



Restoration of *Ostrea edulis* L. along the east coast of Ireland



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Background

Historically, oyster reefs were capable of spanning several hectares in area and could reach 4-7 meters in height. Globally, oyster reefs are the most degraded habitats among coastal systems, with the **loss of 99%** in the last 150 years. These 500 million years old keystone species and their natural keystone habitats are at the brink of a total collapse due to intensive human industrial harvesting and pollution.

Ireland's coastline is just over 6000km long, historically supporting vast habitats of oyster reefs and kelp forests, which do not exist today. *Ostrea edulis* (native European flat oyster) historically embraced and provided numerous ecological functions along the east and southeast coastline of Ireland, establishing 90km extensive reefs from Wicklow Head to Ravens Point. Where **Arklow** was the main port for oyster fisheries in the 1800s, with a harvest of **40 million oysters in 1863**, while today the whole of Ireland lands about 2.1 million native oysters per year.

The local community started the initiative to restore their historic beds and established the **Native Oyster Reef Restoration Ireland (NORRI)**, supported by **Wicklow County Council**. The main restoration goal is to identify suitable pilot project sites for oyster reef restoration based on existing comprehensive site suitability analysis of County Wicklow's coastal marine area.

Educational and outreach activities will take place at the Biomimicry LivingLabs® selected site in Arklow harbor.

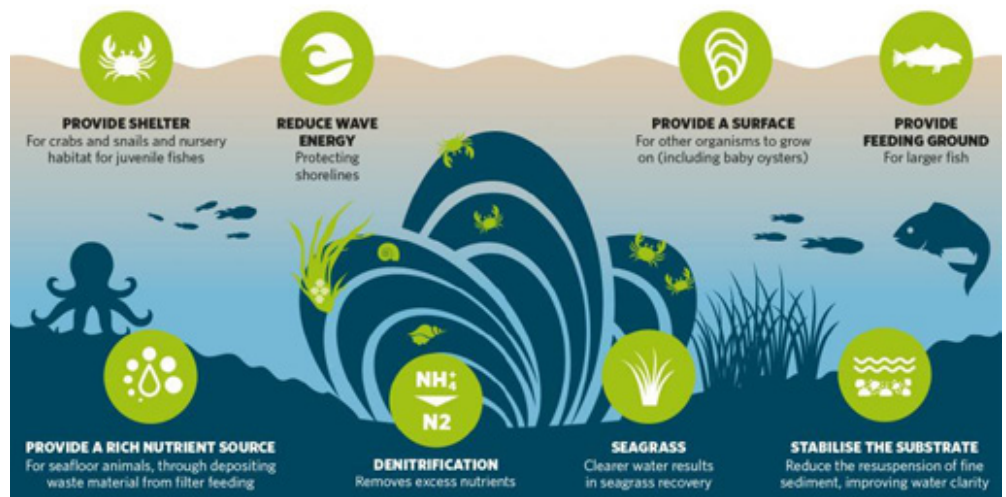
Our successful examples of the oyster restoration biomimicry approach in the USA, are based on the historic and available environmental, social and economic GIS data sets necessary for the site suitability, feasibility and feedback loop analysis. Our solution for oyster habitat restoration uses **six biomimicry principles**: evolve to survive,



Area along the Irish coastline where historic oyster reef used to stretch 90 km long between Wicklow Head and Ravens Point. (Source: K. Janke)

Map of Ireland by Isaac Tirion 1754; SE Ireland from Dublin to Wexford showing the oyster beds in Irish Sea. (Source: tcd.ie)

Ecosystem Services Provided by Native Oysters

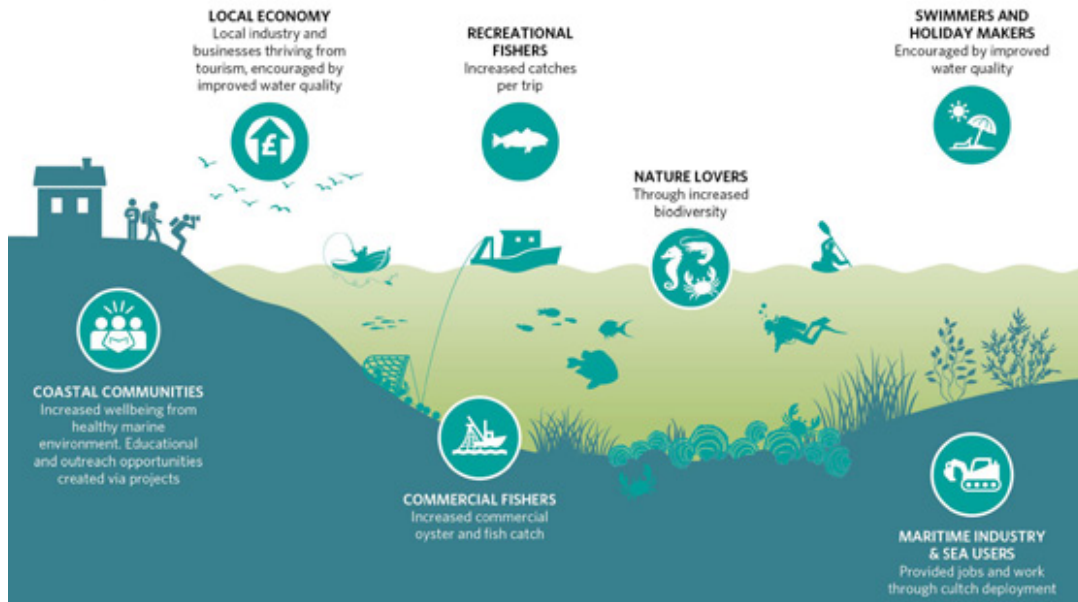


Source: NORA Image courtesy of Fitzsimmons et al. 2019 "Restoration Guidelines for shellfish reefs"

adapt to changing conditions, be locally attuned and responsive, resource efficient, use life-friendly chemistry, and integrate development with growth.

The environment sets the limits for sustainable and resilient development and restoration, so our premise is to work with nature to establish conditions conducive to life and help restore native oyster reef habitats and, therefore, improve water quality, marine biodiversity and ecosystem health.

Beneficiaries of Native Oyster Restoration



Harvesting of the native oyster using rakes and sail driven dredges in the late 1700's (Source: L'Encyclopédie of 1771 author unknown. tcd.ie)



Oyster vender, Omeath, Co. Louth 1950 (Source: tcd.ie; Trinity Centre for Environmental Humanities)



Source: European Native Oyster Habitat Restoration Handbook, (NORA, 2020)

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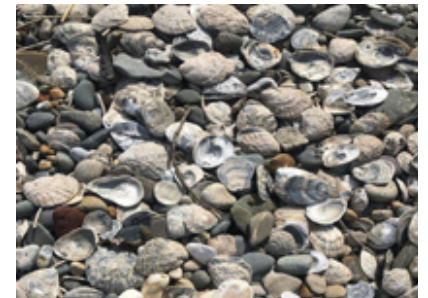


Oyster Facts in Ireland

Ireland's CO₂ emissions were 59.9 million tons in 2019. A 1km wide band of macro algae (e.g. kelp) around Ireland could remove, provide carbon sequestration (carbon sink), of up to 2.6 million tons of CO₂ per year (Krause-Jensen & Duarte, 2016).

A significant percentage of this could be locked away in sediment and the deep ocean. When kelp restoration is integrated with oyster and mussel reef restoration the amount of carbon sink increases significantly, in symbiosis with marine biological diversity that kelp together with oyster reefs and blue mussel reefs are supporting.

However, as with all animals, shellfish are also a carbon source, but at the same time provide multiple ecological services that have been supporting climate adaptations for millions of years.



Arklow beach covered with oyster shells. (Image source: A. Prelog); Test analysis of the relative specific activity of ¹⁴C/age showed that the oyster shells are between 1500 and 4000 years old. (Source: NORRI & Institute Ruder Boskovic, Croatia)

Project Proposal

NORRI proposes the integrated, biomimetic habitat restoration and conservation by actively restoring oyster reefs in tandem with macro algae kelp habitat restoration efforts.

NORRI has identified two potentially suitable sites:

- 1) off of the Murrough, Wicklow Town, and
- 2) off of Arklow North/South coastal area.

NORRI intends to restore the missing historical kelp forests and their associated biodiversity at these sites, together with associated oyster reef habitats, which used to thrive together in the Irish Sea.

In addition, NORRI proposes to establish Biomimicry LivingLabs in Arklow harbor, for research, education and outreach about synergetic relationship between Avoca watershed, the Harbor and the Sea; to learn about missing habitats and biodiversity, understand the importance of learning from nature to support ecosystem resilience and human health. The LivingLabs activities will include designing and building a smaller size aquarium expo, showcasing species and habitats that used to exist in Arklow harbor.

FUNDING & SUPPORT

