



Restoration of flat oyster reefs in Europe: Background, progress and best practice

Dr. Bernadette Pogoda

Photo credit: Scandinavian Fishing Yearbook, N Schuck/AWI, V Merk/AWI













Karl August Möbius

Inspired by the biodiversity and characteristical species composition of the Helgoland oyster beds, in 1877 Möbius created the term "biocoenosis".









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- OSPAR list of threatened and/or declining species and habitats (2008)
- OSPAR recommendation (2013/4)
- Flora Fauna Habitat Directive
- Marine Strategy Framework Directive



THE PISCATORIAL ATLAS.





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- OSPAR recommendation (2013/4)
- Flora Fauna Habitat Directive
- Marine Strategy Framework Directive
- Increasing awareness for the value of ecosystem functions & services
- Further declines of the stocks
- Feasibility studies & pilot projects



THE PISCATORIAL ATLAS.







Photo credit: S Pouvreau/IFREMER, V Merk/AWI/Global Guide for Shellfish Restoration 2019







Photo credit: R Michaelis/AWI, S Pouvreau/IFREMER, V Merk/AWI/Global Guide for Shellfish Restoration 2019







Contents lists available at ScienceDirect Journal of Experimental Marine Biology and Ecology

The Gray Zone: Relationships between habitat loss and marine diversity and their applications in conservation



Laura Airoldi ^{a,*}, David Balata ^a, Michael W. Beck ^b

Structurally complex habitats are clearly becoming rarer across temperate marine environments at local, regional and global scales (e.g. Suchanek, 1994; Duarte, 2002; Thrush and Dayton, 2002; Reise,

2005; Lotze et al., 2006). Biogenic temperate reefs are probably among the most threatened habitats globally (Barbera et al., 2003; Roberts and Hirshfield, 2004; Airoldi and Beck, 2007), and much of the continental shelf and some deeper ocean seafloors have been homogenized by bottom trawling and dredging (Thrush and Dayton, 2002; Gray et al., 2006). Indeed the coastal and marine bottoms are getting flatter, and that is recognized in common treatment in policy, conservation, and management.

Photo credit: R Michaelis/AWI, S Pouvreau/IFREMER, V Merk/AWI/Global Guide for Shellfish Restoration 2019































- Coastal habitats
- Offshore habitats
- Degradation
- Extinction
- Fishery
- Invasives
- Disease
- MPAs









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Photo credit: A Schmidt/AWI









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Photo credit: DJ McGlashan/Global Guide for Shellfish Restoration 2019







> 12 Projects

- DEEP
- ENORI
- RESTORE
- FOREVER
- ... <u>https://noraeurope.eu</u>

Photo credit: W Sanderson/DEEP







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Photo credit: W Sanderson/DEEP, A Debney/ENORI







Progress

Projects are focusing on:

- Broodstock enhancement
- Coastal pilot reefs with juveniles and adults
- Offshore pilot reefs with seed oysters
- Plans for Up-scaling in the Netherlands, in Germany, in UK
- Seed oyster production for restoration
- Conservation and passive regeneration in France
- Disease tolerance in Ireland, in France







Photo credit: V Merk/AWI



Scientific output

- NORA2 presentations
- 13 peer-reviewed articles
- Open access

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Scientific output

Received: 2 December 2019	Revised: 17 July 2020	Accepted: 22 July 2020
DOI: 10.1002/agc.3462	22 C	i.

SPECIAL ISSUE ARTICLE

Forty questions of importance to the policy and practice of native oyster reef restoration in Europe



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Setting Object

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AN ECOSYSTEM SERVICES APPROACH

ofS

RESTORATION GUIDELINES FOR SHELLFISH REEFS

Editors: James Fitzsimons, Simon Branigan, Robert D. Brumbaugh, Tein McDonald and Philine S.E. zu Ermgassen



SER SOCIETY ACH







- Oyster Restoration Workgroup, USA
- Shellfish Restoration Network (SRN), Australia
- Native Oyster Restoration Alliance (NORA), Europe
- UK-Ireland Network





Bringing back an ecological key player: principles for native oyster res

High

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Oyster habitats are hot spots of biodiversity and Oyster habitats are not spots of bioquersity and are vital to the health of the surrounding ecosys-Preface are vital to the health of the surrounding ecosys-tem but are among the most threatened marine of tem but are among the most threatened marne habitats workdwide. Cyster reefs and bads are im nabitats workevinge. Uyster reets and beas are biogenic structures formed by systems that occur te blogenic structures formed by oysters that occur at high densities and provide the dominant strucat high densities and provide the dominant struc-tural component and significant vertical relief on tural component and significant vertical reliet on otherwise unstructured sea floor. As an ecological otherwise unstructured sea-tioor. As an ecological keystone-species it offers substrate, spawning keystone-species it offers substrate, spawning ground, food and shelter for many more species. ground, tood and sheller for many more species. Their ecological role can be compared to the func-Their ecological role can be compared to the func-tion of coral reefs in tropical regions. In Europe, non or coral rees in tropical regions, in Europe, native oysters once formed extensive beds and profe along North Alexandria according to the e oysters once rottined extensive seus and in the along North Atlantic coastlines and in the reefs along North Atlantic coastines and in the North Sea, even in offshore regions of moderate North Sea, even in offshore regions of moderate depth. However, over 90% of former oyster reefs

Over the past two decades, substantial headwa have been lost. Uver one pasi two oecages, substantial negawe has been made in progressing restoration of oy ter behinden in the time training endowment of has been made in progressing restoration or oy ter habitats in the USA. While restoration effo ter habitats in the USA, while restoration end historically sought to address declines in cyr historically sought to address declines in oy landings, many recent efforts focus on recove landings, many recent errors rocus on recove the valuable and diverse ecceystem services t ute valuable and diverse ecusystem services oyster habitats provide. Across Europe, oyster nautuus provide. Advas curves, oyster restoration is also starting to gain m ter restoration is also starting to gain million the starting to gain million the starting to gain million to the starting to ded Ostrea edulis on the list of threater declining species and habitats, for which tion measures should be developed and Habitats Directive also calls for the F Conservation and restoration of bioger CUIDELIVATION AND TEDIOTATION OF DIOUPER European waters. Over the last 3-5 ye European waters. Over the last 3-5 ye' projects have started with the aim of the blodiversity and the ecceystem se ded by oysters.



BERLIN OYSTER RECOMMENDATION

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on the Future of **Native Oyster Restoration in Europe**

Part I. Preface and Recommendations

Bernadette Pogoda, Janet Brown, Boze Hancock, Henning von Nordheim (eds.)

Kick-off Workshop Berlin, November 1st-3rd, 2017 "Native oyster restoration in Europe - current activities and future perspectives"



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Bérenger Colsoul¹ | David Donnan³ | Boze Hancock⁵ | Tristan Hugh-Jones⁶ | Joanne Preston⁷ | William G. Sanderson^{8,9} | Hein Sas¹⁰ | Janet Brown¹¹ Kruno Bonacic¹² | Henning von Nordheim¹³ | Philine S.E. zu Ermgassen¹⁴



Working Groups			
Production	Biosecurity	Site Selection	Monitoring
1. Pro sufficient oysters for res	duce storation of oyster reefs		
2. Identify and create suitable sites for restoration of oyster reefs			
suitabl	3. Provide e substrate for successful recr	uitment	
4. Respect Bonamia-free areas and biosecurity standards			
		5. Create common monitoring protocols	
	6. Pr genetic diversity and a	eserve daptability of populations	

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EUROPEAN GUIDELINES ON BIOSECURITY IN NATIVE OYSTER RESTORATION

NOVEMBER 2020

NATIVE Oyster Network

UK & IRELAND

Editors: Philine zu Ermgassen, Celine Gamble, Alison Debney, Bérenger Colsoul, Monica Fabra, William G Sanderson, Åsa Strand, Joanne Preston.

NORA







NOVEMBER 2020

Editors: Joanne Preston, Celine Gamble,

ike Helmer, Boze Hanco

Denvironment Agency

EUROPEAN ON STER RESTORATION

: Philine zu Ermgassen, Celine Gamble, G Sanderson, Åsa Strand, Joanne Preston.

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Conclusion

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The native European Oyster *Ostrea edulis* once covered vast areas of the open North Sea and other European coastal waters.

As an ecosystem engineer it built biogenic reefs and played a key ecological role for the wider ecosystem by providing many essential ecosystem functions and services.

Efforts to restore the native oyster and its associated habitats are gaining momentum across Europe.

Major challenges have been identified and are being addressed: Up-scaling will be a crucial next step to achieve substantial ecological effects.





Conclusion

Restoration Ecology

EDITORIAL OPINION

Ecosystem Restoration is Now a Global Priority: Time to Roll up our Sleeves

James Aronson^{1,2,3} and Sasha Alexander⁴

UNEP/FAO Factsheet

February 2020



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environment programme

The UN Decade on Ecosystem Restoration 2021-2030

"Prevent, halt and reverse the degradation of ecosystems worldwide"





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