

## Editorial

GAIN - setting the stage for the eco-intensification of EU aquaculture.

At the end of an intense and vibrant year, on May 7th and 8th GAIN partners gathered at Alfred Wegener Institute in Bremerhaven to take stock of the achievements accomplished thus far and to plan for future activities. Here is a short summary; more details can be found on our website, from which GAIN deliverables can be downloaded:

- Ten pilot sites, including salmon, rainbow trout, carp, seabass, shrimp and mussel farms in EU, Canada and China, were instrumented with state-of-the art sensors for real time monitoring of environmental variables as well as behaviour and growth performances of farmed organisms.
- A prototype of the Information Management System, based on data from the ten pilot sites sent to a common platform and analyzed using machine learning algorithm and dynamic models, including data assimilation algorithms , was set up and tested.
- Enzymatic hydrolysis processes for extracting valuable products, e.g. fish protein hydrolysates (FPHs), from farmed fish filleting by-products using were optimized.
- Innovative, sustainable feeds, based on emergent ingredients that contribute to a circular economy towards zero waste, such as FPHs, insect meal, by-products of agroindustry, European-sourced vegetable protein concentrates, macroalgae and microalgae were designed and are being tested on atlantic salmon, trout, turbot and seabream: preliminary results concerning rainbow trout are very encouraging.



# GAIN pilot site for mussel aquaculture at Sagres, SW Portugal

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One of the overarching objectives of the GAIN project is to support producers by providing access to large scale data on environmental conditions using a combination of sensors supported at farms, on drones, aeroplanes and satellites. GAIN has established a common cloud-based data management and services platform that offers unified access to relevant information such as sensor data, relevant public data, model hindcasts, nowcasts, and forecasts, and farm operations data.

An offshore aquaculture concession at Sagres on the SW coast of Portugal is one of the pilot sites for GAIN (Fig. 1a) where Finisterra Lda cultures Mediterranean mussel (*Mytilus galloprovincialis*) on long-lines. The environmental conditions are recorded with sensors fixed on a signal buoy (Fig. 1b) anchored at the concession. More conventional sensor data can be uploaded periodically to the IBM platform (see oC in Fig. 2a), whilst other sensor data are transmitted in near real time to the platform (see fluorometer and transmissometer data in Fig. 2b).

The *in situ* data from the sensors can be related to information from other sources. For example, Fig. 3 show maps of chlorophyll concentration around SW Portugal, both for high bloom (3a) and no bloom conditions (3b), obtained from Earth Observation (EO). The information collected by the in situ sensors can be compared with the EO data (see arrows in Fig 2a,b). Comparing Figs 2 and 3, it is evident that the temperature in spring 2019 is low

during high bloom and high during no bloom; conversely, the fluorescence chlorophyll is high during high bloom and low during no bloom. These relationships between various environmental data sources can contribute to improving culture practice at the farm as well as providing essential information for ongoing growth experiments to validate models.

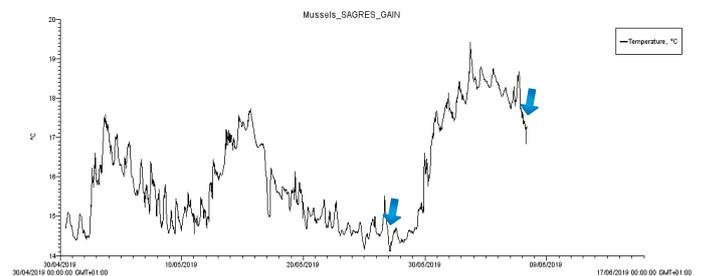


Fig 2a: Temperature from HOBO sensor during May/June 2019. Arrows relate to the dates from the EO maps in Fig 3.

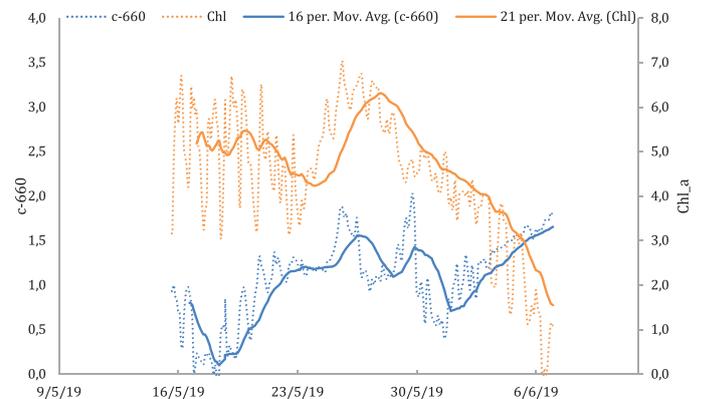


Fig 2b: Fluorescence (chlorophyll) and transmissometer data transmitted every 2h from sensors on the moored system in Fig 2b during May/June 2019. Arrows relate to the dates from the EO maps in Fig 3.



Fig 1a: Geographic location of the Moored System and Offshore Aquaculture (Finisterra) at Sagres on the southwest coast of Portugal (Modified Copernicus Sentinel data obtained in 2019 for Sentinel-2A Level-1-C RGB satellite image).

Fig 1b: Moored System with sensors transmitting readings in near real time to a bank for big data hosted by IBM in Ireland(©John Icely)

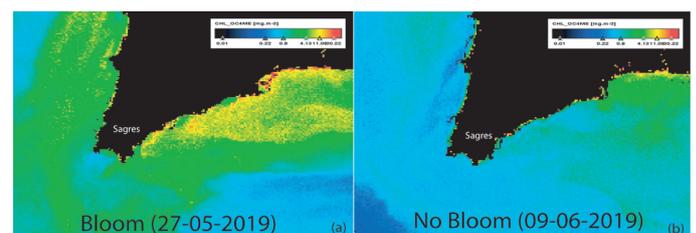


Fig 3: Earth observation maps for chlorophyll a concentration along the SW coast Portugal retrieved by the Sentinel-3A/OLCI/CHL\_OC4Me algorithm for a) bloom condition on 27th May 2019 and b) no bloom condition on 9th June 2019.

## Policy and markets for European aquaculture (Part 1)

WP3's goals of project GAIN are to support policy and market development, including (i) evaluation of policy and regulation challenges to implementation of the circular economy (ii) critical analysis of the aquaculture and fisheries sectors (iii) analysis of value chains of key European and Asian species (iv) evaluation of social acceptance of aquaculture products developed in the project.

Partners have been conducting several tasks over the recent months. Activities are presented over two newsletters because of the extent of the work being carried out.

In the first part we present the work being carried out in the evaluation of the policy concerning the circular economy for seafood and the analysis of seafood production and consumption.



EU seafood demand is increasingly from imports as fisheries are fully exploited

### Evaluation of policy challenges to implementation of the circular economy

ANFACO has been leading a review of the legislation that underpins the laws on processes for value addition to by-products and side-streams from aquaculture. The circular economy is defined by a hierarchy of actions designed to minimise environmental impact of production and waste, whilst adding maximum value. Promoting circular economy in the EU involves changes in some policies, aimed at removing or alleviating some regulatory constraints to its full implementation. The legislation on animal by-products has been particularly controversial in Europe following the BSE crisis of the end of the last millennium. However, the waste of these materials represents a potential hazard to the environment, and a loss of efficiency for resources and value addition.

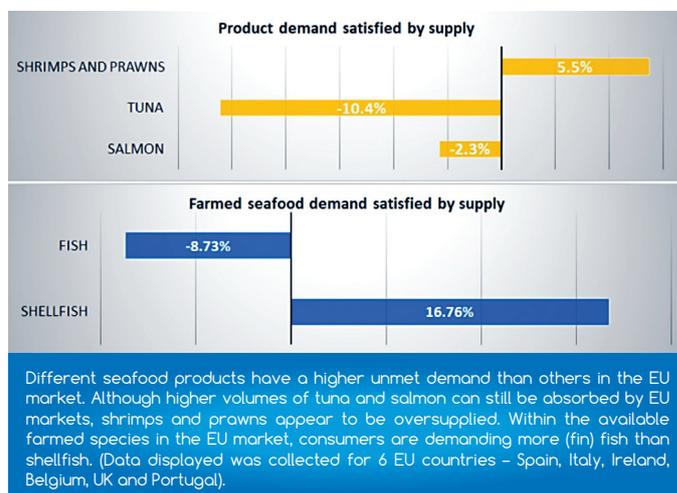
ANFACO has been seeking to review the options available and link these to opportunities and barriers for European aquaculture with subsequent recommendations for revision of EU legislation. This includes, integrated aquaculture, alternative feeds and relaxing laws on aquatic by-products.

### Assessment of production and consumption data and implications for policy

Seafood consumption has been increasing for a considerable number of years and the decline of wild fish stocks has allowed farmed fish to become more central in our plates, but in the EU farmed fish and shellfish production still remains below demand levels. This means we eat approximately double the fish we produce or catch, with imports satisfying the rest of the demand volume.

Efforts of eco-intensification underpinned by legislation can be directed at species and products preferred by consumers. Information from detailed seafood consumption statistics can also provide valuable insights into which countries and markets within the EU have higher levels of unmet demand, presenting better opportunities for producers and retailers.

Andre Sobral Lopes of Longline Environment has been conducting an analysis of European consumption patterns. Insights into the current demand for certain seafood products within the EU have already been obtained. Work is continuing in order to outline growth objectives for the aquaculture sector, based on consumer demand.





## The GAIN consortium



The GAIN consortium

### Main topics for the coming issue:

- Innovative aquafeed formulations for eco-efficient fish farming
- Policies and markets for European aquaculture (Part 2)

**More info:**  
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