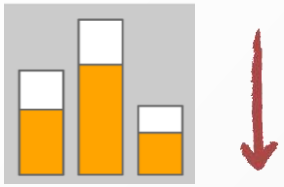
1 milliliter of sample

BACTERIA



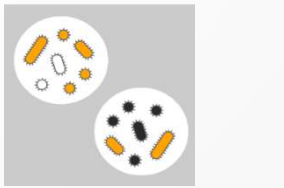
ALGAE

Microbiome Health Indicators

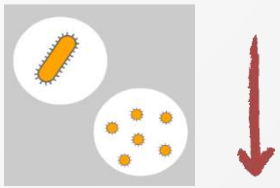


Cell density

Diversity

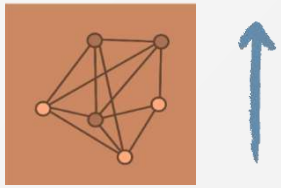


Good/Bad type



Cell size

Health Index



Performance index

Characterize and define healthy microbiome conditions

KYTO*vial*

The preservation solution for your water samples

- **Long-term preservation** solution for water samples
- **Reduces bio-security risks** during storage and transport
- **Enhances quality** of flow cytometry analysis
- **Small footprint** enables rapid and frequent sampling