

# Oyster restoration for nature and nutrition

## Lessons from Sardinia



Dr. Stefano Carboni [s.carboni@fondazioneimc.it](mailto:s.carboni@fondazioneimc.it)

<https://www.fondazioneimc.it/>

<https://noraeurope.eu/>



# NORA - Network



## Organization of NORA

- Founded in 2017- Berlin
- Established as a Foundation- 2023

## Main focus

- Conference Organisation
- Network maintenance
  - Maintain Website
  - Newsletters
- Support Working Groups
- Production of key publications
  - Historical ecology, Thurstan et al. 2024
  - Seascapes restoration. Preston et al 2025

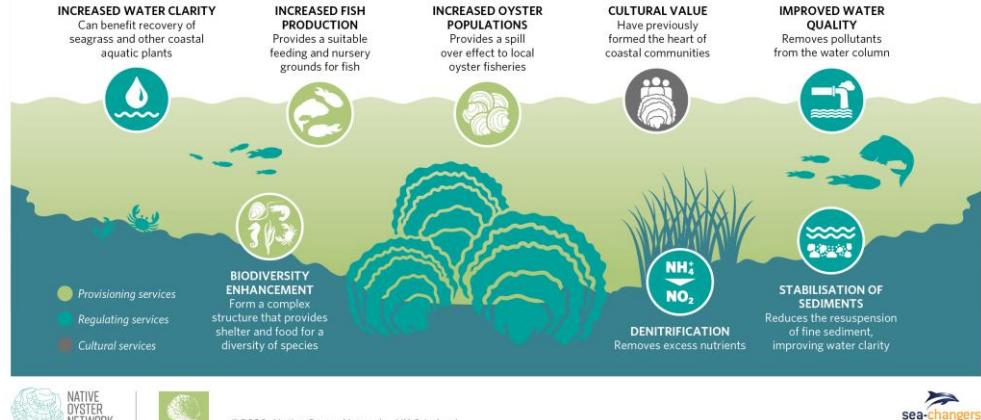




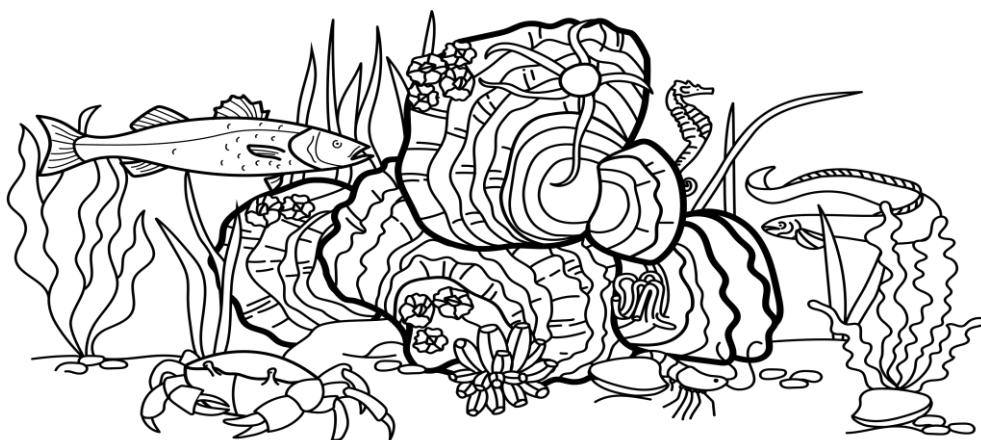
# Promoting Sustainable Aquaculture and Restoration Practices



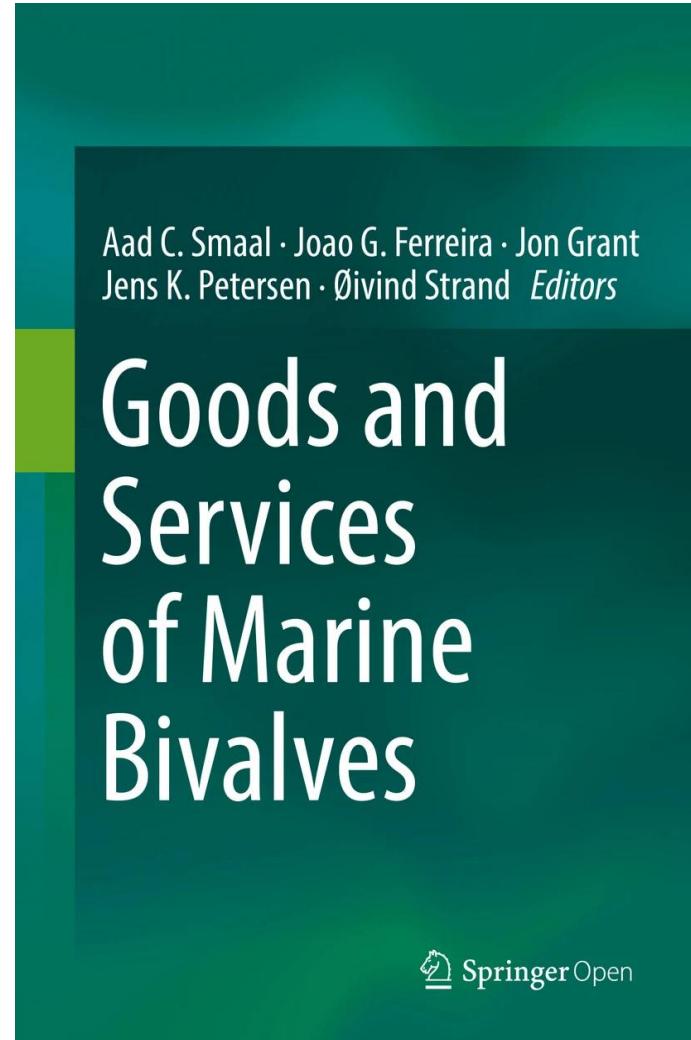
## ECOSYSTEM SERVICES PROVIDED BY NATIVE OYSTERS *OSTREA EDULIS*



NATIVE OYSTER NETWORK  
UK & IRELAND  
©2020, Native Oyster Network - UK & Ireland,  
Native Oyster Restoration Alliance.



©2020, Native Oyster Network - UK & Ireland,  
Native Oyster Restoration Alliance.



## REVIEWS IN Aquaculture

Reviews in Aquaculture (2020) 12, 3–25



### A global review of the ecosystem services provided by bivalve aquaculture

Andrew van der Schatte Olivier<sup>1</sup> , Laurence Jones<sup>2</sup>, Lewis Le Vay<sup>1</sup>, Michael Christie<sup>3</sup>, James Wilson<sup>4</sup> and Shelagh K. Malham<sup>1</sup>

<sup>1</sup> School of Ocean Sciences, Bangor University, Menai Bridge, UK

<sup>2</sup> Centre for Ecology and Hydrology, Bangor, UK

<sup>3</sup> Aberystwyth Business School, Aberystwyth University, Aberystwyth, UK

<sup>4</sup> Deepdock Ltd, Bangor, UK

### Abstract

Bivalve shellfish aquaculture provides many benefits to society, beyond their traditional market value. This study collates the evidence available on the provisioning, regulating and cultural ecosystem services provided by the bivalve species commonly used in aquaculture. For the first time, it synthesises this evidence to provide a global assessment of the potential market and non-market economic value of bivalve aquaculture. Bivalves are filter feeders, filtering water and particulates, creating substrates which provide habitat to act as nursery grounds for other species. Goods from provisioning services include meat, worth an estimated \$23.9 billion as well as pearls, shell and poultry grit, with oyster shell being the most important, with a global potential worth of \$5.2 billion. The most important regulating services are nutrient remediation. Cultivated bivalves remove 49,000 tonnes of nitrogen and 6,000 tonnes of phosphorus, worth a potential \$1.20 billion. Currently, there is little evidence on the cultural services per year of bivalve aquaculture, but we argue that these cultural values are broad ranging, although difficult to quantify. Our assessment indicates that the global, non-food bivalve aquaculture services are worth \$6.47 billion (\$2.95 billion–\$9.9 billion) per annum. However, this is likely to be an underestimate of the true value of bivalve aquaculture as there are significant gaps in evidence of the value for a number of key services. The analysis presented here can be used to indicate the likely scale of payments for ecosystem services provided by bivalve aquaculture, prior to more detailed assessments.

**Key words:** bivalves, blue carbon sequestration, cultural services, nutrient removal, regulating services, valuation.

### Introduction

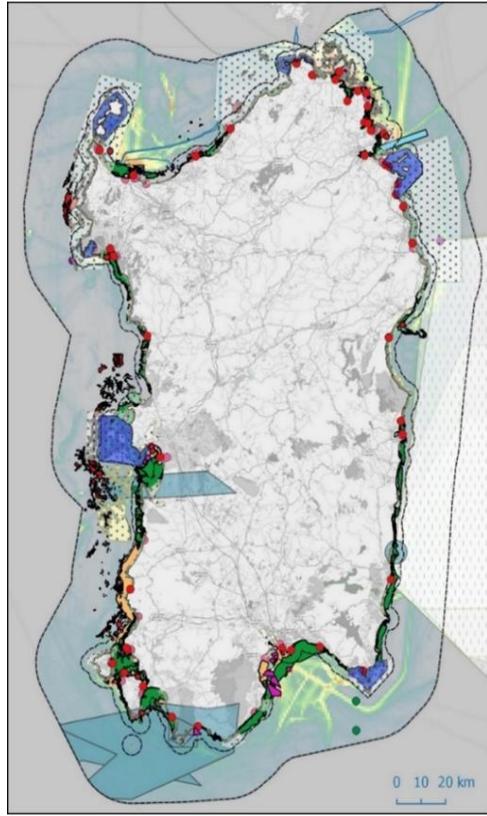
There has been consistent growth in aquaculture production in recent decades, which in 2016 represented 41% of global fisheries and aquaculture food production (SAPFA 2017). Lower trophic species, including shellfish and algae, currently make up about half of all aquaculture production and offer potential for significant contribution to sustainable growth in the global aquatic food supply (Science Advice for Policy by European Academies 2017). Bivalves (primarily clams, mussels and oysters) accounted for 16 million tonnes of coastal and marine animal aquaculture in 2015, with an estimated market value of \$17.1 billion (FAO 2016).

In addition to food supply (provisioning services), there is a growing recognition of the wider ecosystem benefits of bivalve aquaculture in coastal waters, including regulating services such as carbon sequestration, nutrient remediation, coastal defence and indirect benefits arising from shellfish beds and reefs (Shumway *et al.* 2003; Lindahl *et al.* 2005; Rönnbäck *et al.* 2007; Northern Economics 2009; Herbert *et al.* 2012; Seitz *et al.* 2014). However, there remain substantial gaps in the published literature on non-market benefits, and some services remain largely unquantified. For example, the majority of studies focus on only a few regulating services such as carbon sequestration (Filgueira *et al.* 2015) or nutrient remediation (Newell *et al.* 2005). Quantifying cultural services is an

# Fondazione IMC



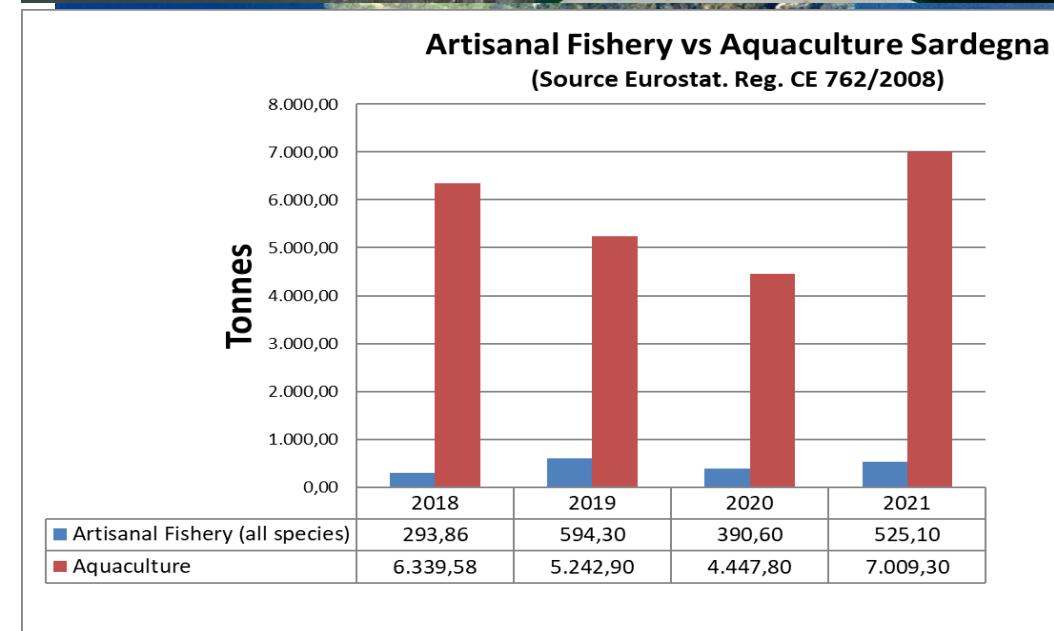
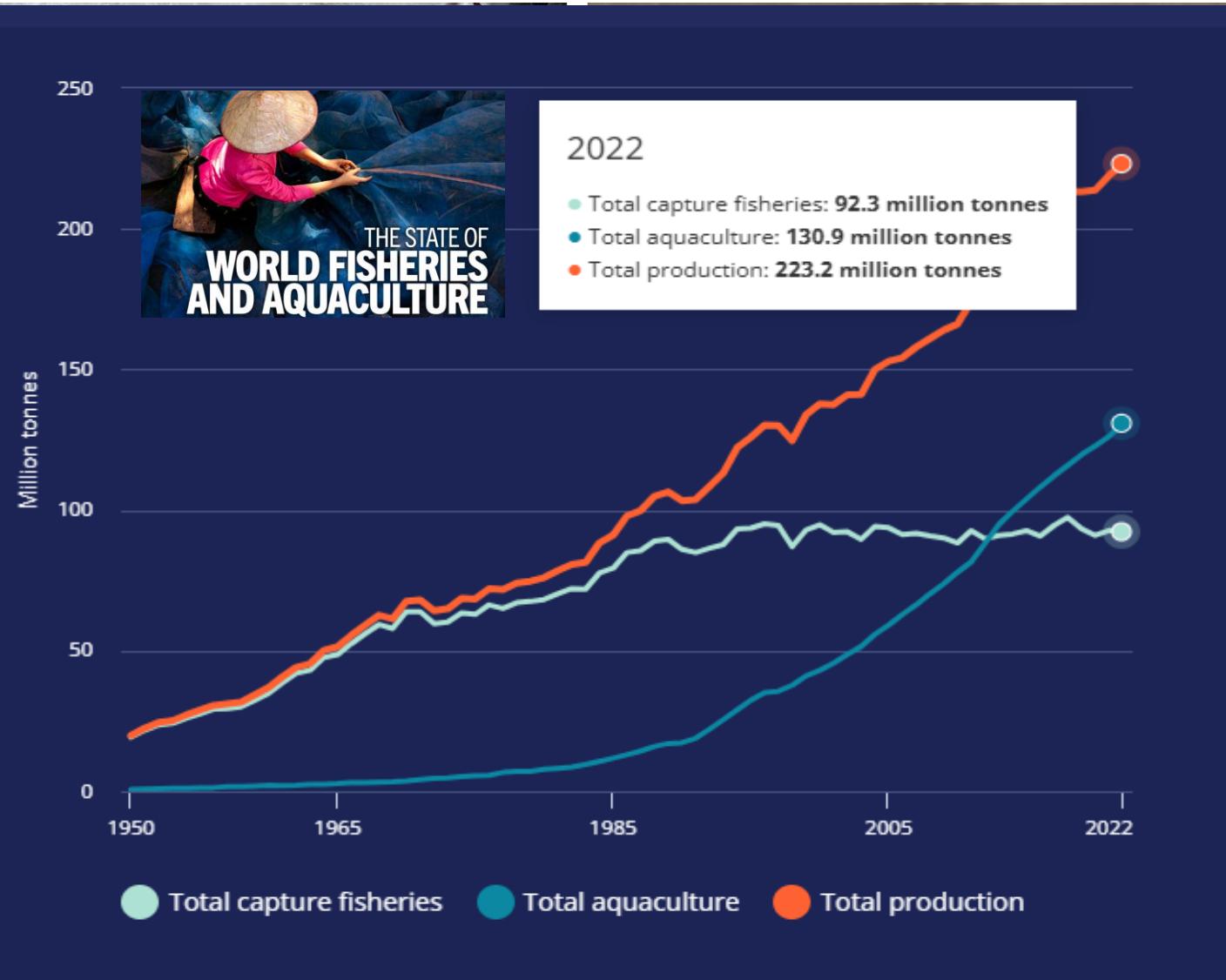
# Natural Capital Use: The Fishing Cooperative System



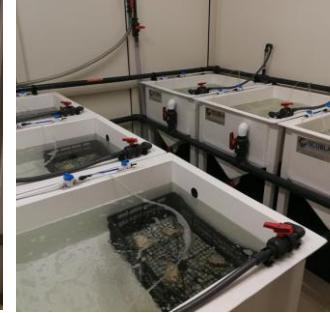
- Coastal lagoons represent key natural and socio-economic assets for the Island
- 10,000 ha of astonishing beauty devoted to nature conservation, artisanal fishery and eco-tourism
- Management is assigned to Cooperatives via exclusive fishing rights

Problems linked with overfishing, ecological crisis, climate change, alien species and most importantly an old and fragile production system leading to **very low productivity, inability to invest and very significant subsidies requirements. Serious socio-economic problem!**

# Fishery and Aquaculture



# Key Activities: Shellfish Aquaculture & Restoration

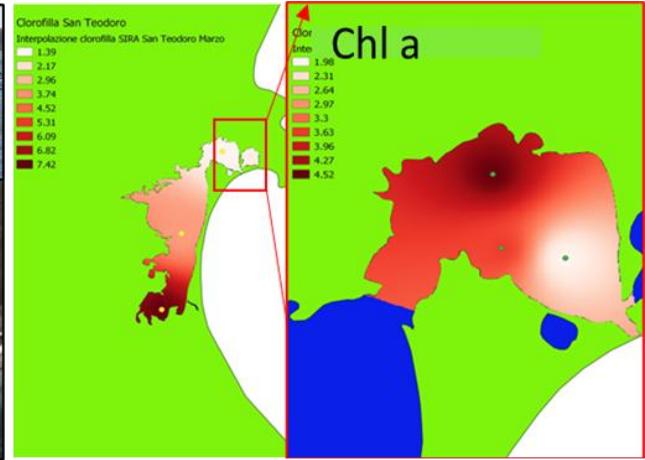
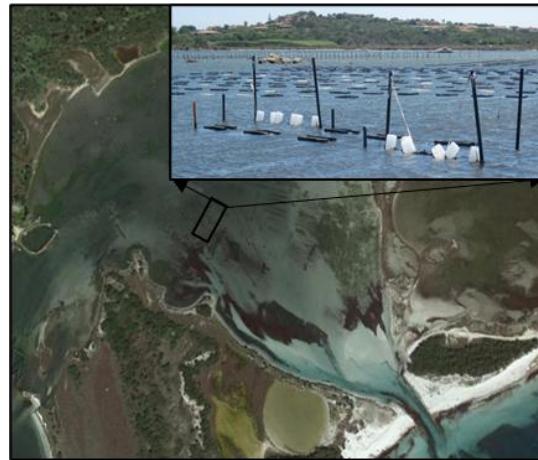


<https://noraeurope.eu>

# The role of research in promoting a shift from artisanal fishery to aquaculture: the Oyster revolution!

Activities started in 2016 with the **objective of exploring the productive potential of Sardinia's lagoons for oyster farming**.

The project brought together fishermen's cooperatives from many Sardinian lagoons and connected them with Research Centers and Regional Agencies, to **explore new production systems, thereby supporting targeted investment planning**.



*Aquaculture* 516 (2020) 734612



ELSEVIER

Contents lists available at [ScienceDirect](#)

*Aquaculture*

journal homepage: [www.elsevier.com/locate/aquaculture](http://www.elsevier.com/locate/aquaculture)



Improving pacific oyster (*Crassostrea gigas*, Thunberg, 1793) production in Mediterranean coastal lagoons: Validation of the growth model "ShellSIM" on traditional and novel farming methods

Philip Graham<sup>a,b</sup>, Gianni Brundu<sup>b</sup>, Maria Scolamacchia<sup>a</sup>, Angelica Giglioli<sup>c</sup>, Piero Addis<sup>c</sup>,  
Yuri Artioli<sup>d</sup>, Trevor Telfer<sup>a</sup>, Stefano Carboni<sup>a,\*</sup>



# The role of research in promoting the 1° shift from artisanal fishery to aquaculture in coastal lagoons: the Oyster revolution!

The validation of a predictive growth model allowed us to extend the assessment of biological suitability from a single lagoon to the regional scale.

**By integrating logistical and biological criteria we defined suitability criteria for oyster farming in the lagoons of Sardinia and estimated their productive potential.**

This provided policymakers and cooperatives with data-driven methods to set priorities for targeted investments in this sector.



Contents lists available at ScienceDirect

**Ocean and Coastal Management**

journal homepage: <http://www.elsevier.com/locate/ocecoaman>



A modelling approach to classify the suitability of shallow Mediterranean lagoons for pacific oyster, *Crassostrea gigas* (Thunberg, 1793) farming

Philip Graham<sup>a,b</sup>, Lynne Falconer<sup>b</sup>, Trevor Telfer<sup>b</sup>, Paolo Mossone<sup>a</sup>, Iolanda Viale<sup>c</sup>, Stefano Carboni<sup>b,\*</sup>



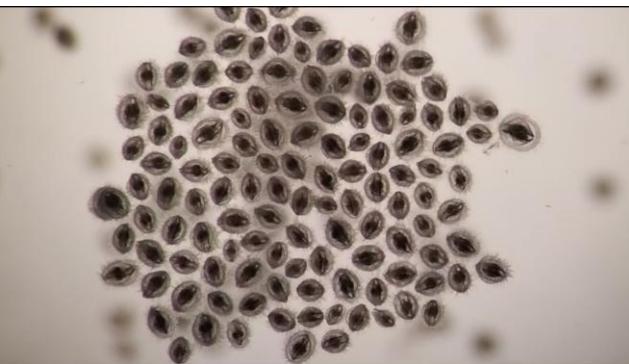
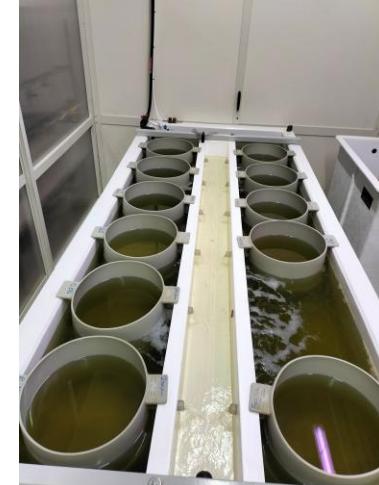
# A Commercial reality in rapid expansion



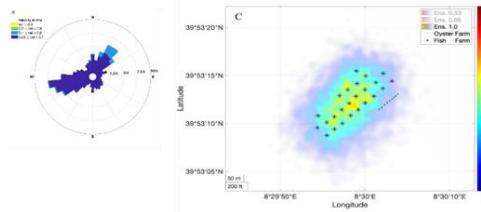
This initial activities together with local leadership by key producers led to an increase in oyster production, making Sardinia the current leading oyster producer in Italy.



# The gradual shift from Pacific Oysters to Native Oysters (the seed conundrum...)



# The gradual shift from Pacific Oysters to Native Oysters (Thinking outside of the Cage...)



Sustainable Blue  
Economy Partnership





# The Nora Lagoon: Shift From Artisanal Fishery to Aquaculture to Restoration...



# Native Oyster farming and Restoration in the «Nora Lagoon»



# Conclusions and Lessons

- A common thread is the promotion of sustainable economic activities: shifting from «extractive» practices to **Nature Base Solutions**  
(Aquaculture can be a Nature Base Solution!)
- Work with economic operators leveraging their economic interests for the scaling-up phase (from research trials to commercial activities)
- Set-up real world scenarios where synergies between fed and unfed aquaculture can be explored at commercial scale
- Promote the use of Native Oyster to maximise synergies between Nature restoration and Human Nutrition
- Create scenarios where such synergies can be **Measured!**
- Develop Guidelines and Recommendation based on these Real world Scenarios

# THANK YOU!!!

