

# Long term evaluation of the impact of traditional rainbow trout farming on river quality in Ireland – a 10 years case study



# FISH

A. Tahar, A. Kennedy, S. Naughton, R. Cooney, R. Fitzgerald, A. Fogarty, N. Rowan, E. Clifford



# Context – the Irish freshwater aquaculture

## Salmonid production (rainbow trout / salmon smolt)

- Marine/freshwater ≈ 11,400 tons/year (FEAP, 2014)  
(Freshwater ≈ 1,400 tons/year)
- Flow through (FT, open systems)
- No / limited water treatment
- Necessity to produce more

**BUT** not possible by using traditional systems



### PRODUCING MORE, OK... BUT...

- with **profitability** for fish farmers
- in a **sustainable** way

→ **MOREFISH** project

# MOREFISH project

## MOREFISH

“Enhancing sustainability in the Irish freshwater aquaculture”



Department of  
**Agriculture,  
Food and the Marine**  
An Roinn  
**Talmhaíochta,  
Bia agus Mara**

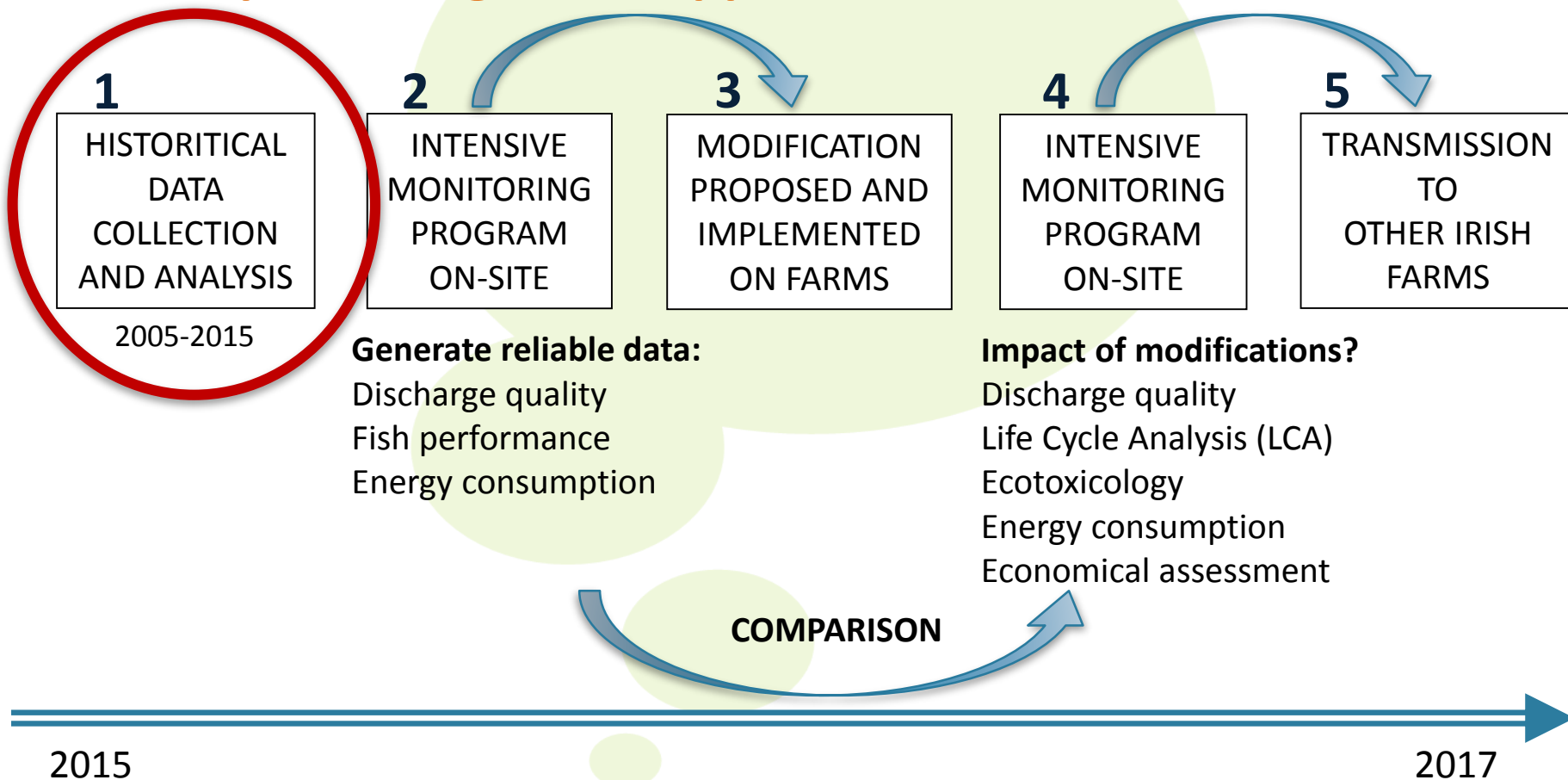
Research program (2015-2017)

## General objectives

- **Increase fish biomass output per unit input**
  - Optimization of energy usage
- **New production management strategies**
  - Water treatment (waste reduction in relation to future regulation)
  - Real-time process monitoring
- **Innovation to increase production efficiency**
  - Aeration
  - Disinfection
- **Sustainability indicators**

# The MOREFISH approach

## Five steps in the general approach



# Environmental and performance historical data

## Objective

Assess the long-term performance / impact of traditional rainbow trout farming

- Benchmark performance?
- Compliance with discharge licence?
- Impact on the river quality?

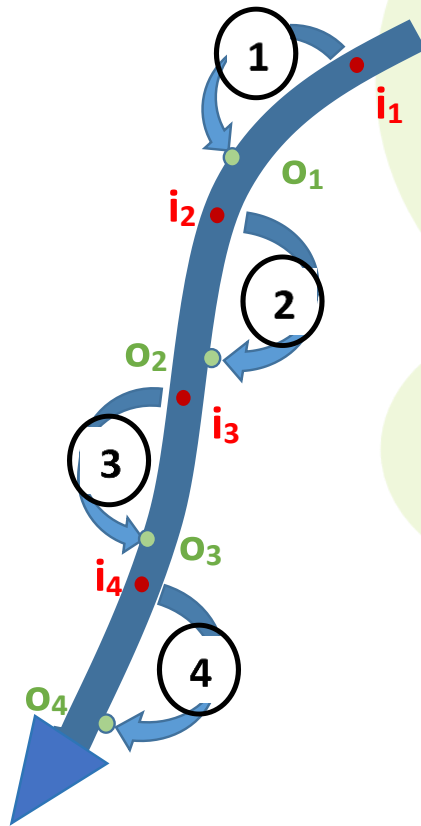
## General approach

- Full historical data analysis from publically available data (2005-2015)  
= Independent (Co. Co) / proprietary (public access) databases
- 4 different farms with discharge in the same river in a relative small area

→ **Original configuration!**

# Environmental and performance historical data

## Approach



## The dataset

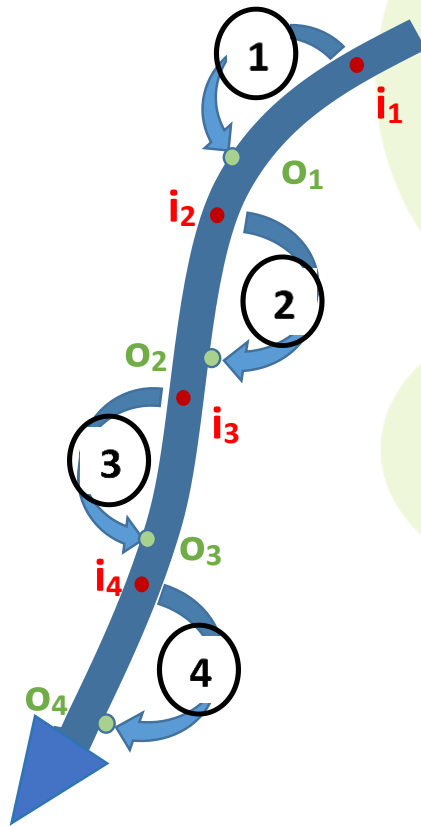
- Full County Council dataset (2005-2015)
- Different physicochemical parameters analysed by accredited labs (APHA methods)
- Spot samples, 4 each year

## Expected results

- 1- Inlet and outlet comparison → impact of each farm and compliance with discharge licence?
- 2- Evolution of inlet waters → cumulative impact on river quality? (student-t tests)

# Environmental and performance historical data

## The four sub-farms



① Hatchery + small size fish (< 100g), concrete channel, partial recirculation

→ ≈ 75 t/year

② 100-500g fish, earthen pond

→ ≈ 50 t/year

③ Main farm, 500g-harvest size, earthen ponds, partial recirculation

→ ≈ 165 t/year

④ Lower farm, 500g-harvest size, earthen pond, sedimentation pond

→ ≈ 100 t/year

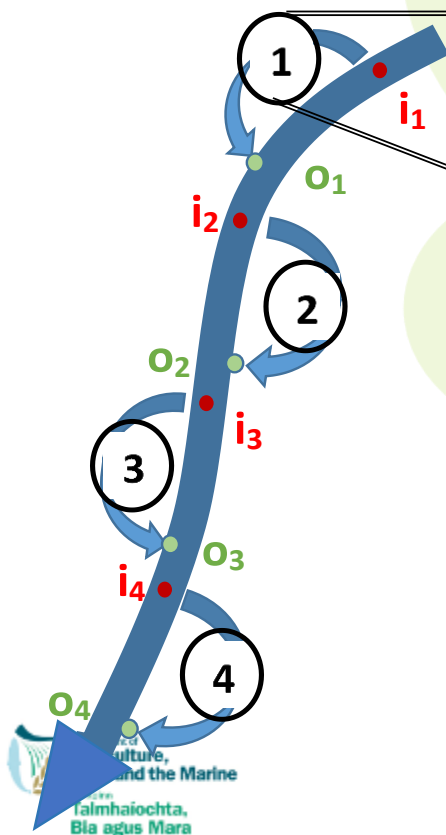
→ Total production ≈ 400 t/year

# Environmental and performance historical data

## Main results

### 1- Compliance with discharge licence?

Comparison of the differential concentration (outlet-inlet)



Parameter	Limit value
	<b>Differential</b>
BOD <sub>5</sub>	1 mg/L
Suspended solids	10 mg/L
Turbidity	5 NTU
Ammonia (as N)	0.4 mg/L
Nitrite (as N)	0.002 mg/L
Orthophosphate (as P)	0.2 mg/L
	<b>Absolute*</b>
Dissolved oxygen	60% sat.
pH	6 - 9
Temperature	Ambient



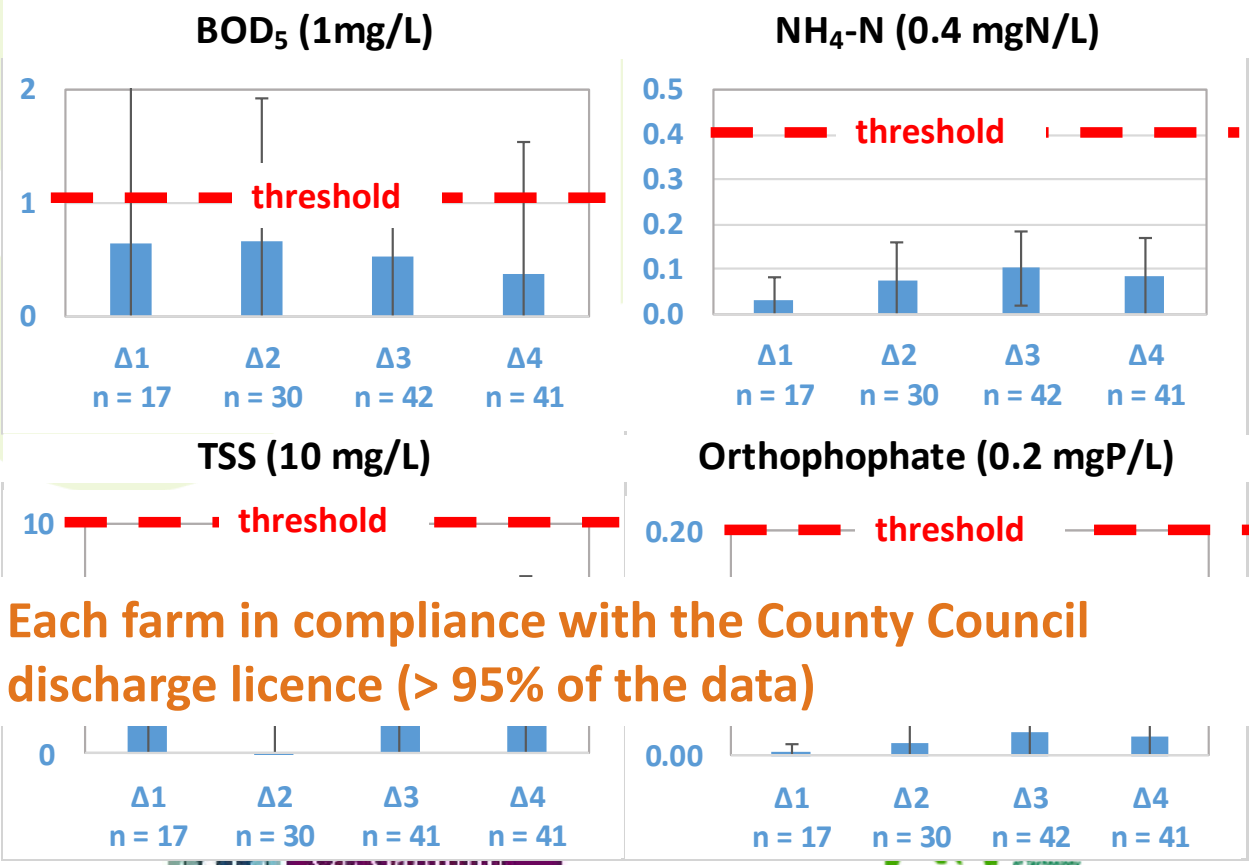
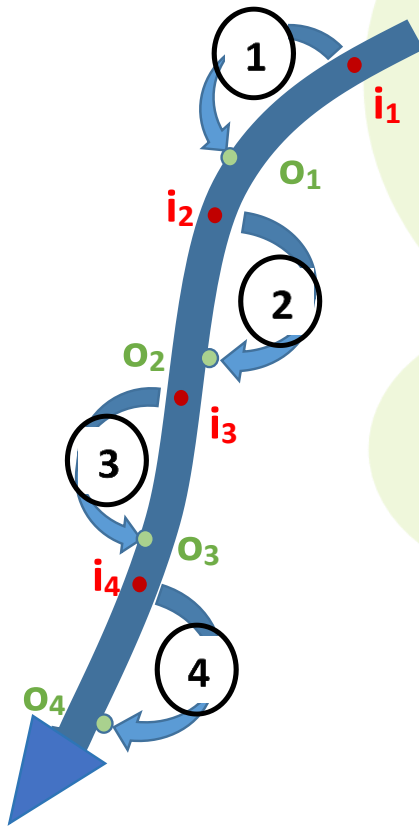


# Environmental and performance historical data

## Main results

### 1- Compliance with discharge licence?

Comparison of the differential concentrations (outlet-inlet)

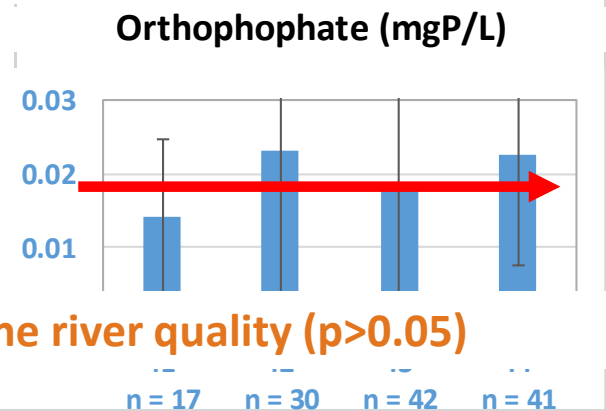
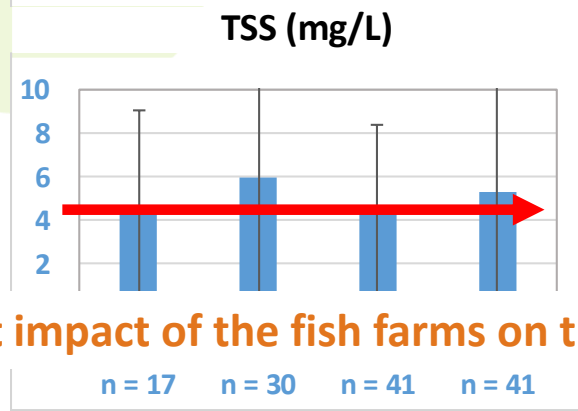
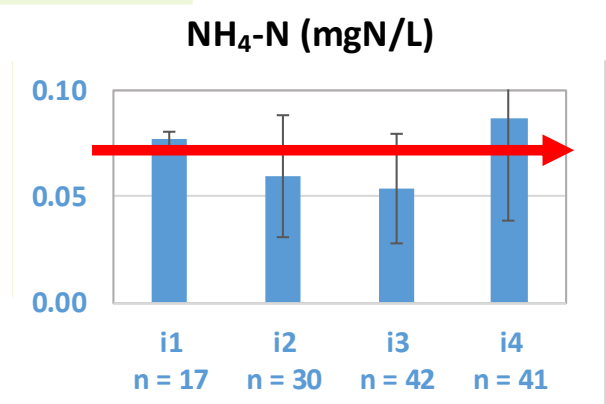
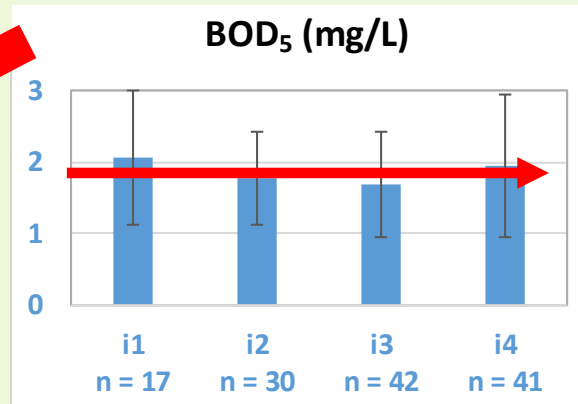
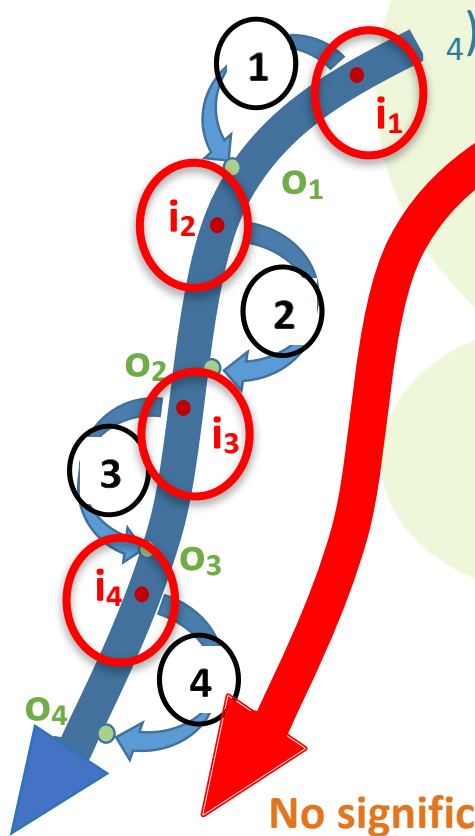


Each farm in compliance with the County Council discharge licence (> 95% of the data)

# Environmental and performance historical data

## Main results

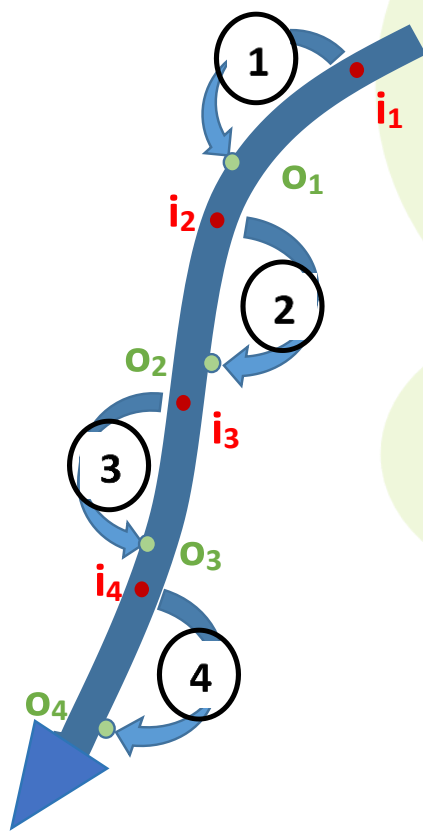
### 2- Impact on river water quality along the farms ( $i_1$ - $i_4$ )



No significant impact of the fish farms on the river quality ( $p > 0.05$ )

# Conclusion and perspectives

## Conclusion



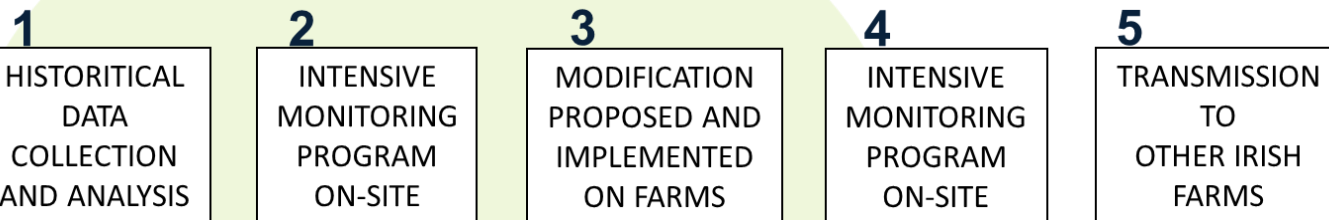
- Negligible impact of each farm for parameters analysed
  - General compliance with discharge licence for all parameters (95% of the collected data)
  - Low impact of the farms on the downstream river quality
- *No accumulation of pollution in the river along the 4 consecutive farms*

## BUT...

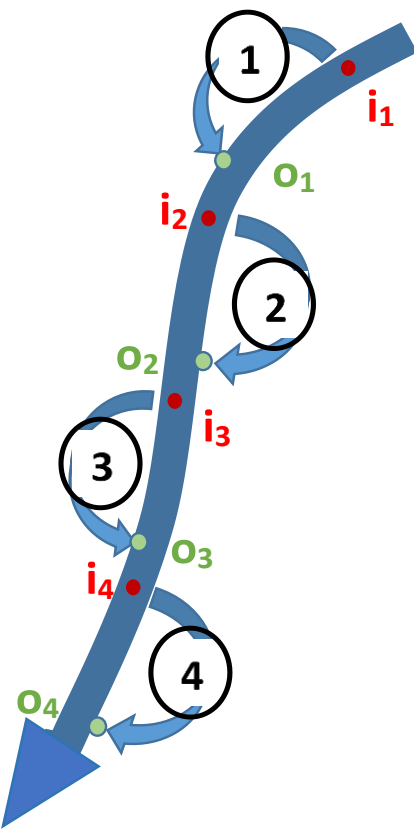
- Relevance of the parameters analysed?
- Relevance of the threshold values?
- Representativeness of sampling methods?
- Sufficient number of data (4/year)?

# Conclusion and perspectives

## Ok, what's next?



- **Intensive water quality monitoring**
  - Impact of fish production on rearing water quality
  - Impact of fish farm on downstream river quality
  - Stressed vs unstressed conditions
  - Impact of recirculation on water quality
- **Set up interventions (water treatment, aeration, disinfection, farm management, etc.)**
- **Assess the impact of interventions?**
  - Comparative impact after interventions
  - Life cycle analysis



# THANK YOU FOR YOUR ATTENTION!

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[www.MOREFISH.ie](http://www.MOREFISH.ie)

Dr. Alexandre Tahar (AIT)  
[atahar@ait.ie](mailto:atahar@ait.ie)