



University of Essex



Colchester
Borough Council



Economic
and Social
Research Council



Aquaculture for a Thriving Future:

Farmed oysters

Ecosystem engineers that provide food and flood protection

Dr Michael Steinke

Senior Lecturer/Associate Professor

msteinke@essex.ac.uk



University of Essex

SCHOOL OF LIFE SCIENCES

PARTNERSHIPS WITH PEOPLE AND NATURE



KEY PROJECTS

GREEN SEA WALLS

- Building nature into sea defences
- Hybrid engineering delivering multiple benefits
- Increasing habitat connectivity

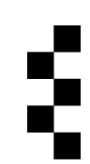
NATURE-BASED SOLUTIONS

- Using nature to tackle coastal erosion and flood risk
- Creating benefits for the environment and economy
- Helping communities adapting to climate change

SEAWILDING

- Restoration and rewilding of our coasts and estuaries
- Working with shellfishing communities
- Recovering ecosystem function and lost fisheries
- REWRITE EU grant funded





Dr Boróka Bó

Sociology



Dr Bethan Greenwood

Life Sciences



Dr Maged Ali

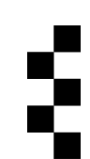
Essex Business School



Dr Michael Steinke

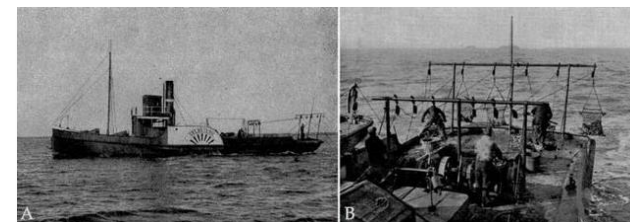
Life Sciences

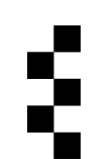
- **Introduction to our ‘Building with Nature’ project**
 - Essex – a place with rich oyster history
 - A drowned future
- **Hard- versus Soft-engineered coastal defence**
- **Hybrid engineering using oyster reefs for coastal defence**
 - Living breakwaters



Essex – a place with rich oyster history

- Generations of oyster fishermen
- Historically, oysters were a source of ‘cheap protein’ to many coastal communities

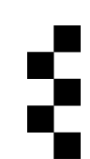




Essex – a place with rich oyster history

- Olsen's Piscatorial Atlas from 1883 suggests native oyster reefs protecting the coastline
- Overfishing and disease: Numbers of European flat/Native oyster (*Ostrea edulis*) have declined

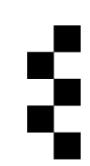




Essex – a place with rich oyster history

- 1960s: Introduction of the Pacific oyster (*Magallana (Crassostrea) gigas*)
- Rebuilding of a shellfish fishery



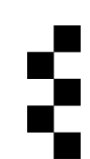


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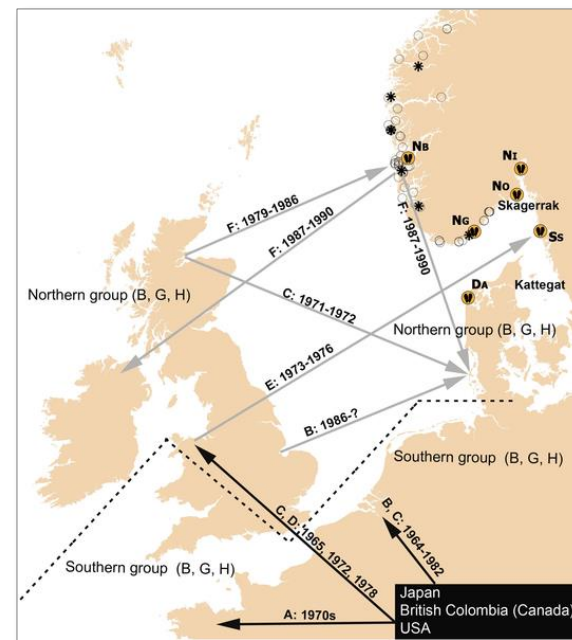


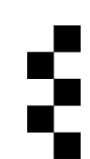
Photo: Global Seafood Alliance



Challenges & Opportunities

- Naturalisation of introduced species
- Distributed throughout southern North Sea and beyond → feral populations
- Legal status = invasive
- DEFRA: No expansion or new oyster aquaculture north of 52 °N (Fishguard – Felixstowe)





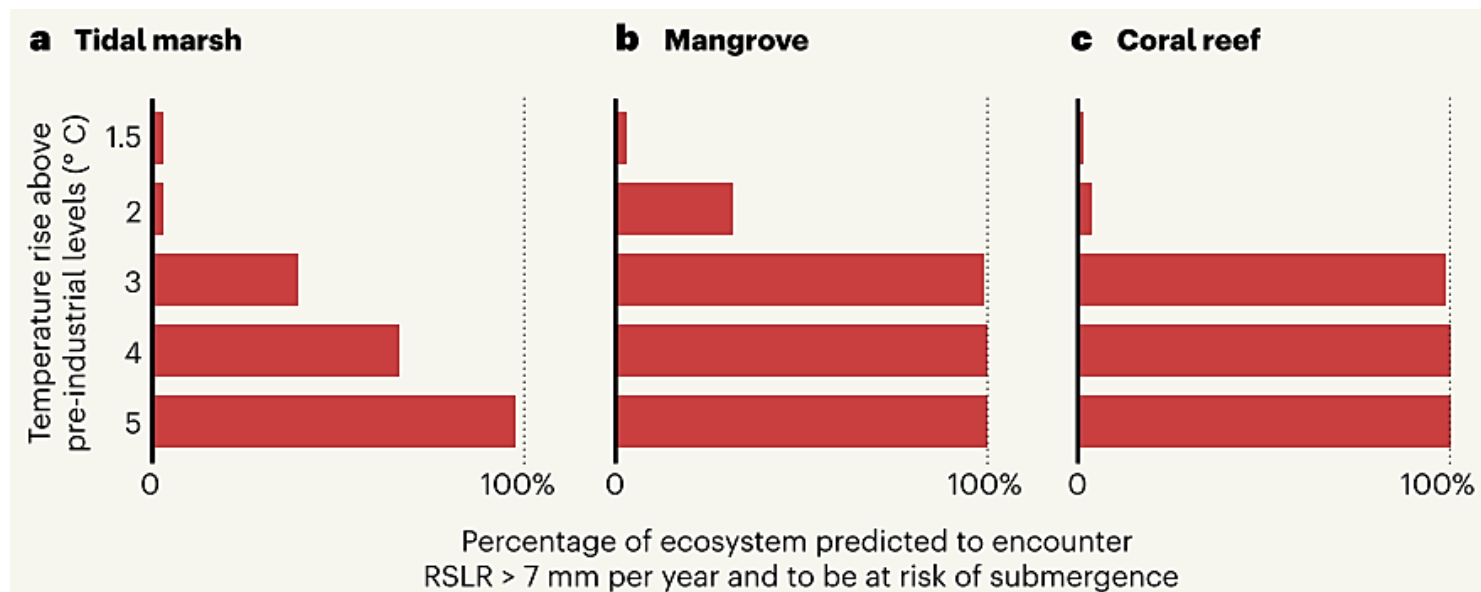
Challenges & Opportunities

Ecology

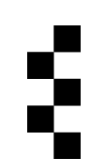
A drowned future for coastal ecosystems

Qiang He

Tidal marshes, mangroves and coral reefs support the livelihoods of millions of people. Most of these ecosystems will be vulnerable to submergence owing to rapid sea-level rise if global warming exceeds 2 °C above pre-industrial levels. See p.112



He (2023) doi:10.1038/d41586-023-02595-5, Saintillan *et al.* (2023) doi:10.1038/s41586-023-06448-z



Challenges & Opportunities

Ecology

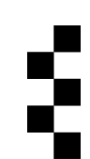
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<https://www.bbc.co.uk/news/uk-england-suffolk-67541260>



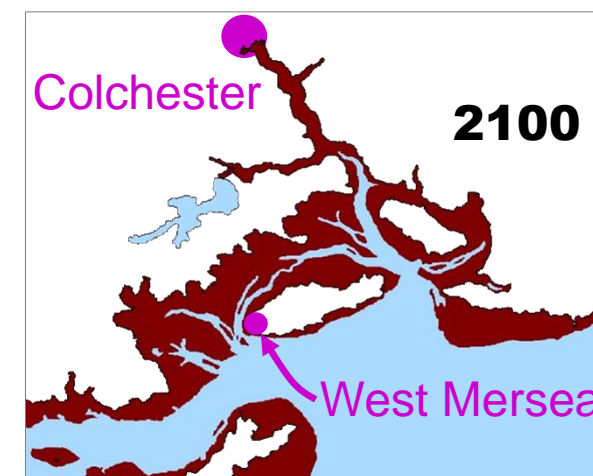
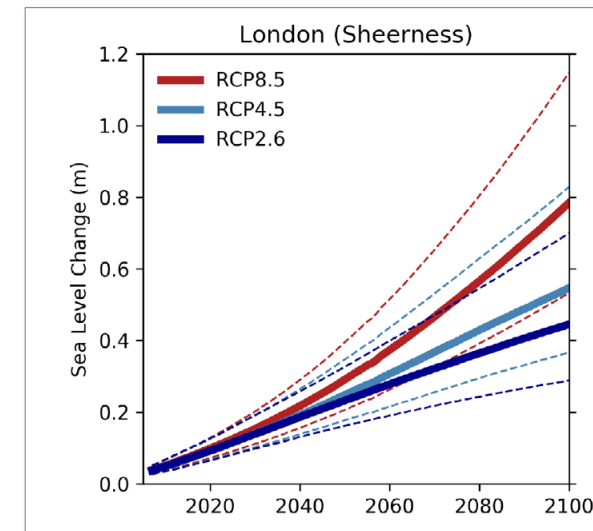
Challenges & Opportunities

Global causes

- Eustatic sea-level change – change in quantity of water
 - Glacio-eustasy
 - Steric or thermal expansion

Regional causes

- Isostatic sea-level change – change in loading of ice-sheets
 - Isostatic readjustment after ice-ages (post-glacial rebound)



<https://coastal.climatecentral.org/>



About News Operations Leisure Environment Live Data Contact

Beneficial disposal project begins at Mersea Island

03 November 2021



From around the **3 November 2021** the trailer suction hopper dredger **Sospan Dau** (IMO number: 7711062) will continue dredging in the main channel, but will move the disposal site from **Horsey Island** to the beneficial disposal scheme at **Mersea Harbour**.

The dredging contractor is the **Boskalis Westminster / Van Oord Joint Venture** appointed by the Harwich Haven Authority to carry out the Harwich Haven Channel Deepening Project.

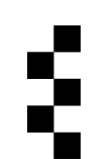
<https://hha.co.uk/>

Sand scaping

98,944 m³ (158,310 tonnes) of sand and gravel = £1.5 m

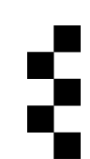
<https://savemerseaharbour.org>

Hard-engineered coastal defence is costly, unnatural and unsustainable



<https://www.wivenhoegallery.com/richardallen>

Soft-engineered coastal defence is economically beneficial, natural and sustainable



Potential for hybrid engineering using oyster reefs

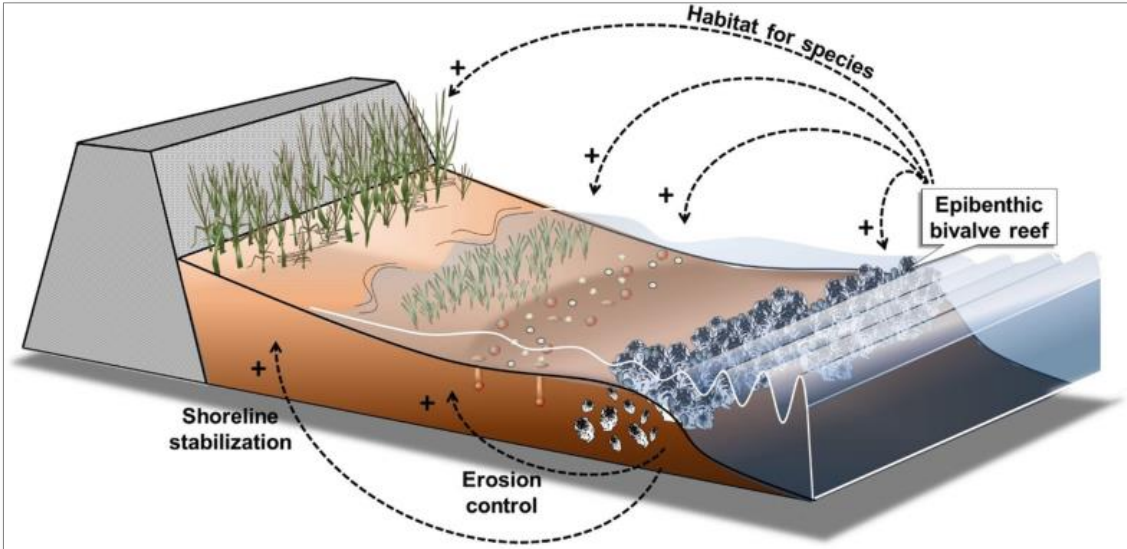
Oyster reefs increase seabed rugosity and elevate the seabed

- dissipating wave energy
- increasing sediment deposition
- reducing erosion



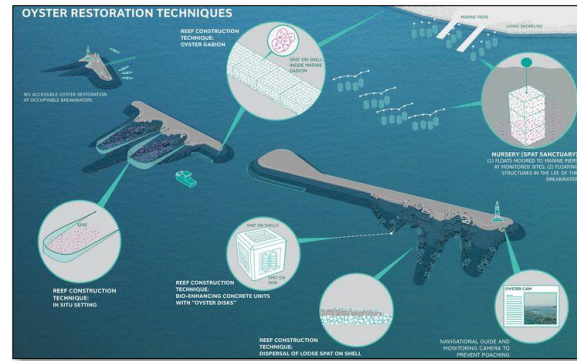
Herbert *et al.* (2016) doi:10.1007/s10531-016-1209-4

Challenges & Opportunities

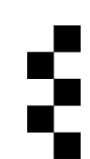


‘Living Breakwaters’ (USA)

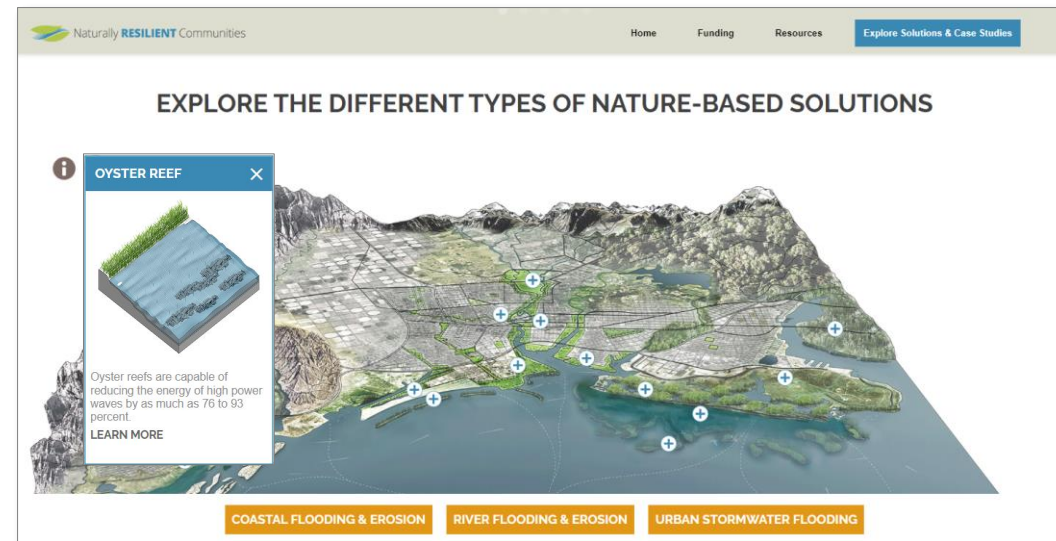
- Installation of oysters on and around coastal defence infrastructure
- Softening the blow of large waves, reducing flooding, preventing erosion



<https://www.billionoysterproject.org/>



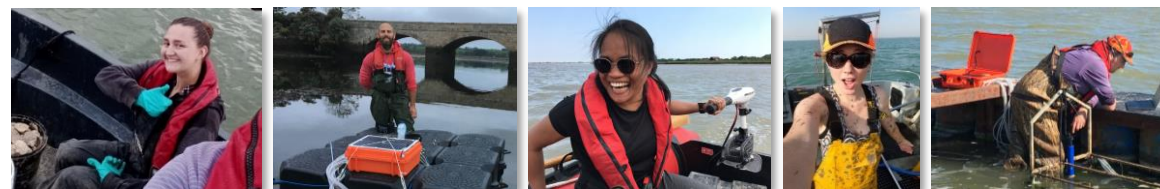
Summary



<https://nrnsolutions.org/>

- Coastal communities benefit from oyster aquaculture
- Sea-level rise is a major challenge to coastal communities
- Pacific oysters are ecosystem engineers that build reefs
- Hybrid engineering of oyster aquaculture – a Nature-based Solution to protect the coastline from future erosion?

Acknowledgements



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Prof. Tom Cameron



Thank you

Michael Steinke

msteinke@essex.ac.uk

essex.ac.uk