The first Belgian Flat Oyster Day on November 24, 2020: Report of the online event

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CONTENTS

LIST OF ABBREVIATIONS 5

INTRODUCTION 6

AGENDA 7

Who is participating? 9

9h10 – 9h25 Keynote 1 – Bernadette Pogoda (AWI/NORA) 10

Biography 10

Restoration of flat oyster reefs in Europe 10

Q&A 11

9h25 – 9h40 Keynote 2 – Bérenger Colsoul (AWI) 12

Biography 12

Flat oyster aquaculture in Europe: an overview 12

BIOSECURITY 14

9h55 – 10h05 Jan Haelters (RBINS) 14

Biography 14

Legal (environmental) requirements for flat oyster introduction in Belgium 14

Q&A 15

10h05 – 10h15 Chantal Rettigner (FASFC) 16

Biography 16

Animal health requirements for flat oysters' movements 16

Q&A 17

10h15 – 10h25 Yana Deschutter (FPS Environment) 18

Biography 18

Oyster reef restoration in the Belgian part of the North Sea: vision on nature restoration 18

Q&A 19

POLL 20

PAST PROJECTS 24

10h50 – 11h00 Value@Sea (EMFF) – Daan Delbare (ILVO) 24

Biography 24

Value@Sea (EMFF) 24

Q&A 25

ONGOING PROJECTS 26

11h – 11h10 SYMAPA (Blue Cluster) – Bert Groenendaal (Brevisco) 26
Biography 26
SYMAPA (Blue Cluster) 26
Q&A 26
11h10 – 11h20 UNITED (H2020) – Nancy Nevejan (Ghent University - ARC) 27
Biography 27
UNITED (H2020) 27
Q&A 28
11h20 – 11h30 BlueMarine³.Com – Mathieu Wille (Ghent University – ARC) 29
Biography 29
BlueMarine³.Com: Development of oyster hatchery techniques in support of Belgian aquaculture and restoration initiatives 29
Q&A 30
WHERE TO GO FROM HERE? 32
11h40 – 11h50 Patrick Sorgeloos (Vlaams Aquacultuurplatform) 32
Biography 32
Potential of flat oyster aquaculture 32
Q&A 33
11h50 – 12h05 Wouter Lengkeek (Bureau Waardenburg) 34
Biography 34
European Flat Oyster in the North Sea, The Dutch Approach 34
Q&A 35
POLL 36
CLOSING REMARKS 39

LIST OF ABBREVIATIONS

ARC	Laboratory for Aquaculture and Artemia Reference Centre
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
BPNS	Belgian part of the North Sea
DG	Directorate-General
EC	European Commission
EMFF	European Maritime and Fisheries Fund (EMFF)
FASFC	Federal Agency for the Safety of the Food Chain
H2020	Horizon 2020
ILVO	Research Institute for Agriculture, Fisheries and Food
IWC	International Whaling Commission
MSFD	Marine Strategy Framework Directive
MUMM	Scientific Service Management Unit of the Mathematical Model of the North Sea
NGO	Non-Governmental Organisation
NORA	The Native Oyster Restoration Alliance
O. edulis	*Ostrea edulis*
OSPAR	Oslo-Paris Conventions
PHB	Polyhydrobutyrate
RBINS	Royal Belgian Institute of Natural Sciences
SME	Small and Medium-sized Enterprise
UGent	Ghent University
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Se
UNITED	Multi-Use offshore platforms demoNstrators for boostIng cost-effecTive and Eco-friendly proDuction in sustainable marine activities
VLAIO	Flanders Innovation & Entrepreneurship
VLIR-UOS	Flemish Interuniversity Council – University Development Cooperation

INTRODUCTION

On Tuesday 24 November 2020, the Royal Belgian Institute of Natural Sciences (RBINS), Ghent University and the Research Institute for Agriculture, Fisheries and Food (ILVO) jointly organised the first Belgian Flat Oyster Day.

The European flat oyster (*Ostrea edulis*) is an iconic species that was once abundant throughout European seas. It formed extensive reefs harbouring diverse communities of marine organisms and was the target of a considerable fishery. Already by the end of the 19th century, flat oyster populations in Europe have been drastically reduced due to overfishing, and disease outbreaks in the 20th century gave the species a final blow. In Belgian waters, the species is now regarded as functionally extinct.

Recently, there has been an increasing interest to restore flat oyster populations in Europe, both from conservation and aquaculture points of view. In Belgium as well, some initiatives on restoration and aquaculture of this important species have been initiated.

The Belgian Flat Oyster Day wanted to address this increased attention and aimed to bring together all relevant actors and interested parties in the Belgian flat oyster scene. By means of two keynote presentations, setting the scene of flat oyster restoration and aquaculture in Europe, and additional presentations on biosecurity and visions for flat oyster restoration and aquaculture in Belgium, the event started with a broad perspective. Thereafter, a clear overview was presented of the ongoing initiatives concerning the flat oyster in Belgium, with regards to both restoration and aquaculture. The event was concluded with an example of the Dutch Flat Oyster Consortium and a reflection on how the flat oyster scene can proceed in Belgium.

Due to the ongoing COVID-19 crisis, the first Belgian Flat Oyster Day has been an online-only event (WebEx), taking place on the morning of Tuesday 24 November 2020. The event has been conducted in English.

The agenda of the Belgian Flat Oyster Day can be found on the next page. This report is structured following the agenda. After each block of presentations, the Q&A is shortly presented, as well as the outcomes of the interactive poll questions. The report is concluded with some reflections on the event and with a look forward.

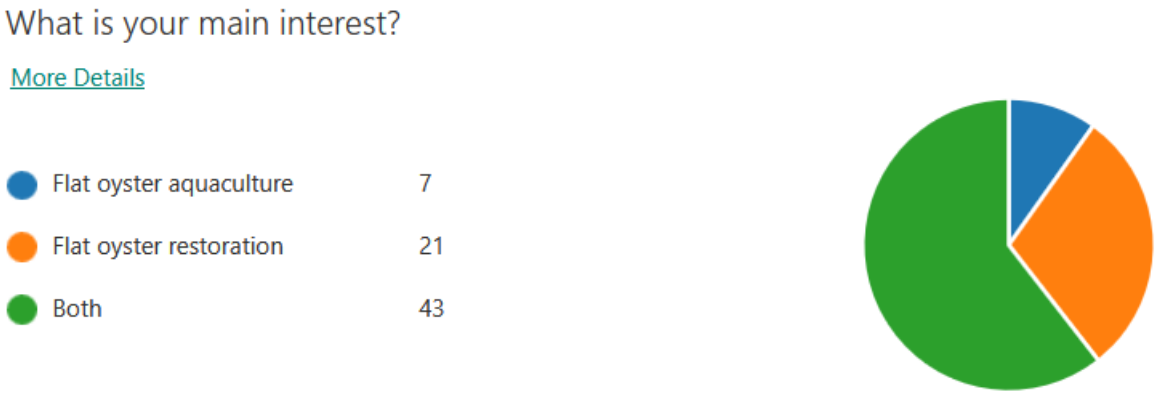
AGENDA

Time	Session
9h – 9h10	Opening *Steven Degraer (RBINS)*
Setting the scene	
9h10 – 9h25	Keynote 1 – Restoration of flat oyster reefs in Europe *Bernadette Pogoda (AWI/NORA)*
9h25 – 9h40	Keynote 2 – Flat oyster aquaculture in Europe: an overview *Bérenger Colsoul (AWI)*
9h40 – 9h55	Questions, comments and poll
Biosecurity	
9h55 – 10h05	Legal (environmental) requirements for flat oyster introduction in Belgium *Jan Haelters (RBINS)*
10h05 – 10h15	Animal health requirements for flat oysters' movements *Chantal Rettigner (FASFC)*
Future vision for the Belgian part of the North Sea	
10h15 – 10h25	Restoration of flat oyster reefs: vision on nature restoration *Yana Deschutter (FPS Environment)*
10h25 – 10h40	Questions, comments and poll
10h40 – 10h50	Break
Lessons learnt from past and ongoing projects	
10h50 – 11h00	Past projects - Value@Sea (EMFF) *Daan Delbare (ILVO)*
11h00 – 11h10	Ongoing projects – SYMAPA (Blue Cluster) *Bert Groenendaal (Brevisco)*
11h10 – 11h20	Ongoing projects – UNITED (H2020) *Nancy Nevejan (Ghent University)*
11h20 – 11h30	Ongoing projects – BlueMarine³.Com (Blue Cluster) *Mathieu Wille (Ghent University)*
11h30 – 11h40	Questions and comments
Where to go from here?	
11h40 – 11h50	Potential of flat oyster aquaculture *Patrick Sorgeloos (Vlaams Aquacultuurplatform)*
11h50 – 12h05	European Flat Oyster in the North Sea, The Dutch Approach *Wouter Lengkeek (Bureau Waardenburg)*
12h05 – 12h20	Questions, comments and poll
12h20 - 12h30	Closing remarks *Steven Degraer (RBINS)*

SETTING THE SCENE

Who is participating?

In total, 71 people registered for the first Belgian Flat Oyster Day on 24 November 2020. More than half of them (60.5%) indicated to be interested in both aquaculture and restoration of flat oyster, while 10% was interested in aquaculture only and 29.5% in restoration only (see figure below).



9h10 – 9h25 Keynote 1 – Bernadette Pogoda (AWI/NORA)

Biography

Dr Bernadette Pogoda is a marine scientist at the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research. With a background in zoology and polar biology, her research now addresses marine ecology in coastal and shelf sea systems of temperate regions, focusing on nature conservation measures and ecological restoration. She is a founding member and initiator of NORA and coordinates the projects RESTORE and PROCEED in close cooperation with the German Federal Agency for Nature Conservation. Both projects address restoration and protection of native oyster beds and associated species in marine protected areas of the German North Sea and engage knowledge transfer into society to communicate the role of biodiversity and other ecosystem services and functions.

Restoration of flat oyster reefs in Europe

Oysters provide a multitude of ecosystem services. In Europe, the native oyster *Ostrea edulis* is an endangered species and functionally extinct in several ecoregions. Reintroduction and restoration of this ecological key-player contribute to nature conservation objectives such as the OSPAR Convention on Protection of the Seas, the EU Flora Fauna Habitat Directive and the Marine Strategy Framework Directive. The Native Oyster Restoration Alliance (NORA) supports the protection and ecological restoration of the native European oyster and its habitat across its current and historical biogeographical range. NORA works to overcome barriers to the conservation, restoration, and recovery of the European oyster by providing a platform to collaborate and participate in knowledge exchange.

Against this background, a series of specific recommendations were formulated in the Berlin Oyster Recommendation, and respective working groups were founded to support native oyster restoration by developing and applying best practice with the aim to recover healthy and resilient marine ecosystems.

The presentation will provide an update on the background and progress of NORA, pointing out major developments, challenges, limitations, and perspectives.

Presentation available here

Q&A

Q: What steps are to be taken to really move to a cross-border restoration initiative on oyster reefs? Are we still far off from that stage?

A: Seed oyster models, where we can integrate production in hatcheries; integrate demand and place orders to existing hatcheries. There is a market for restoration. Practical field work; The Netherlands is an area where oysters formed very large beds

Q: Are the biosecurity rules as stringent for commercial initiatives? I understood that these guidelines can be more strict than legislation?

A: Enormous responsibility by doing ecological restoration, you should not so much focus on the fat oyster and make restoration happen, but also consider negative side-effects we might risk. Personal opinion is that we should be extremely careful. E.g. COVID-19: what it does to us and our society: a dramatic effect. We don't know what we translocate hence should definitely take a look at strict guidelines so we are working into a positive effect. Legislation for aquaculture production is not as strict as we now recommend for oyster restoration. But a lot of harm has been done in the past hence we have to go beyond national legislation. The Netherlands is trying to implement that in their legislation, but it is not easy.

9h25 – 9h40 Keynote 2 – Bérenger Colsoul (AWI)

Biography

Originally from Hannut in Belgium and Sain-Vaast la Hougue in France (Normandy), Bérenger comes from a family of oyster farmers who mainly produce cupped oysters, along the coast from the English Channel to Arcachon in the Gironde. Since 2016, Bérenger has been working within the RESTORE team (lead by Bernadette Pogoda) of the Alfred Wegener Institute in Germany. In charge of co-developing a flat oyster hatchery on the island of Helgoland, his research focuses on improving ecological breeding and restoration techniques.

Flat oyster aquaculture in Europe: an overview

In commercial aquaculture (mariculture), the production of European flat oyster (*Ostrea edulis*) is still largely based on natural seed collection. Despite the development of breeding and controlled reproduction techniques for this species since the late 1930s, seed production today is mainly based on empirical concepts. The farming methods of *O. edulis* vary from country to country in Europe. This overview will present the most popular production methods used today, from seed acquisition to grow out. Some of the issues that producers are facing are already subjects of research; many questions however are still unanswered or even unaddressed. This overview provides a brief summary of knowledge and technologies of *O. edulis* seed production and *O. edulis* farming methods. Furthermore, it states open questions for the aquacultural use and identifies relevant research topics for future investigations.

Presentation available here

BIOSECURITY

BIOSECURITY

9h55 – 10h05 Jan Haelters (RBINS)

Biography

Working at RBINS since 1995. Currently in the section that deals with the management of the marine environment (MUMM). Main tasks are:

- Participation in the follow-up of a number of international fora such as EC marine environment directives, OSPAR, IWC and ASCOBANS;
- Coordination of the scientific investigation of stranded marine mammals; and
- Most relevant here: environmental impact assessment of activities at sea (advice to the minister) and follow-up of licenses and permits: making sure that environmental legislation is being implemented and conditions in environmental permits are met.

Legal (environmental) requirements for flat oyster introduction in Belgium

For introducing oysters in the marine area under Belgian jurisdiction, a number of legal requirements need to be taken account of. The need for specific permits and licences depends on the type (commercial, scientific, management) and area of the project.

Presentation available here

Q&A

Q: Does the appropriate assessment for a scientific project also assures the biosecurity for scientific projects?

A: An appropriate assessment is indeed also needed for scientific projects. It is not a complicated procedure, but should be considered as a means of implementing legislation (and international obligations in an EC framework); it is a system suitable for the government to point project holders to certain obligations, including on biosecurity, and it is an obligation towards the EC.

Q: a) Introduction of *Crassostrea* oysters? Will it be allowed for commercial purposes? As allowed in Europe. b) Allowed to grow out natural spat?

A: There is a national legislation on the protection of the marine environment (law); the legislation on species protection (Royal Decree) is less stringent, and we are consulting with experts in law on how the legislation should be interpreted. Different questions should be answered in this consultation: commercial purposes vs. research, introduction of specimens or growing from natural spat, use of triploids and N4 specimens, etc.

Q: Are there conflicting regulations between North Sea countries in terms of restoration? E.g. are things allowed in the Netherlands that are not allowed in Belgium and vice versa?

A: In terms of restoration there should not be a conflict, but every country can introduce its own management and restoration plans for threatened and declining habitats and species. As the legislation is based on international legislation, there should not be important differences in aquaculture systems and the use of species and other requirements, but on marine spatial planning, EIA, permits, etc., legislation differs.

10h05 – 10h15 Chantal Rettigner (FASFC)

Biography

Chantal Rettigner is a veterinarian, she holds a master's degree in tropical veterinary medicine and a PhD in veterinary science. She has been a veterinary expert at the Federal Agency for the Safety of the Food chain, DG Control Policy, Animal Health Direction since 2004 and is in charge of animal health issues for aquaculture animals.

Animal health requirements for flat oysters' movements

European legislation sets rules governing movements of aquaculture animals in order to protect health status of the place of destination and avoid spreading of diseases. Movements of wild aquatic animals and animal products are also covered by such rules. Main requirements will be presented.

Presentation available here

Q&A

Q: Is it allowed you grow-out natural spat of cupped oysters?

A: I can only answer this question on part of the health requirements, other legislation is also at play here. In case natural spat is "farmed", the oysters must be considered as aquaculture animals and place of production is an aquaculture establishment. Reference should be made to definition of "'aquaculture : means the keeping of aquatic animals where the animals remain the property of one or more natural or legal persons throughout the rearing or culture stages, up to and including harvesting, excluding the harvesting or catching for the purposes of human consumption of wild aquatic animals which are subsequently temporarily kept while awaiting slaughter without being fed". In case of wild oysters are moved from one natural habitat to another one without any "aquaculture" step, the general requirement is that the movement doesn't endanger the health status of the place of destination. But there are more specific requirements if the wild oyster are intended to a place free from disease or under an eradication programme or another Member State (health certificate, notification to Member State of destination). There is also traceability requirements.

Q: Does the biosecurity regulation related to translocations also apply for research projects?

A: The animal health legislation requires biosecurity measures to be applied in all aquaculture establishments. If oysters are intended for an aquaculture establishment, a biosecurity plan is required even if the oysters are kept for scientific purpose. Some derogations exist regarding requirements about animal health status in case of movements of animals for scientific research. However, this derogation must be granted by the competent authority on case by case on request of the operator.

10h15 – 10h25 Yana Deschutter (FPS Environment)

Biography

Yana Deschutter is a marine biologist who has performed several years of research at the Marine Biology department of Ghent University after her studies, mainly focusing on food webs and the effects of multiple stressors on zooplankton. Now she is working at the federal Department of Marine Environment where here main responsibilities are to follow up the dossier on fisheries measures to decrease bottom disturbance and to coordinate actions concerning nature conservation under MSFD and Natura 2000.

Oyster reef restoration in the Belgian part of the North Sea: vision on nature restoration

Within the Belgian part of the North Sea (BPNS) there are several habitats that are currently under serious pressure due to human disturbance. In the past, banks of the European oyster *Ostrea edulis* (Linnaeus, 1758) existed in the Belgian part of the North Sea, which were hotspots for biodiversity. Unfortunately, the oyster reefs in the BPNS completely disappeared at the beginning of the 20th century.

Several EU directives, treaties and strategies such as the Marine Strategy Framework Directive, Habitats Directive, OSPAR, UNCLOS, ... stress the importance of protecting and restoring healthy marine ecosystems. A coherent network of protected areas at sea is essential to achieve this. It is therefore necessary that Belgium, consistent with its neighbouring countries, also makes efforts to restore its precious nature. The federal Department of Marine Environment has therefore developed a vision on nature restoration in the BPNS, which focusses on the preservation and restoration of ecosystems in the BPNS, taking into account that these ecosystems are transboundary.

Oyster bank recovery is an essential part of this vision, in which we strive for the sustainable recovery of healthy oyster populations, oyster banks and the associated long-lived fauna. Our goal is to regain viable populations of the European flat oyster, which are stable or growing and which are able to reproduce successfully without human interference. The marine environment department is currently initiating a vision paper in which the coherence and coordination between the various forms of nature recovery will be determined. Oyster bank restoration can only be successful if it is carried out in a carefully considered manner, in which coordination with other forms of nature restoration will be essential in order to achieve good results in the longer term.

Presentation available here

Q&A

Q: You mentioned that Belgium wants to have restoration projects in a transboundary context. Does that mean that restoration in Belgium is dependent on initiatives in neighbouring countries (although it is in the Belgian top 3), hence: no action in Belgium if no action in France, the Netherlands,...

A: This is actually the opposite of what we stated. We will take action in Belgium regardless of other countries, but any actions that are taken in the Belgian part of the North Sea or in neighbouring countries might contribute to each other. We need to work together with other countries as much as possible, keeping in mind the importance of connectivity, and try to learn from each other as much as possible as well.

Q: How do you plan to assess the presence/absence of a gravel seafloor in the targeted restoration areas? And can you explain why gravel bed restoration is essential for oyster bed restoration?

A: Gravel bed restoration not a prerequisite for oyster restoration, but gravel bed health is an important asset for reconstruction of the ecosystem as a whole as the associated fauna of oyster beds and gravel beds are intertwined. If we are able to restore oyster beds in the most natural way possible, we will have benefits for the ecosystem as a whole.

Q: Has it been proven that flat oyster have preference on gravel? Not rather on shells in between gravel stones?

A: This might be possible. They prefer to settle on shells, but the gravel is also important for associated fauna.

Q: Please, could you share your views on the mapping of gravel. Do you map this kind of environment?

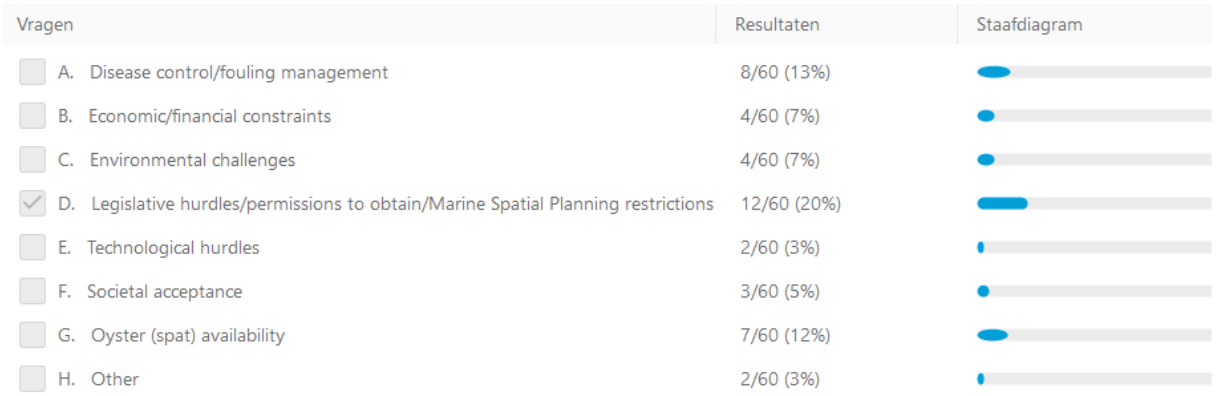
A: For the mapping of the gravel, we will look at several studies from RBINS that are going on right now, depending on the location:

- *mapping of gravel beds in the context of the offshore wind farm studies*
- *studies in preparation for the fisheries measures*

If necessary, we will perform extra small scale monitoring to determine the presence of gravel, again depending on the location, the available information and in close consultation with RBINS.

POLL

- What is (are), in your opinion, the largest hurdle(s) to take before large-scale **restoration** can be conducted in the Belgian North Sea?
    - Disease control/fouling management
    - Economic/financial constraints
    - Environmental challenges
    - Legislative hurdles/permissions to obtain/Marine Spatial Planning restrictions
    - Technological hurdles
    - Societal acceptance
    - Oyster (spat) availability



Vragen	Resultaten	Staafdiagram
A. Disease control/fouling management	8/60 (13%)	
B. Economic/financial constraints	4/60 (7%)	
C. Environmental challenges	4/60 (7%)	
D. Legislative hurdles/permissions to obtain/Marine Spatial Planning restrictions	12/60 (20%)	
E. Technological hurdles	2/60 (3%)	
F. Societal acceptance	3/60 (5%)	
G. Oyster (spat) availability	7/60 (12%)	
H. Other	2/60 (3%)	

- What is (are), in your opinion, the largest hurdle(s) to take before large-scale **aquaculture** can be conducted in the BPNS
    - Disease control/fouling management
    - Economic/financial constraints
    - Environmental challenges
    - Legislative hurdles/permissions to obtain/Marine Spatial Planning restrictions
    - Technological hurdles
    - Societal acceptance
    - Oyster (spat) availability

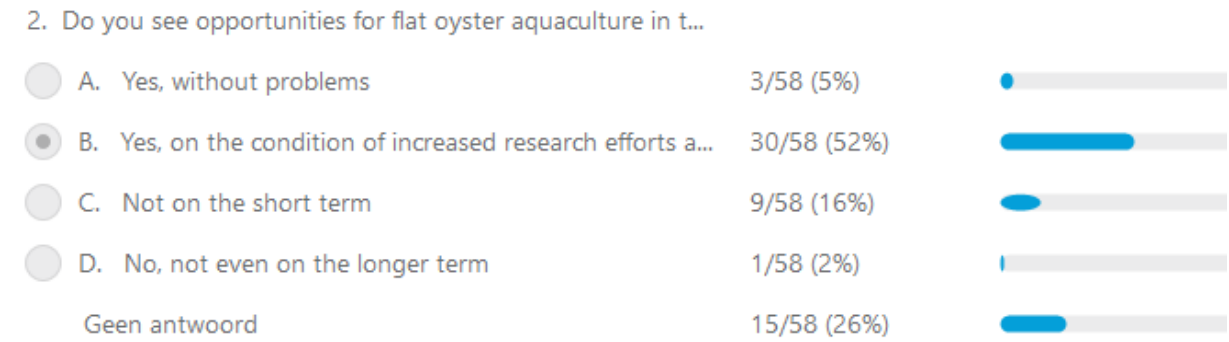
Vragen	Resultaten	Staafdiagram
A. Disease control/fouling management	11/60 (18%)	
B. Economic/financial constraints	4/60 (7%)	
C. Environmental challenges	3/60 (5%)	
D. Legislative hurdles/permissions to obtain/Marine Spatial Planning restrictions	6/60 (10%)	
E. Technological hurdles	7/60 (12%)	
F. Societal acceptance	3/60 (5%)	
G. Oyster (spat) availability	1/60 (2%)	
H. Other	0/60 (0%)	

- Do you see opportunities for flat oyster **restoration** in the BPNS on the short term (by 2025)?
    - Yes, without problems
    - Yes, on the condition of increased research efforts and investments opportunities
    - Not on the short term
    - No, not even on the longer term

1. Do you see opportunities for flat oyster restoration in th...

A. Yes, without problems	5/58 (9%)	
B. Yes, on the condition of increased research efforts a...	34/58 (59%)	
C. Not on the short term	5/58 (9%)	
D. No, not even on the longer term	0/58 (0%)	
Geen antwoord	14/58 (24%)	

- Do you see opportunities for flat oyster **aquaculture** in the BPNS on the short term (by 2025)?
    - Yes, without problems
    - Yes, on the condition of increased research efforts and investments opportunities
    - Not on the short term
    - No, not even on the longer term



LESSONS LEARNT FROM PAST AND ONGOING PROJECTS

PAST PROJECTS

10h50 – 11h00 Value@Sea (EMFF) – Daan Delbare (ILVO)

Biography

Daan Delbare is head of the research group Aquaculture at the Research Institute for Agriculture, Fisheries and Food (ILVO) and is involved in several mariculture projects, as promotor, partner, subcontractor or as adviser. The laboratory is primarily dedicated to the development of aquaculture within Flanders and mariculture in the Belgian part of the North Sea. Daan his work is related to long-line suspended culture of extractive species, environmental monitoring and the introduction of new aquaculture species, but he also has expertise in aquaculture nutrition and different land-based production systems.

Value@Sea (EMFF)

The project Value@Sea investigated the biological and technical feasibility of the culture of extractive species in the Belgian part of the North Sea, i.e. European flat oyster (*Ostrea edulis*), king scallop (*Pecten maximus*) and sugar kelp (*Saccharina latissima*). The project showed that the European flat oyster can be grown successfully under high-energy conditions on a suspended longline system. This presentation describes the growth and condition of the cultured flat oysters, but also reveals the major obstacles to start a commercial oyster farm in the Belgian part of the North Sea.

Presentation available here

Q&A

Q: What was the origin of the flat oysters in the Value@Sea project ?

A: The oysters were from a hatchery from France (Bonamia-free oysters).

Q: What happens with the oysters and mussels when they are full grown and are harvested in the various research projects?

A: All oysters were harvested and analysed. Some oysters were sacrificed for chemical analyses. The remaining oysters were used in the follow-up project SYMAPA and in the project UNITED.

Q: Did I understand well that oysters need to be cleaned 3 times a month during 2 -3 months? Also: if we don't find a mechanical way to clean them, not possible to cultivate oysters?

A: Necessity to have a mechanical cleaning system. High pressure hose: takes 20min for cleaning 1 ladder system. If you have several backbones in the water: it takes a lot of time to clean and time at sea is limited, e.g. with the Stream about 130 days a year feasible to go at sea for maintenance and harvesting. Hence if not mechanised: not possible to have commercial aquaculture activity.

ONGOING PROJECTS

11h – 11h10 SYMAPA (Blue Cluster) – Bert Groenendaal (Brevisco)

Biography

Bert Groenendaal obtained his PhD in polymer chemistry in 1996 at the Eindhoven University of Technology (Netherlands). After a postdoctoral fellowship (1997) at the University of California at Berkeley he moved to industry. Since 2020 Bert also works as an independent consultant for companies involved in aquaculture in general and in seaweed farming in particular. Bert was co-founder of ATSEA Technologies (now ATSEA Nova), being a dynamic SME focused on exploiting large scale seaweed farms across the world. He is also coordinator of several Flemish and European seaweed related innovation and demonstration projects such as AquaValue, AlgaeDemo, Wier&Wind and SYMAPA.

SYMAPA (Blue Cluster)

The specific research lines of this project are:

- Identification of efficient substrates for mussel and flat oyster spatter capture and biodegradable substrates for habitat enrichment as well as an operational monitoring program to evaluate the effects of mariculture and passive fishing.
- Identification of efficient passive fishing gear for the prevailing conditions in the Belgian part of the North Sea and finding efficient incentives to increase the fishing capacity of passive gear.
- Evaluation of North Sea resistant and safe production and harvesting systems for clams and seaweed, including guidelines for ship design, development of monitoring practices, advanced sizing agent for direct seeding of sporophytes, predictable maintenance and harvest times,….
- Sustainable multiple use and value chain creation of marine resources.

Presentation available here

Q&A

Q: What happens with the oysters and mussels when they are full grown and are harvested in the various research projects?

A: All oysters and mussels will be used for scientific purposes.

11h10 – 11h20 UNITED (H2020) – Nancy Nevejan (Ghent University - ARC)

Biography

Dr. ir. Nancy Nevejan has over 20 years of aquaculture experience in Belgium and abroad where she, amongst others, initiated shellfish hatcheries in The Netherlands, Chili and Vietnam. A decade ago, she joined Ghent University as a lecturer for the international Master of Science programme in Aquaculture of the Laboratory for Aquaculture and ARC. She is also involved in VLIR-UOS projects that focus on the development of aquaculture and aquaculture education in the South. As head of the mollusc group, she designed the research program on bivalves for the lab. She initiates and manages a variety of projects that stimulate the bivalve production in Flanders, such as the project Edulis and United to name a few. She is co-founder of the Flemish Aquaculture Platform and a member of the World Oyster Society.

UNITED (H2020)

The Horizon 2020 project United is a research project co-funded by the European Union (January 2020 – June 2023). United wants to demonstrate the added value of multi-use of oceans by supporting 5 pilots in 5 different European countries Belgium, Germany, Denmark, Greece and The Netherlands. All these pilots combine different activities at a same location, going from tourism to aquaculture and energy production. The Belgian pilot focuses on the combination of aquaculture of flat oyster (*Ostrea edulis*) and the seaweed sugar kelp (*Saccharina latissima*), and the restoration of flat oyster reefs inside an offshore windmill park. Belgian offshore wind farms offer an unique environment to interactively restore oyster reefs and develop aquaculture : fishing is not allowed and the scour protection around wind turbine foundations may be a suitable substrate for oyster larvae to settle on and initiate natural oyster reefs. Aquaculture efforts could provide the initial stocking material of flat oysters to help developing natural reefs on the short term while on the longer term, the aquaculture sector could rely on the capture of wild spat originating from the restored reefs, very similar to the current mussel industry practice. The offshore conditions are particular challenging and the aim of the project is to find appropriate technical and managerial solutions. If aquaculture and restoration prove to be feasible in offshore wind farms, a new time of prosperity might start for flat oyster and this blueprint could open the way for new multi-use sites in Belgium.

Presentation available here

Q&A

Q: Lost baskets... recovered? reported?

A: Westdiep is situated in NATURA2000 area, we did not report this yet, but will definitely do this.

Q: Where is fouling being removed? at sea? on land? If at sea: what is being done with it?

A: The fouling is removed in the harbour and ends up back in the harbour.

Q: Are you considering to use only natural materials for the bags? To minimize the artificial impact?

A: We do consider the use of natural materials, hence the use of bags of basalts, which is a natural material and we might consider this instead of deploying the tables.

11h20 – 11h30 BlueMarine³.Com – Mathieu Wille (Ghent University – ARC)

Biography

Mathieu Wille is a senior scientist at the Laboratory of Aquaculture and Artemia Reference Center of Ghent University. He has over 20 years of experience in larval rearing and broodstock management techniques. Initially his research had a strong focus on nutritional (for example live feed enrichment, broodstock nutrition, formulated feeds, …) and technological aspects (for example application of recirculating aquaculture systems in larval rearing). In recent years, also alternative disease control strategies (for example application of PHB, quorum sensing interference, …) as alternatives to the use of antibiotics became a focal point. In this way a broad knowledge on various aspects of husbandry, nutrition and disease control aspects (including immunology) in aquaculture was acquired. In addition Mathieu Wille coordinates collaboration with industry at the Lab of Aquaculture.

BlueMarine³.Com: Development of oyster hatchery techniques in support of Belgian aquaculture and restoration initiatives

Project name: BLUEprint for a viable multispecies hatchery of 3 MARINE COMmercially attractive species groups (BlueMarine³.Com)

Partners: Aquacultuur Oostende, Colruyt Group, DEME, IMAQUA, Proviron, SIOEN, Ghent University

This three-year project, supported by VLAIO through the Blue Cluster, aims to meet the increasing demand for (specialized) seed for Belgian marine aquaculture and restoration initiatives. The overall objective of the project is to develop locally applicable hatchery techniques for three species groups, namely seaweed, shellfish and shrimp. Economic feasibility and ecological sustainability are important , with a strong focus on automation and reduction of environmental impact (automatic feeding, closed systems, biodegradable substrates, alternative disease prevention, ...). In addition, the potential synergies and the associated efficiency gains of the integration of different species groups in a multi-species approach will be investigated. In the current presentation, we will focus on the work that will be performed on hatchery techniques for bivalves. A recirculating system for larval rearing will be developed, including monitoring and management protocols for optimizing water quality and mineral balances, as well as functional off-the-shelf algae products and automatic feeding systems. In addition, the Spuikom in Ostend will be evaluated as a nursery-environment for oyster spat.

Presentation available here

Q&A

Q: How suitable is the Spuikom as an (flat) oyster nursery given the presence of *Bonamia*?

A: In the first place, the set-up of BlueMarine is experimental, to study if the Spuikom is suitable as a nursery area. Currently, there is no direct link, nor the intention, to combine this with outgrow at sea. Looking at this from a broader perspective, Bonamia *will continue to be a problem. There is always the risk of infection if you go from closed to open systems. In that sense, it is the question if the BPNS is really* Bonamia*-free, or this status is due to the lack of (recent) data.*

WHERE TO GO FROM HERE?

WHERE TO GO FROM HERE?

11h40 – 11h50 Patrick Sorgeloos (Vlaams Aquacultuurplatform)

Biography

Born in Kortrijk, Belgium on August 13, 1948. Educated at Ghent University, Belgium: 1966-1971 MSc in Biology, 1971-1975 PhD in Marine Biology, 1975-1979, Postgraduate courses in Marine Biology in France (Station Biologique Roscoff, 1969), FR Germany (Biologische Anstalt Helgoland, 1970) and USA (Duke University Marine Laboratory Beaufort-NC, 1972).

Professor Emeritus, Ghent University, Belgium and Chairman, Working Group International Cooperation of the European Aquaculture Technology and Innovation Programme (EATiP); Scientific Advisor INVE Aquaculture, 2010 till date.

Scientist with the Belgian National Science Foundation, 1971-1994; from Junior Researcher to Research Director, attached at the State University of Ghent, Belgium, Research coordinator of the Artemia Reference Center at the State University of Ghent, Belgium: 1978-2013. Head of Department of Animal Production, Faculty of BioScience Engineering, 2004-2013.

Fellow: World Aquaculture Society (2012)

Research Areas: Marine aquaculture, the culturing biology of Artemia in relation to fish/crustacean farming, as well as solar salt production, and with the larviculture of fish and shellfish

Potential of flat oyster aquaculture

- Extractive aquaculture represents more than 50% of the world's aquaculture, but most specially in Asia.
- In the West, molluscs are considered, perhaps too much, as a luxury product
- Bivalve consumption needs to be recommended more as healthy food, and more effort needs to be put in future (flat) oyster aquaculture

Presentation available here

Q&A

Q: How does the increase in extractive aquaculture link to ecological carrying capacity?

A: Do not simply say: "we will set up extractive aquaculture and solve the problems". For example in China: what are the proper ecological balances? Observation: if too much shellfish along the longlines: faeces will accumulate at the bottom and cause ecological disturbances. That's why China is now experimenting with extractive species on the bottom, such as clams, sea urchins and sea cucumbers. Hence there is a need to further study these ecological principles.

11h50 – 12h05 Wouter Lengkeek (Bureau Waardenburg)

Biography

Dr. Wouter Lengkeek is a marine biologist, professional diver and director at the Netherland's leading ecological consultancy; Bureau Waardenburg. He studied marine biology at the University of Groningen, The Netherlands, and obtained his PhD at the University of East Anglia, UK. As a field biologist and passionate diver, Wouter has studied the world's marine ecosystems for over 20 years. He is specialized in the ecology of hard substrates and reef communities. He has studied the subsea ecosystems of the first Dutch offshore wind farms since 2008 and in 2016 he discovered a unique native oyster reef in the North Sea. Wouter uses his long-standing experience for the benefit of ecosystem restoration and is a pioneer in the field of nature-inclusive-design of wind farm foundations.

European Flat Oyster in the North Sea, The Dutch Approach

Wouter Lengkeek, Pauline Kamermans & Hein Sas

Historical and recent literature clearly states that oyster reefs once covered vast areas of seabed on the Dutch Continental Shelf. Human activity, however, has led to the extinction of this valuable habitat in the North Sea. NGO's, policy makers and scientist have come to realize that the time is right to restore reefs of European flat oysters. In 2015 the first feasibility study was published by a Bureau Waardenburg, Wageningen Marine Research and Hein Sas: The Platte Oester Consortium was born. In that same year, when searching for suitable restoration sites, a natural oyster reef was discovered in the Voordelta, a protected coastal area in the North Sea. Intensive studies on this natural reef provided crucial knowledge on the functioning of a North Sea oyster reef, inspired a large restoration community and kickstarted restoration pilots on several locations on the Dutch Continental Shelf. We present data from the natural oyster reef in the Voordelta and present first results from pilot project further offshore on the Borkum Reef Ground. We conclude with the lessons learned and the main challenges for future restoration projects.

Presentation available here

Q&A

Q: Did you see good survival of oyster that were placed on sandy seabed?

A: Very good survival of the individuals that were traced back, but they were also spread out over large area outside the research site. Spreading to the south, probably due to heavy weather. Some were covered by sand, they are able to manoeuvre them out of the sand but only to a certain degree, but we don't know the exact survival impact. Hence some individuals are moving outside the area, cannot be monitored and can be fished away.

Q: What about fishing pressure at the Borkum reef? Is the reef officially closed?

A: Yes, in the general area there is a lot of fishing pressure especially from shrimp fishers (light gear). The restoration site is now officially closed. Marking buoys indicate this. Voluntarily made available by the fishermen community, hence this is very important.

Q: Did you have an environmental permit for the artificial reef structures?

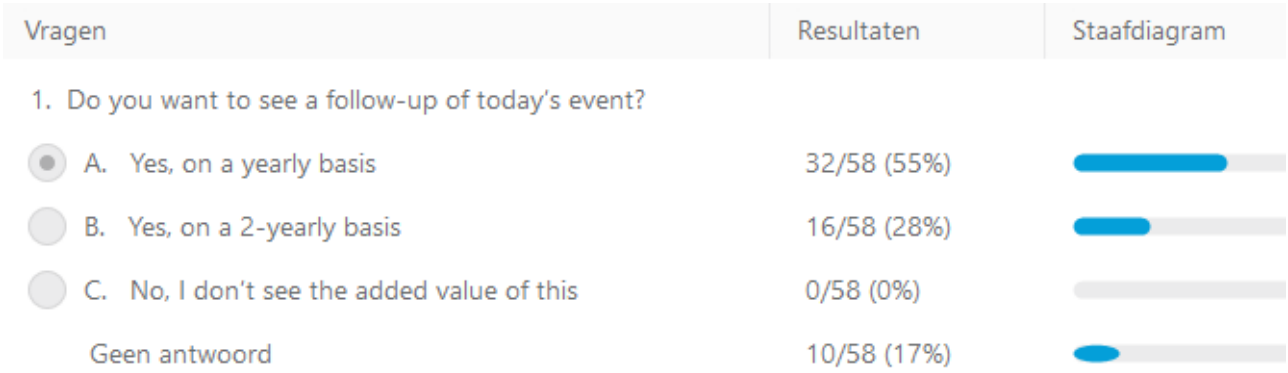
A: Permits: needed at least 2: 1) Nature2000, even if you are outside that area. 2) "waterwet". Both were obtained. No endless permits available in the Netherlands, only for several years hence the structures will need to be removed at a certain point.

Q: Are the artificial reef structures colonized by the flat oysters ?

A: No, no flat oysters, but a lot of other organisms. Flat oyster recruitment is only observed on other oysters.

POLL

- Do you want to see a **follow-up** of today's event?
  - Yes, on a yearly basis
  - Yes, on a 2-yearly basis
  - No, I don't see the added value of this



Vragen	Resultaten	Staafdiagram
1. Do you want to see a follow-up of today's event?		
A. Yes, on a yearly basis	32/58 (55%)	
B. Yes, on a 2-yearly basis	16/58 (28%)	
C. No, I don't see the added value of this	0/58 (0%)	
Geen antwoord	10/58 (17%)	

- If yes: what themes would you like to see presented next time?

Next to the general themes of the event -restoration and aquaculture of flat oyster- participants also want that to see the following themes presented on the follow-up event (broadly summarized):

- Updates and outcomes of the ongoing (scientific) projects, including successes and failures (44%)
- Point of view of other users of the sea, with an emphasis on fisheries (8%)
- Conservation, ecosystem considerations (11%)
- Progress/update in Belgian legislation, vision, etc… (5.5%)
- Cooperation between different projects/platforms (5.5%)
- Stakeholder engagement/public awareness (5.5%)
- Hatchery development (5.5%)

Other themes that participants would like to see addressed on a next event include: other shellfish restoration projects; bacterial food quality, coastal protection, lessons learnt from other areas, e.g. USA and Australia; and microplastics.

- Are you interested in seeing a ‘Belgian Flat Oyster Consortium’ being created - following the Dutch example?
    - Yes, I (my organisation) would like to participate
    - Yes, but I have no interest in actively joining this
    - No, I don’t see the added value of this

Vragen	Resultaten	Staafdiagram
1. Are you interested in seeing a ‘Belgian Flat Oyster Consort...		
A. Yes, I (my organisation) would like to participate	24/54 (44%)	
B. Yes, but I have no interest in actively joining this	16/54 (30%)	
C. No, I don’t see the added value of this	1/54 (2%)	
Geen antwoord	13/54 (24%)	

- If yes: what themes would you like to see tackled in this?

The following themes were mentioned by the participants to be interesting to include in a ‘Belgian Flat Oyster Consortium:

- Interactions with other users of the sea, stakeholder engagement, fisheries dialogue
- Sharing knowledge and experiences, initiating of Belgian projects, creating synergies, finding new opportunities
- Disease management
- Legal aspects
- Monitoring of reef development
- Project progress
- Enhanced cooperation between restoration and aquaculture
- Interaction with similar consortia across Europe
- Following the NORA themes *(these are Biosecurity, Historical Ecology, Monitoring, Outreach, Production and Site Selection)*
- Coastal protection
- Marine litter
- Multi-use with the new OWF area, and related to the concessions of these OWF
- Cost-benefit of aquaculture and restoration
- Practicalities of practices

CLOSING REMARKS

CLOSING REMARKS

1) A lot of information on several aspects of flat oyster restoration and aquaculture was presented during the event. This includes very new information, that perhaps not many people are aware of. It demonstrates that an interest in flat oyster is emerging in Belgium, and can inspire us all to continue being involved in flat oyster restoration and aquaculture, and their combination, in Belgium.
2) What we have covered during this event can be shortly summarised as: restoration and aquaculture of flat oyster in Europe, legal and biosecurity aspects, ambitions for Belgium, and four projects that have dealt or are dealing with these themes.
3) Four thoughts to share:
    a. There is a major interest in flat oyster reef restoration and flat oyster aquaculture in Belgium. This is illustrated by the numerous participants, which was much larger than the organisers had expected.
    b. We can make use of the rich knowledge base that is already present in our neighbouring countries, and also in Belgium. So there is no need to start from scratch. This event constituted a good step towards the direction of successful flat oyster reef restoration and aquaculture in Belgium.
    c. The event shed a light on the Belgian situation; specific aspects were highlighted, but also experiences from other European countries were included.
    d. The interaction with the audience through the polls showed that there is a keen interest in the continuation of the Belgian Flat Oyster Day. In what format this will be, e.g. as a yearly event or as the creation of a Belgian Flat Oyster Consortium, in line with the Dutch initiative, is under consideration. To be continued.
4) The organisers want to sincerely thank the speakers for their inspiring presentations and the audience for their attendance and enthusiastic participation in this online event!