SMART BIOSENSING DEVICE FOR **TRACKING** FISH BEHAVIOUR

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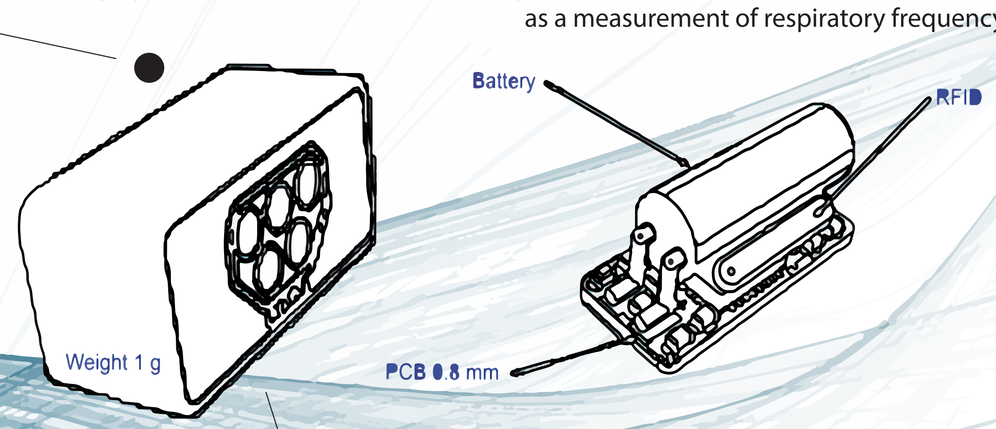
BACKGROUND

The assessment of overall production, health, welfare and stress is a crucial element to deliver efficient and ethical fish production. With the recent technological advances, the use of biosensor approaches is increasingly growing to measure a wide range of variables in a non-invasive manner.

Yet some challenges burden biosensor applications, such as the choice dependency of telemetry technology and tagging methods on fish species, life stage and research question. AQUAEXCEL [2020] EU project proposes a solution to such challenges: **AEFishBIT** [1].

WHAT IS AEFishBIT

AEFishBit is a smart, non-invasive biosensing device – a tri-axial accelerometer – for fish production optimisation. The prototype is externally attached to the operculum to monitor physical activity by mapping accelerations in x- and y- axes, while operculum beats (z-axis) serve as a measurement of respiratory frequency.



HOW IT WORKS

SET UP YOUR MODE OF USE
The biosensing device can be set up with different programmable recording windows, up to **6 hours** of continuous recording time. The recommended mode is a window of 2 minutes every 15 minutes, with a batery life of **2 days.**

ADJUST AEFishBIT TO YOUR SENTINEL FISH
With a two-step procedure using metallic piercing tags and flexible polyethene. A minimally invasive procedure in a unique location – **the operculum**.

LINK YOUR TRACKING SYSTEM
Associating each device with your tagged fish with Trovan's RFID system.

READ, RECHARGE & REUSE
Stand-alone device (non-wireless) that monitors multiple fish individuals in the same space and in deep water, overcoming interference and low signal issues that wireless devices pose.

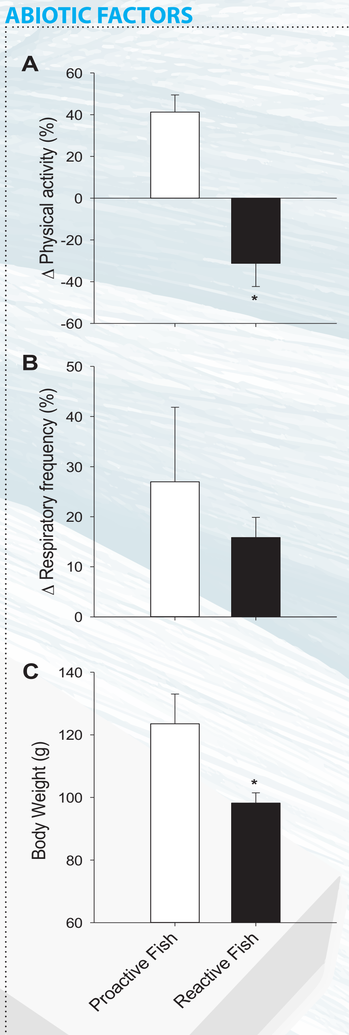
Once the results are collected, and the battery is recharged, the device is ready to be used again.

PROCESS YOUR DATA
On board algorithm that processes the results prior to their download, providing bigger storage capacity and longer recording time.

HOW WE HAVE VALIDATED IT

OBJECTIVE
To evaluate the impact of the biosensor attachement and to validate the functionality of the device by analising abiotic and biotic factors.

ABIOTIC FACTORS



Acute Hypoxia
The device allows for the discrimination of fish with different proactive/reactive stress responses when facing a hypoxia test (2.5h; 2-3 ppm).

BIOSENSOR ATTACHEMENT

Device tagging impact
Observations of tissue damage, change in feeding behaviour, growth performance and circulating levels of stress markers reveal no negative impact on the body weight of 100-200g fish onwards.

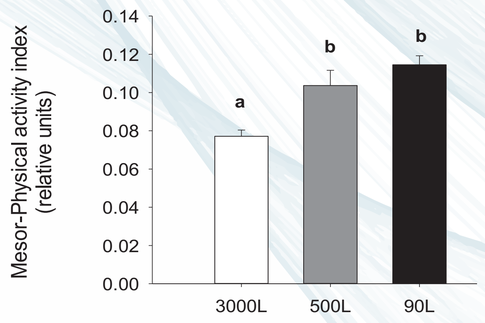
Growth test (10 days) -> FCR=1.0-1.1

	with device	without device
Initial BW (g)	263 ± 6.9	259 ± 8.9
Final BW (g)	294 ± 7.4	291 ± 9.7
SGR (%)	1.14 ± 0.03	1.19 ± 0.04

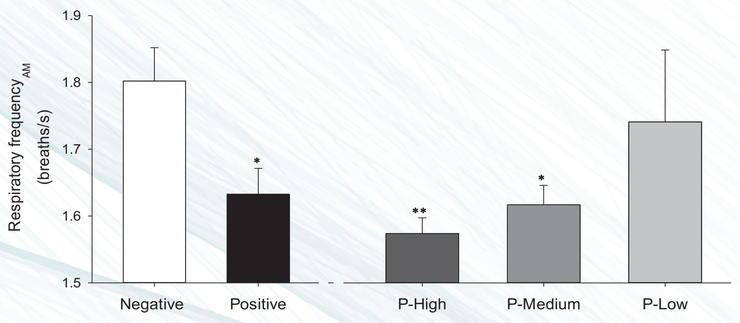
BIOTIC FACTORS

Biological age
Changes in respiratory frequency and jerk accelerations reveal age-related changes in basal metabolism and feeding behaviour.

Tank Size
As the tank size shrinks, the jerk accelerations increase.

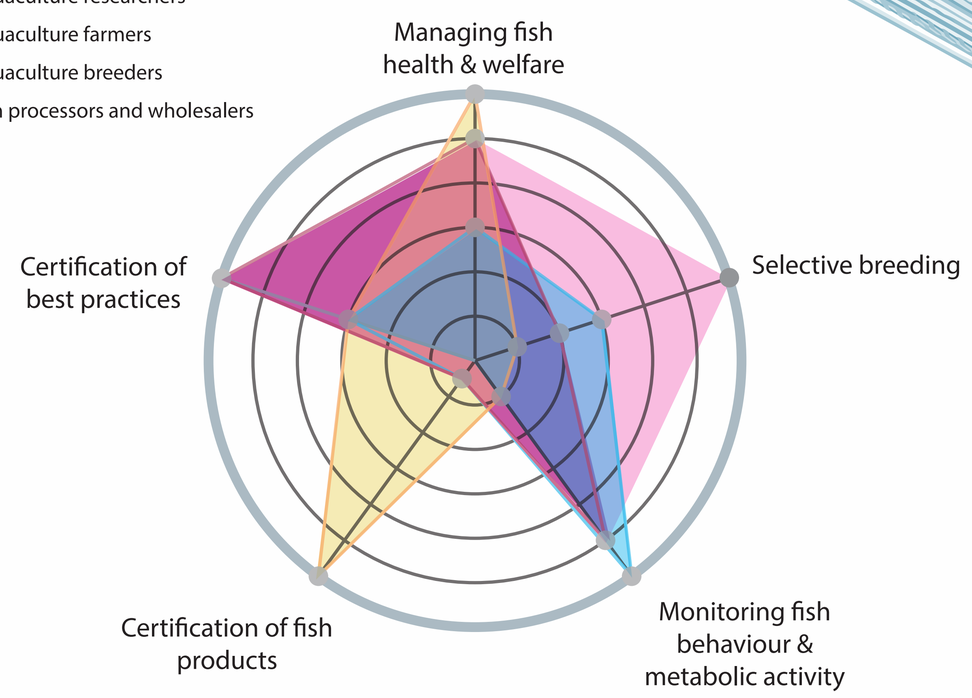


Parasitic Infection
Enteromyxum leei
The reduction of respiratory frequency (basal metabolism) correlates with the different progression stages of parasitic enteritis (P-, parasite positive).



TO WHOM IT MATTERS

- Aquaculture researchers
- Aquaculture farmers
- Aquaculture breeders
- Fish processors and wholesalers



AEFishBIT is protected by a registered patent P201830305

REFERENCES
[1] Martos-Sitcha et al., (2019). Ultra-low power sensor devices for monitoring physical activity and respiratory frequency in farmed fish. Frontiers in Physiology 10:667

A glimpse of our biosensing device here https://vimeo.com/325943543

ACKNOWLEDGMENTS
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