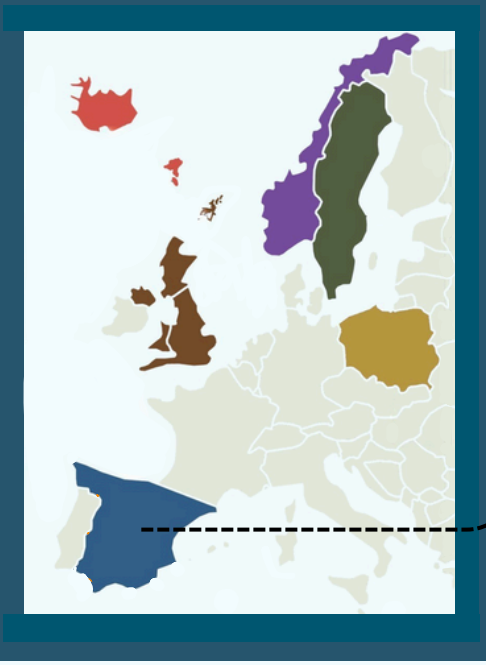
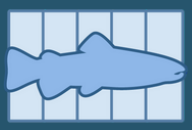


# CS2



**Spain**
Flow-through aquaculture.
**Rainbow trout.**

**Industry partner: CAVIAR PIRINEA**

**Research partner: CSIS**

**Stakeholder: Trout farmers, industry associations**

## Challenges

### 1. Thermal stress induced by rising water temperatures

Rising water temperatures driven by climate change are increasingly **surpassing the optimal conditions for rainbow trout**, a species adapted to cold-water environments.

This thermal stress can disrupt normal physiological functions, weakens immune responses, and makes fish **more prone to disease**.

While today's trout farming remains safe, productive, and high-quality, **prolonged temperature spikes could, over time, impact growth, feed efficiency, and welfare** — highlighting the need to prepare for future climate-related challenges.

### 2. Reduced freshwater quality and availability

**Extended drought periods and shifting precipitation patterns** lead to lower water levels and degraded water quality in freshwater sources.

As a result, **oxygen levels drop** while **pollutants and harmful compounds can become more concentrated**, creating sub-optimal living conditions for trout during such extreme events.

These changes **constrain both the quality and availability of culture water**, forcing farmers to apply many precautionary, approach-based measures (such as reducing stocking densities, halting production, advancing sales, etc), therefore leading to losses in productivity and profitability.

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# Proposed solutions

## S2A: Selective breeding to improve rainbow trout resilience to heat stress

- Estimation of **genetic parameters** and identification of **candidate genes and resilient families** from CAVIAR PIRINEA
- Measurement of heat stress-induced microRNA expression in families with differential resilience to temperature to **assess physiological plasticity for thermal resilience**
- Identify **microRNA-based stress biomarkers** and **regulatory networks** conferring adaptive advantages

## S2B: RAS adaptation of rainbow trout from fresh to brackish water

- Implementation of **Computational Fluid Dynamics (CFD) modelling** to develop a **digital twin** for combining fresh and seawater, enabling scalability, flexibility, and optimization of culture system design and configurations
- Ensure optimal **water flow**, **oxygen distribution**, **feed dispersal**, and **stable salinity** levels for trout in brackish aquaculture environments

**Follow the project here:** occamproject.eu OCCAM Project

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