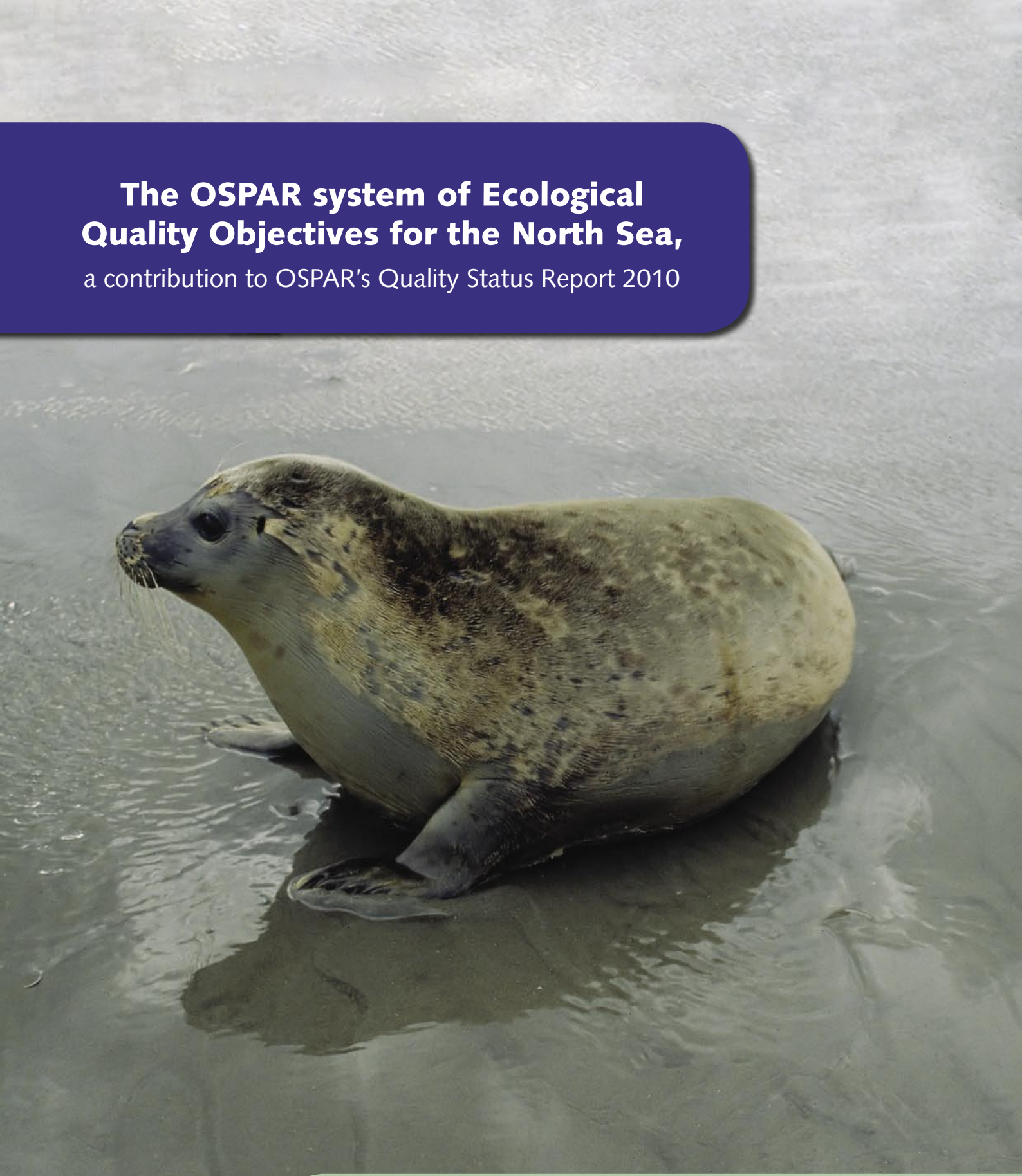
The OSPAR system of Ecological Quality Objectives for the North Sea,

a contribution to OSPAR's Quality Status Report 2010



OSPAR COMMISSION

Protecting and conserving the North-East Atlantic and its resources

Photo: Jan Hopman/Foto Natura

Introduction

The OSPAR Quality Status Report 2010 (QSR 2010) is a holistic assessment of the quality status of the North-East Atlantic that will help inform the 2010 OSPAR Ministerial Meeting on actions needed to protect and conserve the North-East Atlantic.

The QSR 2010 contains brief articles on the Ecological Quality Objectives (EcoQOs) developed by OSPAR. This report supports the QSR 2010 by providing more detailed information on EcoQOs. Further technical details on EcoQOs are available on the OSPAR website (www.ospar.org).

OSPAR

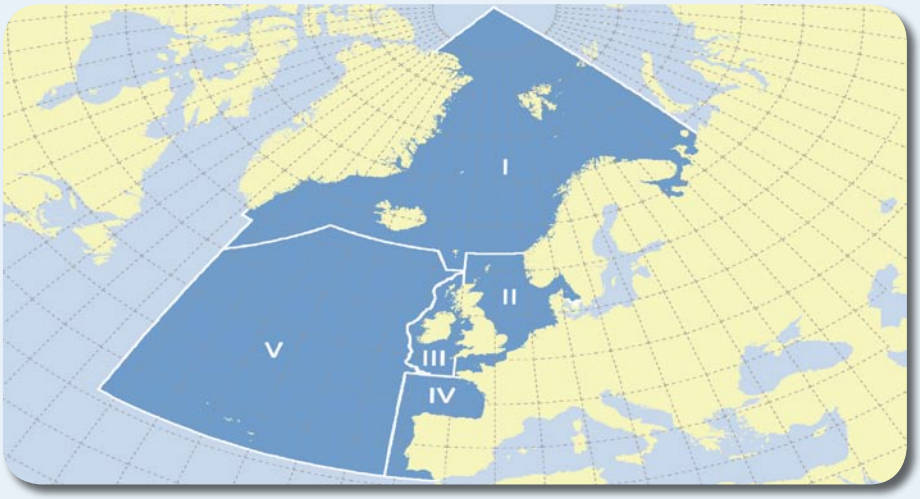


Fig 1: The maritime area covered by the OSPAR Convention includes 5 regions of the North-East Atlantic: I, Arctic Waters, II, the Greater North Sea, III, the Celtic Seas, IV, the Bay of Biscay and Iberian Coast and V, the Wider Atlantic.

The aim of the OSPAR Convention is to protect the marine environment from the adverse effects of human activities and, in doing so, to safeguard human health and conserve marine ecosystems. The OSPAR Commission is the body through which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, come together and cooperate to protect the marine environment of the North-East Atlantic. The area covered by the OSPAR extends from the North Pole southwards to 36° N (the latitude of the Straits of Gibraltar) and from the Atlantic Coasts of Europe out to the mid-Atlantic (42° W).

Ecological Quality Objectives

The ecosystem approach is the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are crucial to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity. The ecosystem approach is not straightforward and requires operational tools. EcoQOs are being developed to provide operational objectives and indicators for applying the ecosystem approach.

OSPAR has been developing the EcoQO system for the North Sea, in collaboration with the International Council for the Exploration of the Sea (ICES), since 1992. EcoQOs express the desired qualities of a component of the ecosystem.
The EcoQOs developed so far cover many elements of the ecosystem, including phytoplankton, benthic species, fish, sea birds and marine mammals. Most of the EcoQOs can be linked to specific human activities, such as shipping (oil at sea), litter, fishing and pollution by chemicals and nutrients.

EcoQOs function both as indicators (to provide specific issues for monitoring) and objectives (against which to measure progress). As a set, they are intended to provide comprehensive coverage of the ecosystem and the pressures acting upon it, so that meeting all EcoQOs should indicate that the ecosystem is in a good state. Where EcoQOs are not met, it indicates the need for appropriate measures to regulate this specific human activity, or triggers further investigations into possible reasons for the EcoQO not being met.

This first set of EcoQOs has been tested and evaluated by North Sea countries (OSPAR Region 2) in the period 2002-2009. This process was led by the Netherlands and Norway with participation from Belgium, Germany and the United Kingdom. The results of this evaluation provide a contribution to the assessment of impacts from selected human pressures on the biodiversity and environmental status of the North Sea. This highlights the need for continued actions and measures to improve quality. A summary of the evaluation of the first application of each of the EcoQOs is given in chapter 2.

Ecological Quality Objectives

Safe fish stocks

What is the Problem?
Overfishing

Ecological quality Objective (EcoQO)

Fisheries have a major impact on the North Sea ecosystem, both directly by affecting targeted fish stocks and indirectly through affecting the food web. The EcoQO seeks to maintain safe levels of fish species by management of fisheries based on the precautionary principle.

The objective is to achieve safe levels of defined commercial fish stocks. This means ensuring that the SSB of these fish stocks is kept above the agreed precautionary limits used in fisheries management, so that we can be reasonably confident that the point at which there is a serious risk of stock collapse (the sustainable limit) is never reached. Precautionary limits have been set for 13 North Sea fish stocks (out of 15). There are also some stocks with restricted distribution in Skagerrak and Kattegat (7 stocks) and the Eastern Channel (2 stocks). The harvesting strategies for these fish stocks should result in a high probability of maintaining them above the agreed limit in the long term. The safest way to achieve this is to keep the fishing mortality (the proportion of the population removed annually by fishing) below the levels that would in the long run result in a SSB below the agreed precautionary limit.

Maintain the spawning stock biomass above precautionary reference points for commercial fish stocks where those were agreed by the competent authority for fisheries management. Spawning stock biomass (SSB) is the part of the biomass of the defined commercial fish stocks that takes part in the reproduction process. This is an important indicator of the biological health of these stocks.

The EcoQO is based on the system of evaluations of the status of commercial fish stocks used in practical fisheries management. Many commercial fish populations in the North Sea are regularly monitored by North Sea countries and assessed annually by ICES as a basis for advice to fisheries managers. By using this information, the EcoQO contributes to the integration of fisheries and environmental issues as part of the application of the ecosystem approach to management.

Has the EcoQO been reached?

An evaluation in 2008 indicated that the objective has not been met: one stock has a SSB below the sustainable limit (cod, *Gadus morhua*), two stocks (sole, *Solea solea* and herring, *Clupea harengus*) have a SSB below the precautionary limit. Two stocks (mackerel, *Scomber scombrus* and blue whiting, *Micromesistius poutassou*) have a SSB above the precautionary limit, but are subject to a fishing mortality above the precautionary level giving rise to a risk of SSB falling below the pre-

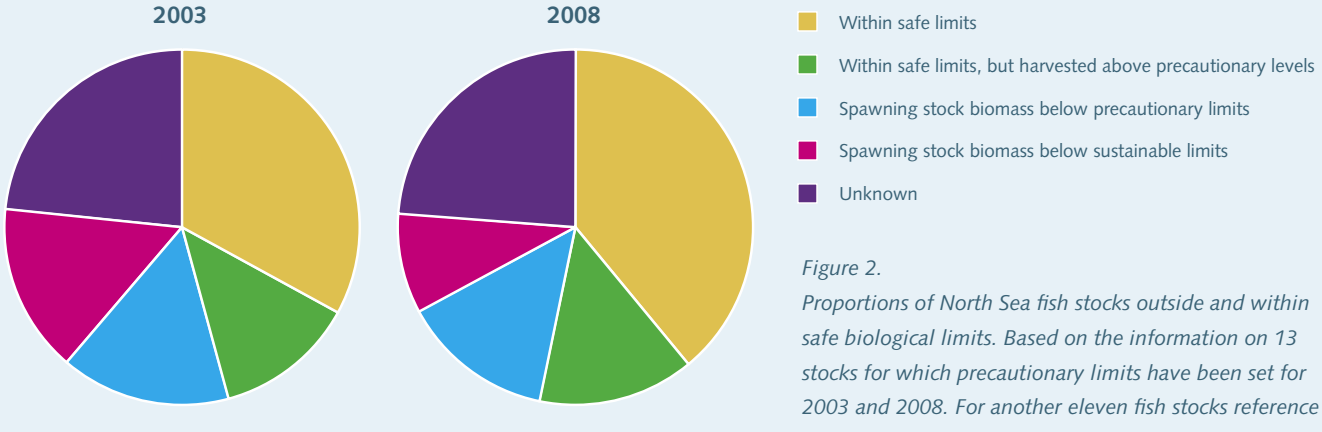


Figure 2.
Proportions of North Sea fish stocks outside and within safe biological limits. Based on the information on 13 stocks for which precautionary limits have been set for 2003 and 2008. For another eleven fish stocks reference points have not been set.

Safe fish stocks

tionary limit in the long run, if this level of harvesting continues. Two other stocks (sandeel, *Ammodytidae* and horse mackerel, T*rachurus trachurus*) have SSB above precautionary limits, but it is unclear whether they are harvested within safe limits. Five stocks are currently at safe levels (haddock, *Melanogrammus aeglefinus*; saithe, *Pollachius virens*; plaice, *Pleuronectes platessa*; hake, *Merluccius merluccius* and Norway pout, *Trisopterus esmarkii*). For 1 stock (whiting, *Merlangius merlangus*) no reliable assessment is available. For many local stocks in Kattegat and Skagerrak (7 stocks) and in the eastern Channel (2 stocks), as well as for two North Sea stocks, reference points have not been set, hence they have not been considered in this analysis.

SSB for plaice and hake has improved since 2003, and they are now considered to be at safe levels. In contrast the SSB for herring has been reduced to a level below the precautionary limit over the same period.

How does this work affect the overall quality status?

Commercial fish species are important components of marine ecosystems because they are the most important part of the biomass in the intermediate links in the food chain, between zooplankton and marine mammals and birds. Several commercial fish species have large populations in the North Sea (e.g. herring and mackerel) and they should have major roles in the structuring and functioning of the North Sea ecosystem and food web.

What do we do next?

This EcoQO reflects the desired quality status of North Sea fish stocks as important components of the North Sea ecosystem. More data are needed to set precautionary limits for all commercially fished stocks. Management measures could include the regulation of the fishing effort, the catch levels and the establishment of protected areas. Since OSPAR recognises that questions of fisheries management are more appropriately regulated by competent fisheries management authorities, OSPAR will urge these authorities to take appropriate measures for those stocks that fail to meet the objective. EU member states and Norway should work together under the Common Fisheries Policy to achieve any fisheries-related objectives under the EU Marine Strategy Framework Directive.

Healthy seal populations

What is the problem?
Declining seal populations

Ecological quality Objective (EcoQO)

Of the five species of seal that occur in the OSPAR area only the grey seal (*Halichoerus grypus*) and the harbour seal (*Phoca vitulina*) are common in the North Sea. Changes in population size or pup recruitment may indicate problems in the ecosystem, such as food shortage or pollution. The objective aims to maintain healthy populations of seals by triggering management actions when needed.

Has the EcoQO been reached?

In general, recruitment of grey seal pups in the North Sea has increased while the population of the harbour seal has decreased over the past five years. The EcoQO has thus probably been met for grey seals for all subunits of the North Sea population. The harbour seal EcoQO has not been met in some areas. This may be a consequence of seal disease outbreaks in these areas but in other areas the cause of decline in numbers hauled out is unknown.

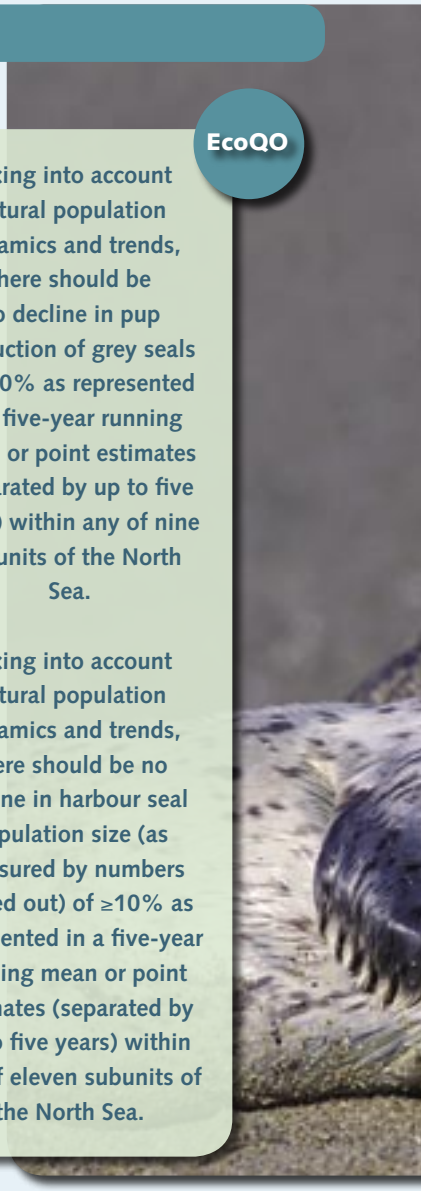
The status of the harbour seal EcoQO for parts of the eastern North Sea is unknown due to lack of data.

How does this work affect the overall quality status?

The EcoQO keeps under surveillance changes in the population size or pup recruitment, which might indicate problems in the ecosystem such as depletion of food stocks through fisheries, pollutants affecting reproductive ability or climate change. Moreover, a combination of problems may lead to deteriorated health and susceptibility to diseases. In recent decades, virus infections have led to high mortality amongst seals.

What do we do next?

This EcoQO does not reflect a single environmental factor but reflects the general status of seals. Many factors could underlie any changes and, therefore, failure to meet the EcoQO should trigger research and investigations to find out the cause of the changes. Where problems result from human activities, suitable management measures might then be taken.



EcoQO

Taking into account natural population dynamics and trends, there should be no decline in pup production of grey seals of ≥10% as represented in a five-year running mean or point estimates (separated by up to five years) within any of nine subunits of the North Sea.

Taking into account natural population dynamics and trends, there should be no decline in harbour seal population size (as measured by numbers hauled out) of ≥10% as represented in a five-year running mean or point estimates (separated by up to five years) within any of eleven subunits of the North Sea.

Minimise bycatch of harbour porpoise

Photo: Florian Graner/SeaPics.com

EcoQO

Annual bycatch levels of harbour porpoise should be reduced to levels below 1.7% of the best population estimate

What is the problem?
Bycatch of harbour porpoise in fisheries

Ecological quality Objective (EcoQO)

The harbour porpoise (*Phocoena phocoena*) is a small cetacean found in coastal waters throughout the OSPAR region. Several types of fisheries catch harbour porpoise as unintentional bycatch, especially those using bottom-set gill nets. Bycatch levels higher than the EcoQO level are considered to be unacceptable, as they are likely to affect the population size of the harbour porpoise in the long term.

Has the EcoQO been reached?

It has not so far been possible to assess whether or not the EcoQO has been met, because monitoring of the bycatch of harbour porpoises in the North Sea has not yet been fully implemented. In order to assess any bycatch as a percentage in this EcoQO, a best estimate of harbour porpoise numbers is also needed. At present, population estimates are considered unreliable.

How does this work affect the overall quality status?

As higher species in the food chain harbour porpoises play an important role in food web structure and ecosystem functioning. Incidental removal of such species can lead to cascading ecological changes.

What do we do next?

The EcoQO highlights the need for management measures. A first priority is to monitor the bycatch of harbour porpoises effectively. This should be done in cooperation with national and EU fisheries authorities and in collaboration with ASCOBANS. Where bycatch needs to be reduced, a number of actions are possible. One of the most promising prevention measures are pingers (acoustic alarms).
These have experimentally been shown to work by keeping porpoises away from nets. Further development is still required to ensure successful deployment in commercial fisheries. In the longer term other techniques may be developed. However, designing effective measures must take account of local conditions and fishing practices, using the expertise and experience of fishermen. All Contracting Parties need to improve the internal coherence between environmental commitments and decisions being taken in relation to the fishing industry.

Photo: Suzi Eszterhas/Foto Natura

Limiting the input of oil into the sea - low number of guillemots killed by oil

What is the problem?
Oil pollution

Photo: Peter Heslenfeld/Rijkswaterstaat

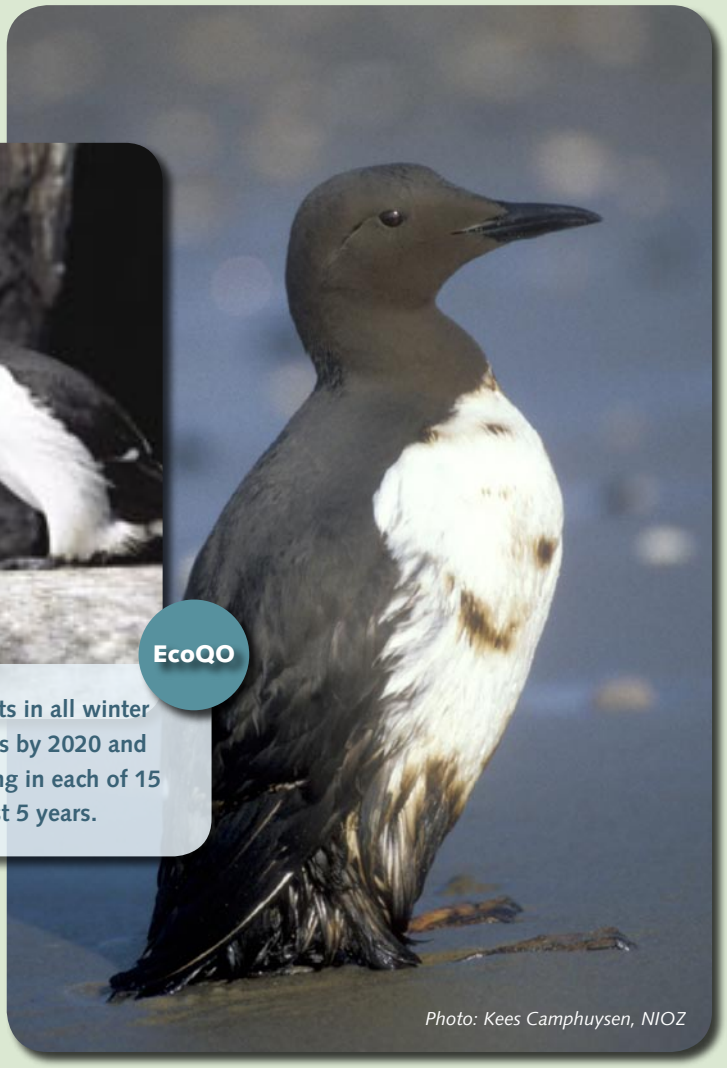


Photo: Kees Camphuysen, NIOZ

EcoQO

The average proportion of oiled common guillemots in all winter months (November to April) should be 20% or less by 2020 and 10% or less by 2030 of the total found dead or dying in each of 15 areas of the North Sea over a period of at least 5 years.

Ecological quality Objective (EcoQO)

Guillemots (*Uria aalge*) are deep-diving seabirds that live mostly at the sea surface and are common and widespread throughout the OSPAR area. Guillemots are very sensitive to oil pollution. A guillemot contaminated with oil will soon die due to hypothermia and because it is unable to forage and feed. Dead birds wash ashore and the proportion of contaminated stranded guillemots is indicative of area-specific levels of oil pollution at sea.

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Has the EcoQO been reached?

Only a few decades ago, around 90% of all stranded Common Guillemots in parts of the North Sea were oiled. Since then oiling rates have declined substantially in most areas and are still declining. This is a result of the introduction of MARPOL regulations, special areas and port state control under the IMO, together with improved awareness of oil pollution through surveillance and the introduction of Port Reception Facilities for oily wastes. Current oiling rates for stranded guillemots in the North Sea vary between 4% and >50% with the highest values in the southern North Sea (the Netherlands, Belgium and south-east England) and the lowest oil rates in Orkney (4%) and Shetland (14%).

How does this work affect the overall quality status?

Oil pollution is a problem for many marine species and habitats. Reaching the EcoQO, e.g. having a low level of oil pollution, would benefit all those affected.

What do we do next?

The main inputs of mineral oil to sea originate from ships (tank washings), land-based sources and, to a lesser extent, from the offshore oil industry (termed 'chronic oil pollution'). Accidents at sea are an episodic source. Since the discharge of oil or oily mixtures that cause slicks is prohibited, further steps would be to improve enforcement of current regulations. In addition, prevention, education, and effective oil recovery may lead to cessation of illegal discharges or reductions in impact.

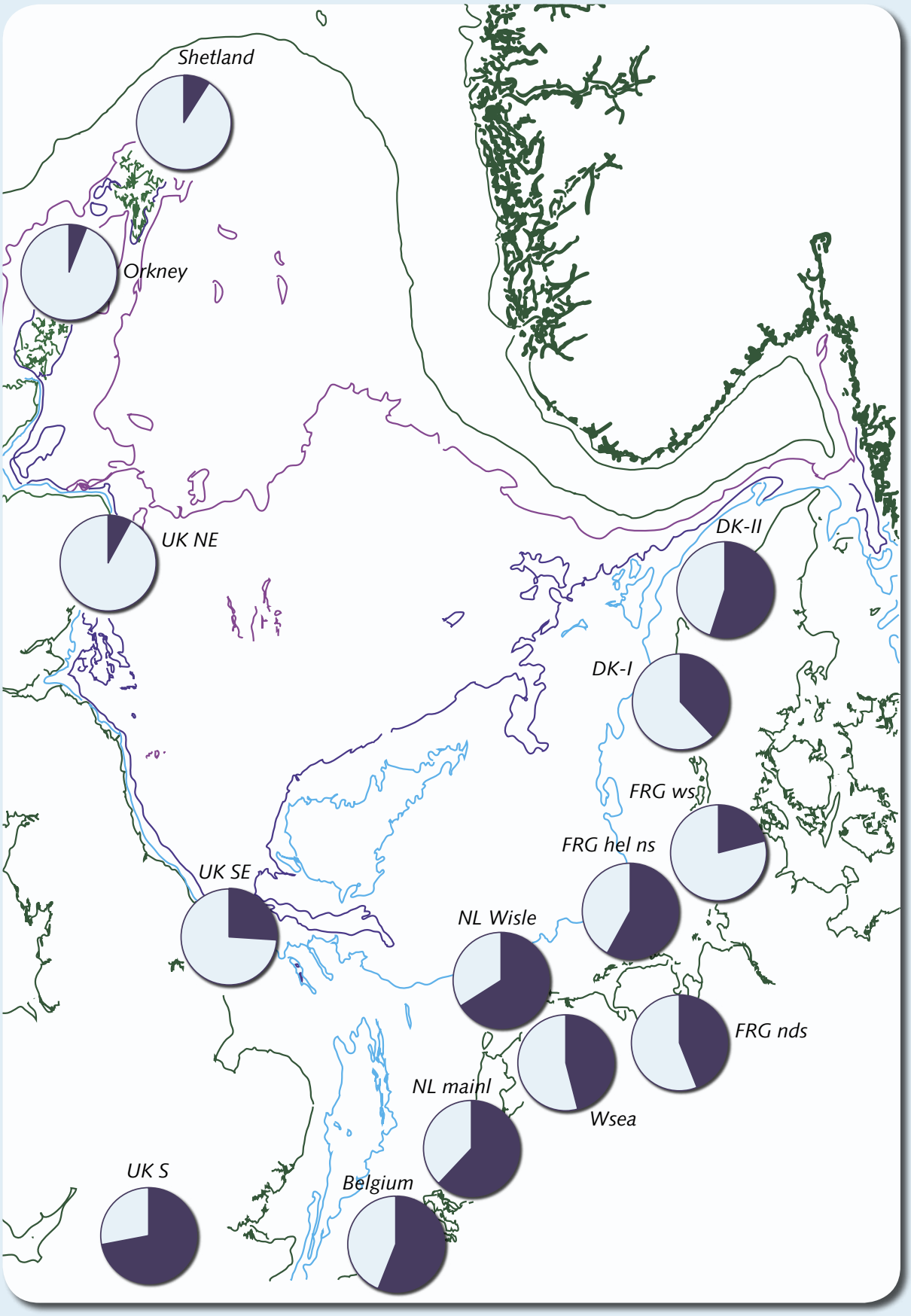
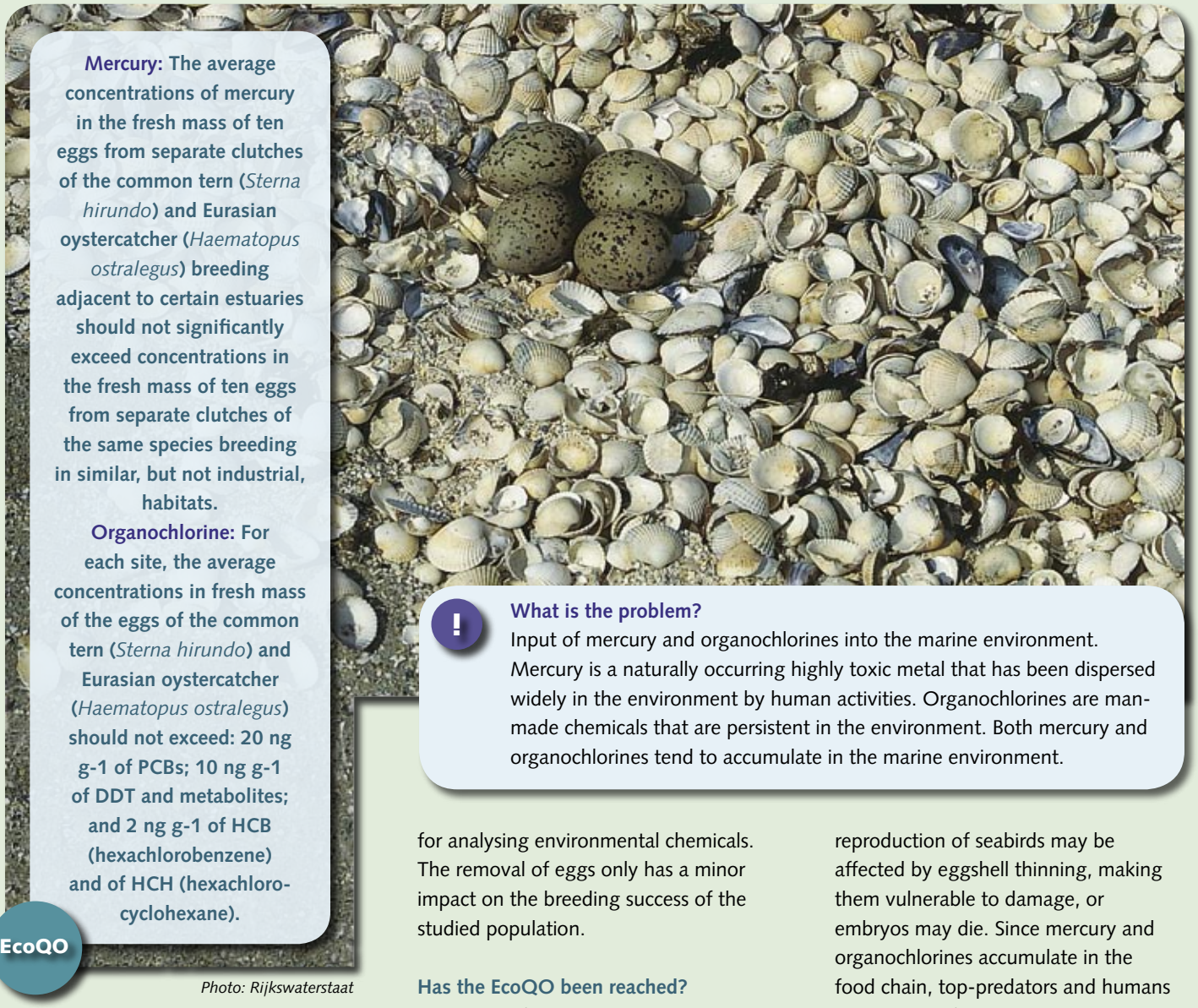


Fig 3: Mean oiled rate (% oiled) in Common Guillemots in the North Sea in the period 1997/98-2001/02

Limiting the input of mercury and organochlorines into the marine environment –level of mercury and organochlorines in seabird eggs



Mercury: The average concentrations of mercury in the fresh mass of ten eggs from separate clutches of the common tern (*Sterna hirundo*) and Eurasian oystercatcher (*Haematopus ostralegus*) breeding adjacent to certain estuaries should not significantly exceed concentrations in the fresh mass of ten eggs from separate clutches of the same species breeding in similar, but not industrial, habitats.

Organochlorine: For each site, the average concentrations in fresh mass of the eggs of the common tern (*Sterna hirundo*) and Eurasian oystercatcher (*Haematopus ostralegus*) should not exceed: 20 ng g-1 of PCBs; 10 ng g-1 of DDT and metabolites; and 2 ng g-1 of HCB (hexachlorobenzene) and of HCH (hexachloro-cyclohexane).

EcoQO

Photo: Rijkswaterstaat

What is the problem?

Input of mercury and organochlorines into the marine environment. Mercury is a naturally occurring highly toxic metal that has been dispersed widely in the environment by human activities. Organochlorines are man-made chemicals that are persistent in the environment. Both mercury and organochlorines tend to accumulate in the marine environment.

Ecological quality Objective (EcoQO)

Many coastal areas are important habitats for seabirds and are protected under the EC Birds and Habitats Directive. These areas are at the same time under pressure from pollution due to environmental chemicals. This contamination affects the coastal food web and accumulates in species at higher trophic level, including birds. Several studies have shown seabird eggs, including those of migrating species like terns, to be good indicators of local pollutant contamination since concentrations in eggs tend to reflect pollutant uptake by the female foraging close to the colony in the days prior to egg-laying. The bird egg has also been proven to be a favourable matrix for analysing environmental chemicals. The removal of eggs only has a minor impact on the breeding success of the studied population.

Has the EcoQO been reached?

First results from a North Sea pilot project on this EcoQO during 2008/09 indicate that, although the EcoQOs are met at many sites, elevated values are observed in some areas close to estuaries. Concentrations of HCB and HCHs are below the EcoQO values at most sites.

Long-term data from the Wadden Sea (since 1981) show a general decline of all substances monitored in eggs of common tern and oystercatcher at estuarine and coastal sites.

How does this work affect the overall quality status?

Persistent chemicals that are also toxic, such as organochlorines and mercury, may affect many aspects of an ecosystem. For instance, the reproduction of seabirds may be affected by eggshell thinning, making them vulnerable to damage, or embryos may die. Since mercury and organochlorines accumulate in the food chain, top-predators and humans run the risk of exposure to high levels, leading to serious health problems.

What do we do next?

Regulatory action to reduce the main discharges, emissions and losses of mercury and organochlorines to the environment has been taken. However, the persistent nature of these chemicals, combined with the possible remobilisation of these persistent substances within the environment, accounts for exceeding the EcoQO values for PCBs in eggs from all sites. These data suggest the need for continued assessment of this EcoQO in the North Sea in order to decide on further management measures or approaches.

Diminishing litter in the marine environment - plastic particles in fulmar stomachs

What is the problem?
Litter in the marine environment

There should be less than 10% of northern fulmars (*Fulmarus glacialis*) having more than 0.1 g plastic particles in the stomach in samples of 50 to 100 beach-washed fulmars found from each of 4 to 5 areas of the North Sea over a period of at least five years.

EcoQO

Photo: Chris Schenk/Foto Natura

Ecological quality Objective (EcoQO)

The northern fulmar has its distribution in the northern part of the OSPAR area, including in the greater North Sea. Fulmars forage exclusively at sea, capturing prey from the sea surface. Fulmars frequently ingest floating litter, including plastic objects presumably because they are mistaken for food. Fulmars do not regurgitate plastic particles but accumulate them. The content of plastic particles in their stomachs can therefore be used as an indicator for the amount of litter encountered at sea. Ingested plastics may reduce food intake and the ability to digest food leading to a deteriorated body condition associated with increased mortality and reduced breeding success.

Has the EcoQO been reached?

Over the period 2002-2006, the stomachs of 1090 beached fulmars from the North Sea were analysed. The percentage of fulmars with more than 0.1 gram plastic in the stomach ranged from about 45% to over 60% per area. The Channel area was the most heavily polluted while the Scottish Islands were the 'cleanest' region with a mean mass for plastics in fulmars of about a third of the level encountered in the Channel. Currently the 10% level of the EcoQO probably only occurs in Arctic populations. A long-term monitoring series for the Netherlands shows a significant reduction in plastic abundance from 1997 to 2006, mainly through a reduction in raw industrial plastics.

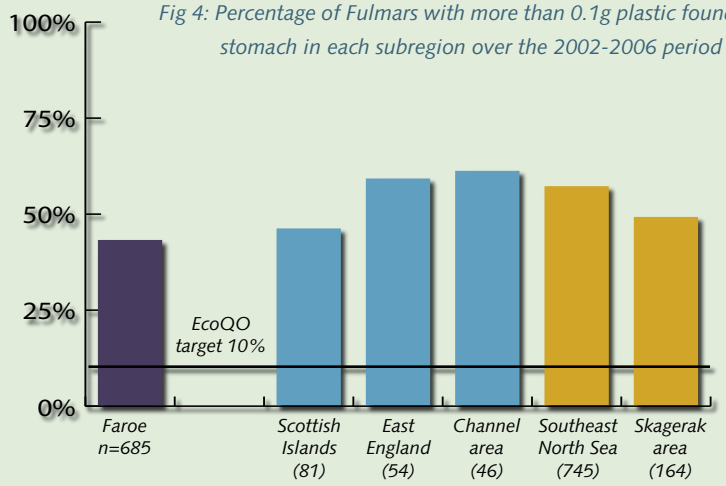
How does this work affect the overall quality status?

Litter causes problems in the marine environment for a number of species; animals die because of ingestion of litter or get entangled in larger pieces of litter. Meeting this EcoQO would indicate a reduction of litter at sea which would be of benefit to many marine species and reduce the amount of litter washed up on beaches.

What do we do next?

In order to meet the EcoQO, further refinements of the implementation of the EU Directive on Port Reception Facilities (2000/59/EC) and MARPOL Annex V may be needed as well as specific measures to reduce lost fishing gear.

Fig 4: Percentage of Fulmars with more than 0.1g plastic found in their stomach in each subregion over the 2002-2006 period



Example of the stomach contents of a fulmar. The ruler shows centimetres.

Restore large fish

What is the problem?
Overfishing

Ecological quality Objective (EcoQO)

TThe average length of fish can be used to indicate the impact of fishing on the fish community, since larger species of fish and larger and older individuals are generally caught more than smaller individuals. This means that, as a result of fishing, the relative abundance of small and early maturing fish species increases. This can be presented by the average length of fish in the catch per year using selected fish species. Over recent decades this average length has declined. The EcoQO seeks to halt this decline in the percentage of large fish and to begin to reverse the negative trend by 2010. This should result in a larger proportion of large fish and would improve fisheries yields. Although the most relevant human activity to this EcoQO is fishing, the reproductive success and life cycle of fish may be, less directly, influenced by land-based sources of discharges and emissions of chemicals.

Has the EcoQO been reached?

From the early 1980s, the percentage of fish greater than 40cm declined from around 30% to a low point of less than 5% in 2001, since then it has recovered to around 22% in 2008 (Figure 5).

How does this work affect the overall quality status?

Restoring the percentage of large fish in fish communities would not only mean healthier fish communities but would also improve fisheries yields.

What do we do next?

In order to reach the EcoQO the spatial and temporal distribution and intensity of fishing effort should be regulated. Additional management measures could include the establishment of protected areas.

Over 30% of fish (by weight) should be greater than 40 cm in length based on the ICES Quarter 1 International Bottom Trawl Survey (ICES Q1 IBTS) series.

EcoQO

Norwegian Cod, by Eva Degre

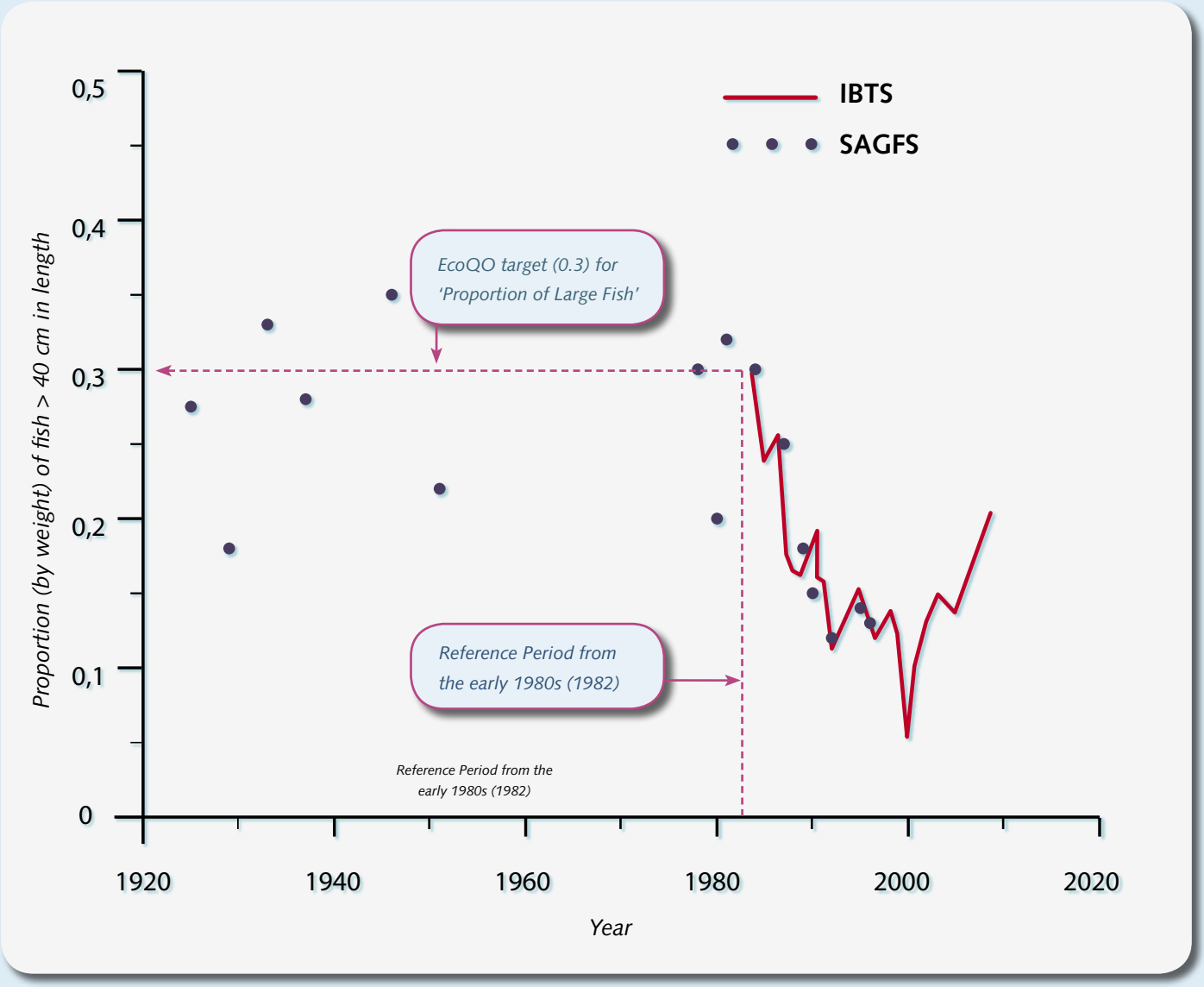


Fig 5: The Scottish Autumn Ground Fish Survey (SAGFS) aggregated year group data has been used to derive a target value for the EcoQO of 30% of fish greater than 40cm in length based upon the "early 1980s" as the reference period. Variation in the ICES IBTS data set (solid red line) shows recent trends.

Decreasing the impact of TBT containing antifouling paints - Imposex in dog whelks and other sea snails

The average level of imposex in a sample of not less than 10 female dog whelks (*Nucella lapillus*) should be consistent with exposure to TBT concentrations below the environmental assessment criterion for TBT. Where Nucella lapillus does not occur naturally or where it has become extinct, other species may be used.

EcoQO

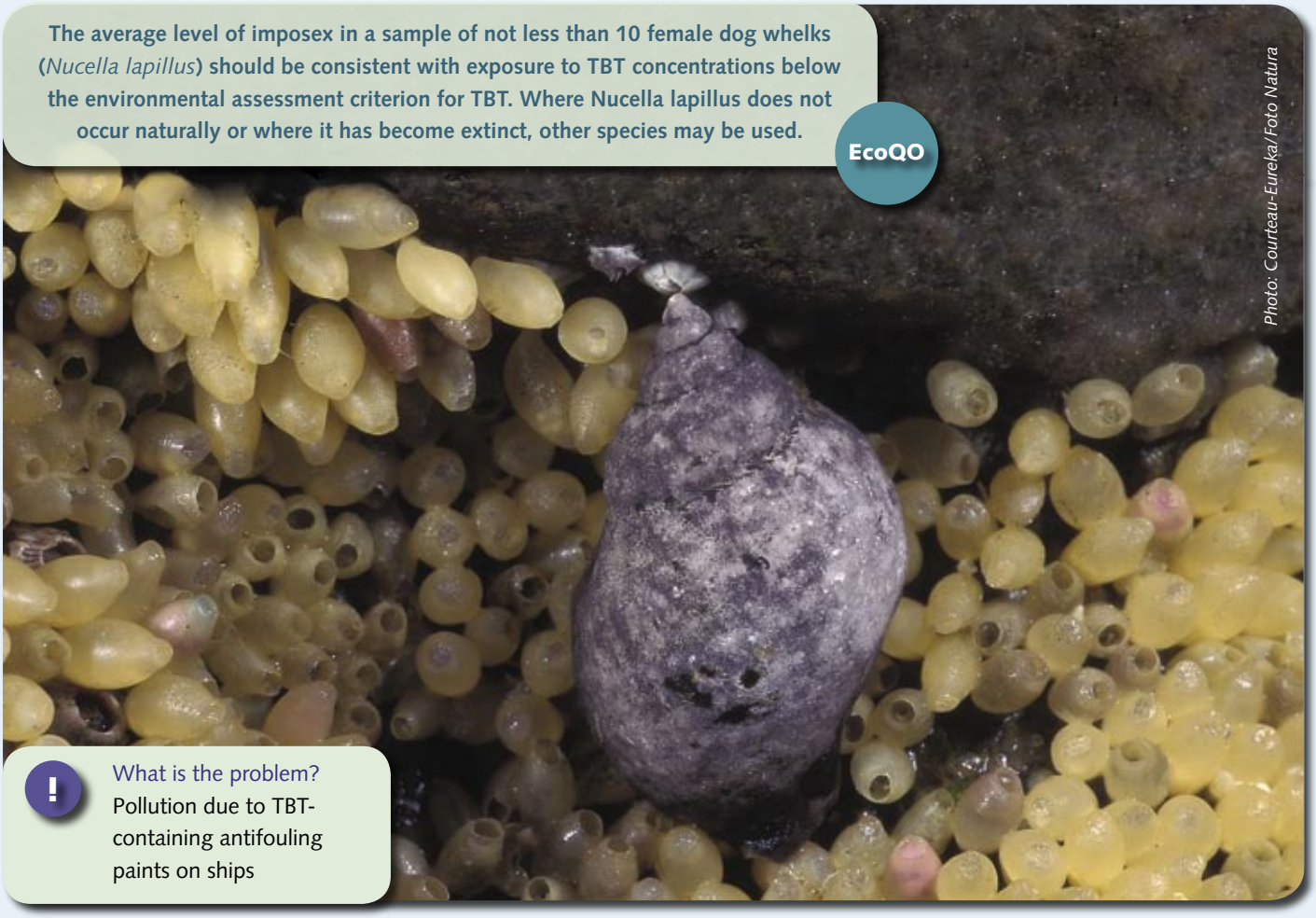


Photo: Courteau-Eureka/Foto Natura

What is the problem?
Pollution due to TBT-containing antifouling paints on ships

Ecological quality Objective (EcoQO)

The dog whelk is a carnivorous sea snail that is found on most rocky shores in the OSPAR area. Dog whelks and related snail species are extremely sensitive to the harmful effects of tributyltin (TBT), which has been extensively used as an antifouling agent in ship paints. Depending on the concentration of TBT in the seawater, female dog whelks develop non-functional male characteristics (such as a male sex organ) in a pathological condition called imposex. This condition prohibits the snails from reproducing which leads to a decline or even disappearance of snail populations. Because of their extreme sensitivity, dog whelks are used as an indicator species to measure the effects of TBT on the marine ecosystem.

Has the EcoQO been reached?

OSPAR's assessments show that, with the exception of a limited number of locations, the EcoQO has not been met in the North Sea area. Levels of imposex are of particular concern in the vicinity of major ports, shipping lanes and shipyards. Out of 134 monitoring time series significant downward trends in the level of imposex have been found at 24 stations, with only 4 stations having a significant upward trend. In the remaining 106 stations a downward trend is estimated. These results indicate that the situation in general is improving. However, the North Sea still suffers from the consequences of historic inputs related to shipping activities as is confirmed by the levels of TBT that are still found in sediments. The relative absence of upward trends indicates that only a limited input still remains linked to very local situations.

How does this work affect the overall quality status?

This work seeks to combat adverse effects on numerous species from the presence of TBT in the marine environment. Low-level exposure of aquatic organisms, such as mussels, clams, and oysters, to TBT may cause structural changes, growth retardation, and death. TBT is also highly toxic to crustaceans. Moreover, TBT bioaccumulates in the food chain posing a potential hazard to birds, sea mammals and even humans.

What do we do next?

International measures have been taken to prohibit the further use of TBT under the International Maritime Organisation and within the European Union. Implementation of these measures should in time lead to the elimination of TBT from the marine environment and improve the water quality. As a result, an improvement in the condition of populations of dog whelks should be expected over the next 10 years. OSPAR continues to monitor and will, if necessary, propose additional measures.

A marine environment where eutrophication does not occur

What is the problem?

Eutrophication occurs when the enrichment of water by nutrients, specifically phosphate and nitrogen leads to an accelerated growth of algae and plants causing an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned. This environmental problem is present in various parts of the OSPAR area.

Ecological quality Objective (EcoQO)

The EcoQO system includes a general (overarching) EcoQO for eutrophication, which represents the overall objective of the OSPAR Eutrophication Strategy to achieve and maintain a healthy marine environment where eutrophication does not occur by 2010. This EcoQO is based on an integrated subset of five EcoQOs for eutrophication. The 5 specific EcoQOs (winter nutrients, phytoplankton chlorophyll a, phytoplankton indicator species, oxygen and benthos) correspond to a selection of cause-effect related assessment parameters and assessment levels as applied under the Comprehensive Procedure for assessing the eutrophication status of an area.

Has the EcoQO been reached?

The overarching objective is not met in several parts of the OSPAR Maritime Area. For the North Sea, a number of coastal waters have been classified as problem areas with regard to eutrophication, in particular, off Belgium, Denmark, France, Germany, the Netherlands, Norway, Sweden and the UK (estuaries).

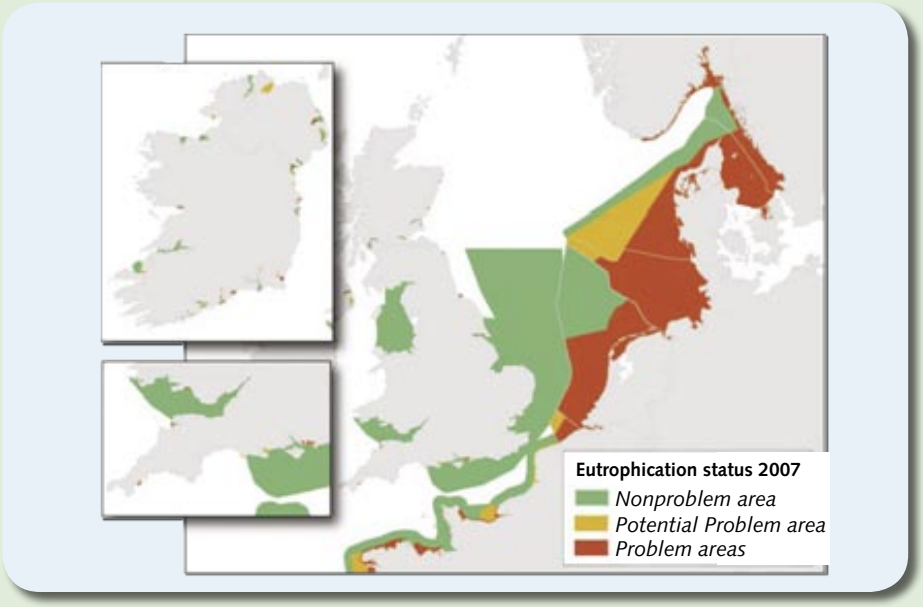


Fig 6: Eutrophication Status of the Greater North Sea and the Celtic Seas in 2007.

How does this work affect the overall quality status?

The EcoQO seeks to combat the negative effects of eutrophication on marine ecosystems which include: algal blooms, increased growth of macroalgae, increased sedimentation and oxygen consumption, oxygen depletion in the bottom water and sometimes the death of benthic animals and fish. Additionally, there is some evidence that changes in nitrogen to phosphorus ratios can affect species composition and food web structure.

What do we do next?

The integrated set of EcoQOs is in a testing phase. Further work within the OSPAR Eutrophication Committee is required to modify them for their application to specific regions. In some areas, current monitoring is not sufficient or coherent and is lacking in spatial and temporal coverage. Thus there is a need to improve monitoring. In this respect, it will be important to coordinate with fisheries agencies that are monitoring nutrients and other variables in order to describe environmental conditions and productivity. Likewise there is a need to make use of other monitoring systems for observing surface algal blooms, such as the routine airborne surveys for spotting oil pollution carried out under the Bonn Agreement. This would have advantages over satellite-based observation where cloud coverage is very often a hindrance.

Photo: Jan Haelters/Mumm

EcoQOs under development

In addition to the nine more advanced EcoQOs described above, work is in progress on further EcoQOs to provide a comprehensive coverage of the ecosystem. The following EcoQOs are currently being developed:

- Seabird population trends as an index of seabird community health.
- Restoring and/or maintaining the quality and extent of threatened and/or declining habitats in the North Sea as shown on the OSPAR List.
- Litter on the beach.

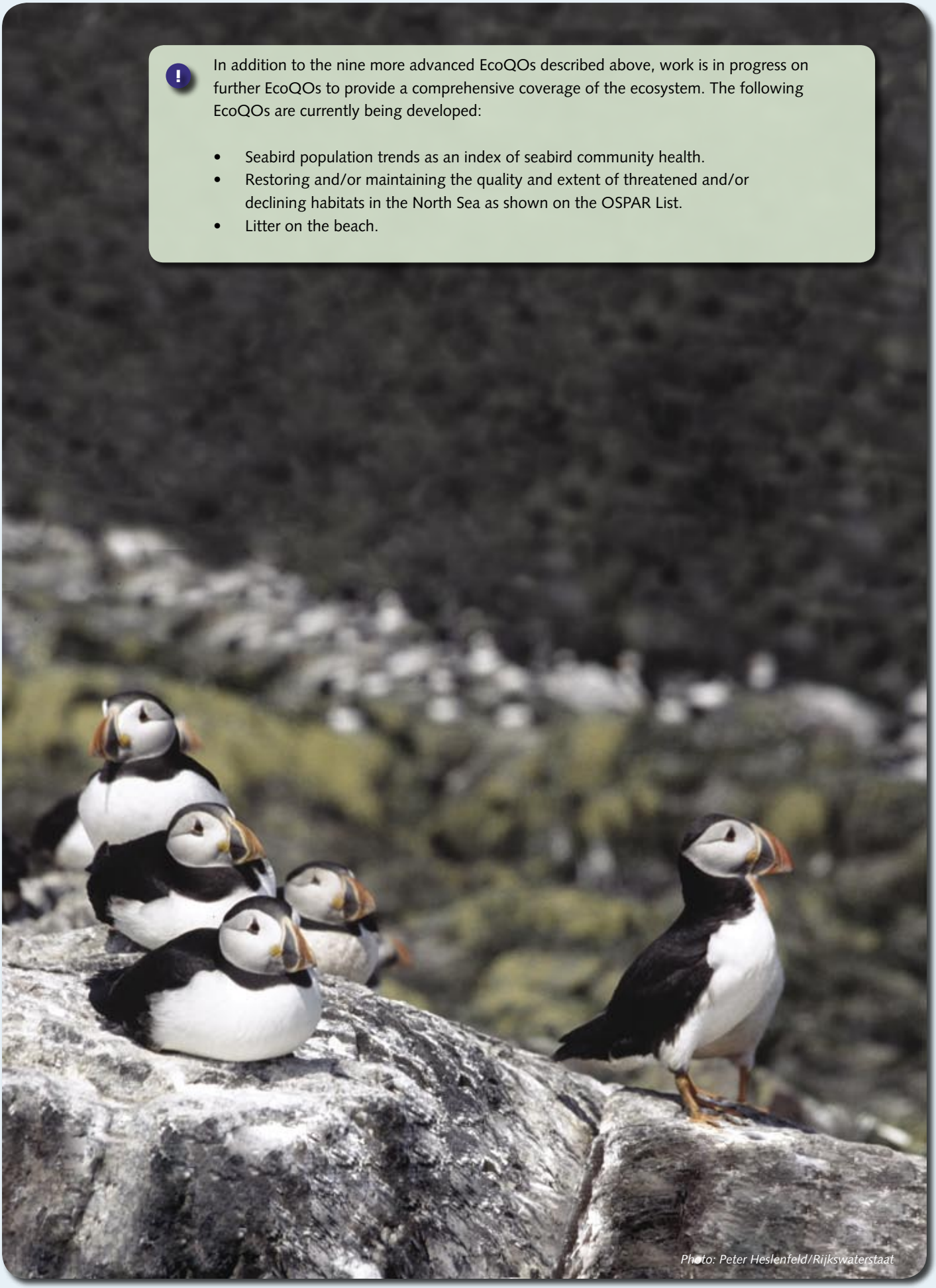


Photo: Peter Heslenfeld/Rijkswaterstaat

Conclusion and recommendations

The EcoQO system provides a clear set of objectives and targets for the quality of different ecosystem components in response to a range of human pressures. Development and implementation of EcoQOs has shown that some are more robust than others and provided valuable experience in developing tools and monitoring programmes via regional cooperation in fields beyond OSPAR's established pollution programmes. A

The most important lessons learnt are that:

1. **the EcoQO system can be enforced by a more thorough implementation by all North Sea countries;**

2. **the set of EcoQOs does not yet cover all components and processes in the marine environment and hence does not yet provide a comprehensive assessment of the overall status of the marine environment in the North Sea**

What do we do next?

The results of the considerable work by OSPAR on EcoQOs, both over the past 15 years and in the future, need to be linked with requirements to assess Good Environmental Status (GES) via the eleven quality descriptors set out in the Marine Strategy Framework Directive.

The EcoQO system needs to be consolidated to provide a more comprehensive coverage of ecosystem components and pressures, which will help to strengthen assessments of the overall status of the North Sea. Existing EcoQOs may require some adaptation for application in other OSPAR Regions. Additional EcoQOs could be developed that are specific to these regions. For example in region I Norway has developed an EcoQO related to Brünnich's guillemot (Uria lomvi) as a measure of the impact of pollutants. For region V an EcoQO related to bycatch of loggerhead turtles (Caretta caretta) and leatherback turtles (Dermochelys coriacea) could be developed. The EcoQO system needs to be supported by a coordinated monitoring programme throughout the OSPAR region. Its results will provide a basis for developments in management of the marine environment.

Photo: Linda Pitkin/Foto Natura

OSPAR COMMISSION

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