



# THE NORTH-EAST ATLANTIC OCEAN

Key findings from OSPAR's  
Quality Status Report 2023



**OSPAR**  
COMMISSION

Protecting and conserving the  
North-East Atlantic and its resources



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# 01.

## INTRODUCTION



# OSPAR'S QUALITY STATUS REPORT 2023

## STEP INTO THE CAPTIVATING WORLD OF THE NORTH-EAST ATLANTIC OCEAN WITH OSPAR'S QUALITY STATUS REPORT (QSR) 2023.

This communication product provides a glimpse into the findings of our assessments and serves as a gateway to a treasure trove of knowledge within our Synthesis Report. As you navigate through its pages, we invite you to put on your virtual snorkel, explore our findings and embark on a journey into our assessment portal. As you read, remember that the health of the North-East Atlantic is intricately intertwined with the well-being of our entire planet and of human societies.

SCAN TO  
DISCOVER OUR  
SYNTHESIS  
REPORT



## WHAT IS OSPAR?

OSPAR is an international organisation that works to protect the marine environment of the North-East Atlantic. OSPAR brings together 15 countries and the European Union, working collaboratively to address environmental issues affecting the North-East Atlantic Ocean.

OSPAR develops and implements policies, strategies, and agreements to protect and restore the marine ecosystem. It also conducts assessments such as the

QSR 2023, to monitor the health of the ocean and track progress in achieving environmental goals.

Through its work, OSPAR strives to safeguard the marine environment for present and future generations, taking into account the interconnectedness of the ocean with climate change, human well-being, and the overall health of our planet.

## WHAT IS THE QSR 2023?

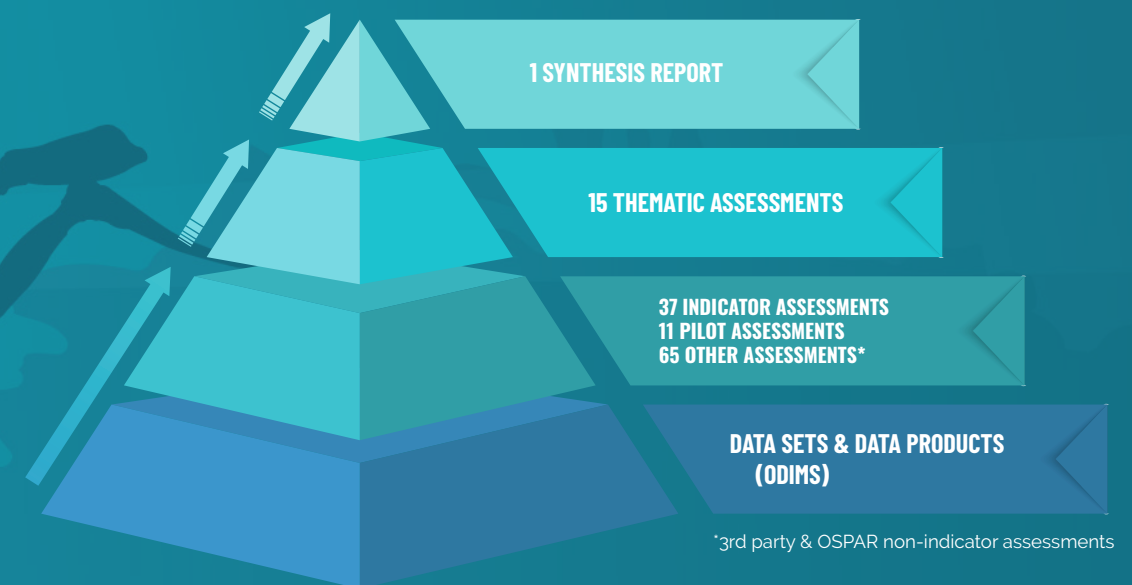
OSPAR's Quality Status Report 2023 is a comprehensive assessment of the environmental health and status of the North-East Atlantic Ocean and of human activities interacting with it.

The report is made up of more than 120 assessments and covers various aspects, including, biodiversity, habitats, and human activities that impact the marine environment. It examines the presence of contaminants and pollutants in the water, such as chemicals and microplastics, and assesses their potential effects on marine life and ecosystems.

Additionally, the report evaluates the status of different marine species, from fish and seabirds to mammals and plants. It looks at population, distribution, and trends, identifying any changes or threats to these species. This information helps scientists and policymakers understand the overall health and resilience of the oceanic ecosystem.

Another crucial aspect addressed in the QSR 2023 is the impact of climate change and ocean acidification on the marine environment. It examines the changes in ocean temperature, acidity, and sea-level rise, among other factors, and assesses their effects on marine life and ecosystems.

Overall, the QSR 2023 serves as an important tool for scientists, policymakers, and the public to understand the current state of the North-East Atlantic Ocean, the challenges it faces, and the measures needed to ensure its long-term health and sustainability.





# FOREWORD

from the convenors of the QSR coordination team

For the third time in my life, I have been involved in the production of an OSPAR Quality Status Report (QSR). OSPAR's QSRs, this one being no exception, are the result of a huge collective effort of the entire OSPAR community.

The fundamental basis is scientific knowledge and understanding of our seas. More than 400 experts contributed their individual expertise to the current production, but this is but one crucial element. Equally important is the spirit of collaboration, the willingness to see beyond national boundaries and specific interests when faced with indisputable observations and a common challenge.

Representatives of national administrations, non-governmental organisations, observers, experts, and the OSPAR secretariat have contributed where and when they can to ensure that this QSR is balanced, representative, innovative and, most importantly, a solid basis for the science-based management of our seas.

This has required a continuous effort to ensure clear and transparent communication with many hours of meetings, numerous virtual exchanges, and let's not forget, a vast number of emails. It's my firm belief that it's only when all actors involved join in an open and fact-based exchange of information around a common goal or challenge that true progress is possible.

The current QSR is an excellent example of such a process. I'm immensely grateful to all those that have contributed. It has been an honour and absolute pleasure to work with all those who participated in this endeavor.



**Dr. Patrick Roose**  
Co-convenor of the QSR coordination team



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*It's my firm belief that it's only when all actors involved join in an open and fact-based exchange of information around a common goal or challenge that true progress is possible.*

This brochure presents the highlights of OSPAR's QSR 2023. Moreover, it serves as the gateway to the wide range of assessments – more than 120! – underpinning the QSR. It is the result of exceptional teamwork, involving the entire OSPAR network of data collectors and managers, analysts, scientists, policymakers, and observer organisations from environmental NGOs and industry bodies.

OSPAR has delivered QSRs since the 1980s, and I've had the honour to be part of the team since QSR 2000. The world around us has completely changed since then, and so have the QSRs: more knowledge and topics, better collaboration, and more impact as European Union member states use the QSR for reporting under the Marine Strategy Framework Directive.

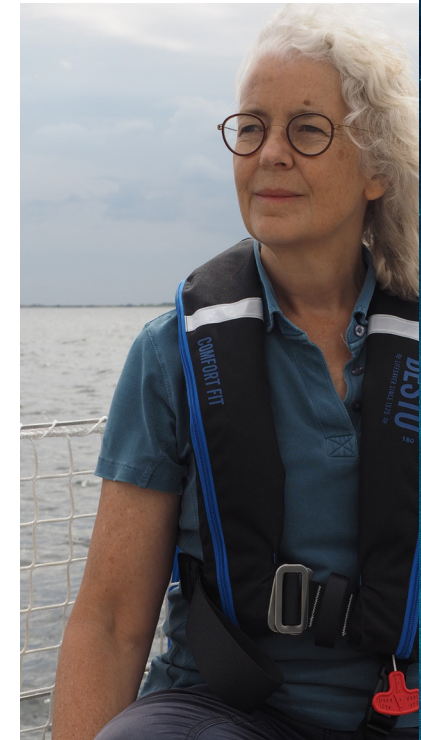
Our assessments of the state of the marine environment provide knowledge that is essential for the development of effective measures to protect the North-East Atlantic Ocean. It is my firm belief that environmental policy and sustainable management need to be based on the best available science.

Over the years, we have found better ways to determine whether the current situation and trends identified therein are 'good' or 'not good'. If the state is deemed to be good, it means that society has properly protected the seas and oceans. If it is not good, something needs to be done.

I call upon you, reader of the QSR 2023, to use the wealth of information and contribute to measures that will make our seas and oceans healthy again.



**Dr. Lisette Enserink**  
Co-convenor of the QSR coordination team



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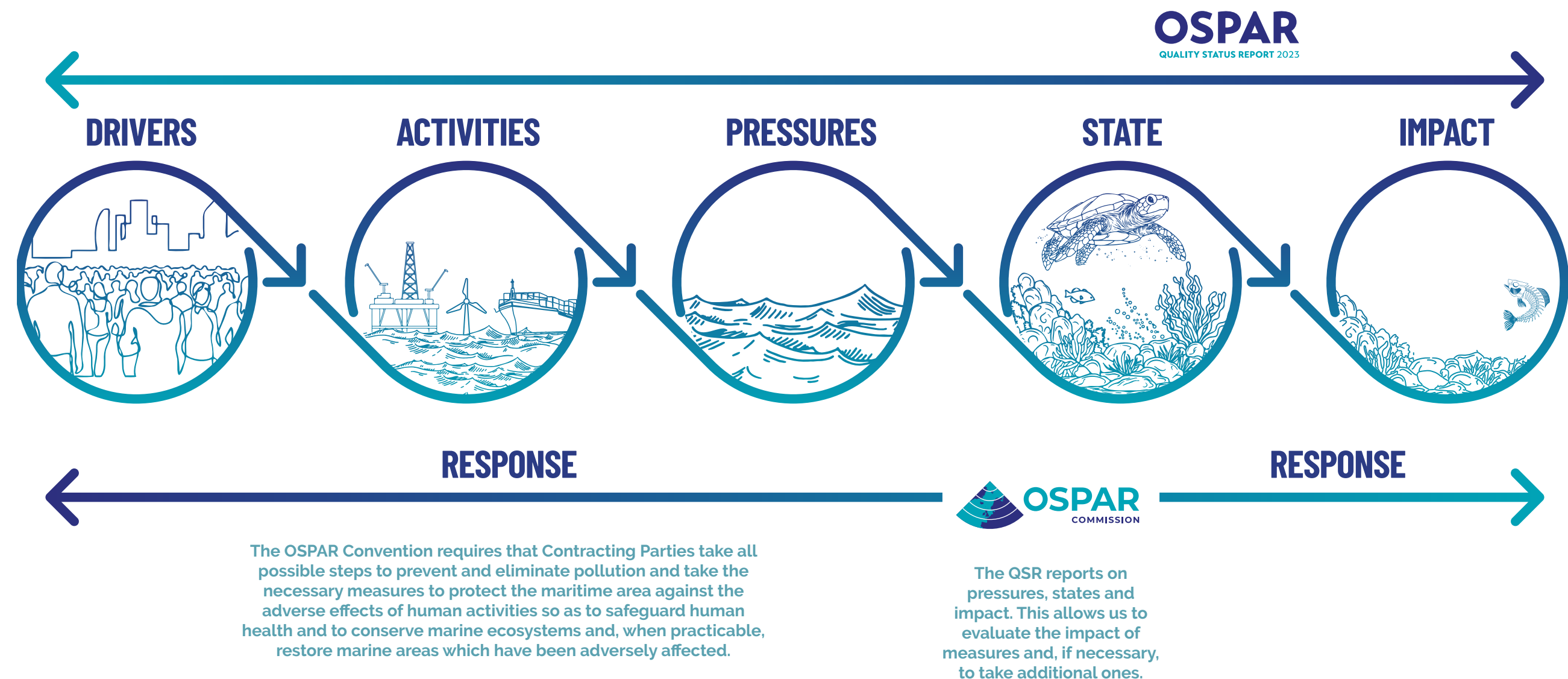
*I call upon you, reader of the QSR 2023, to use the wealth of information and contribute to measures that will make our seas and oceans healthy again.*



# THE STORY OF ... DAPSIR

DAPSIR (Drivers, Activities, Pressures, State, Impact, Response) is a framework to describe the relationships between people, their actions, and the environment.

DAPSIR is the central framework of the QSR allowing us to better understand the bigger picture by presenting all assessments in a comparable way. This maximises the synergies between them and factors in environmental, socio-economic and management aspects. The framework recognises the dependency that societies have on a healthy ocean and ascertains how changes in pressures and states affect the delivery of ecosystem services.





# THE STORY OF... THE NORTH-EAST ATLANTIC: OUR BUSY OCEAN

The North-East Atlantic Ocean is a diverse and vibrant ecosystem, teeming with a rich array of marine life. From the rugged coastlines to the depths of the ocean floor, this vast expanse is home to a remarkable variety of species, habitats, and ecosystems.

The region boasts diverse habitats, from rocky shores and sandy beaches to kelp forests, seagrass meadows, and deep-sea canyons. Its ecosystems range from mussel beds and seagrass beds to deep cold-water coral reefs. Each habitat provides a unique environment that supports specialised species and ecological interactions. Coastal areas serve as nurseries for many fish species, while the open ocean hosts migratory species that traverse vast distances.

The region is rich in marine life with several globally significant populations of marine mammals and seabirds. The air above includes the East Atlantic Flyway, a migratory route for millions of birds who use the coasts for feeding and nesting.

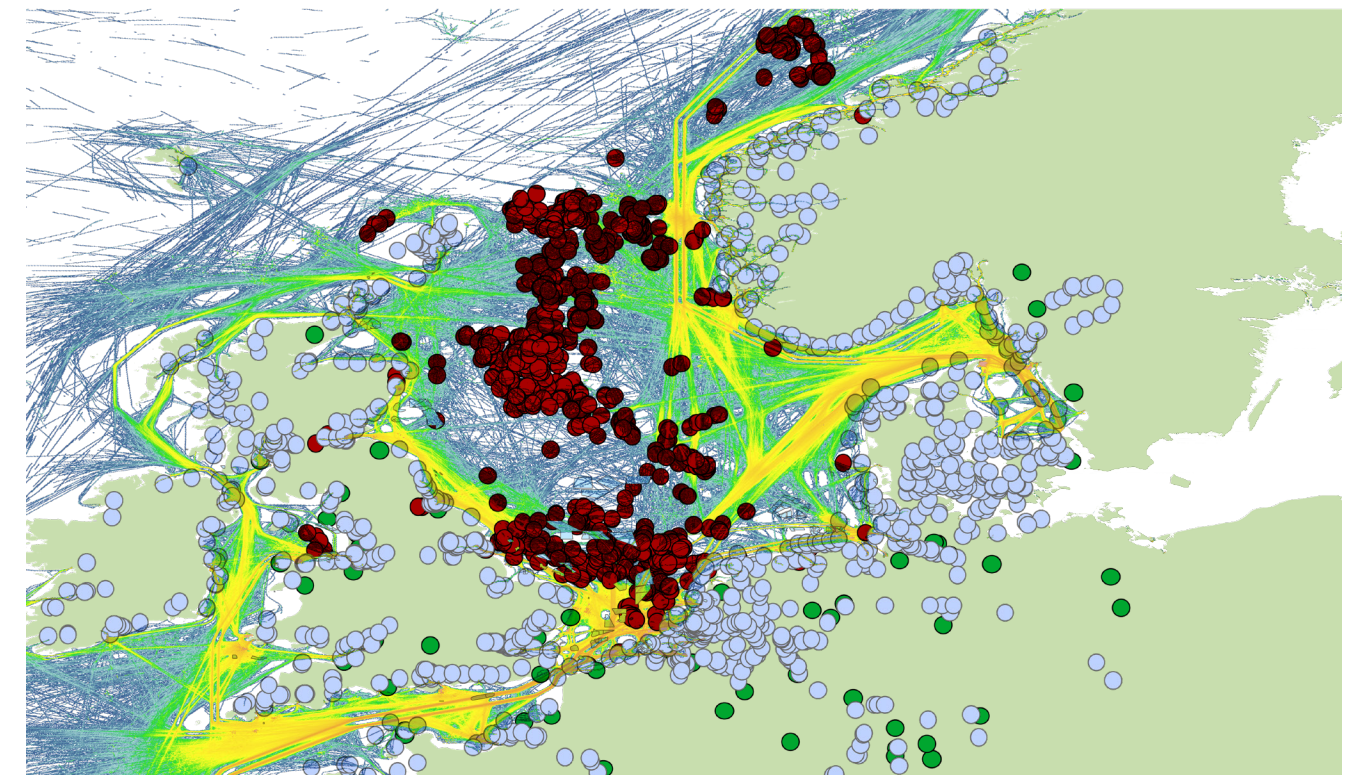
The North-East Atlantic's biodiversity is influenced by a variety of factors, including temperature, currents, and nutrient availability. It is also shaped by interactions between species, such as predator-prey relationships and symbiotic associations.

However, this incredible diversity faces numerous challenges. Human activities, such as shipping, pollution, habitat destruction, and climate change, pose significant threats to the fragile balance of the ecosystem. Efforts are underway to protect and conserve the biodiversity of the North-East Atlantic through the establishment of Marine Protected Areas and pollution reduction measures but there is more to do.

Preserving the diversity of the North-East Atlantic Ocean is crucial not only for the survival of countless species but also for the overall health and resilience of the marine ecosystem. It is a precious natural heritage that warrants our stewardship and respect.

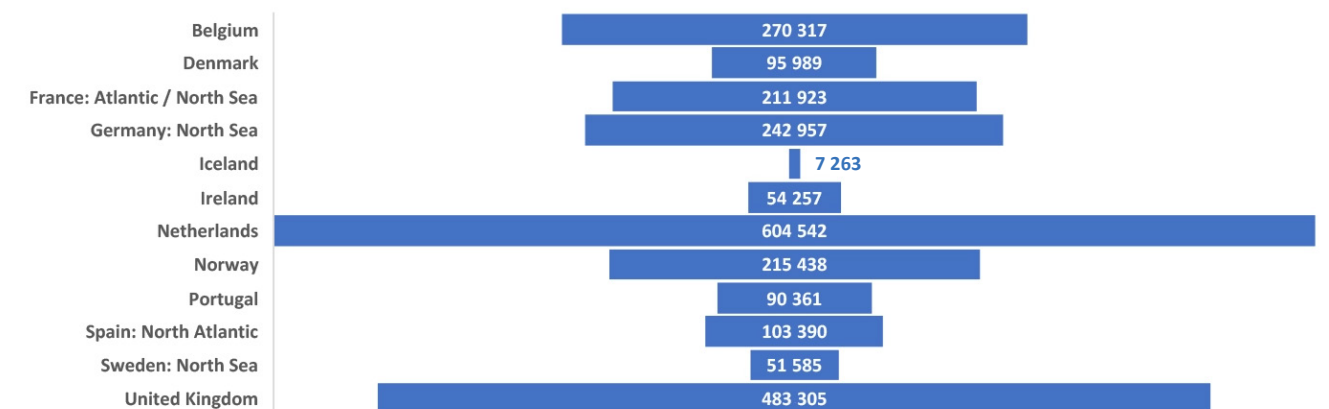
**"Preserving the diversity of the North-East Atlantic Ocean is crucial not only for the survival of countless species but also for the overall health and resilience of the marine ecosystem. It is a precious natural heritage that warrants our stewardship and respect."**

The North Sea is one of the most frequently traversed sea areas of the world with two of the world's largest ports situated on its coasts, Rotterdam and Hamburg.



● LOCATION OF NUCLEAR FACILITIES  
● OFFSHORE INSTALLATIONS  
■ VESSEL DENSITY  
● LOCATION OF PORTS

## GROSS WEIGHT OF GOODS HANDLED IN ALL PORTS IN 2018 BY CONTRACTING PARTY





An aerial photograph of a massive ocean wave, showing the deep blue water and the white, foamy crest. The wave is moving from the top left towards the bottom right. The text '02. PRESSURES' is overlaid on the bottom right of the image.

# 02.

## PRESSURES



# NEGATIVE IMPACTS FROM OIL & GAS ACTIVITIES CONTINUE TO DECREASE

OSPAR measures have resulted in a decrease in all discharges from the offshore oil and gas sector, including discharges of produced water, oil-based drilling fluids, and chemicals that contain hazardous substances. Some pressures that were once widespread, for example pollution from the discharge of untreated oil-based cuttings, have now ceased and the level of contamination has decreased.

A risk-based approach to the management of produced water discharges, the main source of crude oil contamination in the sea, has also been introduced to complement the OSPAR harmonised mandatory control system for offshore chemicals and to promote the shift towards the use of less hazardous substances.

At the same time, OSPAR is working towards the total removal of disused oil and gas installations, with more installations to

be decommissioned in the next decade. Taking into account the experience with the decommissioning of oil and gas installations, relevant research and the exchange of information, OSPAR aims to ensure that derogations from the dumping ban remain exceptional.

These collective measures are expected to further reduce any adverse impacts from oil and gas activities in the OSPAR Maritime Area, although the risks of spills, noise, light and chemical pollution from oil and gas activities remain a concern.

The potential increase in carbon dioxide storage projects to offset carbon emissions from carbon-intensive industries in the OSPAR area will also require greater attention from OSPAR Contracting Parties.

## OSPAR'S NEAES 2030

The environmental pressures from offshore oil and gas activities are addressed under several strategic objectives of the NEAES 2030, namely those relating to the prevention of pollution and marine litter, the reduction of anthropogenic noise and the management of human activities:

**S2.**

Prevent pollution by hazardous substances, by eliminating their emissions, discharges and losses, to achieve levels that do not give rise to adverse effects on human health or the marine environment, with the ultimate aim of achieving and maintaining concentrations in the marine environment at near background values for naturally occurring hazardous substances and close to zero for human made hazardous substances.

**S4.**

Prevent inputs of and significantly reduce marine litter, including microplastics, in the marine environment to reach levels that do not cause adverse effects to the marine and coastal environment with the ultimate aim of eliminating inputs of litter.

**S8.**

Reduce anthropogenic underwater noise to levels that do not adversely affect the marine environment.

**S9.**

Safeguard the structure and functions of the seabed/marine ecosystems by preventing significant habitat loss and physical disturbance due to human activities.

## RELATED ASSESSMENTS

Offshore Industry Thematic Assessment

Impacts of the offshore oil and gas industry on the marine environment

## PRODUCED WATER (PW)

PW is a by-product of oil and/or gas production operations that comes out of the well during production. Discharges of PW represent the largest source of crude oil contamination to the marine environment from offshore oil and gas operations.

### OSPAR MEASURES IMPLEMENTED

#### OSPAR RECOMMENDATION 2001/1

OSPAR Recommendation 2001/1 (as amended) for the management of PW from offshore installations.

#### OSPAR RECOMMENDATION 2012/5

OSPAR Recommendation 2012/5 (as amended) for a risk-based approach (RBA) to the management of PW discharges from offshore installations.

### 2009-2019 FACTS

16% Decrease of dispersed oil discharges PW

21% Decrease of volume of produced and displacement water

## OFFSHORE CHEMICALS

The main discharges of offshore chemicals arise from drilling activities and discharges of PW. Some of the chemicals are hazardous because they contain substances that are either persistent, and/or liable to accumulate in living organisms and/or toxic.

### OSPAR MEASURES IMPLEMENTED

#### OSPAR DECISION 2000/2

OSPAR Decision 2000/2 on a harmonised mandatory control system for the use and reduction of the discharge of offshore chemicals

#### OSPAR RECOMMENDATION 2005/2

OSPAR Recommendation 2005/2 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Contain Added Substances, Listed in the OSPAR 2004 List of Chemicals for Priority Action

#### OSPAR RECOMMENDATION 2017/01

OSPAR Recommendation 2017/01 on a Harmonised Pre-screening Scheme for Offshore Chemicals

#### OSPAR RECOMMENDATION 2010/3

OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format (HOCNF)

### 2009-2019 FACTS

12% Decrease of chemicals used

30% Decrease of chemicals discharged

Phase out of chemicals for Priority Action

## DISUSED OFFSHORE OIL AND GAS INSTALLATIONS

Contracting Parties have fully implemented the ban on dumping or leaving in place disused offshore installations. A review of experience and technical developments relating to the decommissioning of platforms was undertaken in 2013 and 2018.

### OSPAR MEASURES IMPLEMENTED

#### OSPAR DECISION 1998/3

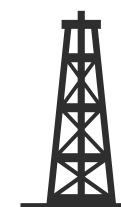
OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations

### FACTS

1300 operational (since 1998)

170 decommissioned

10 derogations issued



5 footings of large steel structures



5 concrete substructures



# POLLUTION BY RADIOACTIVE SUBSTANCES HAS BEEN PREVENTED

The QSR 2023 shows that the application of OSPAR measures achieved progressive and substantial reductions of radioactive discharges from the nuclear sector over the period from 1995 to 2018. Discharges of naturally occurring radionuclides from the oil and gas sub-sector have mostly remained unchanged or have decreased slightly.

Overall, the Contracting Parties have made notable progress towards fulfilling OSPAR's ultimate aim of achieving concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances. The Thematic Assessment on Radioactive Substances concludes that the environmental concentrations of indicator radionuclides present in the OSPAR Maritime Area are not resulting in any significant radiological impact on humans or the marine environment.

OSPAR's focus for the future is to identify further opportunities to prevent discharges of radioactive substances or, where that is not practicable, minimise those discharges even further. OSPAR will also focus on better understanding of the cumulative effects of the various pressures and of the linkages between climate change and radioactive substances in the OSPAR Maritime Area.

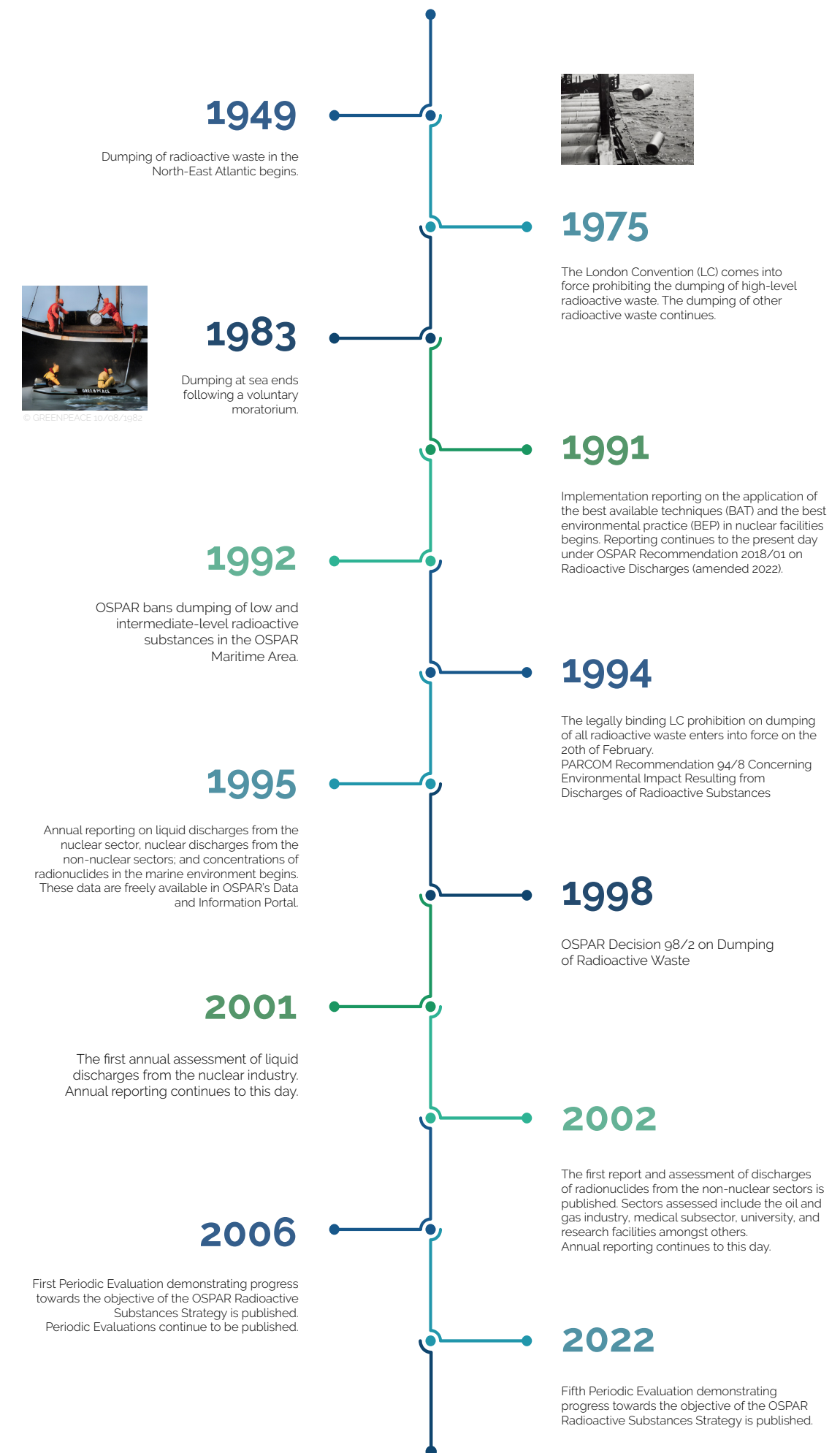
**"Overall, the Contracting Parties have made notable progress towards fulfilling OSPAR's ultimate aim of achieving concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances."**

## OSPAR'S NEAES 2030

- S3.** Prevent pollution by radioactive substances in order to safeguard human health and to protect the marine environment with the ultimate aim of achieving and maintaining concentrations in the marine environment at near background values for naturally occurring radioactive substances and close to zero for human made radioactive substances

## RELATED ASSESSMENTS

- Radioactive Substances Committee Thematic Assessment
- Fifth periodic evaluation of progress towards the objective of the OSPAR Radioactive Substances Strategy





# HAZARDOUS SUBSTANCES ARE CAUSE FOR CONCERN

While concentrations of most hazardous substances lingering in the environment from past introductions (known as legacy hazardous substances) have decreased, their levels remain a cause for concern in the Greater North Sea, Celtic Seas, and Bay of Biscay and Iberian Coast Regions and, at the higher trophic levels, also in the Arctic Region.

Restrictions on the use of hazardous substances have been effective in limiting new releases, but their high chemical stability and re-release from sediment means that they remain a concern. Increasing levels of human activities and new uses of both sea and land could result in increased inputs of other substances, the impacts of which are largely unknown due to lack of ecotoxicological data.

Pollution from the shipping sector has lessened due to regulations on sulphur and nitrogen emissions and ballast water, measures to limit litter, measures regulating port reception facilities and actions to reduce the risk of oil pollution. By contrast, corollary discharges to water through exhaust-gas cleaning systems are increasing.

Furthermore, increased discharges from the rapidly growing aquaculture sector have been reported and it is likely that medicines are included among the substances being discharged. Similarly, dredging and dumping could continue to cause contaminant releases. If seabed mining were to take place in the OSPAR Maritime Area, the potential for additional contaminants would need to be investigated.

## OSPAR'S NEAES 2030

**S2.**

Prevent pollution by hazardous substances, by eliminating their emissions, discharges and losses, to achieve levels that do not give rise to adverse effects on human health or the marine environment, with the ultimate aim of achieving and maintaining concentrations in the marine environment at near background values for naturally occurring hazardous substances and close to zero for human made hazardous substances.

## RELATED ASSESSMENTS

➤ Hazardous Substances Thematic Assessment

➤ Trends in New Records of Non-indigenous Species Introduced by Human Activities

➤ Inputs of Mercury, Cadmium and Lead via Water and Air to the OSPAR Maritime Area

➤ Inputs of Nutrients to the OSPAR Maritime Area

➤ Status and Trend for Heavy Metals (Mercury, Cadmium and Lead) in Fish, Shellfish and Sediment

➤ Status and Trends in the Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) in Shellfish and Sediment

➤ Status and Trends of Polychlorinated Biphenyls (PCB) in Fish, Shellfish and Sediment

➤ Status and Trends in the Levels of Imposch in Marine Gastropods (TBT in Shellfish)

➤ Status and Trends of Organotin in Sediments in the Southern North Sea

➤ Status and Trends of Polybrominated Diphenyl Ethers (PBDEs) in Biota and Sediment

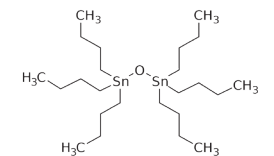
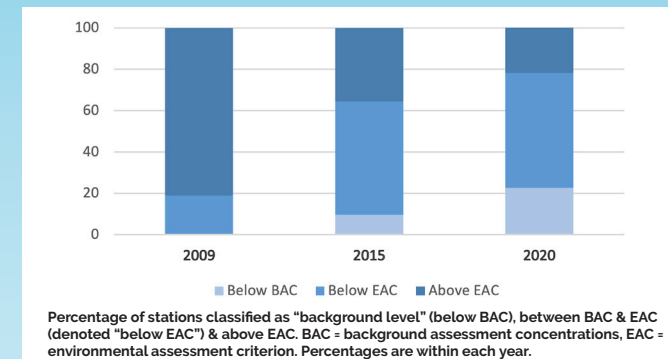
➤ Waterborne and Atmospheric Inputs of Nutrients and Metals to the Sea

➤ Wide-scope target and suspect screening of emerging contaminants and their transformation products in marine biota samples from the North-East Atlantic

➤ Integrated biological effects and chemical contaminants approach: a case study

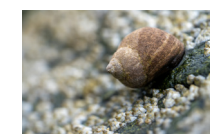
➤ Status and Trend Hazardous Substances using CHASE

## CASE STUDY - EFFECTIVE MEASURES: STATUS AND TRENDS IN THE LEVELS OF IMPOSEX IN MARINE GASTROPODS (TBT IN SHELLFISH)



Tributyltin (TBT) is a highly toxic biocide that was used extensively from the 1980s to prevent the growth of marine organisms on the hulls of ships and pleasure vessels.

Following a global ban on the use of tributyltin and other organotins in antifouling paints in 2008 there has been a marked improvement in the reproductive condition of marine snails since the Quality Status Report 2010.



Tributyltin affects many organisms, but marine gastropods, such as the dogwhelk, *Nucella lapillus* (L.) are among the most sensitive.



# NOISE POLLUTION REMAINS A THREAT

Underwater noise from shipping, oil and gas activities (including seismic surveys) and, increasingly, from offshore wind activities during both construction and exploitation remains a pressure on marine mammals and other forms of marine life.

Guidance from the International Maritime Organization (IMO) on the reduction of shipping noise has been followed in the OSPAR Maritime Area, but as yet without any significant effect on noise levels. The incidence

and intensity of noise pollution, whether continuous noise largely from shipping or impulsive noise from seismic exploration, pile driving and military activities, are expected to increase in the North-East Atlantic.

For this reason, OSPAR has committed to producing a regional action plan of measures to reduce noise more effectively.

## RESPONSE

OSPAR has started to work on the development of the regional action plan for underwater noise. The action plan will tackle pressures from both impulsive and continuous noise.

The plan will add value to existing OSPAR actions and will identify and address gaps. The regional action plan aims to:

- Develop harmonised targets, standards and approaches towards the reduction of anthropogenic noise;
- Develop sub-regional approaches for noise management in order to reduce both pressure and exposure;
- Share best practice;
- Collaborate internationally with other Regional Seas Conventions to develop common approaches, add value to existing processes and not duplicate efforts;
- Collaborate with other international organisations such as IMO in order to improve protection of the North-East Atlantic and promote effective regional implementation of globally agreed measures and guidelines;
- Support Contracting Parties in the development, implementation and coordination of their programmes on underwater noise, including those for the implementation of the EU's Marine Strategy Framework Directive (MSFD);
- Improve the knowledge base on underwater noise, through the OSPAR Science Agenda, and the OSPAR Joint Assessment and Monitoring Programme;

## OSPAR'S NEAES 2030

**S8.**

Reduce anthropogenic underwater noise to levels that do not adversely affect the marine environment.

## RELATED ASSESSMENTS

Underwater Noise Thematic Assessment

Distribution of Reported Impulsive Sounds in the Sea

Risk of Impact from Anthropogenic Impulsive Sound

Pilot Assessment of Ambient Noise

## WHAT IS THE PROBLEM?

Noise can affect marine animals by interfering with their ability to communicate, navigate, find food, or detect threats; by provoking fleeing or distraction; or by causing injury or death.



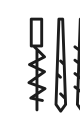
SHIPPING



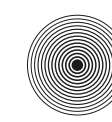
OPERATIONAL WIND FARMS



TIDAL ENERGY



PILE DRIVING



SEISMIC SURVEYS

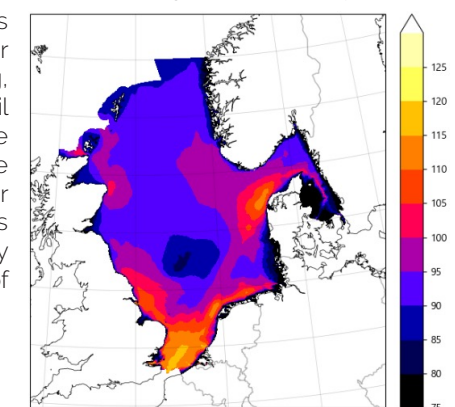


EXPLOSIONS (UXO)

## CONTINUOUS NOISE

The dominant source of continuous underwater noise is shipping; other sources include recreational boating, fishing, aggregates extraction, oil and gas activities, and offshore wind turbines. In large areas of the Southern North Sea, and along major shipping routes, the noise exceeds natural sound in the low frequency bands by over 20 dB for over 50% of the time.

Median total sound pressure level, 2019, measured in 125 Hz band:



## IMPULSIVE NOISE

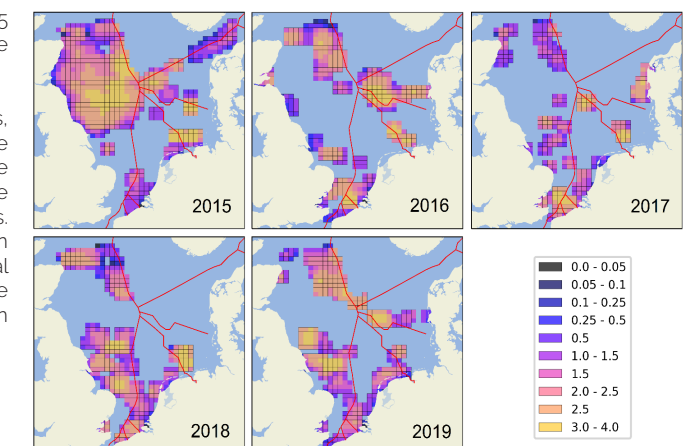
Impulsive noise is produced by various activities such as seismic air gun surveys, pile driving for offshore wind turbines and other construction, explosions, military activities, and certain acoustic deterrent devices.

By combining information on harbour porpoise densities with data on the sources of impulsive noise, it is possible to create risk maps that illustrate the level of overlap between impulsive noise pressure and the presence of porpoises. The risk of disturbance to harbour porpoises from reported impulsive noise

showed a decrease from 2015 to 2017, followed by an increase until 2019.

During pile driving activities, abatement techniques like the use of bubble curtains have been employed to mitigate the impact of impulsive sounds. These techniques have proven effective in reducing the annual exposure indices of pressure from impulsive noise when compared to unabated piling.

Annual risk maps for harbour porpoise from impulsive noise, 2015-2019, March-November





# EUTROPHICATION PERSISTS

The input of nutrients from agriculture, aquaculture, wastewater from point sources such as outfalls and riverine discharges, run-off from land and deposition from the atmosphere continue to cause eutrophication in some OSPAR Regions. Eutrophication of coastal waters affects marine productivity, community composition, food web structure and ecosystem carrying capacity, lowers water quality and the aesthetic values of coastal areas, and can threaten human health.

In response, OSPAR Contracting Parties have made significant efforts to reduce nutrient inputs to the marine environment, particularly from agricultural sources, municipal wastewater and industrial and atmospheric sources. This has led to a steady improvement in the most affected OSPAR Regions, though the pace of advances in combatting eutrophication has not been sustained as compared to a previous assessment period (2000-2010).

## RESPONSE

OSPAR Contracting Parties have made significant efforts to reduce nutrient losses to the marine environment. As early as 1988, Contracting Parties agreed to reduce nutrient emissions to the Greater North Sea by 50% (PARCOM Recommendation 88/2). This commitment was reinforced through PARCOM Recommendation 89/2, which introduced a coordinated programme to reduce nutrient inputs.

PARCOM Recommendation 92/4 introduced a range of measures aimed at agricultural practices that were causing excessive nutrient losses. Measures to reduce inputs have since been implemented and in several cases augmented by European Union Directives covering wastewater treatment, nitrates in agriculture, industrial emissions, and water and marine management. Furthermore,

Eutrophication persists in river plumes and in some coastal areas, and in some catchments, nutrient inputs have even increased. Contracting Parties remain committed to the ever more difficult task of controlling nutrient pollution from point sources, rivers and the atmosphere – which will only become harder, particularly if climate change exacerbates eutrophication effects.

In this regard, the process of setting nutrient reduction targets that reflect how climate change may worsen eutrophication effects is becoming increasingly important. Ways of controlling eutrophication through nature-based solutions which protect and restore estuaries and wetlands that filter nutrients will be explored and adopted where needed.

atmospheric emissions are regulated through the Gothenburg Protocol of the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP), which is implemented by EU Member States through the National Emissions Ceilings Directive (2016/2284/EU).

As a result of these regulations and agreements, wastewater treatment and industrial point sources have reduced their discharges of both nitrogen and phosphorus. Riverine inputs of phosphorus have decreased significantly, as have atmospheric nitrogen inputs. The most dramatic improvements have come from the atmospheric nitrogen input reductions and the reduction in fertiliser use since 1990. Nonetheless, agriculture remains a major nutrient source in our rivers and seas.

## RELATED ASSESSMENTS

- Eutrophication Thematic Assessment
- Concentrations of Dissolved Oxygen Near the Seafloor in the Greater North Sea, Celtic Seas and Bay of Biscay and Iberian Coast
- Concentrations of Chlorophyll-a in the Greater North Sea, Celtic Seas and Bay of Biscay and Iberian Coast
- Winter Nutrient Concentrations in the Greater North Sea, Celtic Seas and Bay of Biscay and Iberian Coast

## OSPAR'S NEAES 2030

**S1.**

Tackle eutrophication, through limiting inputs of nutrients and organic matter to levels that do not give rise to adverse effects on the marine environment.

## WHAT IS EUTROPHICATION?

Eutrophication is the result of excessive enrichment of water with nutrients, which may accelerate the growth of algae (phytoplankton) in the water column. This may result in a range of undesirable disturbances in the marine ecosystem, including a shift in the composition of the flora and fauna, which in turn affects habitats and biodiversity, depletion of oxygen, changes in water clarity, and behavioural changes or even death of fish and other species.

The magnitude of the growth in aquaculture within the OSPAR Maritime Area is striking. The Arctic was the only region to show significant increases in waterborne nutrient inputs. Analysis of changes in direct discharges to the North-East Atlantic showed that almost all the improvements in discharges from industry and wastewater treatment were cancelled out by the increases from marine aquaculture.

## THE COMPEAT TOOL

The Common Procedure is a harmonised and comprehensive approach developed by OSPAR Contracting Parties for assessing eutrophication in the North-East Atlantic. It serves the purpose of identifying, classifying, and evaluating eutrophication status, as well as determining the need for remedial measures, the scale of required actions, and assessing the effectiveness of implemented measures.

By incorporating the best available scientific knowledge, the Common Procedure reflects OSPAR's utilisation of both regional and risk-based approaches to interpret and assess eutrophication in the North-East Atlantic. Based on the rules outlined within the Common Procedure, an assessment of eutrophication status is produced by the Common Procedure Eutrophication Assessment Tool (COMPEAT). This automated classification tool is hosted by ICES.

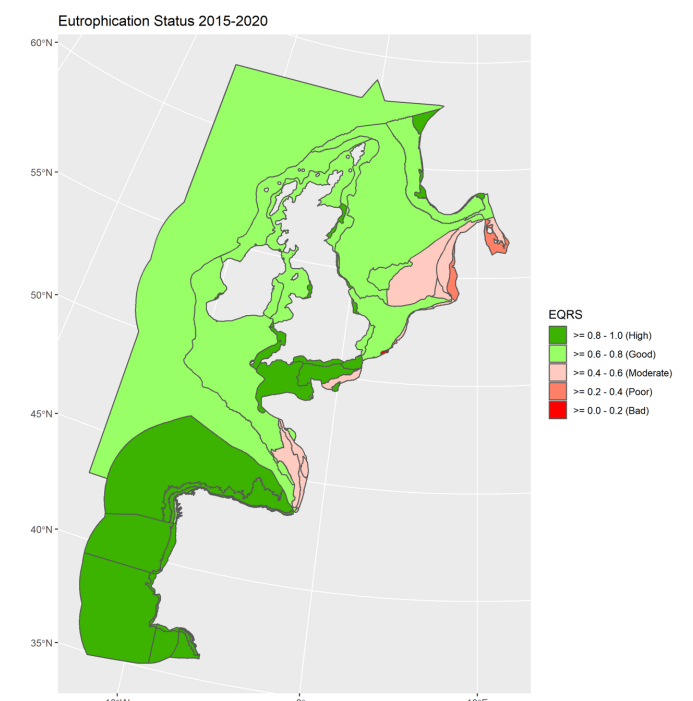
Besides an assessment of the eutrophication status and its confidence the tool also allowed an assessment back in time, re-running COMP1 (1990-2000), COMP2 (2001-2006) and COMP3 (2006-2014) and thereby delineating the history of eutrophication from 1990 until today in the Greater North Sea, Irish Sea, and Bay of Biscay and Iberian Coast. The use of COMPEAT coupled with the refining of specific small-scale assessment areas has led to an objective assessment of status which has a common scientific basis across the whole of the North-East Atlantic.

Assessment areas which were initially developed by JMP-EUNOSAT and refined by ICG-EMO, were defined by oceanographic criteria rather than international boundaries and are therefore consistent across international boundaries, in contrast to previous assessments.

## EUTROPHICATION ASSESSMENT RESULT FOR THE COMP4 PERIOD 2015-2020

All three Common Indicators on winter nutrient concentrations, chlorophyll-a concentrations and seafloor dissolved oxygen have been integrated to the overall eutrophication assessment result.

The results show that the assessment areas in moderate or worse status were mainly detected in the south-eastern North Sea, in river plumes along the continental coast from Belgium up to Denmark and the Kattegat.





# MARINE LITTER LEVELS REMAIN HIGH DESPITE SIGNS OF IMPROVEMENT

Overall, the amounts of marine litter in the OSPAR Maritime Area remain high, although there has been a statistically significant decrease in plastic litter on beaches in most OSPAR Regions and a decrease in floating litter in the North Sea. This can be set against an increase in annual per capita plastic consumption in OSPAR countries, with levels reaching a record 100 kg in western Europe, underlining that waste handling could have an impact on marine pollution levels.

The estimated annual input of microplastics into OSPAR catchments averaged over 0.3 Mt, the largest land-based sources being tyre wear and degradation of litter. Additionally, litter from fisheries (solid waste matter including micro-sized litter, and abandoned, lost, and discarded fishing gear), aquaculture, shipping, recreational boating

and offshore industries continues to threaten marine species and habitats, particularly in some OSPAR Regions.

OSPAR's 2014 Regional Action Plan for Marine Litter (RAP ML), which sets out commitments to promote waste prevention and management practices that impact significantly on marine litter, to encourage recyclability and reuse of plastic products, to assess instruments to reduce single-use items and to reduce inputs of microplastics, has mostly been implemented. However, it is clear that, despite the progress that has been made to prevent plastics from entering the marine environment, more needs to be done, and this is reflected in the second Regional Action Plan on Marine Litter, adopted in 2022.

## RESPONSE

### OSPAR'S SECOND REGIONAL ACTION PLAN ON MARINE LITTER

OSPAR launched its first Regional Action Plan on marine litter in 2014. The plan identified both national and collective actions to tackle sea- and land-based marine litter. Implementation of the Plan was completed in 2021 with 25 out of 32 collective actions completed.

In 2022 OSPAR agreed a second Regional Action Plan to guide its work over the next

decade and achieve further significant reductions in the prevalence of marine litter. The Plan presents 25 collective actions covering issues such as waste management, waste water, riverine inputs, products and packaging, offshore industries, shipping, fishing and microplastics.

## OSPAR'S NEAES 2030

**S4.** Prevent inputs of and significantly reduce marine litter, including microplastics, in the marine environment to reach levels that do not cause adverse effects to the marine and coastal environment with the ultimate aim of eliminating inputs of litter.

## RELATED ASSESSMENTS

Marine Litter Thematic Assessment

Production and Consumption of Plastics

Waste water

Abundance, Composition and Trends of Beach Litter

Composition and Spatial Distribution of Litter on the Seafloor

Marine Litter ingested by Sea Turtles

Plastic Particles in Fulmar Stomachs in the North Sea

51% of beached North Sea fulmars have more than 0.1 g of plastics in their stomachs

Beach litter levels remain high 90% of which is plastic

Each person in Western Europe uses 100 kg of plastic each year

The largest land-based source of microplastics is tyre wear

By 2025 OSPAR will reduce by at least 50% the prevalence of the most commonly found single-use plastic items and of maritime-related plastic items on beaches in order to contribute to the achievement of relevant regional and EU threshold values building upon requirements for EU Member States in the EU Single Use Plastics Directive (Directive 2019/904), and by at least 75% by 2030

There is a high incidence of litter ingestion by sea turtles

Seafloor litter is widespread; fisheries items and plastic materials predominate



# INTRODUCTIONS OF NEW NON-INDIGENOUS SPECIES (NIS) APPEAR TO HAVE DECREASED

The rate of new introductions of NIS appears to have fallen steadily over the assessment period, though the trend is uncertain because of differences in national monitoring efforts and reporting lags. Such uncertainties in monitoring effort and the timing of data reporting for the assessment potentially imply a higher rate of introductions than was assessed for this period.

Though the data suggest that the range of management measures adopted since QSR 2010 are having some positive effect, the annual rate of introduction remains high. NIS continue to affect marine ecosystems in the OSPAR Maritime Area, through aquaculture escapees, accidental introductions from ballast water and biofouling from shipping. Terrestrial NIS are also impacting marine birds, especially in island breeding colonies.

## RESPONSE

NIS may cause unpredictable and irreversible changes to marine ecosystems, such as predation of or competition with indigenous species, modification of habitats, and trophic impacts. A variety of economic or human health impacts are possible through, for example, fouling, harmful non-indigenous algal blooms or damage to structures. Of the known pathways, shipping and mariculture are responsible for most introductions into the OSPAR Maritime Area.

OSPAR has taken action to reduce the introduction of NIS from ships' ballast water by developing general guidance on voluntary ballast water exchange (Agreements 2010-07, 2014-11) and by establishing a joint

Climate change may reverse any decreasing trends in NIS introductions or accelerate the displacement of native species by NIS. Therefore, OSPAR has aimed to make rapid detection of NIS possible and has established a joint group with HELCOM to align monitoring efforts on NIS introduction. Further investment in mitigation methods and technologies will be needed, together with steps to maximise the health of marine ecosystems in the face of many other pressures and thereby decrease the risk of introduced species becoming invasive.

task group with HELCOM to manage non-indigenous species in relation to ballast water management exemptions and to manage ballast water and biofouling (JTG BALLAST & Biofouling). This has resulted in the adoption of the Joint Harmonised Procedure [...] on the granting of exemptions under the International Convention for the Control and Management of Ships' Ballast Water and Sediments (Agreement 2020-01).

The International Maritime Organization (IMO) has adopted a range of measures in relation to ballast water and biofouling aimed at reducing the risk from the transfer of NIS.

## OSPAR'S NEAES 2030

**S7.**

By 2025 OSPAR will develop a coordinated management approach to ensure the number of non-indigenous species introduced via human activity is minimised and where possible reduced to zero.

## RELATED ASSESSMENTS

Non-indigenous Species Thematic Assessment

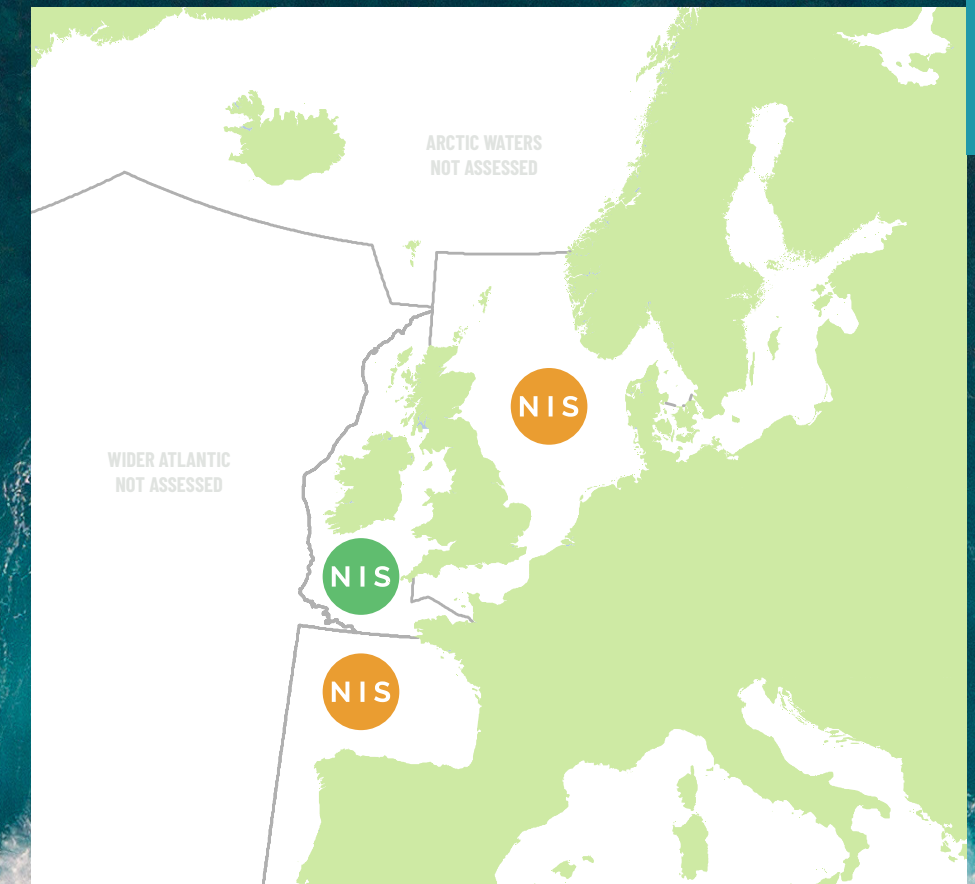
Trends in New Records of Non-indigenous Species Introduced by Human Activities



Invasive King Crabs



The invasive sea squirt *Didemnum vexillum* covering a holding tank at an oyster rearing unit. (Courtesy of Cefas)




## STATUS

- II. GREATER NORTH SEA**
- III. CELTIC SEAS**
- IV. BAY OF BISCAY & IBERIAN COAST**

## LEGEND

- NIS** Significant strong downward trend in rate of NIS introductions
- NIS** Modest downward trend in rate of NIS introductions
- NIS** Stable or upward trend in rate of NIS introductions





# 03.

STATE



# MARINE BIRDS ARE STILL IN TROUBLE

Many marine bird species in the OSPAR Maritime Area continue to be in trouble. The assessments showed that most marine birds are not in good status – only some duck and geese species in the Arctic Waters, Celtic Seas, and Greater North Sea Regions were shown to be in good status. The broader picture across the OSPAR Maritime Area has not improved since the 2017 Intermediate Assessment issued a warning about the status of marine birds.

Of the nine species listed as being threatened and/or in decline by OSPAR, the Balearic shearwater, Black-legged kittiwake, Lesser black-backed gull, and Thick-billed murre have been assessed as still in declining status, despite recommended measures having been put in place to address the multiple pressures affecting them. In addition, the Iberian breeding population of the common guillemot became extinct shortly after listing.

Most marine birds were already not in good status in 2010, but additional deterioration has been observed for many species in the current assessment, with widespread declines in breeding productivity and population abundance observed in all OSPAR Regions.

Climate change is the major driver, affecting food supply and building on underlying pressures such as by-catch, collision, predation by terrestrial non-indigenous species (NIS) such as rats and mink, habitat loss, and disturbance from human activities.

Certain marine bird groups are particularly vulnerable, including top predator species that are affected by low prey availability and shorebirds that are affected by climate change-driven habitat changes. Collective action in OSPAR has strengthened the knowledge base on listed bird species and their status, and OSPAR's work on marine birds has led to conservation action at the national level.

Coastal and Marine Protected Areas (MPAs) have alleviated some of the pressures affecting these bird species. However, it is clear that the existing protected area network may not be sufficient to safeguard critical habitat for marine birds under pressure.

## RESPONSE

OSPAR has taken collective action to strengthen the knowledge base for threatened and/or declining marine bird species and their status. Contracting Parties have taken legislative and administrative action on a national level to protect the OSPAR Listed marine birds, for example by introducing legislation to ban deliberate killing.

MPAs have alleviated some of the pressures affecting marine birds, including by protecting their nesting coastal nesting sites as well as their foraging sites at sea and even foraging sites in the area beyond national jurisdiction for sites such as the North Atlantic Current and Evlanov Sea basin MPA. However, the assessment of the status of management of the MPA network makes it clear that the existing

network needs to be further developed and barriers to management action need to be overcome to safeguard critical habitat for marine birds and the ecosystems.

OSPAR is working to produce a Regional Action Plan on Marine Birds to halt the decline of marine bird populations. The threats and pressures identified in the QSR 2023 will guide the development of regional and collaborative action to allow seabirds to recover. Taking steps towards minimising and where possible eliminating incidental by-catch is the first agreed action and is considered to address a very important pressure.

## OSPAR'S NEAES 2030

S5.

Protect and conserve marine biodiversity, ecosystems and their services to achieve good status of species and habitats, and thereby maintain and strengthen ecosystem resilience.

## RELATED ASSESSMENTS

- |   |  |
|---|--|
| ➤ Marine Birds Thematic Assessment  | ➤ Balearic shearwater - Status Assessment                        |
| ➤ Marine Bird Breeding Productivity                                       | ➤ Black-legged Kittiwake - Status Assessment                     |
| ➤ Marine Bird Abundance   | ➤ Iberian guillemot - Status Assessment                          |
| ➤ Pilot Assessment of Marine Bird Abundance - Non-Breeding Offshore Birds | ➤ Lesser black-backed gull - Status Assessment                   |
| ➤ Pilot Assessment of Marine Bird Bycatch                                 | ➤ Thick-billed murre or Brünnich's guillemot - Status Assessment |
| ➤ Pilot Assessment of Marine Bird Habitat Quality                         |  |

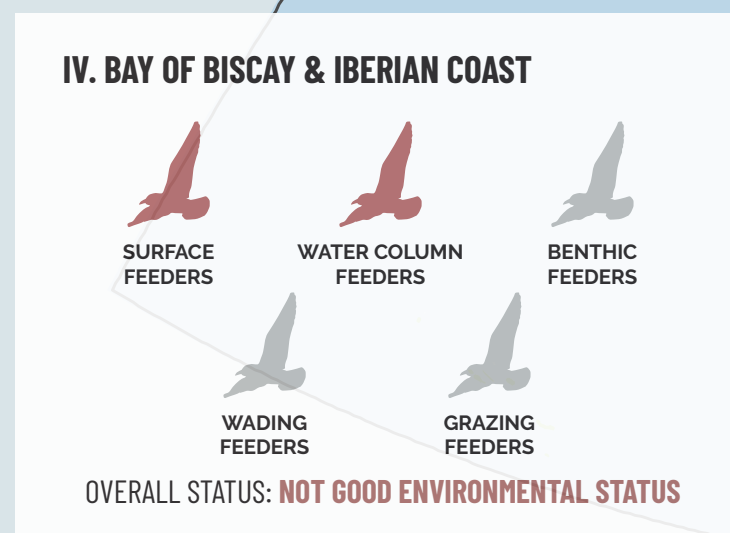
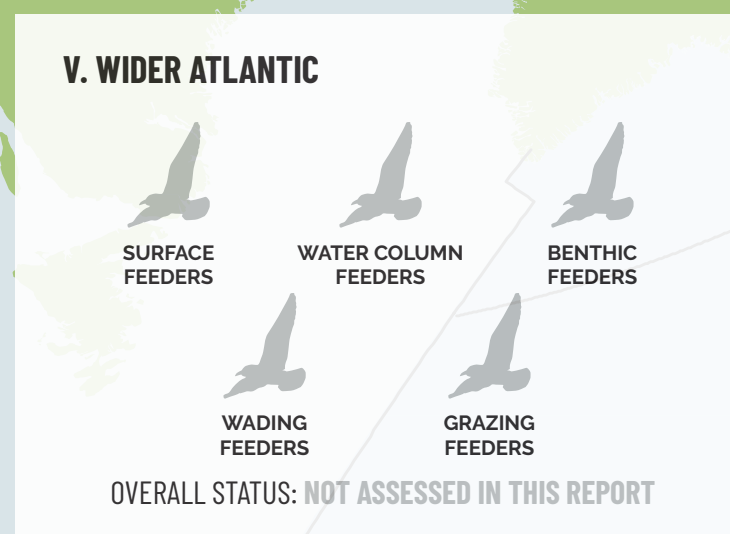


# MARINE BIRDS ARE NOT IN GOOD STATUS



## PRESSURES AFFECTING BIRDS IN THE NORTH-EAST ATLANTIC MARINE PROTECTED AREA

- Prey depletion
- Extraction of, or mortality/injury to, marine birds
- Disturbance of species
- Input or spread of Non-Indigenous Species
- Input of litter
- Availability of prey affected by climate change
- Overfishing of prey species
- Accidental catch in fishing gear
- Marine litter ingestion and entanglement
- Invasive predatory mammals in breeding colonies
- Habitat loss and degradation





# THE STORY OF... PROTECTING AREAS BEYOND NATIONAL JURISDICTION

The OSPAR Maritime Area encompasses extensive areas in the Wider Atlantic (Region V) and the Arctic Waters (Region I) that are beyond the limits of national Exclusive Economic Zones (EEZs). This Area Beyond National Jurisdiction (ABNJ) covers approximately 40% of the OSPAR Maritime Area. OSPAR has agreed to designate Marine Protected Areas (MPA) in ABNJ with the aim of achieving an ecologically coherent and well managed network of MPAs.

## REGION V: WIDER ATLANTIC

12 OSPAR MPAS IN ABNJ  
1 055 043 KM² OR 19,5% OF ABNJ

### 2006

Portugal formally nominates the Rainbow Hydrothermal Vent Field as an MPA

### 2010

OSPAR collectively designates 6 MPAs in ABNJ

### 2011, 2012, 2014

The United Kingdom nominates 3 MPA in ABNJ

### 2012

The Charlie-Gibbs North High Seas MPA is collectively designated

### 2021

OSPAR designates its largest MPA in ABNJ. The North Atlantic Current and Evlanov Sea basin MPA which covers an area the size of France, 595 196 km²

### OSPAR MEASURES:

- OSPAR Decision 2021/01 on the establishment of the North Atlantic Current and Evlanov Sea basin Marine Protected Area
- OSPAR Recommendation 2021/01 on the Management of the North Atlantic Current and Evlanov Sea basin Marine Protected Area
- Nomination proforma for the North Atlantic Current and Evlanov Sea basin Marine Protected Area
- Roadmap for further development of the North Atlantic Current and Evlanov Sea basin Marine Protected Area (OSPAR Agreement 2021-08)

OSPAR Designated MPA  
Protecting: Seabed/Subsoil/Watercolumn

OSPAR Designated MPA  
Protecting: Watercolumn

Nationally Nominated MPA  
Protecting: Seabed/Subsoil

Those MPAs that have been nationally designated are within areas subject to a submission by a Contracting Party to the UN Commission on the Limits of the Continental Shelf for an Extended Continental Shelf.

## PROTECTING BIRDS AT SEA

Worrying declines in seabird numbers shown in OSPAR's 2017 Intermediate Assessment were stark enough for OSPAR to conclude that "seabirds are in trouble". Declines were detected in many species and vulnerabilities shown in all life stages. Whilst many seabird nesting sites are protected, there is a protection gap when it comes to the feeding and foraging grounds at sea.

In 2021, the OSPAR Commission designated the North Atlantic Current and Evlanov Sea basin (NACES) MPA with the goal of protecting and conserving seabirds and the ecosystems of the waters superjacent to the seabed including their biodiversity and processes that support those.

In 2023, OSPAR Contracting Parties agreed to extend the NACES MPA to include the seabed and a number of additional species and habitats, such as coral gardens and deep-sea sharks.

- 595 196 km² in total around the size of France. Used annually by up to 5 million seabirds
- The North Atlantic Current is a transition zone where large oceanic gyres meet, creating currents that bring nutrients from deep waters
- The Arctic Ocean brings very cold, fresh, nutrient rich water
- Biodiversity is high in this area
- Provides a vital foraging ground for numerous seabird species.
- Frequented by other migratory species, such as whales, sharks and turtles.
- Identified by Birdlife International through tracking data from 21 different bird species from 56 colonies across the North and South Atlantic



# MANY MARINE MAMMALS REMAIN AT RISK, EVEN WHILE SOME SPECIES ARE RECOVERING

Marine mammals have been and are subject to significant pressure from both natural causes and human activity, resulting in many populations and species being assessed as not in good status. Many pressures still occur on a wide scale today, such as by-catch and chemical pollution, or are of increasing concern, such as noise, habitat loss, or habitat degradation.

Marine mammals tend to have wide distributional ranges and some species are very rare or highly cryptic in nature, making their monitoring a challenge. Nonetheless, the assessments on marine mammals in this QSR reveal that many species and populations (including all cetaceans) are not in good status, with limited improvements observed as compared with previous assessments.

On the other hand, grey seals, recovering from local extinctions in the past, were found to be in good status in both the Greater North Sea and Celtic Seas Regions, by contrast with the 'not good' status found for harbour seals

## RESPONSE

OSPAR developed several actions and responses to better protect and conserve marine mammals. Four marine mammal species (blue whale, northern right whale, bowhead whale and harbour porpoise) have been listed as threatened or in decline in the OSPAR Maritime Area. Marine Protected Areas (MPAs) are one of the tools we can consider to better protect these species and others, and form part of an important response to protect marine mammals. However, gaps in the OSPAR network of MPAs for marine mammals highlight the opportunities in the future development of the network, including the effectiveness of management.

The developments of the OSPAR Noise Action Plan and the new OSPAR Marine Litter Regional Action Plan (RAP) are positive for

in the Greater North Sea Region. The status of harbour seals in the Celtic Seas Region is unknown because of a lack of data, although, for sites where data are available, their abundance is increasing.

There are four marine mammal species (blue whale, northern right whale, bowhead whale, and harbour porpoise) that have been listed as threatened or in decline in the OSPAR Maritime Area. Marine Protected Areas (MPAs) are a tool considered useful for improving the protection of these species, and they form part of a wider response for protecting marine mammals. However, gaps in the OSPAR network of protected areas for marine mammals highlight opportunities for the future development of the network and for making its management more effective.

There is limited evidence to date that the measures taken to protect and improve the condition of marine mammal populations have been effective.

marine mammals as they are tackling key pressures to these species. Another key aspect of the work of OSPAR is the cooperation with other competent authorities, which is key to ensuring the cumulative responses result in an improved state for marine mammals.

OSPAR notably works with the Agreement on the Conservation of Small Cetaceans of the Baltic, North-East Atlantic, Irish and North Seas (ASCOBANS), the North Atlantic Marine Mammal Commission (NAMMCO), the International Whaling Commission (IWC), the WG on Conservation of the Arctic Flora and Fauna (CAFF) and relevant organisations competent for fisheries management.

## OSPAR'S NEAES 2030

**S5.**

Protect and conserve marine biodiversity, ecosystems and their services to achieve good status of species and habitats, and thereby maintain and strengthen ecosystem resilience.

**S7.**

Ensure that uses of the marine environment are sustainable, through the integrated management of current and emerging human activities, including addressing their cumulative impacts.

**S8.**

Reduce anthropogenic underwater noise to levels that do not adversely affect the marine environment.

## RELATED ASSESSMENTS

➤ Marine Mammals Thematic Assessment

➤ Seal Abundance and Distribution

➤ Grey Seal Pup Production

➤ Abundance and Distribution of Cetaceans

➤ Marine Mammal By-catch

➤ Status and Trends of Persistent Chemicals in Marine Mammals

➤ Marine Mammal By-catch in Arctic Waters

➤ Blue Whale- Status Assessment

➤ North Atlantic Right Whale- Status Assessment

➤ Bowhead Whale - Status Assessment



# THE STATUS OF SEALS AND SMALL TOOTHED CETACEANS IS NOT GOOD WHILE THE STATUS OF OTHER MARINE MAMMALS REMAINS UNKNOWN

## OSPAR MARITIME AREA



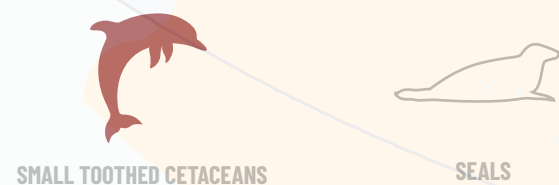
## I. ARCTIC WATERS



## V. WIDER ATLANTIC



## IV. BAY OF BISCAY & IBERIAN COAST



## II. GREATER NORTH SEA



## III. CELTIC SEAS



## HATCHED AREAS:

Area to which both the United Kingdom and the Government of the Kingdom of Denmark together with the Government of the Faroes have transmitted overlapping submissions to the Commission on the Limits of the Continental Shelf (CLCS) in fulfilment of their respective rights and obligations under Article 76 and Annex II to the United Nations Convention on the Law of the Sea in order to determine entitlement of outer continental shelf areas. This map should not be used in any way to prejudice the determination of that question by the CLCS in due course.

The area shows the delineation of the outer limits of the continental shelf beyond 200 M from the territorial sea baselines of France, Ireland, Spain and the United Kingdom in respect of the area of the Celtic Sea and the Bay of Biscay, as provided by the four countries to the Commission on the Limits of the Continental Shelf (CLCS) and included in its recommendations issued on 24 March 2009. The map of the continental shelf's extent shall be used without prejudice to the agreements that will be concluded in due course between these Member States on their marine borders in this area.

Norwegian, Icelandic and United Kingdom marine areas are not covered by the MSFD.

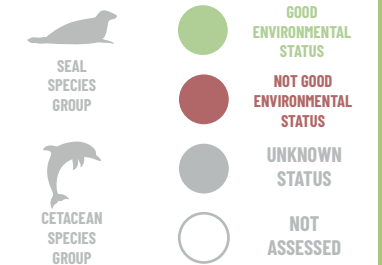


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## AREA KEY:



## KEY:



## PRESSURES AFFECTING MARINE MAMMALS IN THE NORTH-EAST ATLANTIC

- Extracting of, or mortality/injury to, marine mammals
- Prey depletion
- Input of litter
- Habitat loss
- Physical disturbance to seabed
- Disturbance of marine mammals
- Input of anthropogenic sound
- Input of other substances



# DESPITE IMPROVEMENTS IN SOME FISH POPULATIONS, MANY ARE NOT IN GOOD STATUS

The QSR 2023 provides OSPAR's most comprehensive integrated status assessment of fish species to date, and is the first to include consideration of commercial fish stocks. Despite further signs of recovery in some fish stocks, the latest assessment shows that the OSPAR targets of achieving 80% of stocks/species in good status were not reached for coastal, demersal or pelagic fish in the Greater North Sea, Celtic Seas and Bay of Biscay and Iberian Coast Regions, nor for deep-sea species in these areas and in the Wider Atlantic Region.

Fisheries management regulations of the EU Common Fisheries Policy, the North-East Atlantic Fisheries Commission (NEAFC) and national fisheries agencies have successfully limited the harvesting of some commercial fish stocks to sustainable levels, but many stocks are still being harvested unsustainably. By-catch, and the need to better integrate ecosystem function into fisheries management, remain additional concerns.

## RESPONSE

The dominant pressure on fish in the North-East Atlantic comes from fishing activities. Fisheries management is outside the competency of OSPAR, therefore actions and measures to address the pressure from this human activity requires cooperation with other competent bodies, such as the North-East Atlantic Fisheries Commission (NEAFC). Improving cooperation is an explicit objective of OSPAR's NEAES 2030.

OSPAR can provide information on the status of fish, both for single species as well as for fish as species groups considered through an ecosystem perspective. This can inform management actions by other competent authorities. OSPAR has taken national and

While this may appear to contradict the 2017 Intermediate Assessment, which showed that fisheries management measures were beginning to have a positive impact on fish communities, the two assessments are not comparable. For QSR 2023, the overall status of fish was assessed by integrating the OSPAR common indicator for the recovery of sensitive fish species and third-party assessments of commercial fish stocks produced by ICES and ICCAT.

For its part, OSPAR focused on a list of 22 fish species considered to be under threat and/or in decline in the North-East Atlantic; the QSR 2023 shows that the majority of these species continue to be in poor status. On top of other pressures, including fisheries but also including inputs of nutrients and contaminants, climate change effects and ocean acidification are changing the distribution and abundance of fish and affecting food webs, and may constrain the recovery of threatened fish populations.

collective management action on specific issues within its competence to protect the 22 fish species that have been listed as threatened and/or declining.

These actions have included enactment of national legislation for the protection of the species and its habitat, for example for allis shad and sea lamprey, restoration, recovery and restocking efforts for a number of diadromous fish species such as salmon and eel, as well as collective engagement and awareness raising activities for the listed species of fish.

## OSPAR'S NEAES 2030

**S5.** Protect and conserve marine biodiversity, ecosystems and their services to achieve good status of species and habitats, and thereby maintain and strengthen ecosystem resilience.

**S7.** Ensure that uses of the marine environment are sustainable, through the integrated management of current and emerging human activities, including addressing their cumulative impacts.

**SX.** By 2024 OSPAR will initiate discussions on the development of a practical approach for regional-scale ecosystem-based management, including through the 'Collective Arrangement' and in cooperation with fisheries management bodies and other competent organisations, in order to strengthen ecosystem resilience to climate change and to safeguard the marine environment, its biodiversity and ecosystem services.

## RELATED ASSESSMENTS

- |  |  |
|--|--|
| 🔍 Fish Thematic Assessment   | 🔍 Leafscale gulper shark - Status Assessment |
| 🔍 Recovery of Sensitive Fish Species   | 🔍 Porbeagle - Status Assessment              |
| 🔍 Status and Trends of Polychlorinated Biphenyls (PCB) in Fish, Shellfish and Sediment | 🔍 Portuguese dogfish - Status Assessment     |
| 🔍 Pilot Assessment of Feeding Guilds   | 🔍 Atlantic salmon - Status Assessment        |
| 🔍 Mean Maximum Length of Fish - Indicator Assessment                                   | 🔍 Sea lamprey - Status Assessment            |
| 🔍 Allis shad - Status Assessment   | 🔍 Spotted ray - Status Assessment            |
| 🔍 Angel shark - Status Assessment  | 🔍 Spurdog - Status Assessment                |
| 🔍 Basking shark - Status Assessment  | 🔍 European Sturgeon - Status Assessment      |
| 🔍 Common skate - Status Assessment   | 🔍 Thornback ray - Status Assessment          |
| 🔍 European eel - Status Assessment   | 🔍 White skate - Status Assessment            |
| 🔍 Gulper Shark - Status Assessment   |  |



# POPULATION STATUS OF MARINE FISH

## OSPAR MARITIME AREA



## III. CELTIC SEAS



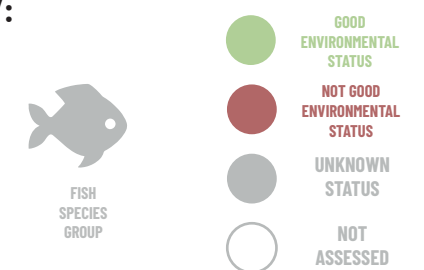
## IV. BAY OF BISCAY & IBERIAN COAST



## AREA KEY:



## KEY:



## PRESSURES AFFECTING FISH IN THE NORTH-EAST ATLANTIC

- Extracting of, or mortality/injury to, fish
- Input of litter
- Input of microbial pathogens
- Input of other substances
- Input of anthropogenic sound
- Input or spread of NIS

## II. GREATER NORTH SEA



## HATCHED AREAS:

Area to which both the United Kingdom and the Government of the Kingdom of Denmark together with the Government of the Faroes have transmitted overlapping submissions to the Commission on the Limits of the Continental Shelf (CLCS) in fulfilment of their respective rights and obligations under Article 76 and Annex II to the United Nations Convention on the Law of the Sea in order to determine entitlement of outer continental shelf areas. This map should not be used in any way to prejudice the determination of that question by the CLCS in due course.

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# THE STORY OF ... THE PEOPLE BEHIND THE QSR

The QSR 2023 is an ambitious collective endeavour involving the whole OSPAR network. The OSPAR QSR 2023 process has brought together scientists, policy makers and experts to deliver over 120 assessments that help to improve our understanding of the marine environment.



## SECRETARIAT

Based in London, our small Secretariat coordinates the process of the QSR and OSPAR's work in general.

## MEETINGS

The process of developing the QSR is a long one. We've held more than 200 meetings over 5 years. We've spent many long days and late nights thrashing out the contents both online and in person and have lost count of the number of cups of coffee we've drunk in that time.



## CONTRACTING PARTIES

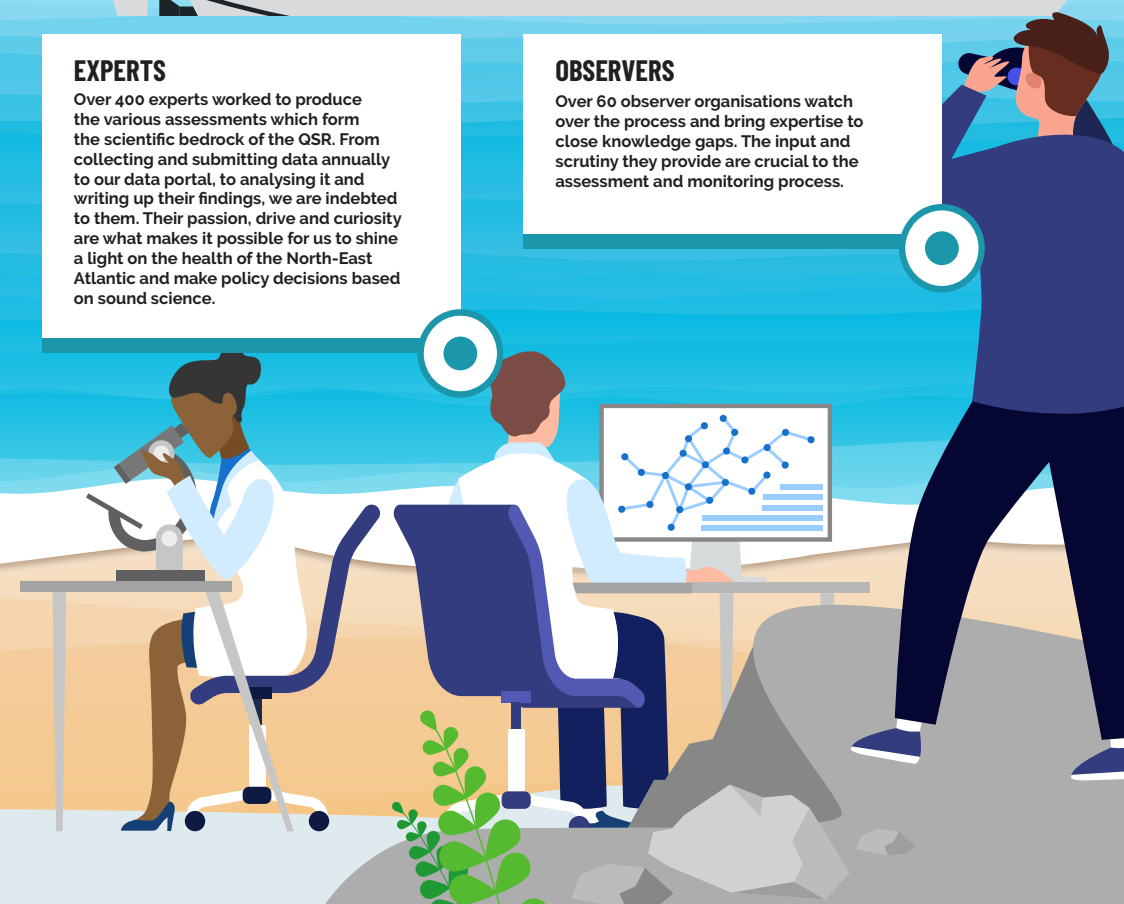
Our Contracting Parties steer the process. From nominating experts to drafting and signing off the text. The commitment of all Contracting Parties working towards a common goal is the driving force behind OSPAR.

## EXPERTS

Over 400 experts worked to produce the various assessments which form the scientific bedrock of the QSR. From collecting and submitting data annually to our data portal, to analysing it and writing up their findings, we are indebted to them. Their passion, drive and curiosity are what makes it possible for us to shine a light on the health of the North-East Atlantic and make policy decisions based on sound science.

## OBSERVERS

Over 60 observer organisations watch over the process and bring expertise to close knowledge gaps. The input and scrutiny they provide are crucial to the assessment and monitoring process.





# BENTHIC HABITATS CONTINUE TO BE DAMAGED

Benthic habitats encompass the biota living on the seafloor. A wide variety of benthic habitats occur in the OSPAR Maritime Area. Where they are assessed in the Greater North Sea, Celtic Seas and Bay of Biscay and Iberian Coast Regions, benthic habitats are already impacted by human activities. The main pressures include physical disturbance (such as abrasion by bottom trawling), modification of substrate (such as sediment extraction or placement of artificial infrastructure), chemical pollution (nutrients and organic enrichment or contaminants), and biological impacts (spread of non-indigenous species).

The degradation of benthic habitats can lead to declining fishery productivity, negative impacts on aquaculture production, loss of nursery habitat, negative impacts on tourism, changes in food webs, and lowered water quality. Of the 18 habitats considered by OSPAR to be threatened and/or declining, all but one are in poor status and show no signs of improvement throughout all the OSPAR

Regions. Some habitats, such as European flat oyster beds and seagrass beds, also show a decrease in distribution and extent in some Regions.

There remain gaps in assessment coverage: oceanic ridges / hydrothermal vents in the Wider Atlantic Region are understudied and comprehensive habitat mapping is incomplete. The future is likely to bring some improvements in trends as countries implement actions to protect habitats of concern. However, climate change and ocean acidification, as well as increasing trends of shifting food and energy production from land to sea, will make it necessary to decrease the pressures on benthic habitats that have been compromised in terms of their quality, function, and ability to provide associated ecosystem services.

**"The degradation of benthic habitats can lead to declining fishery productivity, negative impacts on aquaculture production, loss of nursery habitat, negative impacts on tourism, changes in food webs, and lowered water quality."**

## RESPONSE

OSPAR has taken several actions to better protect, improve and recover benthic ecosystems. For example, actions in relation to the management of specific human activities or pressures, including eutrophication, renewable energy development, mineral extraction and dredging, oil and gas activities, and cable placement, all contribute to addressing the impacts from pressures and should contribute to improving the status of benthic habitats. OSPAR has also identified 18 habitats for priority action in the North-East Atlantic in coastal, shelf and deep-sea waters. Recommendations for actions to protect and conserve these habitats have been adopted.

Furthermore, the OSPAR network of Marine Protected Areas (MPAs) is an important response for improving the status of benthic

habitats. The development of the network is progressing in line with regional and global commitments, however, it is not yet considered to be ecologically coherent and management actions need to be strengthened. The Collective Arrangement provides a useful framework for working with other competent organisations on responses of relevance to benthic habitats in the MPAs in areas beyond national jurisdiction that are outside of OSPAR's competence, for example in relation to fisheries.

Overall, the measures currently being implemented do not seem to have improved the status of benthic habitats sufficiently.

**"OSPAR has also identified 18 habitats for priority action in the North-East Atlantic in coastal, shelf and deep-sea waters. Recommendations for actions to protect and conserve these habitats have been adopted."**

## OSPAR'S NEAES 2030

**S5.** Protect and conserve marine biodiversity, ecosystems and their services to achieve good status of species and habitats, and thereby maintain and strengthen ecosystem resilience.

**S6.** Restore degraded benthic habitats in the North-East Atlantic when practicable to safeguard their ecosystem function and resilience to climate change and ocean acidification.

**S9.** Safeguard the structure and functions of the seabed/marine ecosystems by preventing significant habitat loss and physical disturbance due to human activities.

## RELATED ASSESSMENTS

➤ Benthic Habitats Thematic Assessment	➤ Carbonate mounds - Status Assessment
➤ Area of Habitat Loss	➤ Coral gardens - Status Assessment
➤ Sentinels of the Seabed	➤ Deep-sea sponge aggregations - Status Assessment
➤ Condition of Benthic Habitat Communities: The Common Conceptual Approach	➤ European flat oyster and <i>Ostrea edulis</i> beds - Status Assessment
➤ Condition of Benthic Habitat Communities: Assessment of some Coastal Habitats in Relation to Nutrient and/or Organic Enrichment	➤ <i>Lophelia pertusa</i> reefs - Status Assessment
➤ Condition of Benthic Habitat Communities: Margalef diversity in Region II (Greater North Sea)	➤ Maerl beds - Status Assessment
➤ Extent of Physical Disturbance to Benthic Habitats: Aggregate Extraction	➤ Oceanic Ridges with hydrothermal vents - Status Assessment
➤ Extent of Physical Disturbance to Benthic Habitats: Fisheries with mobile bottom-contacting gears	➤ Seamounts - Status Assessment
➤ Intertidal mudflats - Status Assessment	➤ Sea-pen and Burrowing Megafauna Communities - Status Assessment
➤ <i>Mytilus edulis</i> beds - Status Assessment	➤ <i>Zostera</i> beds - Status Assessment



# PLANKTON, THE BASE OF THE MARINE FOOD WEB, ARE IMPACTED IN PELAGIC HABITATS

The pelagic habitats encompassing the ocean's water column are home to phytoplankton (microscopic algae) and zooplankton (microscopic animals). These organisms form the base of the marine food web and support species higher in the food web, including fish, birds, and marine mammals.

Pelagic habitats in the OSPAR Maritime Area have experienced widespread changes over the past 60 years, with recent changes following long-term trends. Indicator assessments have revealed a general pattern of decreasing phytoplankton and zooplankton abundance and/or biomass across oceanic areas, including much of the Bay of Biscay and Iberian Coast Region, with more complex changes occurring in the Greater North Sea and Celtic Seas Regions.

Phytoplankton biomass has decreased across much of the OSPAR Maritime Area, probably due to widespread changes in water column dynamics and nutrient availability driven by both climate change and reductions in

nutrient inputs. The planktonic larvae of benthic invertebrates, such as crabs and sea urchins, have increased in abundance, probably due to increases in sea temperature. By contrast, other zooplankton which provide the crucial link between primary production and fish have experienced long-term declines in abundance which could resonate higher up the food web.

The pressures on pelagic habitats include increased sea temperature and changes in hydrography as a result of climate change, changes in nutrient availability, and the introduction of non-indigenous species. The continuation of the long-term trends in plankton communities apparent from the current assessment period is expected to impact marine food webs and the ecosystem services delivered by pelagic habitats.

## RESPONSE

There are no OSPAR measures that directly address pelagic habitats. Climate change was identified as the most significant factor affecting the health of the plankton communities that form the pelagic habitat.

The responses required to address the source of this issue lie outside of OSPAR's competence, however, some action will be taken on mitigation and adaptation through the NEAES 2030 that could also benefit the pelagic habitats.

Nutrient inputs were identified as a significant pressure, especially in coastal areas, whereas the human activity of fishing can alter the food

web structure and impact pelagic habitats. Addressing some of these activities and pressures is within the remit of OSPAR, the most significant being the input of nutrients at a more local scale.

Improving the state of pelagic habitats will require OSPAR to continue to strengthen cooperation with relevant competent organisations in order to strengthen ecosystem resilience to climate change and to safeguard the marine environment in line with the ambition set out in the NEAES 2030.

**"Nutrient inputs were identified as a significant pressure, especially in coastal areas, whereas the human activity of fishing can alter the food web structure and impact pelagic habitats."**

## OSPAR'S NEAES 2030

NEAES 2030 includes objectives for conservation and management actions that will ensure ecosystem function and resilience, taking account of changing climatic conditions. The pelagic habitat is fundamental to achieving such ambitions and is specifically referred to in the following operational objectives:

**\$5.04**

By 2025 at the latest OSPAR will take appropriate actions to prevent or reduce pressures to enable the recovery of marine species and benthic and pelagic habitats in order to reach and maintain good environmental status as reflected in relevant OSPAR status assessments, with action by 2023 to halt the decline of marine birds.

**\$11.01**

By 2025 OSPAR will develop a coordinated management approach to strengthening ecosystem resilience, including to the consequences of climate change and ocean acidification.

## RELATED ASSESSMENTS

➤ Pelagic Habitats Thematic Assessment

➤ Changes in Plankton Diversity

➤ Primary Productivity

➤ Changes in Phytoplankton Biomass and Zooplankton Abundance

➤ Changes in Phytoplankton and Zooplankton Communities



# THE STATE OF PELAGIC HABITATS

## PELAGIC HABITAT

- VARIABLE SALINITY
- COASTAL
- SHELF
- OCEANIC / BEYOND SHELF

## KEY:

- GOOD ENVIRONMENTAL STATUS
- NOT GOOD ENVIRONMENTAL STATUS
- UNKNOWN STATUS
- NOT ASSESSED

## PRESSURES AFFECTING PELAGIC HABITATS IN THE NORTH-EAST ATLANTIC

- Changes in nutrients
- Input of organic matter
- Increased sea temperatures
- Acidification
- Changes in upwelling intensity
- Open ocean stratification

### III. CELTIC SEAS

- VARIABLE SALINITY HABITATS
- COASTAL HABITATS
- SHELF HABITATS

### IV. BAY OF BISCAY & IBERIAN COAST

- VARIABLE SALINITY HABITATS
- COASTAL HABITATS
- SHELF HABITATS
- OCEANIC / BEYOND SHELF HABITATS

### II. GREATER NORTH SEA

- VARIABLE SALINITY HABITATS
- COASTAL HABITATS
- SHELF HABITATS



# THE STATE OF MARINE FOOD WEBS IS OF GREAT CONCERN

Food webs encompass the organisms in a community, their relationships, and energy transfer through food chains. OSPAR uses a number of indicators to track and model changes to marine food webs. Climate change, fishing, and pollution, in particular, changes in nutrient levels, represent the main human pressures affecting food webs in OSPAR marine ecosystems. Shifts in nutrient availability affect primary producers (phytoplankton) as well as organisms at higher trophic levels, whereas fisheries, shipping, and maritime infrastructure can impact key species and alter food web structure and dynamics.

OSPAR Regions have shown differing status and trends in food web components in recent decades. For instance, the structure of demersal fish communities has not achieved good status in the Greater North Sea and Celtic Seas Regions, while no clear change has been found in the Bay of Biscay and Iberian Coast Region. However, signs of recovery were observed in top predators and mesopredators of demersal communities in the Bay of Biscay and Iberian Coast Region. No detectable changes appear to have occurred in the demersal fish communities

## RESPONSE

While many OSPAR measures contribute to the integrity of the food webs, there are no specific measures that have been adopted within OSPAR that have an explicit objective of supporting the state, function, or resilience of food webs.

That said, there are several examples of measures that explicitly try to maintain or restore ecosystem functioning and resilience by safeguarding food webs, including the OSPAR MPA network.

of the Wider Atlantic Region, although a pilot study modelling food web dynamics around the Azores suggests decreasing trends in biomass at all levels, which could be an indication of decreasing ecosystem resilience or that species are moving north.

While many OSPAR measures can contribute to the health of food webs, it has not adopted any specific measures with the explicit objective of supporting the state, function, or resilience of food webs. Nonetheless, there are several examples of measures that explicitly attempt to maintain or restore ecosystem functioning and resilience by safeguarding food webs, including the OSPAR MPA network. Further attention to anthropogenic impacts on food web dynamics and the attendant loss of ecosystem services should highlight additional measures that could be taken to maintain productivity and food web balances.

**"There are several examples of measures that explicitly try to maintain or restore ecosystem functioning and resilience by safeguarding food webs, including the OSPAR MPA network."**

Further attention to anthropogenic impacts on food web dynamics and attendant loss of ecosystem services should highlight additional measures that could be taken to maintain productivity and food web balances.

## OSPAR'S NEAES 2030

In the NEAES 2030, safeguarding ecosystem function and resilience features in three of the 12 strategic objectives and is implied in others that aim to avoid adverse effects on the marine environment.

**S5.**

Protect and conserve marine biodiversity, ecosystems and their services to achieve good status of species and habitats, and thereby maintain and strengthen ecosystem resilience.

**S6.**

Restore degraded benthic habitats in the North-East Atlantic when practicable to safeguard their ecosystem function and resilience to climate change and ocean acidification.

**S9.**

Safeguard the structure and functions of the seabed/marine ecosystems by preventing significant habitat loss and physical disturbance due to human activities.

**SX.02**

By 2024 OSPAR will initiate discussions on the development of a practical approach for regional-scale ecosystem-based management, including through the [Collective Arrangement](#) and in cooperation with fisheries management bodies and other competent organisations, in order to strengthen ecosystem resilience to climate change and to safeguard the marine environment, its biodiversity and ecosystem services.

## RELATED ASSESSMENTS

➤ Food Webs Thematic Assessment

➤ Primary Productivity

➤ Ecological Network Analysis Indices

➤ Pilot Assessment of Feeding Guilds

➤ Proportion of Large Fish (Large Fish Index)

➤ Size Composition in Fish Communities

➤ Changes in Average Trophic Level of Marine Consumers

➤ Changes in Phytoplankton and Zooplankton Communities











# THE STATE OF MARINE FOOD WEBS

**PELAGIC HABITAT**

- VARIABLE SALINITY
- COASTAL
- SHELF
- OCEANIC / BEYOND SHELF

## KEY:

INDICATOR TYPE			COMMON INDICATOR	COMMON OR CANDIDATE INDICATOR	
			 THRESHOLD ACHIEVED	 TREND DETECTED	
FOOD WEB INDICATOR	FISH FOOD WEB INDICATOR	PELAGIC FOOD WEB INDICATOR	 THRESHOLD FAILED	 NO TREND DETECTED	
PILOT ASSESSMENT					

## V. WIDER ATLANTIC

### OCEANIC ECOSYSTEM



FW9 PILOT

### SHELF ECOSYSTEM



FC2



FW3



FC3 PILOT



FW7 PILOT

## IV. BAY OF BISCAY & IBERIAN COAST

### COASTAL ECOSYSTEM



PH1/FW5



FW4

### SHELF ECOSYSTEM



FC2



FW3



FC3 PILOT



PH1/FW5



FW2 PILOT



FW7 PILOT

### OCEANIC ECOSYSTEM



PH1/FW5



FW2 PILOT



FW4

## II. GREATER NORTH SEA

### VARIABLE SALINITY ECOSYSTEM



PH1/FW5



FW2 PILOT

### COASTAL ECOSYSTEM



PH1/FW5



FW2 PILOT

### SHELF ECOSYSTEM



FC2



FW3



FC3 PILOT



PH1/FW5



FW2 PILOT



FW7 PILOT



FW9 PILOT

## III. CELTIC SEAS

### VARIABLE SALINITY ECOSYSTEM



PH1/FW5



FW2 PILOT

### COASTAL ECOSYSTEM



PH1/FW5



FW2 PILOT

### SHELF ECOSYSTEM



FC2



FW3



FC3 PILOT



PH1/FW5



FW2 PILOT




FW7 PILOT

## PRESSURES AFFECTING BENTHIC HABITATS IN THE NORTH-EAST ATLANTIC

- Underwater noise
- Input or spread of non-indigenous species
- Input of nutrients
- Physical disturbance
- Extraction of wild species and exploitation of living resources (for example, fishing)





**04.**

**WE MUST ACT NOW**

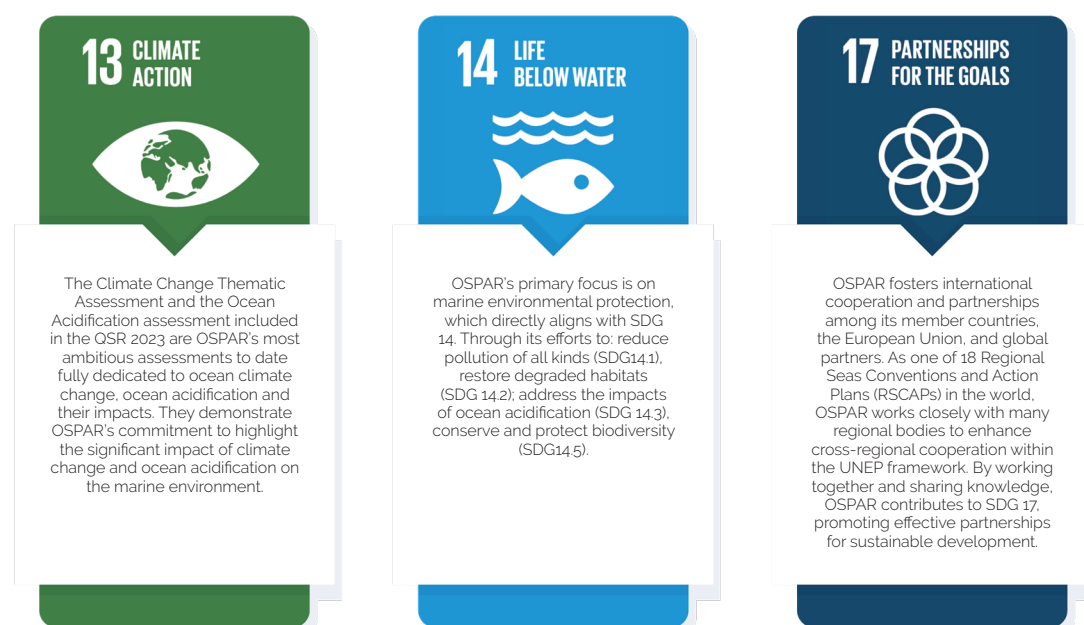


## THE STORY OF... OSPAR & THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs) that build on decades of work.

The "OSPAR and the United Nations SDGs" report highlights OSPAR's role in contributing to the delivery of the SDGs and shows that by working collectively OSPAR Contracting Parties can have a greater impact than working in isolation. The 2023 QSR is a good example of this.

### HERE ARE SOME WAYS OSPAR ALIGNS WITH SPECIFIC SDGs:



By addressing these goals, OSPAR ensures the sustainable use and conservation of the marine environment in the North-East Atlantic, fostering resilience, protecting biodiversity, and supporting the well-being of coastal communities and ecosystems.

## MARINE TECHNOLOGY FOR SUSTAINABLE OCEANS: SDG 14.A

SDG target 14.a Increase scientific knowledge, develop research capacities and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of

marine biodiversity to the development of developing countries, in particular small island developing states and least developed countries

## EMPOWERING SUSTAINABLE COLLABORATION THROUGH THE 2023 QSR IN ODIMS

The assessments that make up the 2023 QSR - and the information and data that underpin them - are available to all in the OSPAR Data and Information Management System (ODIMS). This online tool provides a single point of access and ensures that data are readily accessible. Increasing accessibility to scientific knowledge is a key issue for OSPAR and

provides a strong basis for collaborating with others to ensure that human activities impacting on the marine environment are managed sustainably. OSPAR invites others to use our information and learn from our experiences.

## NAVIGATING MARINE CONSERVATION: OSPAR'S SCIENCE AGENDA

The OSPAR Science Agenda (OSA) sets out OSPAR's most important needs in the broad science areas that underpin OSPAR's work and it helps guide research to address science needs and knowledge gaps. The OSA was developed collaboratively by policy makers and experts across OSPAR committees and working groups to identify science and knowledge needs that will support progress towards the achievement of OSPAR's thematic objectives and it outlines a procedure to define science needs based on a common understanding across Contracting Parties. The 2018 OSA sets out a prioritised list of 44 knowledge

gaps, with the aim of improving future assessments within the OSPAR Maritime Area, for example the QSR 2023. The agenda also outlines recommendations for bridging knowledge gaps, including strengthening cooperation with partner organisations, such as the International Council for the Exploration of the Sea (ICES). The OSA is also used to guide the development of national and regional project proposals to fund innovative scientific research.



# THE EFFECTS OF CLIMATE CHANGE ARE CLEARLY MEASURABLE

## IMPACTS OF CLIMATE CHANGE ON MARINE ECOSYSTEMS IN THE OSPAR MARITIME AREA: REGIONAL VARIATIONS AND LOCAL CONSEQUENCES

Climate change is causing ocean warming, decreased oxygen concentrations, marine heatwaves, and sea-level rise, with many further related impacts across marine ecosystems and the services they provide. Climate change also triggers widespread change in the water cycle and is altering ocean stratification and ocean circulation. These changes in the physical and chemical conditions of the marine environment are affecting marine species across the OSPAR Maritime Area, with regional and local variations in these pressures.

The root cause is global, but the effects, such as storm intensification, increased risks of flooding, and changes in rainfall, are felt at more local scale. There are regional variations in the rate of change, such as the higher rates of ocean temperature increase found in the Arctic region. These localised effects can trigger changes in other regions, as for example when losses of Arctic sea ice affect the position and strength of strong winds such as the polar vortex and the jet stream, which may then cause extreme weather at mid-latitudes.

Changes in sea-level rise and in the frequency and intensity of the strongest storms are expected to impact lower-lying regions in OSPAR countries more significantly. The eventual climate risk, a combination of vulnerability and exposure, emerges on a much more local scale, requiring a national response. While OSPAR does not yet have agreed indicators that would allow regional assessment of climate change effects, there is a broad body of knowledge about climate change in the North Atlantic that provides evidence of effects including warming-related species distribution shifts, altered trophic interactions, changes to productivity, and sea-level rise.

"Climate change is causing ocean warming, decreased oxygen concentrations, marine heatwaves and sea-level rise, with many further related impacts across marine ecosystems and the services they provide."

### WEATHER OR CLIMATE CHANGE?

"Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere 'behaves' over relatively long periods of time" - NASA.



### RELATED ASSESSMENTS

[Climate Change Thematic Assessment](#)

# OCEAN ACIDIFICATION PUTS MARINE ECOSYSTEMS AT FURTHER RISK

## IMPACTS OF OCEAN ACIDIFICATION ON MARINE ECOSYSTEMS IN THE OSPAR MARITIME AREA

Ocean acidification is occurring throughout the OSPAR Maritime Area, though the rate of change varies regionally. This acidification occurs because at least a quarter of the CO<sub>2</sub> released into the atmosphere by human activities is being absorbed by the oceans, changing their carbon chemistry through an increase in acidity and reduced availability of carbonate ions.

This change in the prevailing chemical environment affects marine organisms, with direct effects especially for calcareous habitats and calcifying organisms, and indirect consequences for entire marine ecosystems. Policy responses to combat ocean acidification will need to be considered with care, especially where potential measures to address climate change could exacerbate ocean acidification.

For example, the potential leakage from carbon dioxide storage sites or approaches that aim to increase ocean uptake of atmospheric CO<sub>2</sub>, such as iron fertilisation, could increase ocean acidification. Responses will also need to consider the cumulative impacts of climate change and ocean acidification and the knock-on effects for biodiversity, so as to avoid any unintended consequences of climate change mitigation.

### WHAT IS OCEAN ACIDIFICATION?

Ocean acidification is a climate-ocean impact. Carbon dioxide emissions are being absorbed by the ocean and altering the chemical balance of seawater which marine life depends on for survival.

### OSPAR'S NEAES 2030

**S10.** Raise awareness of climate change and ocean acidification by monitoring, analysing and communicating their effects.

**S12.** Mitigate climate change and ocean acidification by contributing to global efforts, including by safeguarding the marine environment's role as a natural carbon store.

**S11.** Facilitate adaptation to the impacts of climate change and ocean acidification by considering additional pressures when developing programmes, actions and measures

### RELATED ASSESSMENTS

[Ocean Acidification Other Assessment](#)



# UNRAVELLING OCEAN ACIDIFICATION AND ITS ECOLOGICAL EFFECTS

THESE FACTORS RESULT IN A  
MORE ACIDIFIED +  
WARMER +  
LESS OXYGENATED  
**OCEAN**



## Consequences Arising from Shifting Ocean Conditions



MARINE  
HEAT WAVES



HARMFUL ALGAE  
BLOOMS



CORAL  
BLEACHING



INCREASED  
STRATIFICATION

## Observing Detrimental Effects on Ocean Health



Diminishment and  
compromised  
development of  
Shell-forming  
species



Impacts to  
behaviour and  
survival



Changes to  
natural food  
webs



Weakening and  
slower growth of  
coral reef

Ocean acidification is threatening ecosystem  
services that humans depend on.

Fisheries &  
Aquaculture

Food  
Security

Economies &  
Livelihoods





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