TESTING A REAL TIME WEIGHT MEASUREMENT SYSTEM IN A TROUT RACEWAY

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Summary

- GAIN H2020 Project

- Device description

- Case study

- Results and potential applications

- Conclusion

Green Aquaculture INtensification in Europe

- Support the **ecological intensification** of aquaculture
  - Optimizing production and increasing the competitiveness of the industry
  - Reducing the environmental load, enhancing sustainability

- Consortium
  - 10 academic and research institutes
  - 8 companies
  - 2 non-profit organisations

<u>Research areas</u>
• Production optimization
• Valorization of secondary inputs
• Sustainability assessment
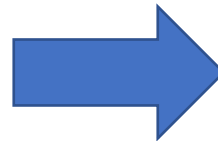
<u>Impact</u>
• Eco-intensification tools
• Professional development

# GAIN: Biomass monitoring devices

Scotland and Canada: Atlantic salmon

- Cage Eye
- Hydroacoustic
- 2D distribution of biomass in cage
- https://www.cageeye.com/nb.

Norway : Atlantic salmon

- Aquaculture Biomass Monitor
- Acoustic
- Mean weight and Biomass vertical distribution
- https://www.biometrics.no/aquaculture-biomass-monitor

Italy: rainbow trout

- Biomass Daily
- Infra Red
- Mean weight
- Population
- https://vakiiceland.is/biomass-daily/


Vertical distribution of fish
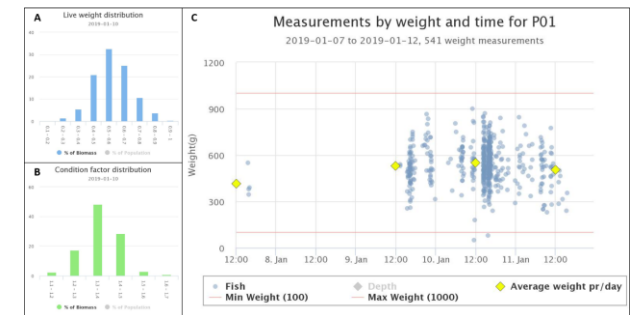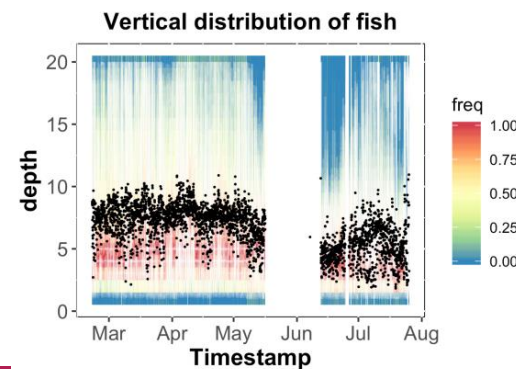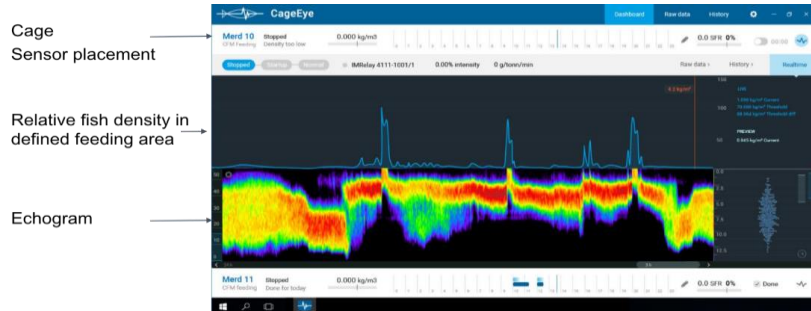
Biomass daily: main features

- Producer: Vaki Ltd / Reseller: Aquatrade Srl

- Infra-Red Sensor: 80 x 80 cm frame

- Remote Transmission: sending box + antennas

- Cloud connection: local pc connected to internet
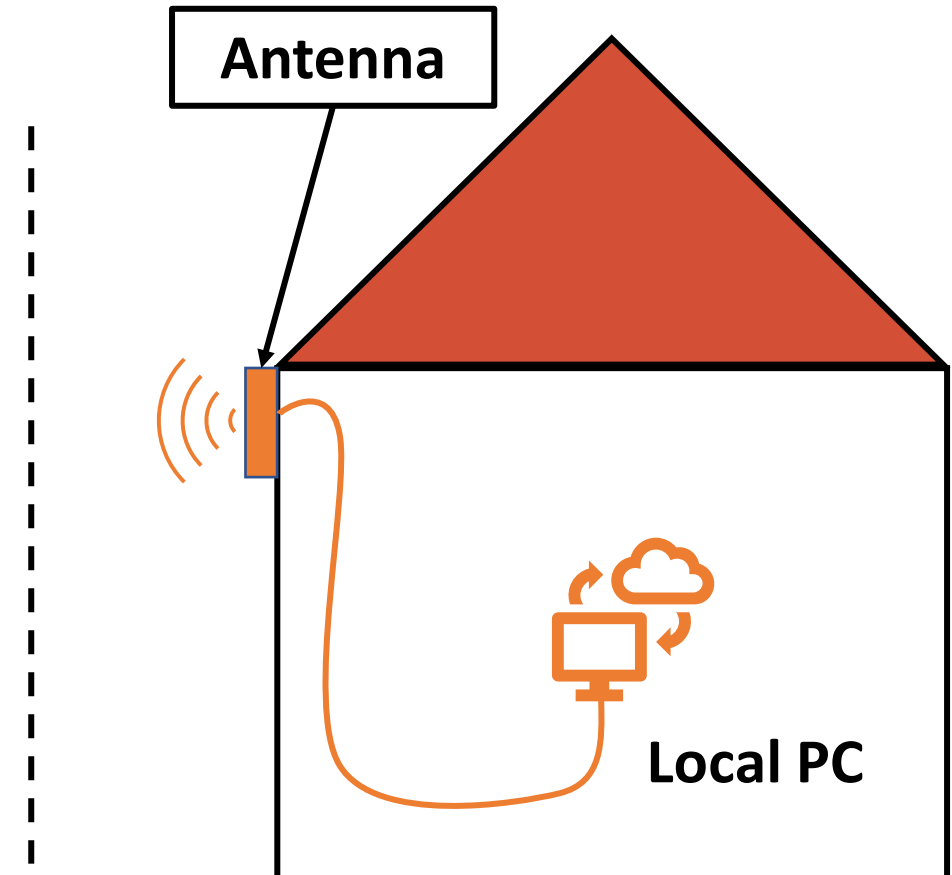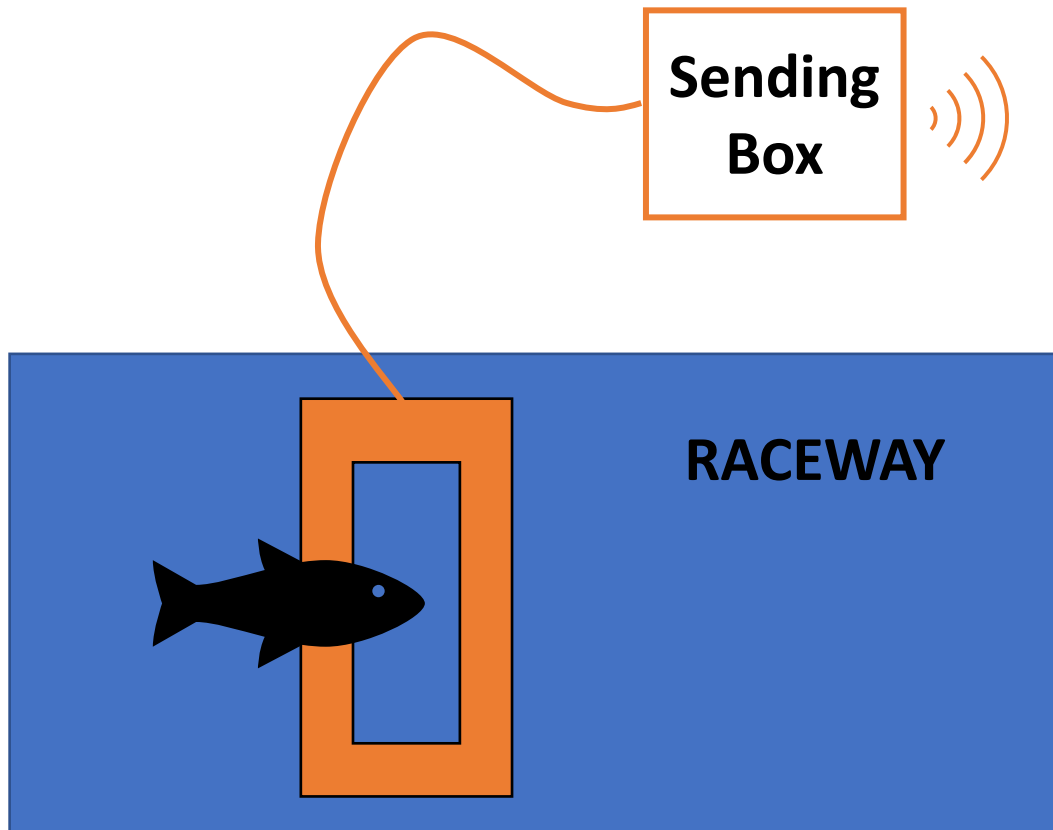
- Designed for and used in the salmon industry

Case study: Trout farm

- **Troticultura Fratelli Leonardi**, Preore, Northern Italy

- Rainbow **trout** (*Oncorhynchus mykiss*)

- 7 **Raceways** : 200 m x 8 m

20 m
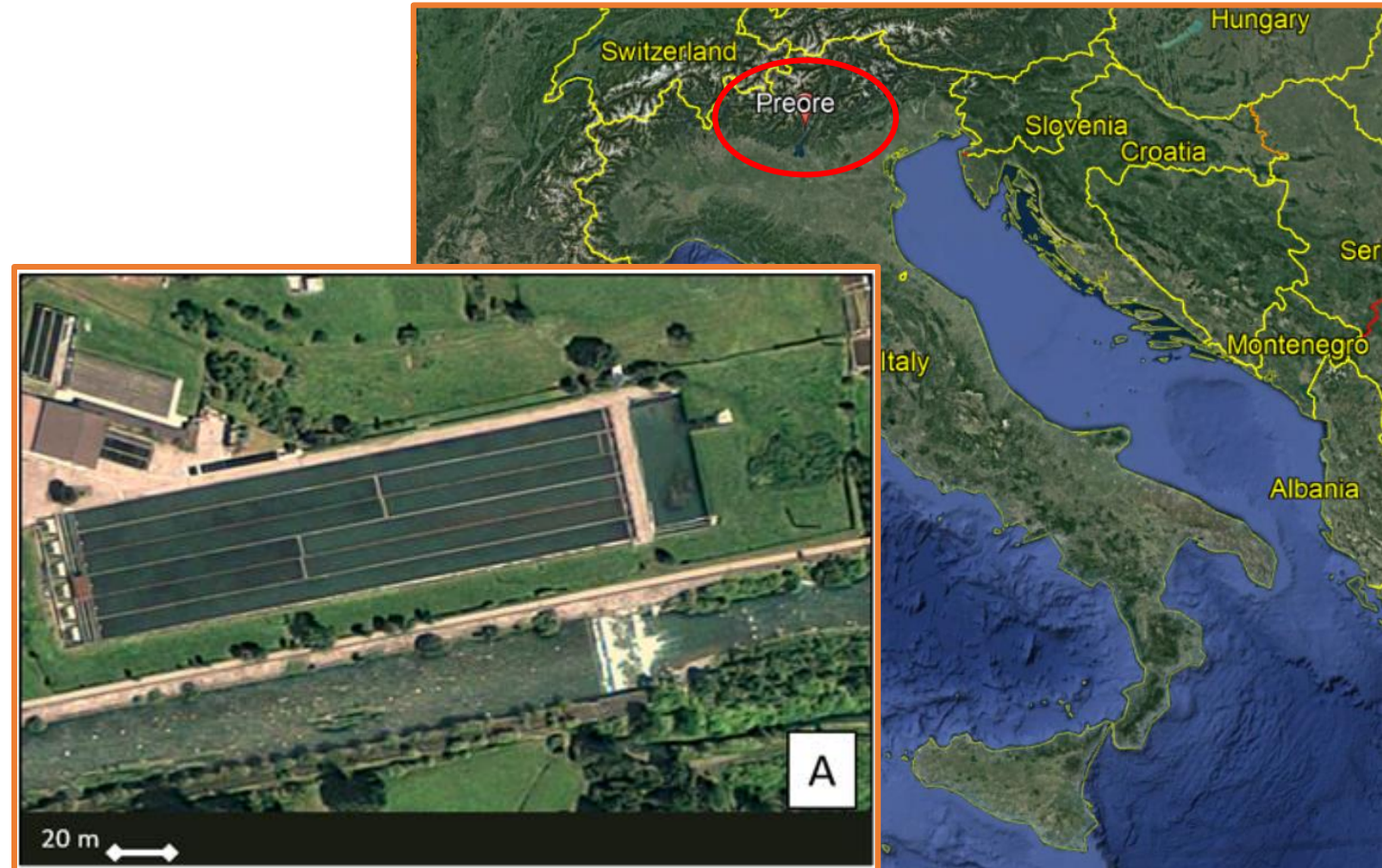
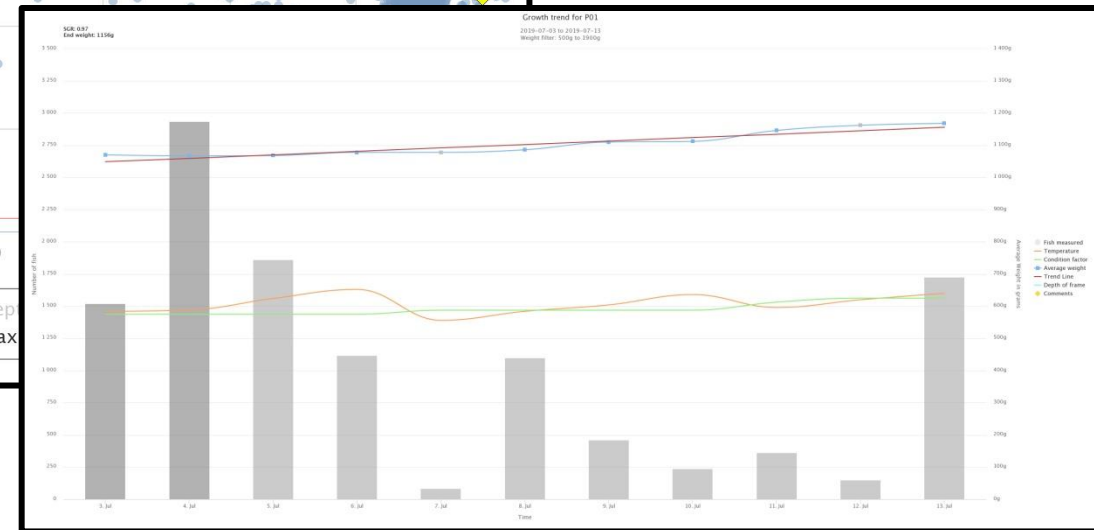# Case Study: BD configuration

Biomass Daily : Data

- **Available Data**
  - Daily average weight
  - Detection number
  - Size distribution
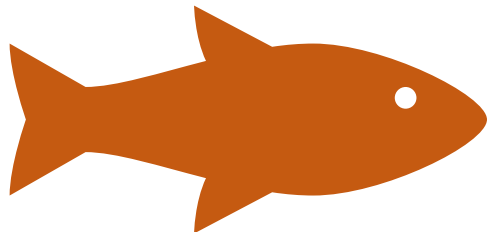 - Condition factor

- **Human-Machine Interface**
  - Dashboard
  - User/Password access
  - Graphics and raw data

Case Study: monitoring campaigns

Summer 2019	**Winter 2019-20**	**Summer 2020**
• 07/2019 to 11/2019	• 11/2019 to 01/2020	• 07/2020 to 11/2020
• 1050 g to 2200 g	• 80 g g to 110 g	• 300 g to 660 g
• ≈ 15 000 fishes	• ≈ 75 000 fishes	• ≈ 30 000 fishes

Results: representativity

Better representativity than intermittent samples made by farmer
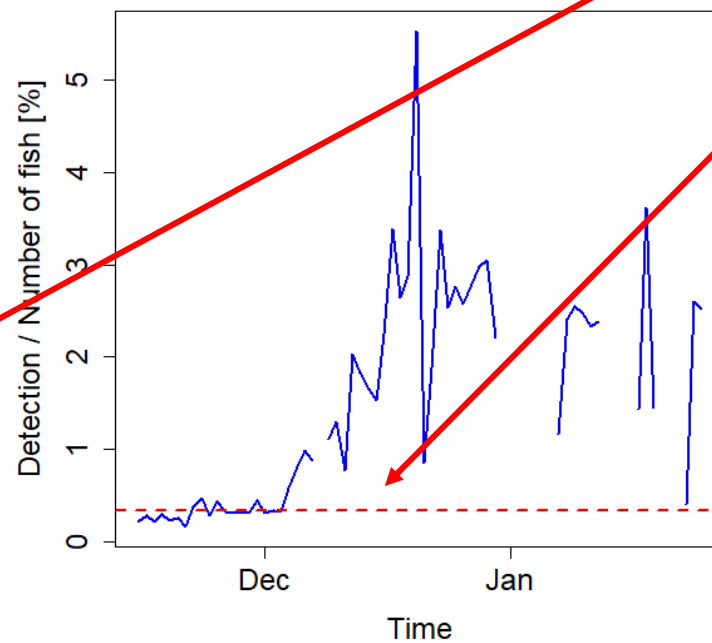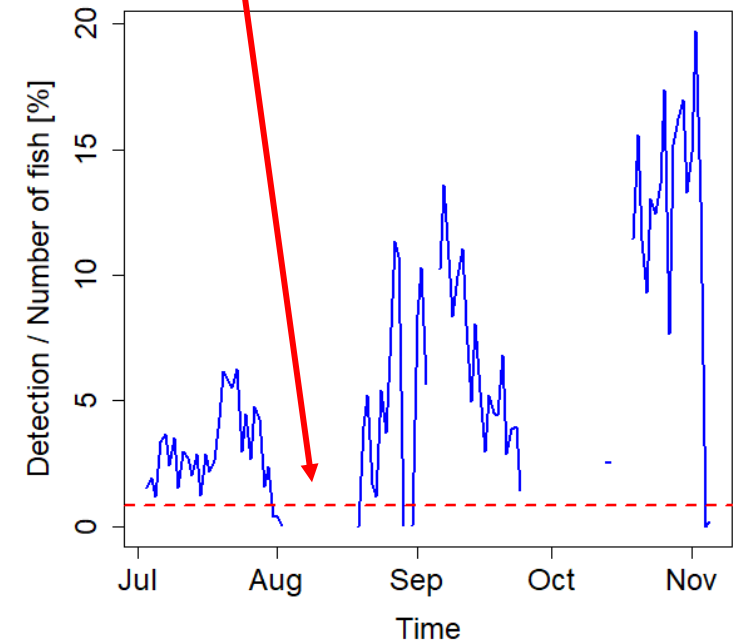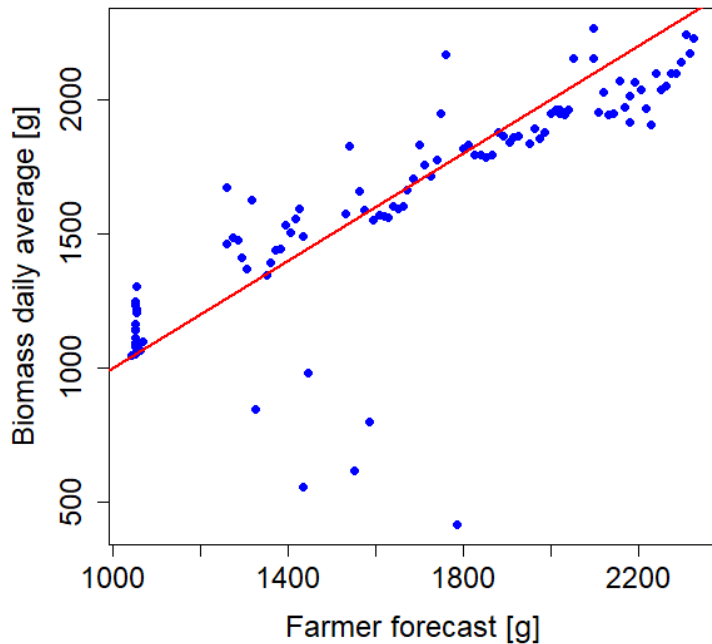
Population weight monitoring

Farmer software v/s BD : Weight estimates could be biased below 100 g.
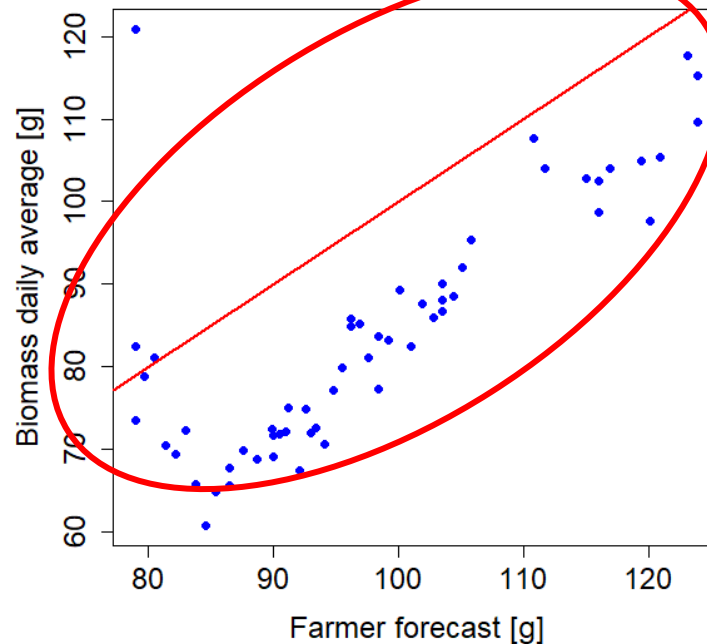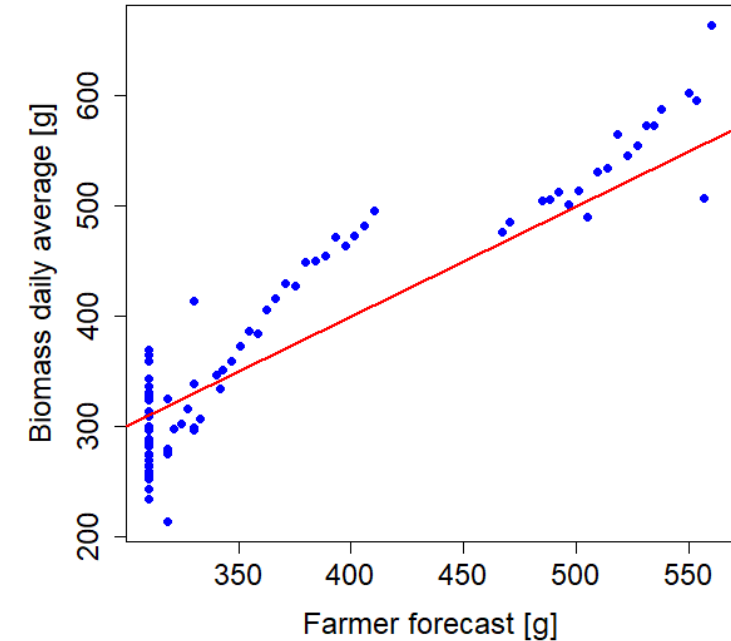
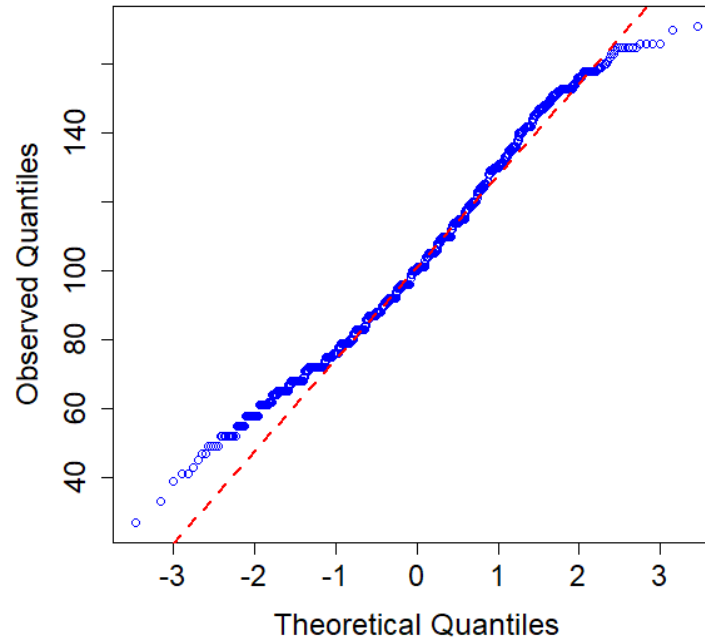# Results : Population distribution

Quantile-Quantile plot of some daily distributions
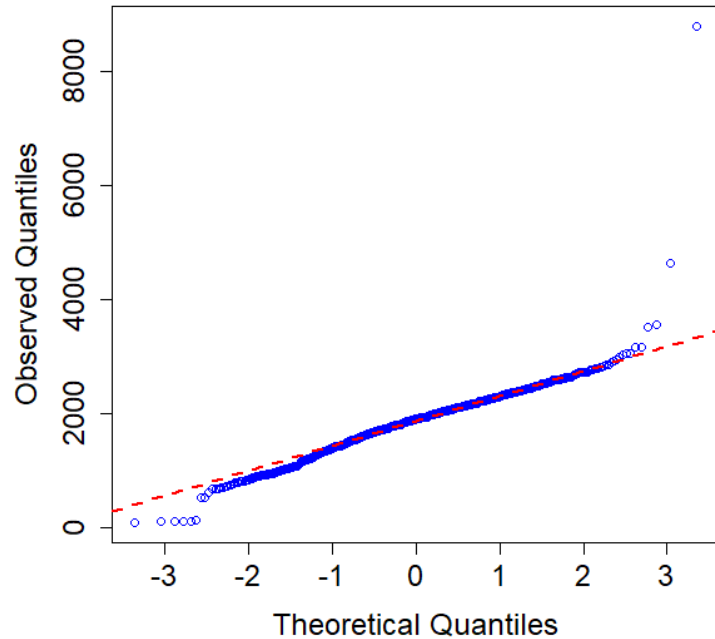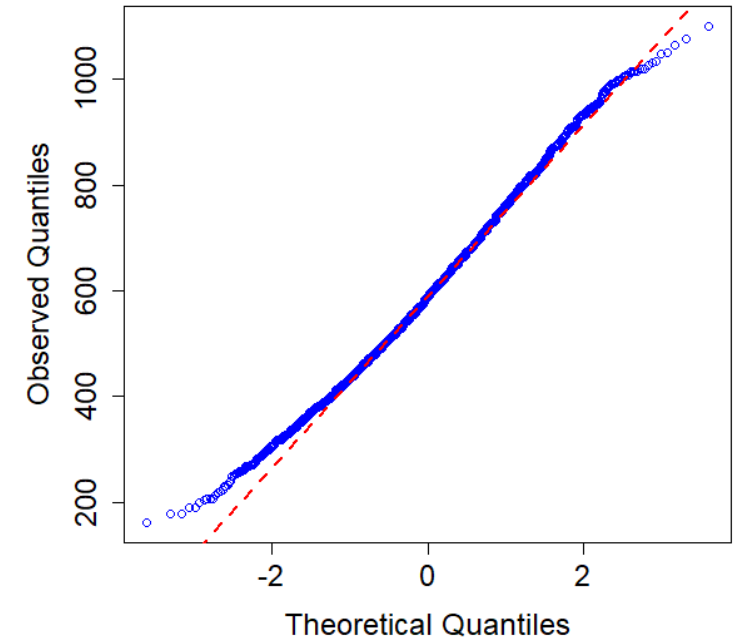
Results : Population distribution

- Distributions are **clearly unimodal**

- Very close to normal distributions, small deviations on tails for highest detection number.

- **Mean** and **standard deviation** can be considered as reliable statistical indicators of the population distribution

Conclusion

- **First tests very positive:** BD able to monitor trout biomass within the raceways from 100g to 2 Kg.

- **Limitation:** Bias with smaller fishes (as expected), but the algorithm could be optimized on the basis of more field data.

- **Next step:** Validation with a dedicated sampling campaign

Potential applications

- **Data assimilation**: collected data could be assimilated by dynamic models for predicting growth, oxygen demand, metabolites (e.g. ammonia) production.

- **Management** practices **optimization**:
  - Feed ration
  - Oxygen supply
  - Harvestable biomass using weight distribution (not only sample mean)

- **Example**: estimated **oxygen demand**, one raceway, 13 summer days:
  - Sample mean: 838 m^3
  - Weight distribution: 809 m^3

Acknowledgments

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THANK YOU FOR YOUR ATTENTION !!

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