Seaweed and Shellfish Farming in Offshore Wind Farms – *Co-location Potential*

Martin Syvret - Aquafish Solutions Ltd. – January 2020

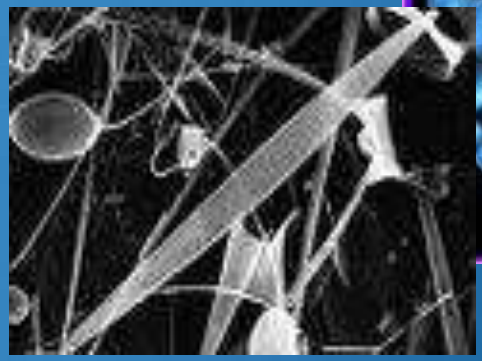
Y Gronfa Pysgodfeydd Ewropeaidd:
Buddsoddi mewn Pysgodfeydd Cynaliadwy
European Fisheries Fund:
Investing in Sustainable Fisheries

Llywodraeth Cymru
Welsh Government

Why do we need Aquaculture?

- **Food Security / Economic Growth /Employment / Tourism**
  - ***"AQUACULTURE has the potential to feed almost two thirds of the world's population, according to a new report from the United Nations"*** https://www.fishfarmermagazine.com/news/fish-farming-can-feed-most-of-world-report/
- **Health Benefits;**
  - Currently a mental health crisis – role of DHA in normal brain function https://www.theguardian.com/uk_news/story/0,,1687248,00.html http://www.themotherandchildfoundation.org/the-world-is-our-oyster/
  - Omega-6 to Omega-3 ratio in UK diet currently 10:1. WHO recommended levels are 2:1
- **Ecosystem Services & Climate Emergency;**
  - Reduce dependence on wild stocks
  - Bioremediation of excess nutrients/euthrophication
  - 'Reef' creation – fish aggregation / settlement substrates / nursery areas / eco-engineering solutions for Climate Change / biodiversity increases / habitat creation https://fstjournal.org/features/33-2/offshore-bivalve-farming
  - Carbon sequestration impacts of shellfish and seaweed (?)
  - Reduction in reliance on meat production

But Why Move Offshore?



- **Environment;**
  - Increased water flow leading to higher phytoplankton levels & dispersal of detritus
  - Generally superior water quality - Classifications
  - Less impacts of diffuse pollution e.g. faecal run-off from agriculture
  - Lower shellfish disease/pathogen load e.g. oysters
- **Food Safety;**
  - Less norovirus / microbial contaminants / HABs
- **Economics & Operational;**
  - Inshore = Lack of sites / Competition for space / Visual impact
  - Greater economies of scale with large farms
  - EU & Govt. Stance; Importance of aquaculture now being recognised

Why Allow Co-location in a Wind Farm Site?

For Aquaculture Industry;

- Less large traffic through wind farm sites
- Known environmental and bathymetric parameters
- Potential exclusion of other activities

For Other Stakeholders;

- Raises revenue for The Crown Estate
- Efficient use of the marine space
- Food security

For Wind Farm Developers/Operators;

- ***This is the question that is asked by this sector…***

Aquaculture Opportunities Report 2013 – Past studies, policy drivers & permissions for shellfish cultivation in offshore wind farms (OWFs)

1. Identify suitable forms of shellfish aquaculture
2. Permission & tenure
3. Requirements for a safe & compatible approach to shellfish culture in OWFs
4. Nature conservation interests
5. Key policy drivers from all sectors

- ***End point =*** guidance / recommendations on what shellfish culture types most suitable *now* or *in near future* – not MUPS!

Findings - Aquaculture Species & Technology

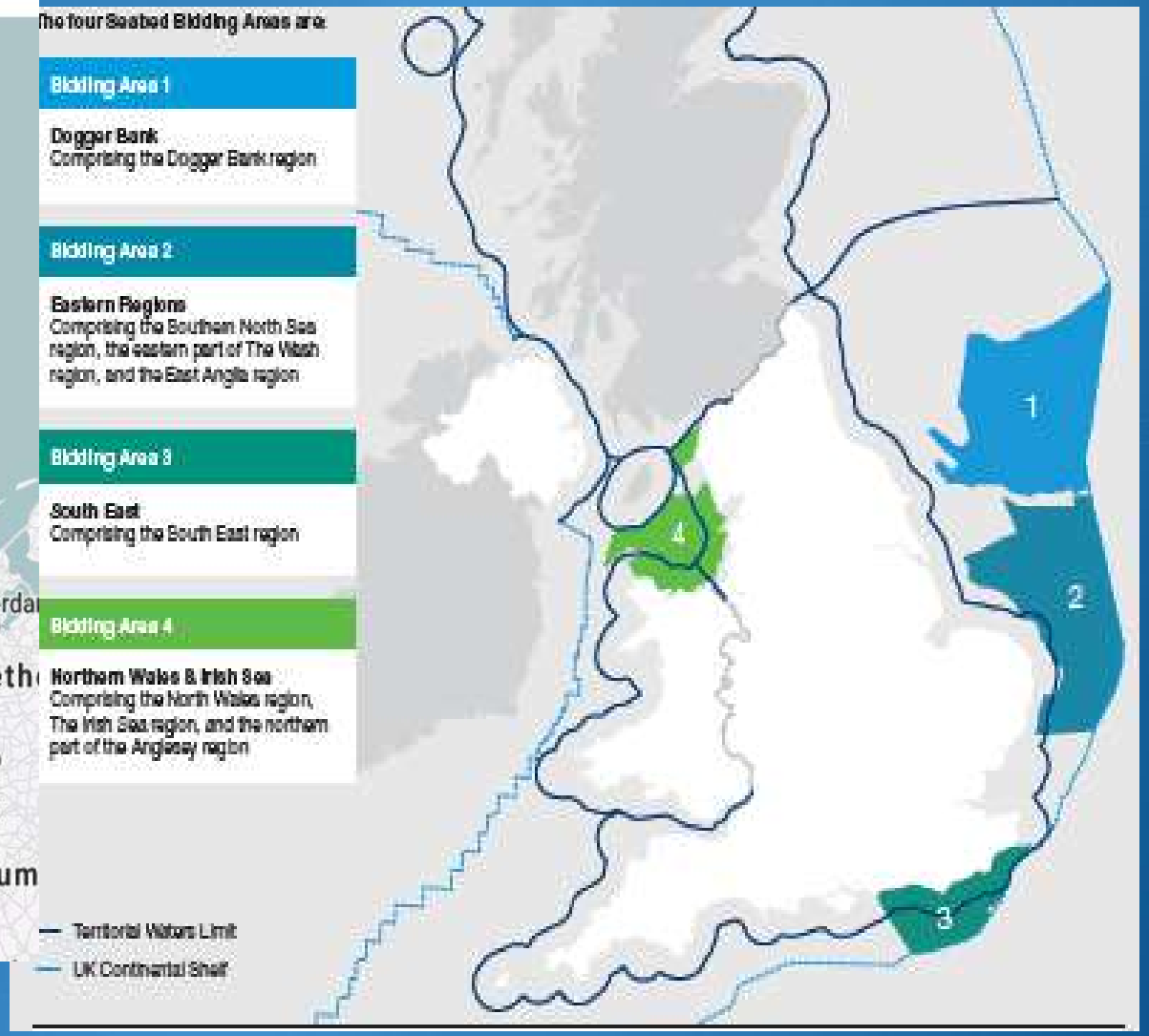
- It is the Wind Farm that is Offshore, not necessarily the type of aquaculture.

➢ Therefore approach may be a mixture of nearshore techniques (e.g. seabed culture of mussels or oysters)

➢ ***Or*** it may be truly offshore cultivation in higher energy environments (e.g. fixed gear rope-mussel cultivation with screw anchors)

➢ Types of aquaculture may develop & change over time & at that stage MUPs may play a role…

Current OWFs vs. Leasing Round 4



Source: https://www.thecrownestate.co.uk/media/3338/tce-r4-seabed-bidding-areas.pdf

Old OWFs vs. New

Source: https://seafish.org/media/Talking_Points_Bulletin_Jan_2020.pdf

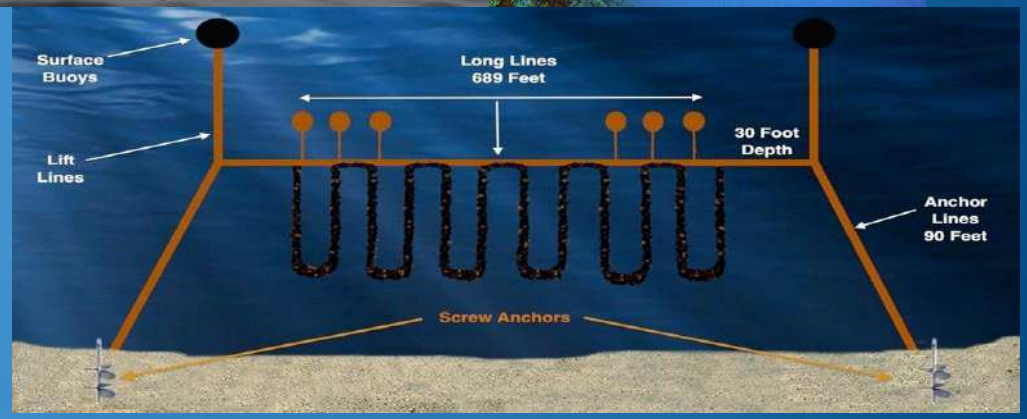
* Each illustration shows a trawl door 'spread' of approx. 100m and total gear length of approx. 250m (vessel to cod end). Distances between rows of turbines are based on Barrow (older wind farm) in comparison to Hornsea One (newer wind farm).

- Fully offshore aquaculture might require a new approach e.g. automation, remote sensors, spat transfer from inshore
- The potential future use of floating offshore wind platforms would probably prove a greater challenge for co-location with aquaculture, at least in a more traditional sense
- Floating platforms might well work well with restoration and future fishery efforts for species such as the native oyster

Short-term

- ***Blue mussel* (*Mytilus edulis*)**
- **Seabed cultivation**: North Hoyle trial by Deepdock is an example of this type of aquaculture in practise in an OWF

- **Fixed-gear rope-mussel cultivation**: Offshore technology/techniques exist - Refinement & impact assessment for UK conditions via commercial-scale trials is now underway in south west waters – results to date have been positive



Medium-term

- ***Pacific oyster* (*C. gigas*) –** Non-native mitigation? / Disease & parasite loads may be less offshore
- ***Native oyster* (*Ostrea edulis*) –** BAP species

- **Seabed cultivation**: Potential for cage culture or direct onto seabed in nearshore wind farms
- **Fixed-gear suspended cultivation**: Offshore technology similar to mussels but using containment

Report 2- Guidance Manual on how to cultivate shellfish within an offshore wind farm site

1. Safe access & development of a *Safe Access Protocol*
2. Operational compatibility of shellfish cultivation & wind farm operation
3. Shellfish cultivation & nature conservation interests
4. Emergency procedures

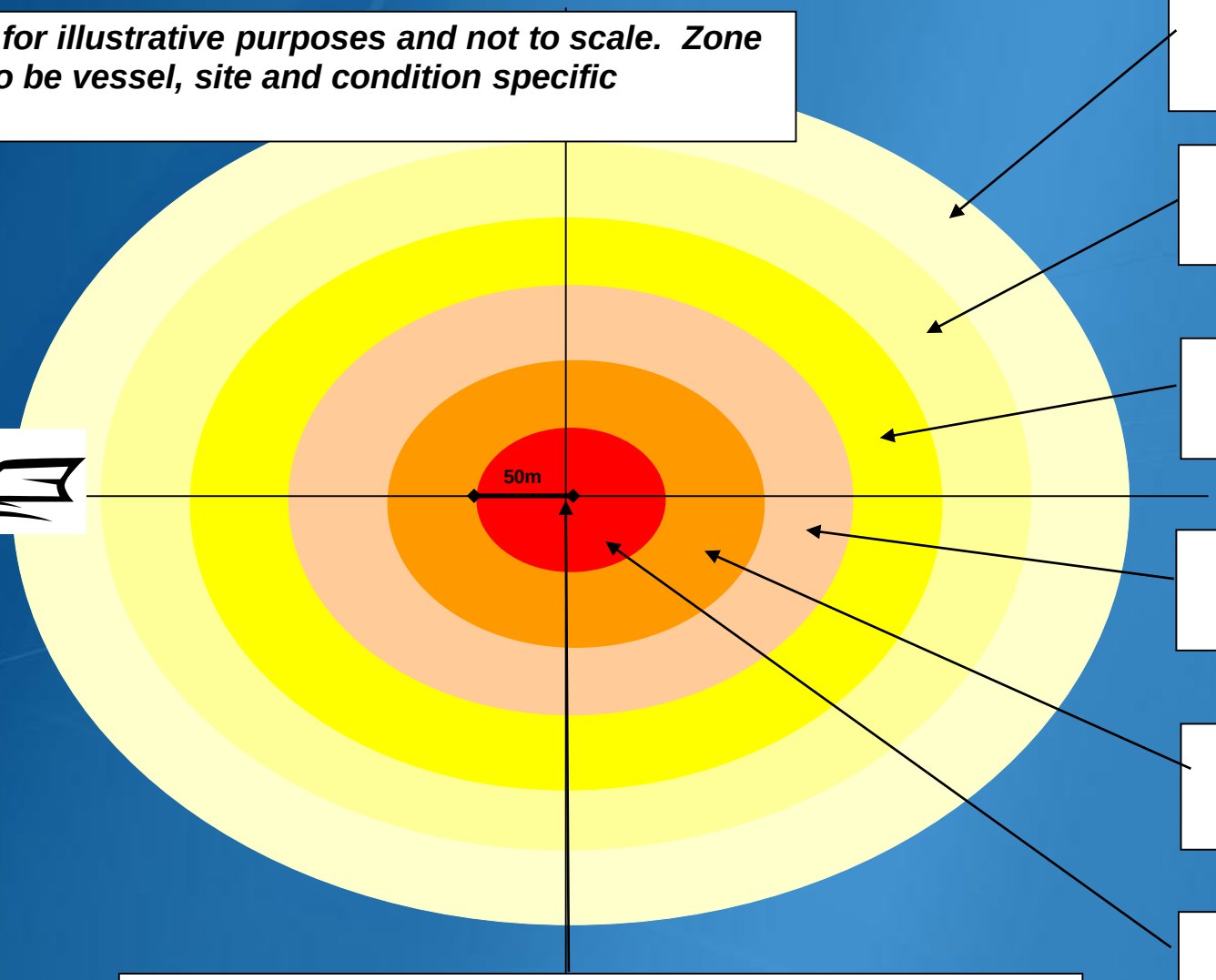
❖ ***End point*** =

- A practical *Manual* on how to safely cultivate shellfish in OWF sites
- Takes into account requirements of *wind farm operators* & *nature conservation designations*

Exclusion & Restriction Zone Sizing

Principal: There is a need to develop a system for setting risk-based restriction zones

Note: Zone sizing for illustrative purposes and not to scale. Zone scaling to be vessel, site and condition specific



Turbine Structure

Zone 6 - Vessel manoeuvrability Offset
RESTRICTION
Vessel turning circle

Zone 5 - Emergency Response Offset
RESTRICTION
Distance travelled whilst deploying anchor

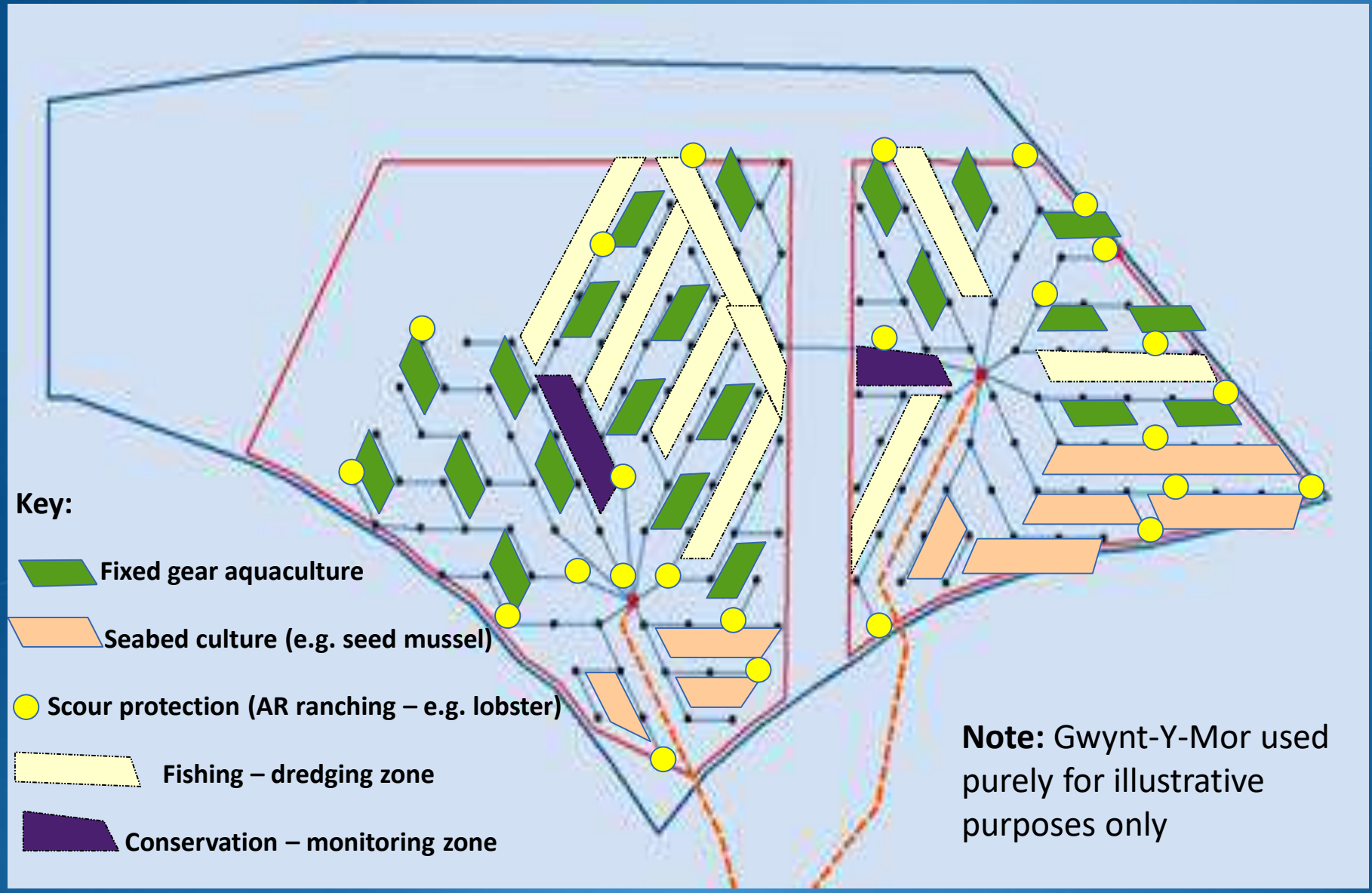
Zone 4 - Condition Specific Offset
RESTRICTION
Mooring line length (windage)

Zone 3 - Site Specific Offset
RESTRICTION
Mooring line length (depth/currents)

Zone 2 - VMS Offset
RESTRICTION
Vessel length

Zone 1 - Inner Exclusion Zone
MANDATORY

Offshore Wind Farm Co-location Illustration



Challenges - Marine Licensing

- **The key aspect for successful Co- location?**

- Fishery Orders only go out to 6nm – probably ok due to need for primary productivity
- Can Fishery Orders work within existing OWFs? They are vital if stock, culture & restoration, is to be protected
- TCE lease can be used for fixed-gear out to 12nm
- Beyond 12nm licensing seems uncertain for both seabed and fixed gear.

Marine Licensing *contd.*

- Lease for a wind farm granted to the WFD/WFO includes the entire area encompassed by the wind turbines.
- This is for “purpose of producing electricity” – does this therefore preclude other co-location activities?
- No rights are granted under the current lease agreements for WFOs or 3rd parties to undertake any aquaculture activities within OWFs.
- Multi-use of existing leases uncertain. Do you need ability to sub-let or just to issue new leases – would this mean new leases for WFOs?
- To what extent is the support for co-existence in Marine Plans being translated into action?

Marine Licensing - Existing OWFs

Three possible solutions to licensing of fixed gear aquaculture activities within existing OWFs were proposed:

1. Areas requested for aquaculture activities are extracted from the wind farm lease.
2. Agreement with the WFO to a doubling of the leasing of rights within the wind farm.
3. The WFO requests amendment to current lease allowing them undertake marine aquaculture activities.

- ***However, all proposed solutions require the interest, agreement and co-operation of the WFOs!***

Policy Drivers for Future OWFs – German Case Study

- 2013 = Lots of discussions about benefits of co-location but for years there had been no progress on implementing practical projects
- German legislation then changed to require WFDs to consider & evidence co-location assessment during application process
- In theory - No investigation = no permit/licence
- 2020 = Follow up with researchers at AWI has shown that the legislation has proved toothless with no true commercial operations
- However, new legislation is being written and co-location with aquaculture is likely to be given a higher priority going forward
- Legislative drivers requiring co-location may still be the answer if they are effective. Belgium has taken this approach & insists on co-location with large scale seaweed projects now planned

Conclusions – Our original question…

Why should the WFDs/WFOs get involved?

What is in it for them?

"The challenge to developing offshore co-location is not technical but revolves around the ability to persuade Wind Farm Developers/Operators to work with the aquaculture sector"

(*Prof. Bela Buck, AWI*)

TOP DOWN APPROACH

Policy drivers – Requiring and/or **Incentives** – Encouraging

Marine Licensing - Role for Defra / Government / MMO / TCE

Collaboration between Govt. Depts – Joint engagement with OWFs

Socio-Economic Study to;

Highlight & Quantify potential wider benefits of co-location

Commercial-scale Trials! to test;

- Theories/Models
- Environ. impacts
- Operational aspects
- Technical challenges
- Ecosystem services
- Economics
- Insurance realities

BOTTOM UP APPROACH

Requires - Industry Interest / Investment / Know-how

Investment – Supported by Funding/Finance

http://www.shellfish.org.uk/files/Literature/Projects-Reports/Project-Ref-ID-71-Co-location-Project-Ver.FR1.1.pdf

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