

# 6<sup>th</sup> International Conference on Progress in Marine Conservation 2023

How to Stop Biodiversity Loss - from Knowledge to Action

18. – 22. September 2023  
OZEANEUM Stralsund, Germany

**Abstracts**



# **ABSTRACTS**

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## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 9:15h

### EU Marine Conservation Targets

Vedran Nikolić

European Commission, DG Environment, Unit D3 – Nature conservation

The EU's biodiversity strategy for 2030 is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030, and contains specific actions and commitments which were supported by EU Member States. It is the EU's contribution to the implementation of the (Kunming-Montreal) global biodiversity framework and a core part of the European Green Deal. At the heart of the Strategy is the target to legally and effectively protect 30% of EU seas and to strictly protect one third of that area, creating a coherent trans-European nature network, building on the Natura 2000 network under EU Birds and Habitats Directives and national protected areas which currently together cover 12% of EU seas. To stop biodiversity loss and bring back nature back into our lives for the benefit of people and the climate, action is needed also beyond protected areas. As part of the EU nature restoration plan presented in the Strategy, the Commission has proposed the EU Nature Restoration Law with legally binding restoration targets, including for marine ecosystems. To enable transformative change and to facilitate engagement and efforts of Member States, stakeholders and economic sectors towards achieving the Strategy's targets, the Commission has launched many initiatives, amongst them the EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 9:45h

### On the right path for marine protection in the EU? – an NGO perspective

Christine Adams  
Seas at Risk

The world we live in is increasingly volatile: unexpected events shake the foundations of society and everything we were used to in a more and more frequent manner. We are in the midst of a climate and biodiversity emergency, and we are fast approaching various, critical tipping points. This obliges us to re-think the way we have been doing things in the past and question if the systems we have in place are working to bring us on the right path for the future.

Therefore, we need marine and coastal ecosystems to be rich in biodiversity so that they can perform their natural functions, and to increase the resilience of marine ecosystems to climate changes. The European Union has committed itself to effectively protect 30% of its marine areas by 2030. The Habitats and Birds Directive as well as the Marine Strategy Framework Directive include legal requirements to protect biodiversity and manage damaging activities in MPAs. But there is a low level of compliance with these rules across the EU and many MPAs are lacking good management, with high-risk fishing activities still allowed in a large percentage of them.

Overall, we can observe a miss match between commitments and promises and what happens when it comes down to taking concrete measure to protect and restore marine biodiversity. This became evident again by the strong reaction by many actors to the 'EU Action Plan: protecting and restoring marine ecosystems for sustainable and resilient fisheries' that was published by the European Commission earlier this year as part of their European Green Deal and aims among others at phasing out mobile bottom fishing in all MPAs by 2023, as well as the controversy around the EU Nature Restoration Law that was largely disputed in the European Parliament.

However, good examples of successful MPA management exist with benefits not only for the marine environment but also for local communities and blue economy activities, including fisheries. We need to build on these and use the tools at our disposal to step up marine protection in the EU.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 10:10h

### Expanding the MPA network in Finland: highest benefits with small expansions?

Elina A Virtanen<sup>1,2</sup>, Markku Viitasalo<sup>1</sup> & Samuli Korpinen<sup>1</sup>

<sup>1</sup> Finnish Environment Institute

<sup>2</sup> University of Helsinki

Finnish MPA network achieved the Aichi target several years ago, but its protection of marine biodiversity was planned for seabirds, seals, and terrestrial plant species on islands and skerries. After almost 20 years of underwater surveys, we analyzed how well the underwater biodiversity is represented, what efforts would be needed to expand the network over the most valuable areas and to meet the new 30 % coverage target, and which underwater features would act as reliable surrogates for area designations.

We found that marine biodiversity is highly concentrated: a fraction (~22 %) of the overall seascape includes more than 91 % of the biodiversity. Most of these features occur in relatively shallow waters. A major finding was that the present MPA network covers only ca. 27 % of the distributions of marine biodiversity features. Even 69 to 74 % of some endangered biotopes located outside any MPAs. Increasing the MPA coverage by just 1 %, in carefully selected locations, would increase the mean coverage of features from 27 to 60 %!

Moreover, we studied the consequences of designating MPAs solely based on legally protected species and habitats. If conservation efforts were only aimed at threatened species, common species would experience a loss of 62 % coverage. In contrast, if the MPA network were planned only based on common species, threatened species would only suffer a loss of 1 %. Threatened species are rare and spatially limited to small ecological niches, making them poor surrogates for biodiversity. We propose that conservation should move from protecting individual rare species and habitats towards protecting also ecological networks, functions and interactions. According to our analyses, a 30 % MPA coverage in a spatially prioritized network design, would not only protect 90 % of the “common biodiversity” but almost the entire distribution area of the threatened species.



## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 10:25h

### UK: Progress on Highly Protected Marine Areas (HPMAs)

Stephanie Byford

Highly Protected Marine Areas (HPMAs) are areas of the sea designated for the protection and recovery of all marine biodiversity within their boundaries. The UK Government are in the process of implementing a pilot project concerning the identification and designation of HPMAs within England's marine environment. In July 2023, this culminated in the designation of the UK's first three HPMAs. This talk will outline the approach to the selection of the UK's first HPMAs within the context of the broader marine policy framework, reflect on the challenges and successes encountered, and provide lessons learned that are hoped to be of benefit to others embarking upon stricter protection measures within their waters. Notably, we will talk from the perspective of identifying and applying site selection criteria from an ecological and socio-economic perspective, the role of stakeholders in shaping and influencing the process, and the approach to management of these stricter protection areas on the ground.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 11:15h

### Implementing the EU biodiversity strategy in the German North and Baltic Sea – challenges and state of the art

Jochen Krause, Simone Eisenbarth, Axel Kreutle  
German Federal Agency for Nature Conservation (BfN)

The EU biodiversity strategy is a comprehensive commitment of the EU Member States with an ambitious timeline to protect nature and reverse the degradation of ecosystem on land and at sea. The main objective to achieve the recovery of biodiversity by 2030, requires specific actions by all member states.

The present state of German MPAs does not fulfil the EU commission criteria for legally protected and strictly protected areas. However, measures and actions are in preparation.

Currently, the MPA network in the German North and Baltic Seas covers about 45 %. Therefore, the 30 % objective is already achieved in terms of quantity. However, substantial goals to build up a representative network are still missing. By creating refuge and resting areas for specific species, habitats and functions, Germany is intending to close the gap.

Concerning the aim of strictly protected areas (10 % target), additional actions are needed. Currently, there are only tiny non-intervention areas in the German North and Baltic Seas. All administrations in charge of the coastal sea and the EEZ are currently developing plans for suitable areas to pledge for the 10 % target within their areas of responsibility. BfN guides the process in the EEZ. The identification of suitable areas requires consideration of the distribution of habitats and species according to the Habitat Directive and ecological components of the MSFD (e.g. certain fish species). Ecological contents of national allegations and other important ecological functions, such as areas that serve as stepping stones for the distribution of species, are also considered. Longstanding pressures are challenging in the 10 % identification process. However, first steps can be made by using already existing legal instruments. Pressures and impacts that cannot be tackled on national level (especially fisheries and shipping) will, however, be a major issue in the further course.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 11:40h

### PROTECT BALTIC - an ambitious approach for implementing ecological coherent and effectively managed MPAs in the Baltic Sea

Cecilia Nyman  
HELCOM

PROTECT BALTIC will function as a major contributor towards achieving the biodiversity goals of the Baltic Sea Action Plan, the EU Biodiversity Strategy and the CBD Global Biodiversity Targets in the Baltic Sea. The aim of the work is to ensure sufficient spatial protection, covering both marine protected areas (MPAs) and possible other effective area-based conservation measures (OECMs), as well as sufficient restoration of the marine environment. The focus is on strategic, outcome-driven efforts that secure genuine positive biodiversity outcomes that surpass mere percentage targets. In other words: PROTECT BALTIC aims to enable our current and future protection efforts to reach their full potential. PROTECT BALTIC strives to achieve sufficient spatial protection and restoration of the marine environment. This secures positive biodiversity outcomes, maintains ecosystem functions, and enables short and long-term production of ecosystem services and sustainable use. The project takes a multi-avenue, MPA-network level approach to comprehensively address challenges in spatial protection in the Baltic Sea, challenges which are shared by marine areas around the globe. The planned work covers the full spectrum of planning, designation, governance, and management of protection and restoration efforts. This all-encompassing approach establishes the groundwork for a long-term, region-wide protection framework. One that transcends national borders and prioritizes ecological relevance and ecosystem function in decision making. Running from 2023 to 2028, PROTECT BALTIC seeks to create and showcase a robust foundation of evidence and infrastructure to guide decision making and spatial protection. It will identify and comprehensively address protection gaps by offering cutting-edge solutions for Baltic Sea preservation and restoration. This involves optimizing spatial protection efforts, minimizing the negative impact of human activities on the ecosystem, and enhancing the understanding of what, why, where, and from what protection is needed. This approach adapts to the changing demands of spatial protection amid the triple threat of biodiversity loss, climate change, and pollution challenges. The project's ultimate aim is to preserve and revive the Baltic Sea ecosystem. This means maintaining and restoring its ecosystem functions to enable the provision of short and long-term ecosystem services, allowing both the Baltic Sea and society to thrive.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 12:05h

### The MEPCA Indicator: quantitative evaluation of MPA management effectiveness

Sarah Blanchard

Marine Ecosystems Advisor, JNCC

There is a universal need for quantifiable assessments of management effectiveness, especially for marine protected areas (MPAs), to review progress over time and to support large datasets. Around the globe, there are hundreds of protected area management effectiveness (PAME) methodologies, which can be extremely specific for different countries, governance types, and even for the types of protected and conserved areas (PCAs). As the outputs of the range of PAME methodologies may not be directly comparable, there is a need for one tool which can be comprehensively used for different types of governance and PCAs. The Management Effectiveness of Protected and Conserved Areas (MEPCA) indicator is a globally recognised tool that can be used to quantify the management effectiveness of MPAs, as well as other types of PCAs, including Other Effective area-based Conservation Measures (OECMs). The MEPCA indicator is listed as a complementary indicator as part of the vital Monitoring Framework that will be used to monitor progress in the implementation of the Kunming-Montreal Global Biodiversity Framework (GBF). The “effectively conserved and managed” element of Target 3 of GBF is essential to ensure that global efforts to protect 30 per cent of land and sea is successful and that conservation outcomes are achieved. The MEPCA indicator is aptly suited as a tool for reporting against Target 3 due to its quantifiable outputs and useability for large datasets. It can work either as a direct assessment or using existing assessment data from other reporting requirements from local to regional scale as source information, making MEPCA globally applicable. The MEPCA indicator consists of differently weighted metrics to account for the significant link between achieving conservation outcomes and successful effective management. The MEPCA indicator has been trialled globally, through partnerships with PCA managers, workshops with key PCA organisations and discussed at international events such as IMPAC5 and CBD COP15.

## 30/10 targets of the EU and MPAs

Tuesday, 19<sup>th</sup> September 2023, 12:30h

### Lessons Learned from 50 years of the U.S. National Marine Sanctuary System

Monique Baskin  
NOAA

50 years ago, the U.S. ushered in a new era of ocean conservation by creating the National Marine Sanctuary System. Since then, the system has grown into a nationwide network of 15 national marine sanctuaries and two marine national monuments that conserve more than 620,000 square miles of spectacular ocean and Great Lakes waters.

The nation's marine legacy from the last half century contains both victories: a global moratorium on commercial whaling, recovery of fisheries, creation of some of the largest underwater parks on the planet; and challenges: climate change, species on the brink of extinction, continuing habitat and biodiversity losses, and a growing problem with plastic pollution. As an integral part of that marine legacy, the National Marine Sanctuary System has a story to tell of change, growth, and impact.

This presentation will cover a series of findings, based on evidence and external reviews that have been conducted of the National Marine Sanctuary System since the mid-1970s, to the scholarly words of academic, legal, and policy experts, to our own condition reports, and performance measures. Together, they speak to a legacy in which we can take pride. Together, they also speak to a challenge that remains.

Many scientific assessments have concluded that just as human demands on the ocean are about to increase exponentially, our last four centuries of pressure have brought the oceanic ecosystem closer to collapse. As Dr. Jane Lubchenco and Dr. Steven Gaines said in 2019: "The ocean is not too big to fail, nor is it too big to fix. It is too big to ignore." As we advance on multiple marine conservation fronts, underwater parks will become even more important to a thriving blue planet. The next 50 years of the National Marine Sanctuary System will be crucial to that effort.



## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 14:00h

### Ammunition clearance in the Baltic Sea

Mark Wernicke  
Kampfmittelräumdienst Schleswig-Holstein

At the end of World War II around 1.6 Million tons of ammunition had been dumped in Baltic and North Sea. Most of the amount is relocated in German coastal waters. Since Schleswig-Holstein has shares on both North and Baltic Sea, the Federal State is looking at the issue with a particular interest. The EOD-Unit of Schleswig-Holstein (in German called Kampfmittelräumdienst) is the public authority obliged to deal with ammunition disposal. However, the area of responsibility is limited to coastal waters and does not include the EEZ (Exclusive Economic Zone). Furthermore, the authority's action focuses on public safety and security. The legal framework of Schleswig-Holstein is not yet addressing environmental concerns when it comes to ammunition disposal. Despite an ongoing legal discussion the EOD unit has developed specific methods of munition clearance depending on the respective munition type. In addition, the Kampfmittelräumdienst Schleswig-Holstein is providing technical infrastructure to ensure documentation of disposal measures.

## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 14:15h

### Ammunition clearance in construction sites of Offshore Windfarms in the North Sea

Ulrich Schneider, Dieter Guldin  
Seaterra GmbH

Over 25 years SeaTerra is a highly specialised and innovative company for onshore and offshore geophysical surveys and UXO clearance. For projects on the water, SeaTerra has its own fleet of vessels and state-of-the-art technology, including a variety of remotely- controlled underwater vehicles. Since 2010 SeaTerra does marine surveying and UXO clearance of fairways, cable routes, windfarm areas and munition dumping sites in the North and Baltic Sea.

The lecture shows, by way of example and in an overview, what experiences SeaTerra has had with the detection, identification, and clearance of unexploded ordnance (UXO) in the sea. For each construction project, small areas of the seabed are cleared from UXO. The much bigger long-term problem, however, are the known or not yet known ammunition dumping areas, where the majority of the estimated 1.6 million tons of ammunition are in the North and Baltic Seas and slowly corrode and release pollutants into the seawater.

## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 14:35h

### Risks for the health of marine mammals – effects of ammunition explosions, pile driving

Ursula Siebert & Maria Morell

University of Veterinary medicine Hannover (TiHo)

Institute for Terrestrial and Aquatic Wildlife Research (ITAW)

During the construction phase of offshore wind farms, clearance of the area by detonation of ammunition that was dumped in large amounts into the sea during and after World War II, as well as pile driving, are both processes that might risk the health of harbour porpoises. To study the effects of explosions on harbour porpoise health, we conducted comprehensive post-mortem examination of porpoises that stranded after clearance of ammunition. Within the marine protected area of Fehmarn Belt in the Baltic Sea, 42 British ground mines from World War II were cleared by means of blasting from 28 to 31 August 2019. Between September and November 2019, 24 harbour porpoises were found dead along the coastline of the federal state of Schleswig-Holstein. Health evaluations were conducted including examinations of the brain, the air-filled (lungs and gastrointestinal tract) and acoustic organs (melon, acoustic fat in the lower jaw, ears and their surrounding tissues). In 8 out of 24 harbour porpoises, microfractures of the malleus, dislocation of middle ear bones (examined by high-resolution CT scans), bleeding, and haemorrhages in the melon, lower jaw and peribullar acoustic fat were detected, suggesting blast injury. In addition, one bycaught animal and another porpoise with signs of blunt force trauma also showed evidence of blast injury. The cause of death of the other 14 animals varied and remained unclear in two individuals. On the other hand, it was tested whether porpoises can suffer temporary hearing loss (temporary threshold shift, TTS) from multiple exposures of pile driving strikes under current protective regulations. Only the combination of sound exposure levels of single strikes (maximum 160 dB re 1  $\mu$ Pa<sub>2s</sub> at 750 m from the sound source), previous deterrence, and soft start would allow harbor porpoises to avoid a TTS from multiple exposures. However, deterrence efficiency has to be monitored. The data presented highlight the importance of systematic investigations into the acute and chronic effects of blast and hearing loss in marine mammals, improving the understanding of underwater noise effects and develop effective measures to protect marine mammals at a population level.

# Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 15:00h

## Technical development of offshore wind farms in the North and Baltic Sea (piles, turbines) and possible noise mitigation measures

Dr. Michael A. Bellmann; Patrick Remmers, Josef Poppitz, Dr. Torben Wendt & Stephan Gerlach  
itap – Institute of technical and applied physics GmbH

The installation of renewable energy sources offshore is growing fast in Europe, also in Germany, forced by the energy turnaround after 2011. However, the demand for renewable energies has to go hand in hand with the awareness of sustainability issues, especially the conservation of nature and marine ecosystems. Besides other ecological topics, the underwater noise emissions have moved into focus due to the fact that most foundations are installed by using the impact pile-driving method. This installation method leads to enormous acoustic emissions (pile-driving noise), which are potentially harmful to marine life. For nature conservation purposes, it is therefore necessary to reduce underwater noise levels, when harm to marine life is anticipated.

Currently, 26 Offshore Wind Farms (OWF) in Germany are in operation as well as many Offshore Supply Stations, converter platforms are also installed in the German EEZ of the Baltic- and North Sea. All available post-processed underwater noise measurement data and many relevant meta data of all German OWF constructions are summarized in the German noisy register (MarinEARS). Based on the MarinEARS data base, an OWF overlapping analysis regarding the most influencing factors on impact pile-driving noise was conducted within a research- and development project funded by the German government (BMU) on behalf of the BSH (Bellmann et al., 2020). This study points out, that the emitted pile-driving noise is on the one hand highly influenced by site-specific variables as well as by project-specific and source-related variables. Furthermore, the effect and the limits of applied NAS and noise mitigation systems (NMS) was investigated.

In this presentation a short overview of the most important outputs of the cross-project analysis (Bellmann et al., 2020) will be briefly summarized. Furthermore, the ongoing developments and enhancements regarding noise mitigation and abatement systems during the last 3 years will be presented. Moreover, the experiences with alternative installation methods will be briefly described. Based on that knowledge the possible challenges with the construction of upcoming OWF projects with increasing water depth and pile diameter will be discussed.

## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 15:55h

### Impact of Offshore Wind Farms on Migrating Birds, with a focus on the Baltic Sea

Anthony D. Fox

Aarhus University, Department of Ecoscience, Denmark

The European Union offshore renewable energy strategy has set targets for an installed capacity of at least 60 GW of offshore wind energy by 2030 and 300 GW by 2050, a substantial expansion on the 16 GW installed by January 2023. To avoid attempting to save the planet at cost to the organisms that use the airspace occupied by offshore windfarms, we need to understand the impacts of the current installations and predict the consequences of the planned expansions. Millions of migrating terrestrial, aquatic and marine birds traverse the North and Baltic Seas annually, where they are exposed to wind turbines as a stimulus that causes displacement from preferred feeding and resting areas, a physical barrier to movement, and a potential source of collision mortality. Studies to date have concentrated on species with special protection, use affected areas important at some stage in their annual cycle, that are more vulnerable to collision and exhibit high survival/low reproductive success. Among these species, many show high levels of complete (“macro”) avoidance preferring to fly around existing wind farms. Among those crossing offshore windfarms, many show high levels (>50-70 %) of “meso-avoidance” to avoid collision, e.g. by flying equidistance between turbine rows, low over the water, or gaining altitude to fly high over turbines, including at night. Recent combined video/radar monitoring suggest very high levels (>96 %) of “micro-avoidance” at one studied windfarm, where the authors concluded seabirds were exposed to “very low risks of collision in offshore windfarms during daylight hours”, based on no collisions or narrow escapes among 10,000 bird video sequences. However, we must be prudent about extrapolation from previous experiences, given we only have data from existing sites for a limited number of species (excluding most passerine species) under generally good weather conditions. How will birds respond to more windfarms when our seas are almost continually covered in turbines? We need to invest more in monitoring and modelling to answer such questions and understand how collision mortality, effects of barrier effects and effective lost feeding areas from turbines combine with other human effects to impact changes in avian population sizes.



## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 16:10h

### Impact of Offshore Wind Farms on Seabirds in the German North Sea

Stefan Garthe<sup>1</sup>, Verena Peschko<sup>1</sup>, Henriette Schwemmer<sup>2</sup>, Moritz Mercker<sup>3</sup>

<sup>1</sup>Research and Technology Centre (FTZ), Kiel University, Büsum, Germany

<sup>2</sup>Federation of German Avifaunists (DDA), Büsum, Germany

<sup>3</sup>Bionum GmbH – Consultants in Biostatistics, Hamburg, Germany

The North Sea is a key area worldwide for the installation of offshore wind farms. In this paper, we focus on displacement vs. attraction effects by operating wind farms on seabirds in the German sector of the North Sea. From a variety of approaches and data sets, we present results for the following two scenarios.

1) We tagged several species with state of the art GPS data loggers to reconstruct individual flight tracks during the breeding season. We present data for the Northern Gannet (*Morus bassanus*) that showed strongly varying individual responses to the wind farms near their breeding colony on Helgoland.

2) Comprehensive survey data from 2000 to 2017 from research projects, the national biodiversity monitoring program, environmental impact assessments and the ecological monitoring of operating wind farms were used to quantify the species-specific effects of operating wind farms during different seasons. Seabird counts comprise ship-based counts, visual aerial surveys and digital aerial surveys and were analysed in a combined data base.

The results show strong displacements at large distances for loons (divers, *Gavia spec.*) and Common Guillemot (*Uria aalge*), strong displacement at shorter distances for Northern Gannet, Razorbill (*Alca torda*) and Northern Fulmar (*Fulmarus glacialis*), as well as variable reactions (attraction, displacement) for Black-legged Kittiwake (*Rissa tridactyla*) and Lesser Black-backed Gull (*Larus fuscus*).

## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 16:45h

### Potential Impacts of Offshore Wind Farms on the Physical Oceanography of Coastal Seas

Jeff Carpenter

Institute of Coastal Ocean Dynamics / Helmholtz-Centre Hereon

There are currently rapid and widespread plans to develop large fractions of European coastal seas with offshore wind farms. For such a development scenario, we must carefully consider the impacts to the coastal environment. In this talk I will outline a body of work that has been devoted to understanding the potential physical oceanographic impacts of offshore wind farms. In particular, I will focus on the ocean wakes generated by the foundation structures of the turbines, whose injection of turbulence and extraction of momentum results in an increased mixing and decreased currents, respectively. I show that for widespread wind farm development there is the potential to alter the large scale stratification of the German Bight sector of the North Sea, which can have cascading effects on ocean ecosystems. In addition, reductions in mean ocean residual currents of up to 10 % are possible.

## Offshore wind energy

Tuesday, 19<sup>th</sup> September 2023, 17:10h

### Regional scale effects of large-scale Offshore Wind Farms in the coastal marine ecosystem of the North Sea

Ute Daewel, Nils Christiansen, Corinna Schrum  
Institute of Coastal Ocean Dynamics / Helmholtz-Centre Hereon

The North Seas have become a focus of renewable energy production and are planned to become the Green Power Plant of Europe. In the Ostend Declaration nine European countries pledged to install a total combined capacity of at least 300 GW by 2050 in the North Sea in order to help reach the EU's 40 % renewable target. As the North Sea is also a complex ecosystem that is strongly driven by hydrodynamical features such as tidal fronts and seasonal stratification, these large OWFs can be expected to impact the ecosystem dynamics in the area. By using numerical models, we investigated the effects that an extensive offshore energy development would have on the physical conditions and the ecosystem of the southern North Sea. Our results show that the ongoing OWF developments can have a substantial impact on the structuring of coastal marine ecosystems.

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 9:35h

### Cumulative impacts of offshore windfarms on marine biodiversity

Rob Gerits

NESC-MSP Group and OSPAR ICG Offshore Renewable Energy Development

Current offshore renewable energy development in the North Sea is only the beginning. There are strong ambitions to increasing the scale of renewable energy development and the urgency to speed up this development. In 2030 we can expect a fourfold of installed capacity compared to the 2022 capacity. In 2050 a tenfold might be expected.

North Seas Energy Ministers (NSEC) are collaborating in the development of offshore renewable energy and one of the field of collaboration is Marine Spatial Planning.

The MSP support group of NSEC explored spatial tensions to be expected due to 2030 developments. It was concluded that spatial tensions with biodiversity are of major concern. A quick scan was carried out to gain more insight in the long-term cumulative impacts of offshore renewable energy developments on the ecosystem of the North Seas.

#### Main results

The main concerns include potential changes in primary production on a large scale (potentially affecting the North Sea ecosystem as a whole). Another concern is the impact on migrating species; not only birds but a main concern is on specific bird species. Offshore windfarm developments are not the only source of pressures on already threatened bird species but adding up to a total of pressures is likely to be too high.

Nature enhancement in windfarms is promising on a local scale but also entails risks. It is unlikely however to compensate potential loss of biodiversity on a regional sea scale.

OSPAR as the North East Atlantic regional seas convention on the protection of the marine environment started a workgroup that is developing an approach on cumulative effect assessment of offshore wind farm development on a regional sea scale. This work is aiming at identifying the need for measures and developing guidance to minimize the impacts. A first step is a bird pilot.

Time is pressing and the urgency of developing a common approach on cumulative impact assessment on a regional sea scale and defining measures, based on identified potential impacts is high.

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 10:05h

### Germany: Current status of Offshore Wind Farms in the German EEZ and Site Development Plan 2023

Kai Trümpler  
German Federal Maritime and Hydrographic Agency (BSH)

The talk will give an update on the implementation of Germany's goal to implement 30 GW of offshore wind power by 2030, 40 GW by 2035 and 70 GW by 2045. It will focus on the main offshore planning instrument, the Flächenentwicklungsplan or Site Development Plan.



## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 10:20h

### The Netherlands: Policy for offshore wind and nature enhancement

Jeroen Vis

DG Nature and Fisheries, Ministry of Agriculture, Nature and Food Quality

The Dutch North Sea Nature Enhancement Program is aimed at strengthening the carrying capacity of the natural capital of the North Sea, so it will be possible to achieve both ecological goals (from reduction to strengthening) and to develop more sustainable economic benefits (production of sustainable energy increases, realization of installed capacity increases). The policy builds on the Dutch North Sea Agreement and is additionally focused on the acceleration and leap of scale of offshore energy projects and the recent challenges for the fisheries sector. In more concrete terms it means achieving and maintaining the European N2000 and KRM goals and achieving the sustainable energy goals and sustainable use.

To achieve these objectives, the government is committed to developing and implementing measures in nature reinforcement aimed at sea (and on land when needed), on a national level and internationally based on science. Nature protection/reinforcement plans need to be drawn up on species protection plans for fish, birds, marine mammals and bottom animals and related habitats. Strengthening existing protected nature areas on the basis of management plans of existing N2000 nature reserves at sea, aimed at the restoration and management of the target species.

There are many challenges ahead, in what way do we expect nature to develop autonomously, which actions and measure are fitting and can we expect to create “true nature” at all?

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 11:15h

### Maritime Spatial Planning and Offshore Wind Energy - towards an ecosystem approach

Cormac Walsh  
Consultant/Germany

Maritime spatial planning (MSP) has a key role to play in the coordination and regulation of human activities at sea. Through MSP, ambitious objectives for offshore wind energy are translated into concrete plans for wind park development. It is the task of MSP to ensure that such developments are compatible with other uses of maritime space and other policy objectives and legal obligations pertaining to the marine ecosystem. Through the EU MSP Directive (2014) Germany is committed to the implementation of an ecosystem-based approach, which calls for the cumulative effects of all activities at sea to be compatible with the achievement and maintenance of Good Environmental status for the marine ecosystem.

An ecosystem-based approach to MSP requires that ecological considerations are foregrounded in decision-making on offshore wind energy and other planned and proposed activities. Ecosystem-based MSP must build be based on functional understanding of marine ecosystems, explicitly recognising the complex and dynamic nature of interactions among multiple ecosystem components. Maritime spatial plans must be guided by the precautionary principle to ensure that the potential adverse impacts of planned developments do not compromise the integrity, health and resilience of the marine ecosystem. It is imperative that the future planning of offshore wind energy not only encompasses state of the art mitigation as a basic requirement but also sets out options for minimising adverse impacts through the careful selection of appropriate sites and a commitment to working within the carrying capacity of the marine ecosystem. Assessments commissioned by Birdlife International and WWF have found that the majority of EU Member States, including Germany have not fully implemented an ecosystem-based approach in their plans to date.

This presentation will outline what is required to implement an ecosystem-based approach and achieve a better integration of offshore renewable energy and marine conservation in future maritime spatial plans. It will draw on recent BfN-commissioned work on the preparation of draft guidelines for cetacean-sensitive MSP, which serves to illustrate the challenges and opportunities associated with a shift towards scientifically-informed ecosystem-based MSP.

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 11:40h

### Smart site selection approach for a more nature-friendly offshore wind development

Dr. Anne Böhnke-Henrichs  
NABU e.V.

The legally established goal in Germany of 70 GW offshore wind capacity until 2045 translates into substantial environmental changes for the German Exclusive Economic Zone (EEZ). How can the impacts on the marine ecosystems be attenuated and a nature-friendly offshore wind development be achieved? The German Marine Spatial Planning (MSP) in 2021 failed to answer this question properly, although according to the EU's MSP Directive (2018/89/EU) resources and uses are due to be allocated in line with the ecosystem approach. The implementation of this principle, however, remained inadequate within the German MSP. This study contributes to close this gap and evaluates the suitability of the German EEZ, covering both the North and Baltic Seas, for offshore wind (OW) expansion in terms of nature conservation.

This spatial evaluation is based on an analysis of a series of environmental parameters (14 seabird species, harbour porpoise and protected biotopes) and their associated ecological needs. Subsequently, the different areas of the EEZ are, following a traffic light scheme, classified as either a) suitable for OW (green), b) suitable given certain restriction/regulation measures (yellow) or c) as not suitable from the perspective of nature conservation (red). It has to be noted that Environmental Impact Assessments will still be required for the green areas. This assessment only serves to illustrate that in terms of nature conservation these areas should be developed as a matter of priority. The general methodology of this study can be applied to other areas and an upscaling to an entire regional sea would be desirable.

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 12:05h

### Mitigation measures to protect birds in Offshore Wind Farms

Camiel van der Hout

DG Climate and Energy, Ministry of Economic Affairs and Climate Policy

The Start Stop project aims to limit the number of bird casualties by shutting down offshore wind turbines when bird migration is expected to reach a peak.

The Netherlands has the ambition of providing our country with sustainable sources of energy. Offshore wind energy can make an important contribution to this. Over the next few years, a large number of new wind farms will be built on the Dutch part of the North Sea. Within the Wind Farm Site Decisions regulations are taken to prevent significantly adverse effects on the ecology. One of these regulations is known as the Start Stop regulation, which aims to shut down the wind turbines (or bring them close to a standstill) - known as 'curtailment' - when bird migration is expected. The basis is a prediction model developed by the University of Amsterdam. The model is in place since the spring of 2023. Also in place is a protocol with clear roles and steps for participating parties starting with a bird migration model prediction and ending with the turbines being shut down. This was tested in May 2023.

The Start/Stop project both uses and gathers knowledge on bird migration on the North Sea, while developing measures to make shutting down the turbines as efficient (and cost-effective) as possible.

## Offshore wind energy

Wednesday, 20<sup>th</sup> September 2023, 12:30h

### Nature Enhancement in Dutch Coastal and Offshore Wind Farms: A Path Towards Biodiversity Restoration

Serena Rivero  
The Rich North Sea

Offshore wind farms in Dutch coastal and offshore waters provide a unique opportunity to address two critical challenges facing our planet: combatting climate change through renewable energy and enhancing biodiversity in the North Sea. The Rich North Sea initiative is at the forefront of this effort, recognizing that active intervention is crucial to restore the declining biodiversity in this vast marine ecosystem.

This presentation explores The Rich North Sea's groundbreaking approach to nature enhancement within wind farms, focusing on the placement of artificial reefs and the release of oysters to foster marine life. By examining optimal conditions for nature development, the initiative aims to apply its findings across all North Sea wind parks.

The Rich North Sea's commitment to a sustainable future is reflected in the development of the 'Toolbox nature enhancement,' a digital platform that consolidates knowledge from various projects. This toolbox, created in collaboration with industry experts, scientists, and government agencies, facilitates a nature-inclusive deployment of offshore wind farms, ensuring both renewable energy and a thriving natural environment. Open-source and adaptable, it serves as a blueprint for future projects worldwide.

Central to the approach is the close partnership between The Rich North Sea, the wind and hydraulic engineering sector, and scientific researchers. Together, they work on underwater nature enhancement by creating living reefs and testing innovative adaptations to foundation structures. Through scientific research and breeding programs for flat oysters, the initiative aims to promote diverse species like tube-building worms, mussels, and cuttlefish.

Unified monitoring and research efforts connect these diverse projects, with knowledge-sharing through webinars and conferences contributing to the growth of scientific understanding and operational expertise in nature-enhancing construction in the North Sea. The Rich North Sea's work not only underscores the vital role of offshore wind farms in climate action but also demonstrates that they can be a force for positive change in marine conservation.



## Fisheries and fisheries management

Tuesday, 19<sup>th</sup> September 2023, 14:00h

### EU Action Plan:

### Protecting and restoring marine ecosystems for sustainable and resilient fisheries

Vedran Nikolić

European Commission, DG Environment, Unit D3 – Nature conservation)

Climate change, biodiversity loss and ocean pollution threaten the viability of marine ecosystems and the sustainability of fisheries. A healthy marine environment with healthy fish stocks and rich biodiversity is the only way to ensure a prosperous future for EU fisheries communities in the medium and long term. As part of the EU Biodiversity Strategy for 2030, the European Commission presented a marine action plan to reduce the adverse impact of fishing activities on marine ecosystems, particularly through seabed disturbance, by-catch of sensitive species and effects on marine food webs. The action plan will also be part of the EU's contribution to the implementation of the recently agreed Kunming-Montréal global biodiversity framework. To facilitate the implementation of the action plan and to track its progress, the Commission established a joint special group gathering Member States' fisheries and environmental authorities and stakeholders.

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 14:25h

### Results from the project APOC – the role of marine sediments as carbon sink and the impact of bottom trawling on seafloor carbon sequestration

Sabine Kasten<sup>1</sup>, Wenyan Zhang<sup>2</sup>

<sup>1</sup> Alfred-Wegener Institute Helmholtz Center for Polar and Marine Research (AWI)

<sup>2</sup> Institute of Coastal Systems, Helmholtz-Centre (HEREON)

Marine sediments – in particular fine-grained shelf-sea deposits - represent the largest long-term carbon sinks on our planet. The BMBF-funded collaborative project APOC „Anthropogenic impacts on particulate organic carbon cycling in the North Sea“ seeks to understand how the turnover of particulate organic carbon (POC) contributes to carbon sequestration in the North Sea and how this ecosystem service is affected by climate change and anthropogenic pressures. The sediment budget of the North Sea is strongly affected by bottom-trawling fisheries and other uses that result in the mobilization of sediments. These activities result in lower rates of POC burial and less CO<sub>2</sub> fixed in the North Sea. The project APOC aims to quantify these effects and contributes to ensure that they are minimized through appropriate measures. The research takes place in the context of existing policy legislation, commitments and activities at national, regional and EU level. Improved knowledge transfer, coordinated dialogue with stakeholders and recommendations to policy makers are key tasks and objectives of the project.

Among all physical anthropogenic disturbances to shelf sea sediments, bottom trawling has the most widespread coverage. While trawling-induced changes in benthic communities has been widely recognized, its impacts on ecosystem functioning and carbon cycling at regional to global scales remain unclear and contested in existing evidence. To address this we first examined an extensive field dataset from the heavily trawled North Sea. A clear pattern emerges when comparing the surface sediment POC-to-mud ratio (POC/mud) and the trawling intensity represented by the annual swept area ratio (SAR). POC/mud is scattered between 0 and 1 where SAR < 0.5, but decreases rapidly into a narrow range with an increase of SAR. This constraint can be ideally described by a power function linking POC/mud with trawling intensity. We then applied three-dimensional physical–biogeochemical modeling to investigate the driving mechanisms behind this relationship. Results suggest that in the long term, intense and persistent trawling (SAR > 0.5) results in a net reduction of sedimentary carbon. The identified dependence of POC/mud on trawling, and associated process-based understanding could help to assist both national and international marine spatial plans for climate change mitigation.

Website: <https://www.apoc-project.de/>

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 14:50h

### Impact of bottom trawl fisheries on benthic communities and possible management options

Marija Scibberas  
Heriot Watt University, Edinburgh, UK

Bottom trawl fishing is a controversial activity. It is important for global food security and the livelihoods of those that depend on the industry. However, it also impacts on the marine environment in ways that can threaten the sustainability of the same environment if poorly managed. Recent efforts have synthesized our current understanding of trawling extent and impacts around the world. The combined approaches of meta-analysis and modelling that link fishing-gear penetration of the seabed to benthic depletion, and recovery to taxon longevity, have enabled the development of a modelling framework to estimate the impact and sustainability of benthic communities in areas subject to bottom fishing. Management measures and voluntary industry actions that can reduce these impacts, and help meet sustainability objectives for fisheries, conservation and environmental management will be reviewed. Ultimately, an effective management measure will need to strike a balance between fisheries value (both economically and socially) and seafloor impacts.

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 15:40h

### Impact of gillnet fisheries on harbour porpoises and management options

Ida Carlén

Swedish Society for Nature Conservation

The Baltic Proper harbour porpoise is listed as Critically Endangered by IUCN and HELCOM as well as several of the countries surrounding the Baltic Sea. It has been estimated that only a few hundred animals remain, and conservation action is urgently needed. The main threats to this population is considered to be disturbance from underwater noise, prey quality and quantity, and mainly, bycatch in static net fisheries. In 2020, ICES produced scientific advice on measures to prevent bycatch of Baltic Proper harbour porpoise, specifying measures both within protected areas designated for the harbour porpoise as well as in the entire population range. Based on this advice, the Baltic Sea regional fisheries body, BALTFISH, negotiated joint recommendations under article 11 of the Common Fisheries Policy, and a delegated act was published in February 2022. This delegated act specifies closures of static net fisheries in some important areas and Natura 2000 areas designated for harbour porpoise in the Baltic Proper, some all year and some part of the year, as well as the use of pingers in a couple of areas in Polish and Swedish waters. There are still no fisheries regulations or other conservation measures implemented in the entire population range, which according to the ICES advice will be necessary to secure the survival of the population. To further minimise bycatch, ICES recommends the use of pingers in all static net fisheries outside of the closed areas in the population range. However, the military forces of some countries have denied large-scale use of pingers due to potential interference with military underwater acoustic applications such as sonars. To ensure the long-term survival of the Baltic Proper harbour porpoise, and fulfil the aims and targets of international agreements such as CMS/ASCOBANS, the EU habitats directive and Biodiversity strategy to 2030, including a special mention in the EU Marine Action Plan, further measures are urgently needed. If pingers cannot be deployed, other solutions must be found.

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 16:10h

### Impact of gillnet fisheries on seabirds – UNCATCH, preventing bycatch of seabirds

Julius Morkūnas, Rasa Morkūnė, Yann Rouxel, Ramūnas Žydelis  
Lithuanian Ornithological Society, Lithuania  
Marine Research Institute, Klaipeda University, Lithuania  
RSPB, UK

Seabird wintering areas and coastal gillnet fishing grounds largely overlap in the Baltic Sea, causing large amounts of accidental seabird mortality. To date, no consistent bycatch monitoring for seabirds has been implemented in the area, and no mitigation measure has proven to reduce seabird bycatch levels in the overall Baltic Sea. In the Lithuanian coastal waters, collaboration with local fishermen, systematic data collection on bycatch, and trials of mitigation measures have been ongoing for the search of possible solutions. Here, we present the results of testing two bycatch mitigation measures for gillnet fisheries predator-shaped kites and night-fishing. Both measures have proven to significantly reduce bycatch levels of seabirds. Moreover, new data on bird behavior through the use of innovative telemetry tools could lead to new effective solutions. Here, we present how newly developed GPS/GSM transmitters attached to the back feathers of diving seabirds can collect data during the Baltic winter season, when seabird bycatch from gillnets is at its peak in the area. The GPS/GSM transmitters equipped with diving sensors monitored the foraging behavior of wintering diving seabirds within the Lithuanian coastal waters. Data indicate that Velvet Scoters, Long-tailed Ducks, and Red-throated Divers generally forage during the day with little diving activity during the night. Precise knowledge of wintering seabirds foraging depths, times and locations brings new insights that could be used by fishery managers to tackle bycatch. Results indicate that night-fishing could halve bird bycatch levels compared to standard fishing practices. The accumulation of different strategies in bycatch mitigation efforts in Lithuania over the past decade, is building a toolbox of potential solutions to the bycatch issue, both domestically and at regional level.

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 16:35h

### Ecosystem-based fisheries management restores biodiversity and catch of commercial stocks in the western Baltic Sea

Marco Scotti<sup>1,2</sup>

<sup>1</sup>GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany

<sup>2</sup>Institute of Biosciences and Bioresources, National Research Council of Italy, Sesto Fiorentino, Italy

During the last decades, excessive fish extraction altered the structure and functioning of the western Baltic Sea (WBS) ecosystem. Stock size and productivity of western Baltic spring-spawning (WBSS) herring and western Baltic cod have been heavily compromised, which caused a substantial decline of their yields. Moreover, the direct impact of fishing may propagate beyond the exploited stocks and cascade its negative consequences on other species in the ecosystem. This is the case of harbour porpoise, which is negatively influenced by the collapse of the WBSS herring, one of its main prey. To quantify both the direct and indirect effects caused by alternative fishery management strategies we built the first Ecopath with Ecosim (EwE) ecosystem model of the WBS. After validating the model, we applied it to assess how the interplay of fishery management, ocean warming and varying biomasses of phytoplankton alter the biodiversity and the productivity of main commercial fish stocks. In particular, we compared two fisheries scenarios: (1) business as usual (BAU; fishing mortality corresponding to the average of last five years), and (2) ecosystem-based fisheries management (EBFM; all fishing mortalities set below the FMSY level, with lower pressure exerted over forage fishes such as herring and sprat). We found that EBFM is the most promising strategy to recover the biomass of depleted stocks up to the levels of early 2000s, increase the catch of WBSS herring and western Baltic cod, and maintain harbour porpoises within the limits of a healthy population. EBFM also contributes towards shaping an ecosystem that is resilient to ocean warming and changes in phytoplankton biomass. Our work presents a modelling exercise for the interrelated assessment of trophic guilds as required by the EU Marine Strategy Framework Directive. It shows that combining fishery biology principles (i.e. fishing all stocks below the FMSY threshold) and ecological criteria (i.e. fishing less those stocks feeding lower along the trophic chain as they provide food for high trophic-level consumers) represents a step forward towards developing a management strategy capable of maintaining the ecosystem in a Good Environmental Status.

## Fisheries and fisheries management

Wednesday, 20<sup>th</sup> September 2023, 17:00h

### Marine Foodwebs:

### Effects of fisheries on fish communities & depletion of predatory species

Boris Worm

Dalhousie University, Canada

Fisheries necessarily deplete the abundance of target species and often have adverse impacts on a range of by-catch species as well. These changes directly alter fish communities, but also have indirect impacts on marine ecosystems that are mediated by food-web interactions such as predation. There is good evidence to suggest that changes in the abundance of predatory species can cause cascading interactions that affect the entire food web across up to four trophic levels, all the way down to plankton and coastal algae. Such interactions are particularly strong in simplified ecosystems like the Baltic Sea and other cold-temperate to subarctic seas, including most of Northern Europe. Predator population can be restored by fisheries management that prioritizes rebuilding, and by protected areas that exclude fisheries from key habitats that can act as predator refuges. Most European waters are currently not managed in a way to allow such recovery to occur.

## Fisheries and fisheries management

Thursday, 21<sup>th</sup> September 2023, 9:35h

### The danger of not accepting failure

Nils Höglund  
Coalition Clean Baltic (CCB)

We have failed to manage the fisheries for the major commercial Baltic Sea fish stocks. The cod fisheries as it has existed for decades, is gone. Several herring stocks are in a rapid and never seen before decline. The cod fishery is now for poets and storytellers to describe since the outlook for a return of these iconic fish is very bleak. How did we get here? What can be done and most importantly, what must we learn from these dramatic events?

Nils Höglund's presentation will explain why we have to accept failure and why this is crucial. He will also point to three key elements that must change and how the concept of a new "Ocean Law" could help us improve and facilitate the implementation of an ecosystem based management.



## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 10:05h

### Germany: 15 years after EMPAS

Christian Pusch  
Federal Agency for Nature Conservation (BfN)

In 2008 the BfN conference “Marine Natura 2000 sites and fisheries management: the results of the EMPAS project” took place in Stralsund. During this conference the European process of developing fisheries management plans in marine Natura 2000 areas in Europe was presented and discussed with scientist and representatives from ministries, federal states and EU member states. Fifteen years later it is time for a review.

As part of the BfN-funded research project (Environmentally sound fisheries management in Marine Protected Areas (EMPAS), 2006-2008), the International Council for the Exploration of the Sea (ICES) carried out a conflict analysis between the conservation objectives and the fishing activities in the marine Natura 2000 sites in the German EEZ of the North and Baltic Sea. Based on this analysis, ICES has proposed the first spatially and temporally differentiated fisheries regulations in the Natura 2000 sites of the German EEZ. The central results of the EMPAS project and the resulting ICES recommendation served as a basis for the further development and implementation of fisheries management measures in the Natura 2000 sites.

In retrospect this turned out to be the beginning of a very long process undertaken by the responsible Ministries for Fisheries (BMEL), for Nature Conservation (BMUV) and their respective agencies Thünen-Institute (TI) and the Federal Agency for Nature Conservation (BfN) to agree on fisheries management measures in the Natura 2000 sites in the German EEZ. Subsequently to national negotiations a long and complex process within the framework of the European Common Fisheries Policy (according to Articles 11 and 18) took place, which required the agreement of all EU member states with fisheries interest in the respective Natura 2000 site.

In this presentation a short review of the process, the lessons learnt and the current status of the implementation of fisheries management measures in the Natura 2000 sites in the German EEZ will be given. Further an outlook, which tasks regarding fisheries management in MPAs remain will be presented. Lastly a suggestion on how the Common Fisheries Policy could be improved in order to fulfil conservation objectives according to European environmental directives by member states will be given.

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 10:15h

### Sweden: Fisheries conservation measures in marine protected areas (MPAs) in the Baltic Sea and in the North Sea

Lena Tingström, Malin Wilhelmsson  
Swedish Agency Marine and Water Management

Sweden works continuously with introducing necessary fisheries conservation measures in marine protected areas, both nationally and within areas that require a process with other concerned Member States within the Common Fisheries Policy. The high ambition of the work originates from a voluntary commitment from Sweden at the Oceans Conference in 2017, saying that necessary fisheries conservation measures in Swedish MPAs should be introduced in order to reach conservation objectives.

In Sweden, designation of and management in marine protected areas is mainly conducted by the County Administrative Boards (CABs). The Swedish Agency for Marine and Water Management (SwAM) is the national agency responsible for guidance and support to the CABs on issues concerning marine protected areas, as well as implementing national fisheries regulations, among other things.

SwAM has for many years, in close cooperation with the CABs, identified additional needs for fisheries conservation measures in marine protected areas. The conclusion from these efforts is that in 30 of approximately 300 MPAs there is a need for fisheries conservation measures in order to reach conservation objectives.

To streamline work on fisheries regulation in MPAs with a view to achieving conservation objectives SwAM carries out the work on a sea basin basis, where all marine protected areas with the need for fishing regulation in the Gulf of Bothnia, in the Baltic Proper and in the North Sea respectively is referred and prepared collectively within the framework of a so-called “platform”. This goes for both measures where SwAM has national discretion and concerning measures requiring regulation within the Common Fisheries Policy. Within the platform, SwAM conducts continuous work on fisheries regulation in marine protected areas based on the needs identified by the relevant CAB.

We will give an overview of how the work is conducted, the mandate within the Common Fisheries Policy to introduce necessary fisheries regulations in MPAs in order to fulfil obligations under the Union Environmental Legislation and share with you the results. We will end the session with lessons learned and experiences from the processes.

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 11:00h

### CIBBRINA - Coordinated Development and Implementation of Best Practice in Bycatch Reduction in the North Atlantic, Baltic and Mediterranean Regions

Anne-Marie Svoboda

Department of Nature & Biodiversity, Ministry of Agriculture, Nature and Food Quality, The Netherlands

Incidental bycatch has been identified as one of the major threats to marine species worldwide. In recent years, there have been several developments demonstrating a need from an international perspective for coordinated effort to tackle this problem. The LIFE CIBBRiNA project aims to address this issue by setting up a European flagship initiative in which fishers, scientists, fisheries and environment ministries and NGOs from 13 European countries will work jointly to minimize incidental bycatch in fisheries which have a high risk of bycatch of priority marine mammals, birds, turtles, sharks and rays and to work towards transparent and environmentally and socioeconomically sustainable fisheries in the Northeast Atlantic, Baltic and Mediterranean regions. The main objective is to minimise and, where possible, eliminate bycatch mortality of priority endangered, threatened and protected (ETP) species. This will be achieved through cross-border and cross-sectoral cooperation, involving industry, scientists, authorities and other relevant stakeholders, to establish regionally coordinated mitigation, monitoring and assessment programmes. For this, an innovative toolbox will be created, building on a review of current approaches and learning from new case studies conducted in a “safe environment” of mutual trust and cooperation. CIBBRiNA will ensure the long-term sustainability of the recommended tools and procedures by embedding these in policy and best practice going forward. The project is closely linked to the first specific objective of the sub-programme Nature and Biodiversity: to develop, demonstrate, promote and stimulate scale up of innovative techniques, methods and approaches for reaching the objectives of the EU legislation and policy on nature and biodiversity; it relates to the intervention area “Protecting our species”, in which priority is given to projects that focus their activities on reducing the mortality of these species, including through bycatch.

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 11:25h

### STELLA 2

#### (STELnetzfisherei-Lösungs-Ansätze 2) - „Gillnetfishery-Solution-Approach 2“

Katharina Brundiers  
NABU e.V.

Fisheries across the German Baltic are in a challenging state. Stocks of cod and herring are in a catastrophic status and fishermen struggle to keep up their business e.g., through diversification like eco-tourism. The transformation of conventional fisheries is long overdue. While gillnets have a lower impact on the environment compared to mobile bottom contacting gear types, negative impacts remain and require urgent attention. Bycatch of diving seabirds and marine mammals in gillnets are one of the main areas of conflict between small-scale fisheries and nature conservation in the German Baltic. The aim of the “STELLA 2” project is to reduce bycatch in gillnet fisheries by further optimizing systematically developed methods from the initial “STELLA” project, namely the PearlNet (gillnet modification to avoid bycatch of harbour porpoises), fish pots and the pontoon trap. In order to prepare for the implementation of these methods in commercial fisheries “STELLA 2” also focusses on communication and cooperation with local commercial fishermen (e.g. workshops, personal exchange, joint information trips). Furthermore, “STELLA 2” contributes to improving the awareness of consumers regarding the benefits of sustainable fishing methods, and the willingness among consumers to pay higher prices for sustainably caught fish. Another important aspect is assembling cooperations e.g., between local retailers and ecologically aware fishermen to ensure a profitable value chain to establish sustainable local fish as an available commodity in long term. Taken together all these components contribute to transforming conventional commercial small-scale fisheries in the German Baltic Sea in order to ultimately result in more environmental-friendly and ecological and economic sustainable fishing practices.

STELLA 2 is a cooperative project between the Thünen Institute of Baltic Sea Fisheries (Thünen-Institut für Ost-seefischerei) and NABU e.V., funded by the Federal Agency for Nature Conservation (Bundesamt für Naturschutz).

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 11:40h

### Eutrophication in the Baltic Sea and its effects on marine biodiversity

Dr. Barbara Bauer, Dr. Wera Leujak  
German Environment Agency (UBA)

The most recent HELCOM thematic assessment of eutrophication based on data from 2016 to 2021 shows that despite substantial reductions in nutrient inputs 94 % of the Baltic Sea is still eutrophied. Eutrophication is caused by excessive anthropogenic inputs of nutrients - phosphorus and nitrogen. None of the objectives of the Baltic Sea Action Plan (BSAP) with respect to eutrophication have yet been achieved.

HELCOM has undertaken substantial efforts in combating eutrophication by setting quantitative nutrient reduction targets in the BSAP and as a result nitrogen inputs decreased by 12 % and phosphorus inputs by 28 % since the reference period 1997-2003. Nevertheless, nutrient inputs to the Baltic Sea are still too high, especially in the central Baltic Sea.

While nutrient inputs are decreasing, nutrient concentrations, especially phosphorus, show a substantial increase in a number of basins. The reason is likely the release of the phosphorus already stored in the sediment. Additional pressures on the ecosystem, such as changes in the grazing pressure on lower trophic levels due to overfishing, also play a role.

Eutrophication is one of the main factors for pelagic and benthic habitats failing to achieve good status. Excessive nutrients in the water, especially together with warming caused by climate change, promote blooms of both phytoplankton and opportunistic filamentous benthic macroalgae. These negatively affect marine habitats via increasing turbidity and thereby decreasing light for habitat-forming macrophytes. Microbial degradation of organic material contributes to widespread hypoxia, which is permanent in deeper areas of the Baltic Sea, but can temporally affect even shallower areas, with severe negative consequences for biodiversity. Hypoxia has contributed to the Baltic cod crisis and is expected to be exacerbated by climate change.

Due to the stressed state and inertia of the Baltic Sea, it will take decades until the objective of a healthy sea can be fully achieved. Further ambitious nutrient input reduction efforts are needed to improve the eutrophication status. It needs to be carefully considered if, in addition, sea-based measures to manage internal nutrient reserves should be undertaken to speed up recovery to avoid unforeseen and detrimental side-effects on Baltic Sea biodiversity.

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 12:05h

### Cod or fertilizer?

#### No future for Baltic fish and fisheries with ongoing eutrophication

Rainer Froese, Eva Papaioannou, Felix Mittermayer, Liam MacNeil  
GEOMAR Helmholtz Centre for Ocean Research Kiel

Climate change is causing the warming of the Baltic Sea, with summer temperatures being too warm for commercial fish species. Responses of species vary: while herring migrates to the North Sea, other species retreat to nearby deeper, cooler waters. However, due to over-fertilisation, oxygen levels in these depths are substantially lower than tolerable, with adverse effects on species survival, growth and condition (weight per length).

The study was conducted to review how overfertilization affects commercial fish species in the Kiel Bight. For the purpose of the analysis data on water temperature, salinity, oxygen and the condition of commercial fish species (cod, herring, plaice, flounder, dab) were assessed. In May 2023, oxygen levels at depths below 12 m were about 50 % lower than at the surface and continued to decrease over the summer. Turning food into body weight (assimilation) is an oxygen-demanding process and reduced oxygen levels means reduced growth and condition, as observed in all commercial fish species. Very low oxygen levels lead to fish kills. The natural retreat of fish to deep and cool waters in warm summers fails due to over-fertilisation.

There is a need to provide temperature refuge MPAs for fish in deeper, cooler waters, which however must also have sufficient oxygen. Thus, protected coastal areas are not enough. If commercial fish and fishermen are to have a future in the Western Baltic Sea then the input of liquid manure and of fertilisers must be drastically reduced. Moreover, nutrients deposited on the seafloor must not be resuspended into the water column by bottom contacting fishing activities (e.g. bottom trawling).

## Fisheries and fisheries management

Thursday, 21<sup>st</sup> September 2023, 12:30h

Spillover effects of MPAs

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 14:00h

### Effects of disturbances on harbour porpoise populations simulated using the DEPONS model

Jacob Nabe-Nielsen, Caitlin K. Frankish  
Aarhus University, DK

Marine species are exposed to anthropogenic disturbances that cause animals to change behaviour, reduce their access to food, cause them to die, and that may ultimately result in population declines. Here we describe how knowledge of behavioural responses to disturbances can be incorporated in highly realistic agent-based models that simulate the movements and energetics of individual animals, and where population dynamics emerge from the individuals' interactions with each other and with the environment. We use the harbour porpoise (*Phocoena phocoena*) as an example, and demonstrate how cumulative impacts of noise from wind farm construction and ships can be predicted by simulating how individual animals react to different disturbances. Simulations are run using the DEPONS model, which has been calibrated based on satellite telemetry data for porpoises, ship movement tracks, data on the distribution of wind turbine construction sites, and knowledge about how sound propagates from turbines and ships. The framework may be used for different species, or in different areas, if the necessary input parameters are available. We argue that spatially explicit, process-based models are needed to fully understand how competition for food and behavioural reactions to disturbances will shape the dynamics of populations when we change the marine environment.



## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 14:25h

### How SATURN is developing solutions to underwater radiated noise

Joseph Schnitzler

Institute for Terrestrial and Aquatic Wildlife Research (ITAW)

University of Veterinary Medicine Hannover (TiHo)

It is generally accepted that sound from shipping and other human activities in the underwater environment can disturb, harm and harass aquatic species. However, there are gaps in the knowledge and understanding of how underwater sound can be detrimental to individual animals and whole populations.

SATURN proposes a selection of relevant studies to improve the understanding of vessel noise on aquatic animals. Assessing the effects of underwater noise on aquatic animals is particularly complex due to the diversity of taxa involved, each with its own spectral and temporal sensitivity to sound, as well as behavioural and physiological sensitivity to acoustic disturbance. The three main taxonomic groups in aquatic ecosystems are invertebrates, fish and marine mammals.

For fish and invertebrates, which are sensitive to the particle motion component of sound, we have designed innovative laboratory set-ups to conduct exposure experiments. Using an exposure chamber, we are investigating the comparative effects of particle motion and sound pressure from ship URNs on invertebrate species. Migratory fish species are tested in a novel set-up that integrates the latest established swimming tunnel technology with an innovative combination of experimental exposure to physical and chemical water quality and underwater sound.

SATURN focuses on three marine mammal species: harbour porpoises, pilot whales and seals. Together, the three species provide broad biological coverage of acoustic specialisations and relevant European habitats. We collected field data and established dose-response relationships of marine mammal behaviour and energetics as a function of real-world exposure to ship URN. We developed an open source standardised processing software toolbox for analysing dosimeter (D-tag) and animal behaviour data, including the extraction and categorisation of ship passes, and applied the software to process the field data. The impact of underwater noise pollution on harbour porpoise populations are assessed using the updated DEPONS model.

What is unique about SATURN is that marine biologists are working directly with marine engineers to assess which of a range of existing and innovative operational and technical mitigation measures would be most effective and feasible to reduce the environmental impact of underwater noise from a policy, legal and commercial perspective.

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 14:50h

### Demographic monitoring of a declining seaduck population

Jochen Bellebaum<sup>1</sup>, Pius Korner<sup>2</sup>, Kjell Larsson<sup>3</sup>, Nele Markones<sup>4</sup>

<sup>1</sup> IWWR e.V., Germany

<sup>2</sup> oikostat, Switzerland

<sup>3</sup> LNU Kalmar, Sweden

<sup>4</sup> DDA, Germany

Demographic monitoring of Arctic breeding birds in their more accessible non-breeding grounds has a long tradition. Seaducks like the Long-tailed Duck *Clangula hyemalis* form an exception as they move between the tundra and off-shore wintering sites, making monitoring difficult at any time of the year. Due to their recent decline, gathering information on the state of European seaduck populations has become more important.

Field studies in the Russian tundra and tracking of female Long-tailed Ducks showed that most of the population still winter in the Baltic Sea. There were no indications for decreased survival in adult females, but proportions of females breeding successfully were very low.

To monitor breeding success across the entire population, we developed a field method to record age and sex composition of Long-tailed Duck flocks in their marine wintering areas. We combined the data obtained with records from other sources in a multi-step approach including error propagation, to estimate annual breeding success at the population level, taking into account the seasonal and spatial variation in flock composition.

We found a long-term decrease in breeding success, likely linked to the disappearance of Lemming cycles, which are known to affect many tundra-breeding birds. A matrix population model showed that this may be sufficient to explain the decline of the Long-tailed Duck population of Western Siberia/North Europe as observed in the Baltic Sea.

Supported by the Federal Agency for Nature Conservation (BfN) with funds from the German Ministry of Environment and by Vogelschutz-Komitee e.V.

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 15:45h

### eDNA as a non-invasive tool for biomonitoring and ecological assessment in the marine environment

Dr. Alicia Dalongeville  
SPYGEN

Environmental DNA (eDNA) metabarcoding is a recent technology for inventorying aquatic biodiversity based on DNA traces taken from the environment. All species constantly secrete fluids and cells containing DNA that can persist in the environment for several hours. Hence, eDNA offers new possibilities to study rare, elusive and cryptic marine fauna. By collecting, extracting, amplifying and sequencing the DNA contained in seawater samples, the species present in the immediate area where the sample was collected can be identified. eDNA is non-invasive for the species and the ecosystems, since it does not require catching organisms. With fast-growing developments and utilization over the past 10 years, the technic has proved successful in tracking endangered marine species and to produce wider biodiversity assessments than classical census methods, particularly for highly mobile fishes and elusive sharks and marine mammals. These features make this method particularly suitable for ecological survey and biomonitoring of the marine ecosystem.

We will see multiple applications of eDNA technics for biomonitoring and ecological assessment of marine systems through various projects conducted in different regions. In particular, we will see how eDNA can be used to track endangered and exotic species, to monitor marine protected areas and to explore remote marine environments. Finally, we will see the current developments of eDNA technologies, protocols and sampling tools to monitor offshore and deep marine ecosystems, that are particularly poorly known despite their increasing importance for conservation and human activities.

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 16:10h

### Using eDNA to capture elasmobranch diversity in temperate marine environments

Stefano Mariani  
Liverpool John Moores University

Sharks and rays are among the most threatened organisms on the planet and their conservation management has progressively become a prominent topic in marine ecology. Since these organisms are often rare, elusive, and generally challenging to observe and study using traditional visual and capture-based methods, we set out to devise and refine environmental DNA (eDNA) approaches to assess their diversity and track their distribution. While initial efforts focused on megadiverse hotspots in tropical reefs in the Caribbean and the Indo-Pacific, we expanded our investigations to temperate areas, including coastal waters around the British Isles, continental slopes in the Mediterranean, and kelp forests along the California coast. Here I will recount our experiences with this methodology, the insights obtained by looking at these animals through the tiny organic fragments they leave behind, and how novel stratagems can help circumvent some of the current limitations of this approach.

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 16:35h

### eDNA in sediments to identify ecosystem history

Inés Andrea Barrenechea Angeles  
Arctic University, Tromsø

Environmental DNA (eDNA) has emerged as a powerful tool across diverse habitats, including water, sediment, and air, revolutionizing diversity biomonitoring, invasive species detection, and environmental assessment. DNA associated with mineral particles in sediments has a remarkable conservation potential, ranging from thousands to two million years. Named sedimentary DNA (sedDNA), it unveils a spectrum of life forms: prokaryotes (bacteria, archaea), unicellular eukaryotes (foraminifera, radiolarians), and animals (molluscs, worms). This biological diversity spans primary producers like algae (diatoms, dinoflagellates) to higher trophic levels encompassing fish and whales. By decoding this diversity, ancient ecosystems can be reconstructed and diversity shifts to the present can be tracked. Furthermore, by finding indicator species, past climatic conditions and environmental qualities can be inferred. This presentation highlights and illustrates how genetic data, especially sedimentary DNA, can be used to establish a baseline, particularly in cases where biodiversity has already been compromised such as in the highly polluted Bagnoli Bay (Italy).

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 17:00h

### Data management for biodiversity monitoring

Mirko Hauswirth<sup>1</sup>, Bernadette Lier & Matthias Bluhm<sup>2</sup>

<sup>1</sup>German Federal Agency for Nature Conservation(BfN)

<sup>2</sup>con terra

The Federal Agency for Nature Conservation (BfN), Dept. Marine Nature Conservation, is responsible for nature conservation in the German Exclusive Economic Zone (EEZ). Tasks include the selection and administration of marine protected areas and the marine biodiversity monitoring. The acquisition of long-term systematic monitoring data of the environment is a major focus at the BfN. This is how many data are created: conservation status of biotopes and habitats, seabirds, marine mammal and benthos populations. This includes distribution and abundance, habitat quality, trends and threats. The information collected and processed by the BfN must be provided internally and for public by national law and EU Directive Guidelines in the required reporting formats (Marine Strategy Framework Directive [MSFD], EU Birds Directive and the Habitats Directive, INSPIRE). To meet these requirements information must simply be made available with modern Apps and Services. For these purposes, a system architecture was developed at BfN. Result is a database with consolidated data from 2001 and a workflow for future data updates.

To map the geographic and temporal distribution of cetaceans and sea birds spatiotemporal selections and mappings of all sightings from surveys by regular vessel and aircraft-based counts along transects in the German North and Baltic Sea were performed. In the Baltic Sea, harbour porpoise echolocation clicks are additionally monitored by a specially developed network of detectors. This data can also be used to infer spatial and temporal distributions. The results will be made available by Mapping-Services, Web-Apps and Story Maps (e.g. <https://storymaps.arcgis.com/stories/c66060373e0743a1a052027e152c6196>).

For a smooth operation of the infrastructure a workflow with supporting software tools is developed, which provides a simple flow of information from data collection to the desired information products.

This case study shows how GIS can help to manage marine protected areas and bring information to both, scientists and public. It is a helpful tool for the analysis of correlations between marine biodiversity monitoring data and other spatial data, e. g. fisheries, shipping and offshore wind turbines."

## Monitoring and mapping – new techniques and results

Thursday, 21<sup>st</sup> September 2023, 17:25h

### BfN Data Buoys: Towards a better monitoring of MPA's

Henning Gerstmann, Alexander Dehn, Jochen Krause  
German Federal Agency for Nature Conservation(BfN)

BfN started a pre-operational monitoring of environmental status in marine protected areas in the German EEZ in the Baltic Sea and the North Sea in 2023. Three so-called data buoys are currently measuring several parameters for assessment of the marine environment, including oceanographic and acoustic and physical parameters. Three additional buoys are currently under development and are planned to be subsequently taken into operational status within the near future.

However, there are open questions and challenges to be answered before the collected data can be operationally used. E.g. the data flow from offshore to the spatial data infrastructure of BfN is challenging due to data amount and unstable transfer solutions. Here, more effective ways must be designed and implemented. Moreover, legal questions must be discussed and answered with other affected parties.

Since the data buoys are enqueueing the existing monitoring network in the German territorial waters harmonized access to the collected data is required for analysis to fulfil reporting obligations to OSPAR, HELCOM and the European Commission as well as for scientific needs and public relation. European standards, that harmonize environmental monitoring data, exist but are hard to implement. Thus, complex transformation workflows must be designed to make the measurement data available in geodata infrastructures.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 9:20h

Transformative perspective:

A plea for a paradigm shift towards mindful conservation

Fabian Ritter  
M.E.E.R. e.V.

The seas enjoy a high esteem in the general public, while at the same time they suffer from anthropogenic impacts on a global scale, and often in extreme ways. It seems there is a huge discrepancy between how we humans think about our marine environment(s), and how we behave to impact and/or conserve them. In this talk, I am going to argue that the purely scientific and thus intellectual approach to marine conservation has largely failed over the past decades. The situation today is, for many habitats, species and populations, more dire than it has ever been. The idea of “we need to know more” – a credo of the scientific community – often is even being (mis)used to postpone necessary conservation decisions. To adapt our path towards more profound and, importantly, more effective marine conservation, we need to go deeper and change the Narrative of Separation, i.e. the concept of humans being set apart from the rest of nature. Instead, we need to create a narrative of connectedness, i.e. the consciousness of humans being an integral part of the planetary system. More holistic aspects of conservation need to be incorporated in our future efforts, including the integration of traditional and indigenous knowledge, recognizing ecosystem functions of marine life and protecting the processes they sustain, respecting “holiness” of nature while focusing on animals’ individuality, personhood and the cultural identity of distinct communities, e.g. in cetaceans. Fruitful marine conservation will be possible only on the basis of a profound change of our values and a fundamental change of the societal system we are living in.



## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 9:30h

### Protection and recovery of the Baltic sturgeon (*Acipenser oxyrinchus*)

Christin Höhne

LFA MV, Mecklenburg-Vorpommern Research Centre for Agriculture and Fisheries

With almost all populations showing a dramatic downward trend, sturgeon have long been considered one of the most threatened vertebrate groups, and efforts to protect and recover them are underway worldwide.

Measures to prepare for the re-introduction of the extinct Baltic sturgeon began some 30 years ago in Germany and Poland. Milestones for today's success were the mapping of historical and potential spawning areas, and genetic studies of museum specimens with surprising results. These lead to first releases of Canadian *A. oxyrinchus* from artificial reproductions and to the establishment of a broodstock of Canadian *A. oxyrinchus* in Germany between 2005 and 2006.

The Baltic Sea Action Plan (BSAP 2007) from the Helsinki Commission (HELCOM) states that contracting parties should support Poland and Germany in the re-introduction of Baltic sturgeon. Thus, in 2013, partners from Germany, Poland, Denmark, Estonia, Latvia, Lithuania and Russia began to develop the Baltic Sea Sturgeon Action Plan (BSSAP 2019) for the protection and recovery of the Baltic sturgeon.

Furthermore, in 2019, the EG STUR was established as an official HELCOM Expert Group of sturgeon experts. Its main goal is the support of signatory countries in the implementation of the BSSAP to revive self-sustaining sturgeon populations in the Baltic. The EG STUR serves as a platform for the exchange of experience and the coordination of national activities. It provides support for the implementing bodies in the respective countries and raises awareness upon conflicting measures that hinder the implementation of the plan. Its members develop common best practice guidelines and harmonize ex situ as well as in situ measures.

In four member states, the EG STUR established broodstocks of *A. oxyrinchus*. Genetic management enables the development of genetic reproduction plans and studbooks. Joint monitoring projects of released sturgeons allow understanding habitat utilization and migration. The study of historical newspapers and findings of sturgeon as well as habitat assessments in the field revealed that *A. oxyrinchus* was also present in Göta Älv (SWE) and in UK waters. Now, a Swedish Restoration project is under preparation and EG STUR members developed an Action Plan for the UK.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 9:55h

### Swimway – an initiative for the protection of migrating fish species in the Wadden Sea Area

Julia A. Busch

CWSS and trilateral Expert Group Swimway

The Wadden Sea is the largest tidal flats system in the world, where natural processes proceed largely undisturbed. The UNESCO World Heritage property extends along the coasts of Denmark, Germany and the Netherlands. In the framework of the Trilateral Wadden Sea Cooperation (TWSC), the three countries take on the responsibility of preserving this irreplaceable ecosystem for the benefit of present and future generations.

The Wadden Sea ecosystem holds important habitats for fish species, at least at some parts of their life stages. Yet, populations of many fish species in the Wadden Sea have declined in recent decades. A trilateral Expert Group Swimway is working on improving the situation for fish in the Wadden Sea. This goal is to be achieved by fostering trilateral collaboration on the implementation of trilateral fish targets and to provide an overarching Swimway approach: Swimway Wadden Sea is this overarching approach - an umbrella – for a wide variety of initiatives related to achieving trilateral fish targets (<https://swimway.waddensea-worldheritage.org>).

Recent Swimway Wadden Sea activities include the project Systematic review for historical reconstruction of the Wadden Sea fish assemblage – Swimway historical reference” (SHIRE) in 2022. The study aimed to fill the gap in historical knowledge by providing a database on fish assemblages in the Wadden Sea between 1500-1970. In total 4240 individual records were screened of which 109 were eventually included in the synthesis.

The main benefit of Swimway activities will be the identification of population bottlenecks and the translation of this knowledge into effective management and conservation measures. Closing these knowledge gaps will help to improve effective conservation.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 10:20h

### European oyster restoration in Germany – RESTORE & PROCEED

Bernadette Pogoda

Alfred-Wegener Institute Helmholtz-Centre for Polar and Marine Research

Against the background of the UN decade on ecosystem restoration and the new EU Biodiversity Strategy for 2030, restoration of ecological key habitats to achieve the recovery of biodiversity hotspots are gaining in importance. The European oyster is considered a keystone species, providing unique ecological functions for its typical habitat. Due to its global and regional significance, it was included in the OSPAR list of endangered species which need protecting. Oyster beds are characterized as hot spots of biological diversity; they provide food, shelter, and substrate for fish and invertebrates, and act as spawning and nursery grounds for mobile fauna; they improve the water quality by filtering suspended particles, locally reduce toxic algal blooms, consolidate loose sediments, provide coastal protection and, in general, increase the value of the surrounding ecosystem (ecosystem value). Native oyster stocks are classified as highly endangered throughout Europe. Permanent and massive fishing pressure over centuries resulted in the collapse of Europe's oyster populations in the 20th century. The originally extensive oyster habitats of the German Bight have been destroyed and vanished over the course of a century, driven to extinction by overfishing. We present the progress of two closely linked initiatives for biogenic reef restoration, addressing the restoration of native European oyster *Ostrea edulis* in marine protected areas (MPAs) of the German Bight in the North Sea. In the context of marine spatial planning and complex maritime user conflicts, we provide information on habitat suitability for large-scale restoration and showcase critical steps for the design and implementation of conservation management and for supporting successful, sustainable, and ecologically efficient restoration measures. We discuss our pilot reef and progress in the restorative continuum, between feasibility studies with small-scale experiments and designated upscaling for marine conservation measures.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 11:10h

### An overview of European Oyster restoration in UK

Philine zu Ermgassen  
University of Edinburgh

Reef ecosystems built by the European flat oyster (*Ostrea edulis*) are functionally extinct throughout their native range. Over the past decade, following encouraging results for oyster restoration in the USA, there have been increasing efforts to restore this once dominant habitat. The functional extinction of the habitat has, however, presented several challenges to the development of restoration efforts. Here we will chart the growth and development of restoration efforts in the UK, examine some of the lessons learned and identify barriers that have or need to be overcome. We will showcase projects from across the UK to illustrate the progress that has been made to date.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 11:25h

### The Mar Menor Oyster Initiative: Nature-based solutions for eutrophicated marine ecosystems

Marina Albentosa

Oceanographic Centre of Murcia / Spanish Institute for Oceanography

The Mar Menor lagoon (SE Spain) is the largest hyperhaline lagoon in the Mediterranean basin. The effect of several anthropogenic impacts on the lagoon during the last decades have been degrading the lagoon environmental conditions until the recent ecosystem collapse in 2016. In this context, The Mar Menor Oyster Initiative (MMOI, <https://noraeeurope.eu/spain-the-mar-menor-oyster-initiative/>), included in the NORA Alliance since 2020, aims to gain knowledge on the nutrient extraction capability of the Mar Menor oyster (*Ostrea edulis*) and develop the necessary tools for restoration and bioextraction actions.

The first MMOI program has been the RemediOS project (<https://www.youtube.com/watch?v=ql-p6l-TZ-zo&t=44s>) that aims to obtain oyster seed using the decimated local broodstock to provide the initiative with an oyster population to work with. For that purpose, the RemediOS hatchery was designed as a small-scale experimental hatchery for the proof of concept and as a place for dissemination of nutrient bioextraction and oyster restoration concepts. Larvae produced in the hatchery accounted for 57.5 million, of which 11.8 million were cultured and 0.68 million survived to settlement and metamorphosis.

In collaboration with NGOs, ANSE and WWF, the seed produced in the RemediOS hatchery is being growing in the salt marshes around the Mar Menor through RESALAR project (The Regeneration of salines and sandbanks in the Mar Menor <https://www.asociacionanse.org/presentacion-del-proyecto-resalar-en-las-salinas-de-mar-chamalo/20221205/>), whose main objective is the restoration of Marchamalo saltponds and their use for the reproduction and conservation of species of the Mar Menor that can be used in restoration actions of the lagoon. These saltponds have a high ecological and cultural value despite having been abandoned for more than 30 years. Oysters growth together with a complete physiological study (clearance, absorption and respiration rates and their integration in the energy balance equation) are assessed every month in the salt channels where the oysters are growing.

Other actions foreseen for the near future include two pilot studies. A demonstration scale oyster reef restoration pilot to determine the viability of restoration and provide a platform to measure denitrification rates. And a small-scale aquaculture pilot to assess its viability, demonstrate depuration of biological contaminants and measure bioextraction potential.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 11:50h

### Progressing Seagrass Restoration in the UK

Eric Holden & Katherine Knight  
Seawilding, Community-led Marine Habitat Restoration

Seawilding have been restoring *Zostera marina* in Loch Craginish since 2021. Now into their third season of restoration, the seagrass project officers Eric and Katherine will share their experiences to date, their challenges and successes along the way, which started with planting seeds in hessian bags, more recently progressing to the exciting rhizome transplant method which they have introduced to the UK from Canada.

#### Background

Scotland is an important location for seagrass globally, holding 20 % of the seagrass beds in north-west Europe. Yet as of 2020 no seagrass restoration had been undertaken in Scottish waters. The lack of restoration activities meant that not only was the habitat not being improved, but also that no data was available on the feasibility of seagrass restoration in Scotland. In 2021 the Scottish charity Seawilding began the first seagrass restoration project in Scotland. Led entirely by the community it was also the first of its kind in the UK. Seawilding was founded by the community living on the shores of Loch Craginish in order to protect the health of the loch. Having begun restoration efforts with a pioneering community led Native oyster (*Ostrea edulis*) restoration program aiming to put 1 million Native oysters back into the waters of Loch Craginish, Seawilding were well placed to trial seagrass restoration. To date they have returned over 350,000 native oysters to the loch, planted 320,000 seagrass seeds, and transplanted 10,000 seagrass rhizomes. A further 125,000 seeds have been collected and are currently undergoing processing.

## Initiatives and projects to enhance biodiversity

Friday, 22<sup>nd</sup> September 2023, 12:05h

### SEASTORE - Seagrass restoration in the Baltic Sea

Mia M. Bengtsson, Katharina Kesy, Tadhg O. Corcora, Angela Stevenson, Thorsten Reusch,  
Boris Schröder-Esselbach & Maike Paul  
Greifswald University, Germany

Seagrass meadows are important habitats providing many ecosystem services, such as nursery grounds for crustaceans, bivalves and fish, along with carbon sequestration. To halt the ongoing decline in seagrass area, global attempts to actively restore lost meadows have been initiated, with variable results. Within Project SeaStore, restoration works in the form of replanting using the single shoot method have been carried out at 3 locations in the southwestern Baltic, in the German state of Schleswig-Holstein, chosen for their variety in hydrodynamic conditions, sediment type, and proximity to a natural meadow. Results after 2 years since replanting were promising, with survival of restored plots in all locations, and high shoot densities achieved at some locations. Preliminary results indicate that biodiversity of seagrass epifauna and sediment infauna were rapidly restored upon seagrass replanting, while seagrass sediment microbiomes and carbon stocks took longer to respond to the increased seagrass shoot densities. Project SeaStore demonstrates the feasibility of biodiversity enhancement through seagrass restoration in the Baltic Sea and highlights the need for a better understanding of the interplay between biodiversity, including microbiomes of seagrass and sediments, with carbon sequestration. It is also vital to further investigate the time scales at which seagrass restoration is effective with regards to delivering ecosystem services relating to carbon sequestration and biodiversity enhancement, requiring longer-term restoration and monitoring efforts.