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OYSTER RESTORATION IN EUROPE & USA: REALISING MULTIPLE BENEFITS



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OYSTERS ECOSYSTEM SERVICES

Oysters provide a suite of ecosystem services

- Biodiversity hotspots
- Water quality
- Denitrification
- More fish
- Livelihoods

Recognised ecosystem engineers



OYSTERS FISHERY



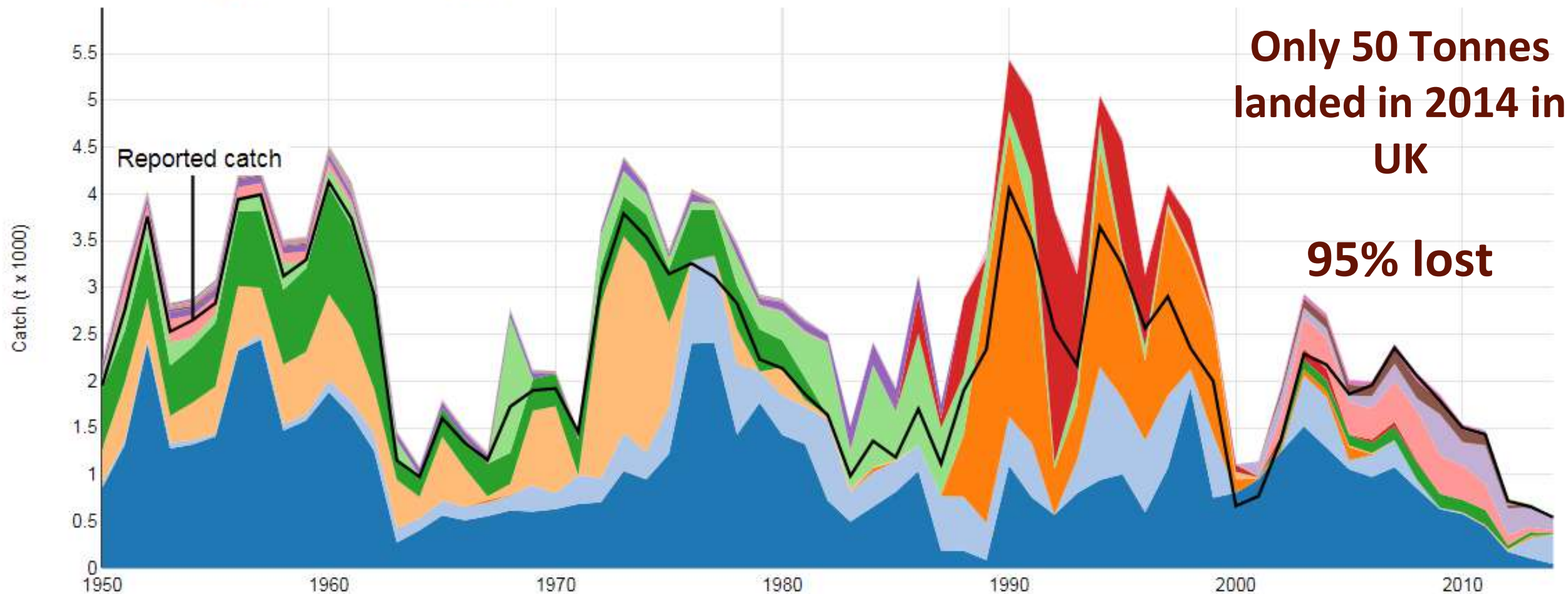
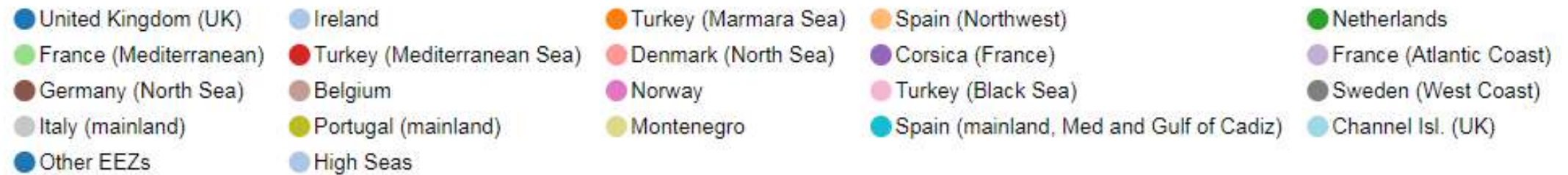
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Oysters have supported booming, valuable fisheries

- US East Coast: nearly 27 million bushels in the 1890s
- France: 100 million oysters per year in the early 19th century
- Solent: 15 million oysters were landed in 1978



Global catches of European flat oyster (*Ostrea edulis*) by EEZ



85% of the worlds oyster reefs lost

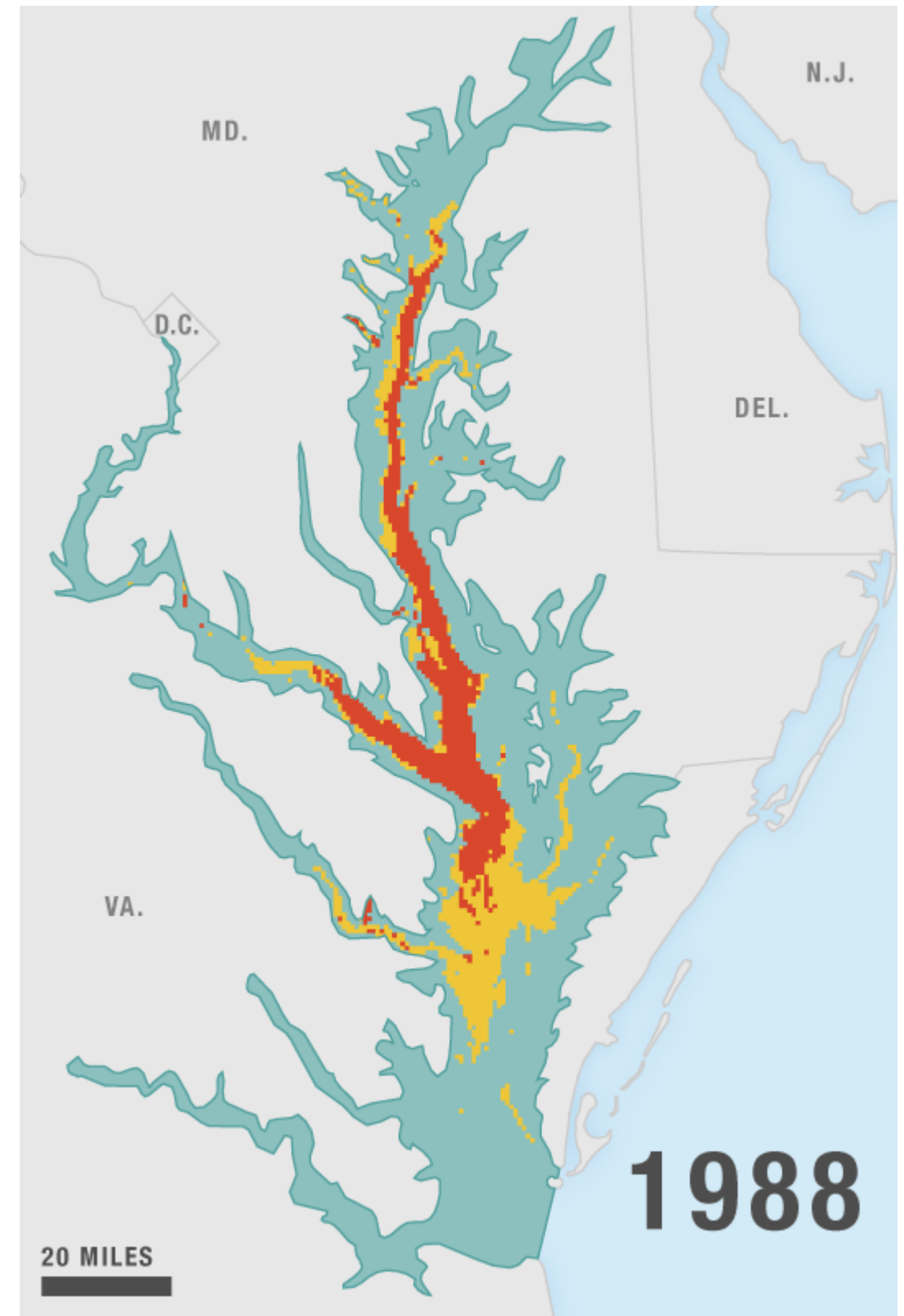


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OYSTERS CONSEQUENCES

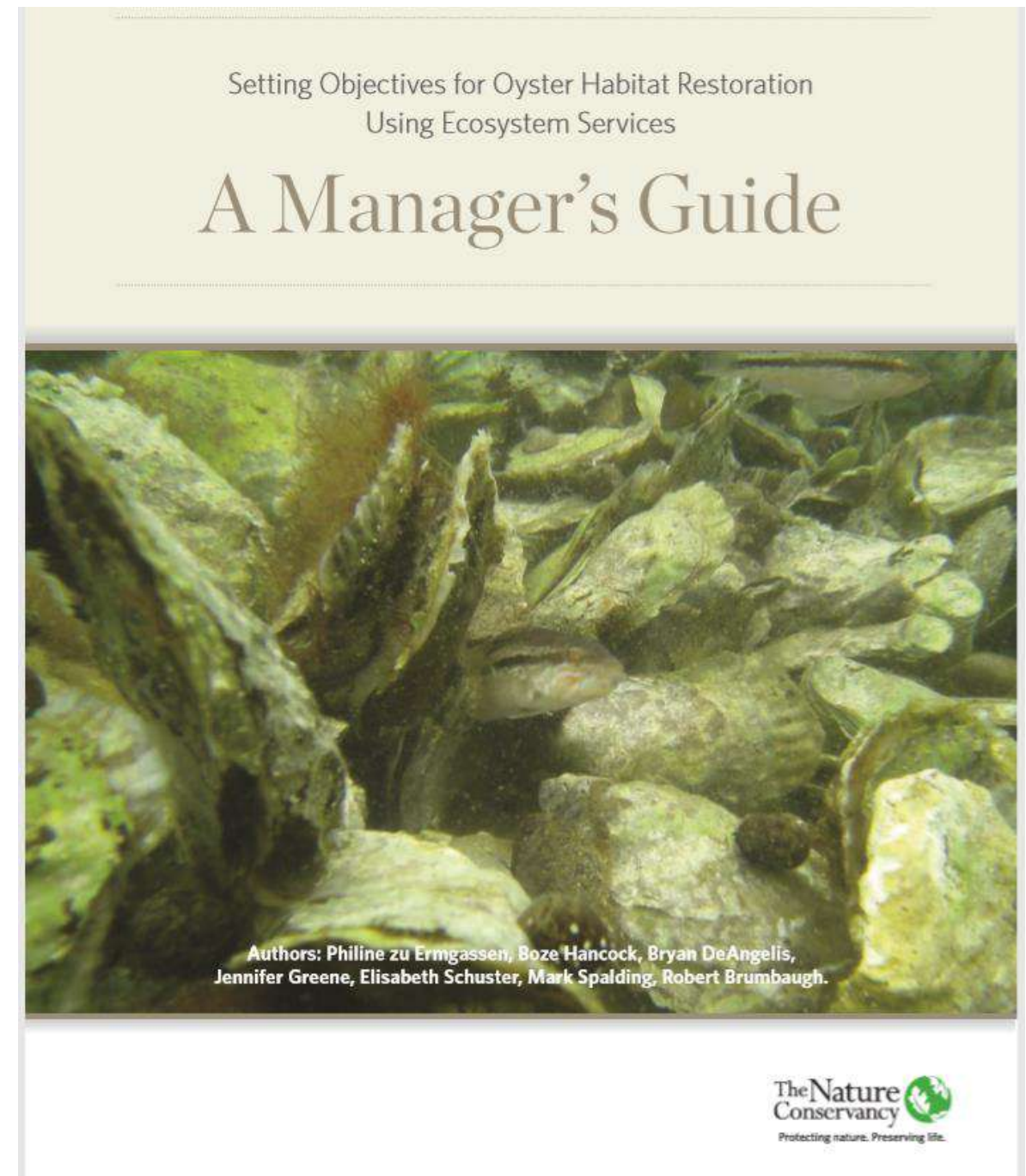
- Fisheries collapse
- Vast dead zones
- Coastal erosion
- Biodiversity loss
- Loss of heritage
- Climate change

RED IS DEAD



OYSTERS MAKING THE CASE FOR RESTORATION

- Increase in number and scale
- Focus on restoration for ecosystem services
- Quantitative objectives at a system scale



Key guide: <http://oceanwealth.org/wp-content/uploads/2016/06/Setting-Objectives-for-Oyster-Habitat-Restoration-Using-Ecosystem-Service.pdf>

USA

- Two species: Eastern oyster (*Crassostrea virginica*) and Olympia oyster (*Ostrea lurida*)
- 15/20 years
- American Recovery and Reinvestment Act of 2009 – federal and state decision making
- Significant funding
- State of the art hatcheries



CASE STUDY DENITRIFICATION AND NUTRIENT ASSIMILATION



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Harris Creek, Maryland

- Largest restoration project ever undertaken. \$27.68 million
- 2.13 billion hatchery oysters planted on 351 acres' worth of reefs.
- Once complete ~48% of the total external nitrogen inputs will be removed annually.



Maryland Oyster Restoration Interagency Workgroup

CASE STUDY COASTAL PROTECTION



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MOBILE BAY, ALABAMA

- Natural approach to coastline protection
- *Crassostrea* create reefs capable of absorbing the impact of wave energy
- 3 acres of oyster reef protecting 30 acres of marsh and seagrass



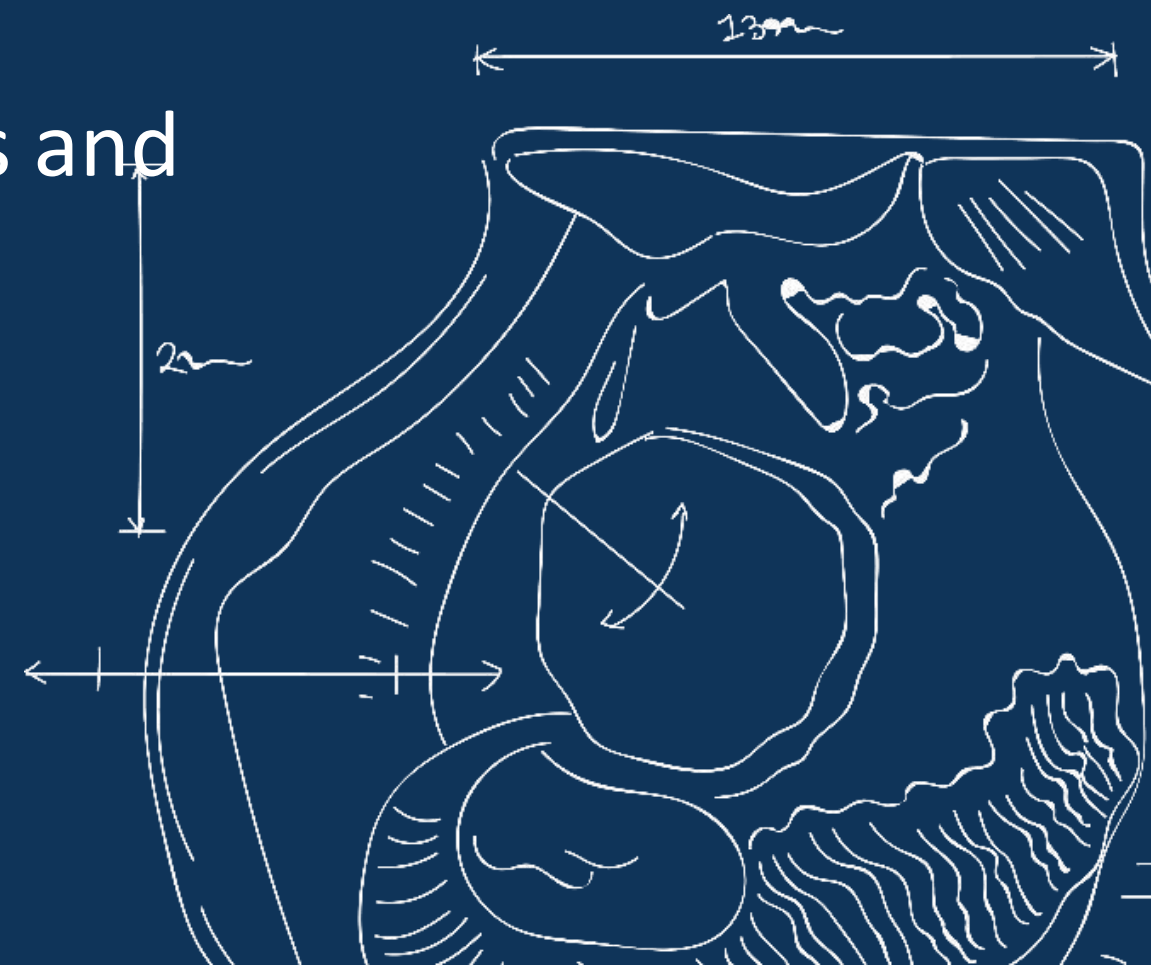
MATAGORDA BAY, TEXAS

- Biodiversity is 40% higher
- 19 species enhanced by oyster reefs; black drum, sheephead and speckled trout
- One hectare of oyster reef produces 3,200 mature crabs
- \$691,000 added per year to Texas GDP from recreational fishery



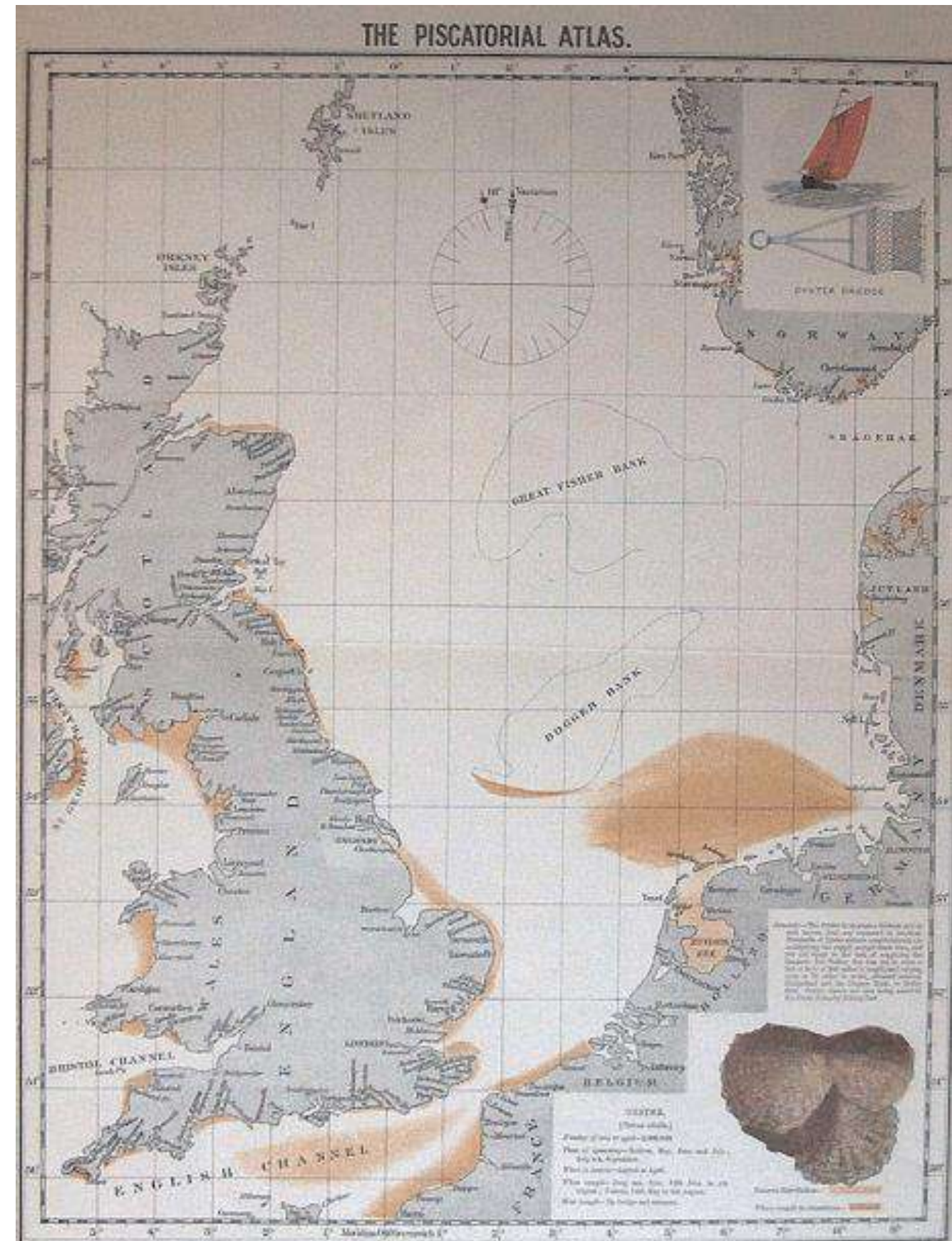
EUROPE

- One species; *Ostrea edulis*
- Early stages
- Need to establish operation goals and oyster metrics
- Range of barriers
- Very hard to find oysters!!!



THE NORTH SEA

- Once covered 20% of the North Sea
- Logistically harder
- Holland: ascertain critical success factors using wind farms
- Germany: obstacles in the legal approval process



DORNOCH FIRTH, SCOTLAND

- Absent for last 100 years
- Restore 40 hectares of oyster reef
- Almost 100% survival rates after two months
- Partnership with Glenmorangie to remove excess organic waste from Distillery

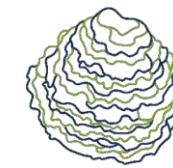


ESSEX, ENGLAND

- Only MCZ in UK designated for oyster beds
- ‘Blackwater Conservation Box’
- Focus on shell budget and broodstock
- End goal: sustainable oyster fishery in the wider MCZ



CASE STUDY MULTIPLE BENEFITS



**SOLENT
OYSTER**
RESTORATION PROJECT



THE SOLENT, ENGLAND

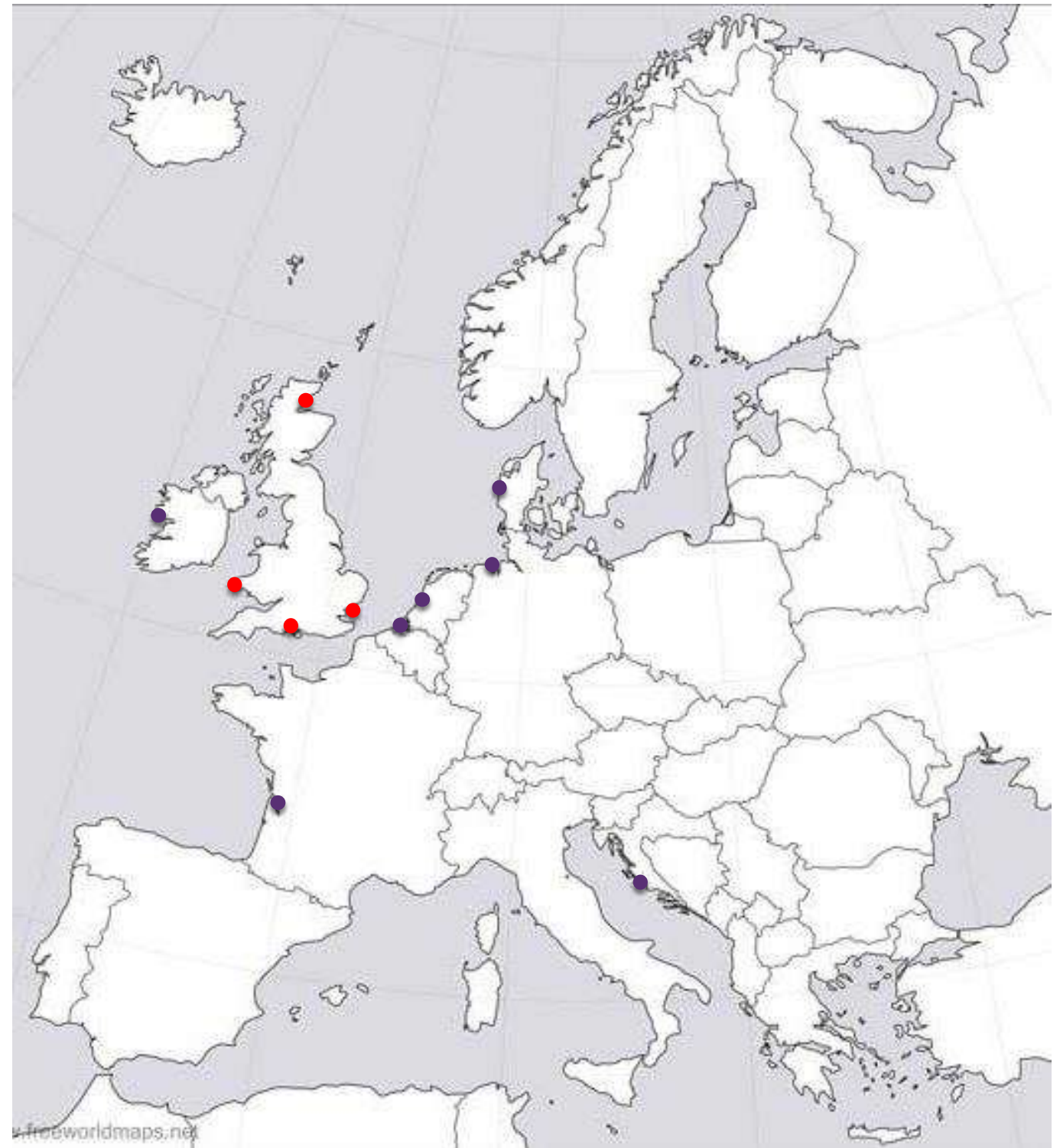
- Low densities 0.01 oysters/m²
- No designations for oyster beds
- Restoring 5 million oysters
- Broodstock cages and large scale seabed sites in multiple estuaries
- Results 25,000 oysters restored
91% survival rate
Over 90 species



- Different species – survival, growth and reproduction conditions
- Recognition of shifting baselines
- Oyster metrics – defining restoration and benefits
- Other issues: disease, density, seed supply



- Restoration as a **national objective**
- Increased awareness and education
- Solutions to barriers
- Knowledge exchange and sharing



 UK native oyster network  Native Oyster Restoration Alliance



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OYSTERS UK DECLINE

UK landings 1886 - 2002

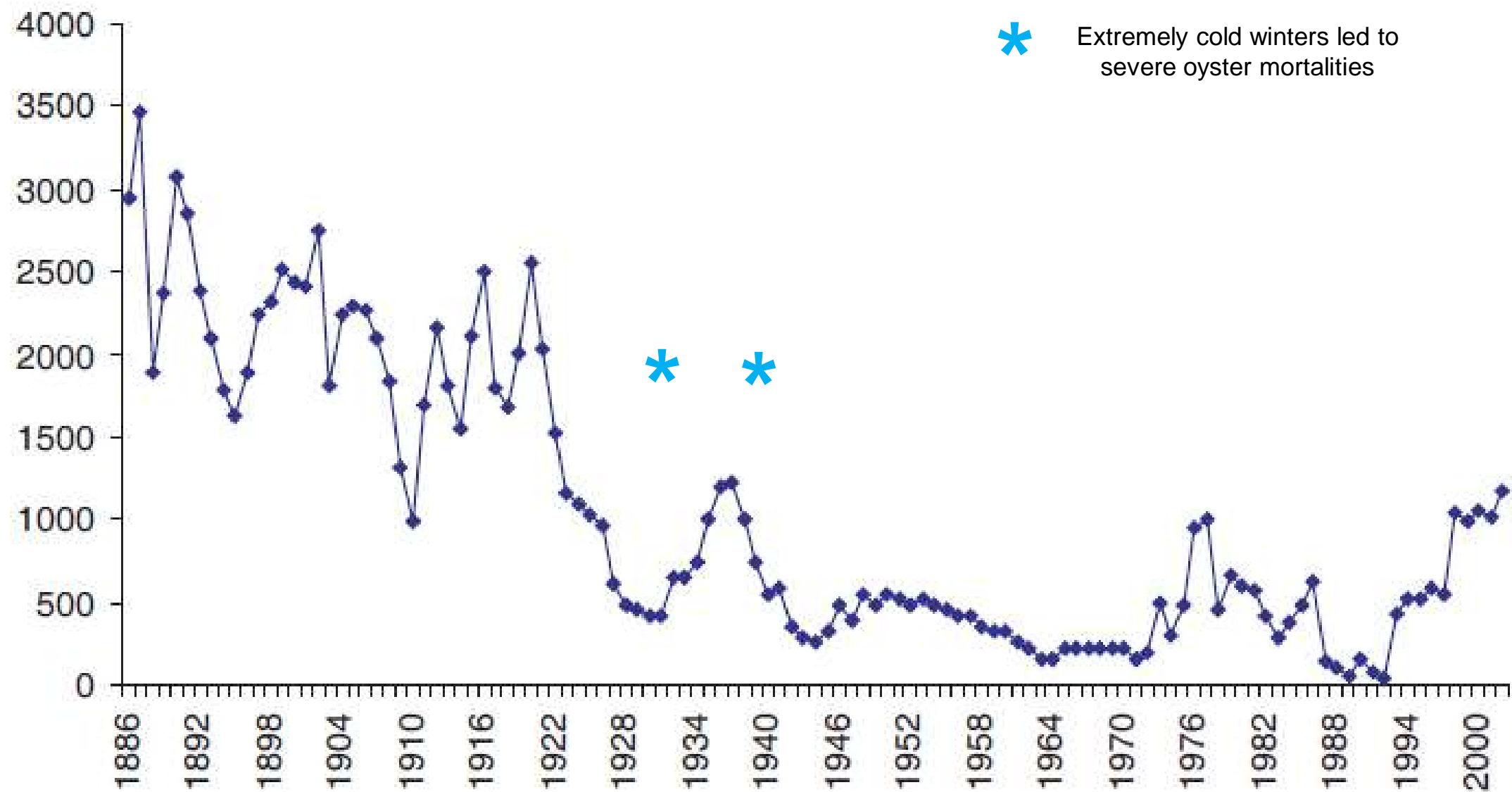


Figure 5.2.1. Native oyster landings (tonnes) in England and Wales (1886-2002)



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CASE STUDY WATER IMPROVEMENT

HUDSON RIVER, NY

- Nearly lifeless and toxic in 1906
- Billion oysters restored by 2035
- Public engagement: BOP schools and restaurants



Billion Oyster Project



Gallons of water
filtered

19.7 trillion



Number of oysters
restored

20,000,000



Pounds of Nitrogen
removed

72,500