



# POSITIVE TIPPING POINTS FOR SUSTAINABLE GROWTH OF BIVALVE SHELLFISH MARICULTURE IN ENGLAND AND WALES

POLICY BRIEF

This briefing summarises the findings of a report submitted to Open Research Exeter in March 2023

## **Recommended citation**

Brown AR, Huntington T, Bickley LK, Powell T, Tyler CR (2023). Positive Tipping Points for sustainable growth of bivalve shellfish mariculture in England and Wales. Policy Brief. 7pp. <http://hdl.handle.net/10871/133125>.

# BACKGROUND

## The potential for sustainable growth in aquaculture

- Expanding aquaculture - the farming of finfish, shellfish and seaweeds - is vital for ensuring global food security. <sup>1</sup>
- Marine aquaculture (mariculture) will play a key role in sector growth, with huge potential to grow shellfish. UK shellfish production is currently 21,000 tonnes (\$35 million<sup>2</sup>), versus 17.7 million tonnes (\$29 billion) globally in 2020. <sup>1</sup>
- Bivalve shellfish mariculture is highly sustainable, since shellfish filter feed on freely available suspended organic material including marine phytoplankton and zooplankton.
- Moreover, bivalve shellfish perform a wide range of ecosystem services, including nutrient regulation, habitat provisioning, coastal protection and carbon capture, which collectively are estimated to double the economic value of shellfish production. <sup>1,3</sup>
- Despite considerable potential for sustainable growth, shellfish mariculture is declining in England and Wales due to a number of key environmental and socio-economic constraints <sup>4</sup> (see [Table 1](#)).

**Table 1: Constraints for the development of the shellfish mariculture industry in England and Wales and areas for intervention to address them**

Intervention area	Current constraints
<b>I. Governance &amp; public investment</b>	1) Uncertainty (post-Brexit) over land/agriculture, marine/aquaculture and environmental policy 2) Precaution overrides risk - short-term hygiene data determine long-term classification of shellfish sites 3) Lack of guidance and data to aid aquaculture licencing and marine spatial planning (& licencing is short-term) 4) Restricted diets and reliance on agriculture and fisheries rather than aquaculture 5) Threat of invasive cultivated species (e.g. Pacific oysters) 6) Ecosystem services from shellfish aquaculture (beyond food production) are rarely measured/considered
<b>II. Private finance &amp; markets</b>	7) Limited range of shellfish food products (e.g. processed products with longer shelflives) 8) Limited use of shellfish-derived raw materials (including meat, shells and byssus) 9) Limited scale and consistency of supply of farmed shellfish are barriers to market diversification/expansion Plus 6)
<b>III. Innovation &amp; technology</b>	10) Uncertainty over climate change and its impacts 11) Reluctance of larger maritime sectors (e.g. offshore wind farms) to co-locate with aquaculture 12) Perceived visual impact of aquaculture infrastructure Plus 6) and 9)
<b>IV. Education knowledge &amp; information</b>	13) Limited awareness of the benefits of shellfish as a healthy and sustainable alternative to other animal protein 14) Poor image of shellfish aquaculture as a result of pen-farmed finfish issues Plus 3), 6) and 12)
<b>V. Behavioural nudges</b>	15) Differing views on non-native invasive species, versus naturalised species 16) Environmental and political concerns over larger scale aquaculture systems Plus 1), 2) and 4)
<b>VI. Monitoring &amp; accountability</b>	17) Upper catchment investments to improve water quality are diluted further downstream Plus 2), 3), 5), 6), 10)

# APPROACH

## Realising sustainable growth in shellfish mariculture using the Positive Tipping Points (PTP) framework

- Positive Tipping Points can occur when small interventions initiate cascading and reinforcing feedbacks driving adoption of new practices and technology, resulting in sustainable growth.
- To identify interventions and 'leverage points' for enabling sustainable growth of shellfish mariculture, we engaged industry and policy stakeholders to help map the relationships between actors and processes across the sector, and opportunities for leveraging transformative change – according to the Positive Tipping Points (PTP) framework.<sup>5</sup>
- Opportunities for unlocking existing constraints for shellfish mariculture (**Table 1**) were identified within the six intervention areas defined by the PTP framework (**Figure 1**), along with five enabling conditions (**Table 2**), required to drive reinforcing feedbacks and sustainable growth in shellfish mariculture. Interventions were then sequenced and assigned to key actors.

**Figure 1: Positive Tipping Point Framework applied to shellfish mariculture**



# APPROACH (continued)

**Table 2: Enabling conditions for sustainable growth of shellfish mariculture**

- 1. Accessibility** to resources including guidance, data, technology and funding is required to aid spatial planning and site licensing. The current licensing system is complicated, costly and lengthy, while licences themselves often only last 5-10 years.
- 2. Economic competitiveness** of shellfish mariculture is dependent upon improving pollution regulation (including agricultural and municipal sewage pollution) and the adoption of diversified business models, such as trading ecosystem services (including nutrient regulation and bioremediation of pollution by farmed shellfish).
- 3. Capability:** Sharing of data and practices (through data portals and aquaculture training centres) are essential for realising opportunities for improved policy and regulation, monitoring and accountability, financing and technical innovation.
- 4. Performance:** Shellfish mariculture is potentially a 'high performing' 'blue growth' system with co-benefits that enhance other activities (including local marine conservation and fisheries). Performance needs to be measured and evidenced by quantifying ecosystem service provisioning (including habitat provisioning) alongside food production.
- 5. Cultural and social norms:** Shifting seafood consumption towards greater inclusion of shellfish in a wider variety of products and menus offers both human and environmental health benefits. More holistic environmental management and planning (for example managing coastal water quality through a whole catchment approach) are also key to more sustainable food production.

## Summary of Positive Tipping Points theory of change



## APPROACH (continued)

**Table 3: Future vision for sustainable shellfish mariculture in England and Wales (created using the PTP framework)**

- Shellfish mariculture is equitable with agriculture, fisheries and finfish aquaculture in terms of profile and support in the National Food Strategy and the UK's Net Zero Strategy around food production.
- A Mariculture Portal for England and Wales provides detailed information on the production economics of shellfish mariculture required for investment and growth. This complements existing guidance i.e. Aquaculture Regulatory Toolbox for England<sup>6</sup> and the Aquaculture Regulatory Toolbox for Wales.<sup>7</sup>
- Catchment management has a more holistic approach (from source to sea), fully recognising the cumulative impacts of natural, agricultural, industrial and urban sources of chemical pollutants, nutrients and pathogens on coastal ecosystems and their uses (including shellfish mariculture).
- Monitoring of shellfish waters is dynamic and predictive, allowing mariculture businesses to manage current and future commercial production, whilst ensuring that human and environmental health risks are minimised.
- Shellfish mariculture systems are recognised to provide fully quantified and valued ecosystem services across different environments/habitats and at different scales. This is understood by policy makers and included in marine spatial planning and licensing systems to ensure access to marine space, as well as integration, where possible, with other maritime economic activities, such as capture fisheries, offshore energy production and marine conservation.
- Shellfish mariculture expands to provide a variety of ecosystem services, including food provision, nutrient assimilation and carbon fixation, both in the form of integrated multi-trophic mariculture (IMTA) and as an ecosystem engineering solution (e.g. coastal protection, habitat provisioning, biodiversity and fisheries enhancement) at regional and national scales.
- Production and consumption of shellfish mariculture products is increased towards aspirational targets in the English Aquaculture Strategy and the Welsh Marine and Fisheries Strategic Action Plan. Shellfish are included in a wide variety of raw and value-added products, emulating the situation currently found in mainland Europe.
- Supermarkets preferentially buy and sell mariculture products (including bivalve shellfish) with guaranteed provenance, sustainability and quality.

# CONCLUSIONS

“ The Positive Tipping Point (PTP) framework provides a powerful tool for aiding strategic planning for sustainable food production. ”

“ Driving positive tipping towards the sustainable growth of shellfish mariculture involves adopting new practices and technologies, as well as challenging the status quo around our reliance on agriculture and fisheries (Table 3), which have reached or exceeded maximum sustainable yields.<sup>1</sup> ”



## References

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## ACKNOWLEDGEMENTS

The authors are very grateful to the wide range of stakeholders who participated in the PTP workshop in Exeter in September 2022. We also acknowledge funding via the University of Exeter's Knowledge Exchange Culture Programme, supported by the Higher Education Funding Council for England.

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