Challenges and opportunities for offshore Aquaculture in Portugal
AQUACULTURE’S MOMENTUM IS INCREASING

Aquaculture has been responsible for the continuing impressive growth in the supply of fish for human consumption.

In per capita terms, food fish consumption grew from 9.0kg in 1961 to 20.2 kg in 2015, at an average yearly rate of about 1.5 percent.

Fish consumption will tend to increase in order to supply protein diets to sustain growing world population needs.

The state of World Fisheries and Aquaculture: Meeting the Sustainable development goals – Food and Agriculture Organization of the United Nations, 2018
PORTUGAL IS THE BIGGEST FISH CONSUMER IN EUROPE

95% of farmed fish consumed in Portugal is imported.

Portugal is the biggest fish consumer in Europe, with a 55.7 kg/capita/year consumption.

Portuguese are the 3rd biggest per capita fish consumer in the world.

In Portugal consumption of farmed fish is increasing.

In Fish Dependence 2018 Update by New Economics Foundation, Table 1: Fish Consumption per capita for EU28 Member States, 2014.
Aquaculture production in Portugal is very fragmented, producing small amounts of many species.

Production of 3 species of bivalves and 7 species of fish.

Production is dominated by shellfish (clams, oyster, mussels).

AVAILABILITY OF LAND FOR AQUACULTURE IS LIMITED
CAGE CULTURE IS THE MOST EFFICIENT PRODUCTION SYSTEM

- Most efficient aquaculture operations are based on cage farming (Ex Salmon)
- Lower installation costs vs production volume
- Higher productivity

Introduction of technology to optimize production cycle and costs:
- Automatic feeding
- Underwater cameras
- Mortality inspection and collection
CONSTRAINTS NEED TO BE OVERCOME

GLOBAL OVERVIEW

PORTUGUESE CONTEXT
➢ Market
➢ Species
➢ Facilities

CHALLENGES

Natural Conditions
• Ocean Water temperature profile is not optimal for most species actually farmed;
• Rough sea conditions (5-6 [m] in height)

Licensing
• Complexity in licensing and difficulty in reaching out to public entities

Capital Intensive
• Demand for high investments
• High capital expenditure for production costs

Competition
• Strong competition by other producing countries
• Conflict of interests with other activities: Tourism, Fisheries

FUTURE PROSPECTS
ROUGHNESS OF THE SEA IS THE BIGGEST CHALLENGE

- Continental west coast is exposed to extreme waves.
- South coast characterized by strong currents.
- Madeira Island North Coast is exposed to rough Sea conditions
- Madeira South Cost is more calm and with possibility for installations
- Azores Islands are quite exposed and with possibility of extreme weather (typhons)

GLOBAL OVERVIEW

PORTUGUESE CONTEXT
- Market
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CHALLENGES
- Waves/currents
- Temperature
- Logistics

OPPORTUNITIES

FUTURE PROSPECTS
EXTREME WAVES ARE BIGGEST CHALLENGES

- Typical yearly extreme waves in the range of $H_s = 5-6\ m$
- Extreme structural design $H_s \sim 12\ m$
- Typical tidal currents in the range of 0.2 to 0.4 m/s. Expected throughout the whole water column
- Maximum wave induced current in the range of 1 to 1.5 m/s at 40 to 100 meters water depth
- Wave conditions have longer wave period than typical North Sea conditions.
- Can be favourable as farm will "move with waves" earlier but need to be investigated.
ENVIRONMENTAL CONDITIONS CAN CHALLENGE PRODUCTION

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CHALLENGES

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OPPORTUNITIES

FUTURE PROSPECTS

- Continental waters do not have optimal temperature profiles
- Madeira island has excellent temperature profile for temperate species
LOGISTIC AND PORT ACCESS ARE CRITICAL FOR OFFSHORE AQUACULTURE

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OPPORTUNITIES

FUTURE PROSPECTS

Few ports are located in suitable aquaculture areas
Areas in the south compete with tourism activities
Close down period is high due to rough sea conditions
There is a need to have suitable boats to operate in rough conditions
TOOLS NEEDED FOR ESTABLISHING OFFSHORE AQUACULTURE IN PORTUGAL

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OPPORTUNITIES

FUTURE PROSPECTS

Data
- Accurate environmental data
- Data on waves, current, temperatures
- Reliable predictive models

Technology
- New cages
- New moorings
- Support vehicles

Monitoring
- ROV’s
- Remote control
- Sensors and Radio Transmitters
MADEIRA HAS EXCELLENT TEMPERATURE PROFILE AND SOME CALM CONDITIONS

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OPPORTUNITIES

FUTURE PROSPECTS

THERE ARE PLANS TO ESTABLISH A 6,000 TON/YEAR OFFSHORE INDUSTRY

CONFLICT OF INTEREST WITH TOURISM INDUSTRY

Possibility for Production cycles of 12-13 month for seabream

3 production units installed
NEW TECHNOLOGIES ALLOW INTERESTING SOLUTIONS AND OPPORTUNITIES

Open Sea Farming / Offshore Aquaculture is a new approach to marine farming progressively gaining momentum

- New trend in industry
- Development of many new different concepts
- Allows higher scale of production
- More open areas, less risk of diseases
NEW TECHNOLOGIES WILL ALLOW INTERESTING OPORTUNITIES

Development of offshore aquaculture in Portugal is highly dependent on **new technology** that can **adapt to our sea conditions** and using the **right species**.

- Technology in development phase
- High investment
- Directed at high value species
INVESTING IN OPEN SEA FARMING: SALMON?

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OPPORTUNITIES

Salmon is an endogenous species, occurring in the rivers of the north of the country.

In Northern West Coast most part of the year average surface temperature is below 16°C (13-15°C)

Open sea farming has less risk of disease and parasites (lice)
PILOT TEST TO EVALUATE SALMON PRODUCTION OFFSHORE

PRIVATE PROJECT TO EVALUATE SALMON FARMING IN PORTUGAL

EVALUATE BIOLOGICAL PARAMETERS AND GROWTH PERFORMANCE OF SALMON

TESTING CAGE TECHNOLOGY, ENVIRONMENTAL SENSORS

POSSIBILITY OF CREATING NEW AQUA INDUSTRY

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FUTURE PROSPECTS
OFFSHORE AQUACULTURE IS THE FUTURE, BUT DEPENDS ON TECHNOLOGY DEVELOPMENT

- New technological breakthroughs will allow to adapt to Portuguese rough sea conditions and boost the development of offshore aquaculture in Portugal.

- Possibility of synergies with renewable energy infrastructures: source to power aqua farms